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PRODUCT INDEX

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SYNERGY® MICROWAVE CORPORATION

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SURFACE MOUNT COMPONENTS

Surface-mounting of components saves critical space on the circuit board, can result in more reliable circuits and systems, and can reduce the cost of production through automated circuit fabrication. And since circuit densities are increasing as more and more functions are combined within the confines of a finite amount of space, surface mounting looks more appealing all the time.

Surface mounting and its benefits

Unlike familiar flatpacks and plug-in packages, surface mount components do not require the PC board to be machined (drilled, routed, punched, etc.), and thus, eliminate special handling considerations. In addition, the components may be placed on the circuit board with automated "pick and place" equipment, saving an enormous amount of manpower while significantly increasing productivity and circuit yield.

No holes or cutouts are needed, as is the case with using other package styles, such as flatpacks or through hole mount. Components can be mounted to both sides of the printed circuit board, making better use of circuit board area. The height of most surface mount components is also much lower than most other component types. This combined with the area reduction, contributes to significant circuit volume reduction. Circuit fabrication can be automated.

There are also electrical performance benefits to using surface mount components. Inductance and stray capacitances are lower, due to elimination of series connecting leads and glass to metal seals. Recent advances in surface-mount technology have also added EMI/RFI shielding to many surface-mount package styles, making them exceed the performance of other package styles well into the microwave range.

Compare these advantages to the traditional package styles, and you can see why surface mounting has become so popular.

Fabrication considerations

Like any package configuration, surface mounting has its own requirements, which if followed scrupulously, will produce extremely reliable mounting.

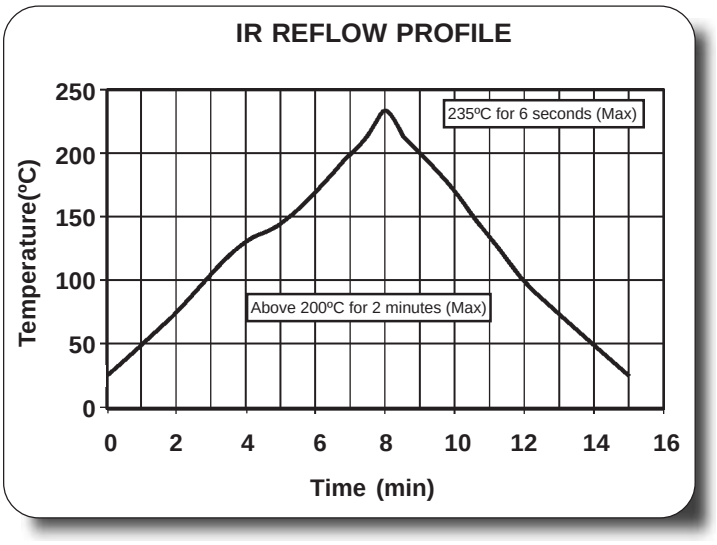
For high volume applications, tape and reel specifications must first be considered and the pick and place equipment must be programmed for proper and accurate feeding of the tape into the pick and place machines. Tape and reel information, component placement and orientation for specific models are given in this catalog.

Coplanarity is a concern with surface mount technology, and is more prominent with leaded packages. Synergy components are generally less than 0.003 inches (0.006 inches on gull-wing surface mount models, such as in the TW series of transformers). Leadless packages have the pad connections in the same plane, etched on the substrate and coplanarity is not usually of concern. As the size of surface mount packages increases, due to higher and higher circuit densities, coplanarity is more difficult to control.

Clean surface of the component leads/pads and circuit board is essential for reliable solder connections. Proper storage and handling precautions must be exercised to minimize contaminants and oxides. Flux should be used in the soldering operation to enhance solderability.

There are various soldering methods available which can be used to assemble surface-mount components. Synergy recommends vapor phase solder re-flow because it produces rapid, uniform heating of the assembly and melting of the solder. It is the cleanest method, and generally produces the best overall results. The infrared method in comparison, provides far less even heating, because some parts of a component can be in a shadow (infrared is after all light). Other sections of the component can be overheated. Consequently, yield is usually lower, and reliable solder joints are not as easy to ensure. The conducted heat method inherently provides less control over the heating process, and is subject to more variables than any other method. It is the least acceptable method.

The re-flow temperature profile should be monitored to insure that surface mount components are not being overheated. Proper planning and experimentation is necessary to optimize the soldering process. Small components heat up quicker than larger components and an optimum temperature must be established. With infrared heating, temperature probes should be placed on various points of the printed circuit board assembly, to insure that components are not being overheated. In some extreme cases, soldering of the larger components may have to be done by hand, after the assembly of the smaller components. Larger components may shadow smaller components from the heat source. The recommended solder profile for Synergy products follows.

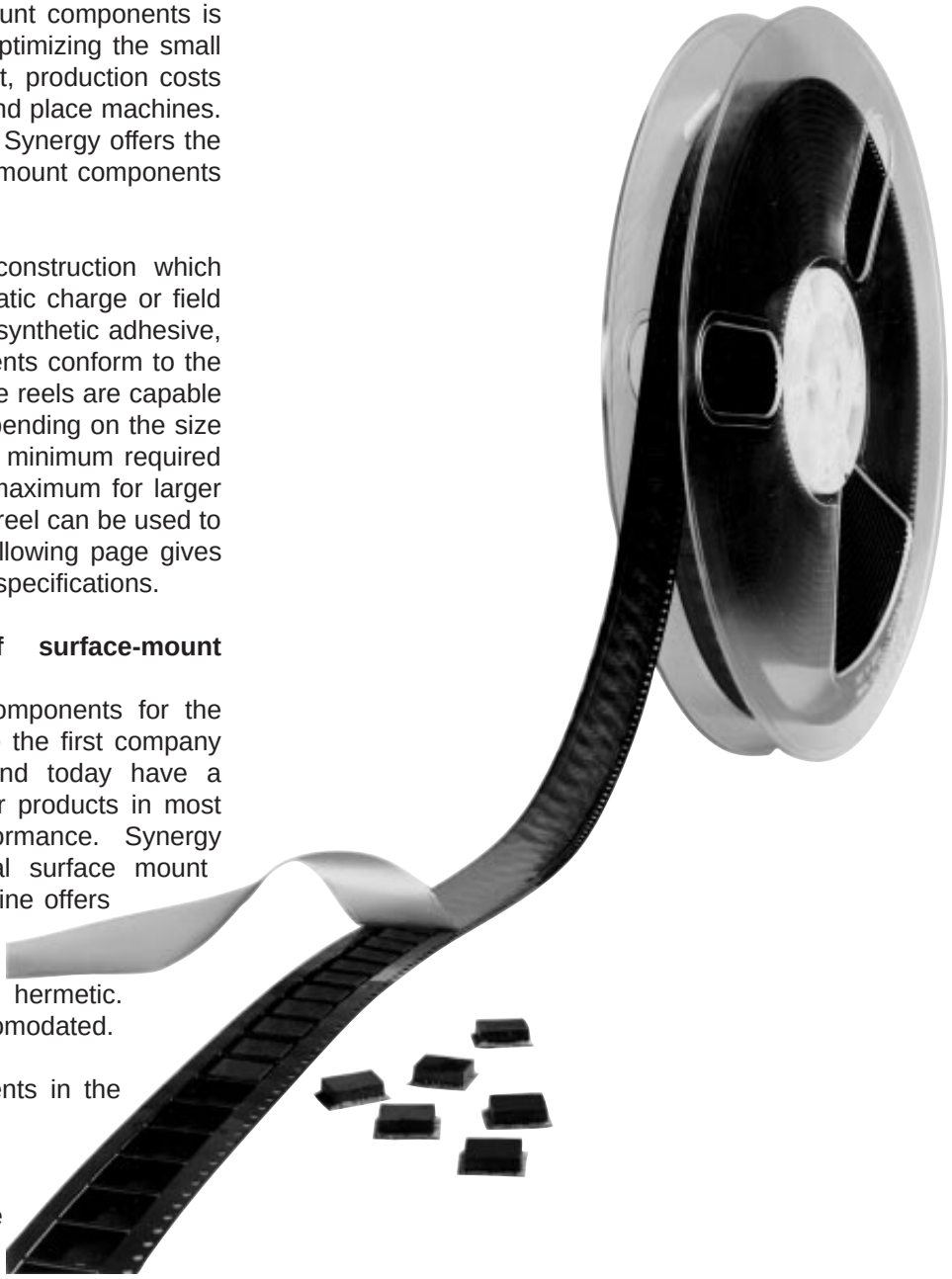


Aqueous cleaning after the soldering operation is now used extensively, due to new environmental laws. A concern arises for non-hermetic surface mount components, where moisture can penetrate to the inside of the components and degrade the electrical performance. A cool down period of approximately one hour should be allowed after soldering and prior to cleaning. If necessary, a stabilization bake should be performed to remove any moisture that may have seeped into the inside.

TAPE AND REEL

The main calling card for surface-mount components is to allow for automated assembly. By optimizing the small design of the surface mount component, production costs can be minimized with the use of pick and place machines. To allow for the use of these machines, Synergy offers the option of receiving most of the surface mount components on tape and reel.

Each reel uses thermoplastic film construction which protects the components from electrostatic charge or field induced effects. When sealed with the synthetic adhesive, nonconductive cover tape, the components conform to the specifications as listed in EIA-481A. The reels are capable of holding from 100 to 1000 pieces (depending on the size of the component.) In most cases, the minimum required quantity per reel is 500 pieces or the maximum for larger components. In special cases, a 7 inch reel can be used to accomodate smaller quantities. The following page gives further information on the tape and reel specifications.



Synergy offers many types of surface-mount components.

Synergy pioneered surface-mount components for the RF and microwave designer. We were the first company to introduce surface-mount mixers, and today have a complete family of surface-mount mixer products in most popular combinations of electrical performance. Synergy has earned a patent for a "universal surface mount package", and in its extensive product line offers various surface-mount package styles to choose from such as - leaded, leadless, ceramic, plastic, EMI/RFI shielded and hermetic. Custom requirements can easily be accomodated.

We also offer the following components in the various surface-mount packages:

* Voltage controlled oscillators
* Frequency synthesizers and phase locked oscillators
* I&Q modulators/demodulators
* Image reject mixers
* QPSK modulators
* Phase shifters
* Filters - low pass, bandpass, highpass
* Phase detectors
* Phase comparators
* Directional couplers
* Power dividers
* BPSK modulators
* Frequency doublers
* Quadrature hybrids
* Transformers

Contact Synergy if the device you need is not found in this standard catalog.

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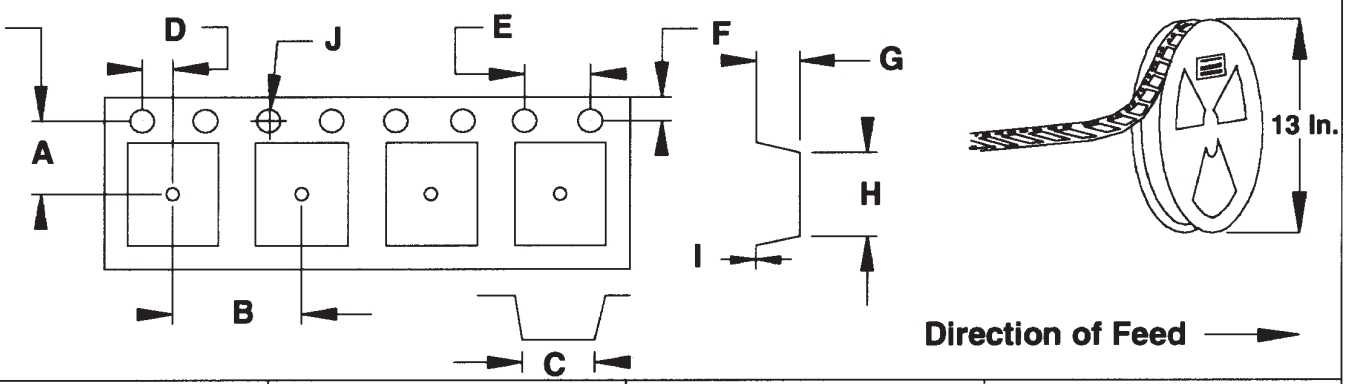
TAPE AND REEL SPECIFICATIONS

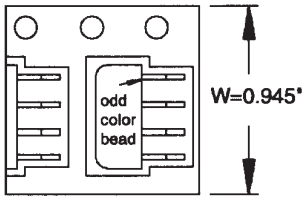


Tolerances:

For W < 1.0"	For W >1.0"
A = +/-0.005"	A = +/-0.015"
B = +/-0.005"	B = +/-0.010"
C = +/-0.005"	C = +/-0.014"
D = +/-0.005"	D = +/-0.006"
E = +/-0.004"	E = +/-0.004"
F = +/-0.005"	F = +/-0.005"
G = +/-0.005"	G = +/-0.004"
H = +/-0.005"	H = +/-0.005"
I = +/-0.0005"	I = +/-0.0005"
J = +0.004" (-0.000")	J = +0.004" (-0.000")
W=+0.012" (-0.004")	W=+0.012" (-0.004")

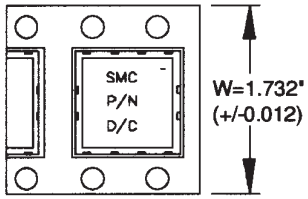
A	0.453	G	0.251
B	0.630	H	0.516
C	0.472	I	0.0135
D	0.079	J	0.061
E	0.158		
F	0.069		

106B



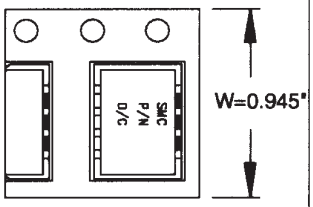
A	0.795	G	0.446
B	1.257	H	0.971
C	0.970	I	0.0165
D	0.079	J	0.0591
E	0.158		
F	0.069		

124S



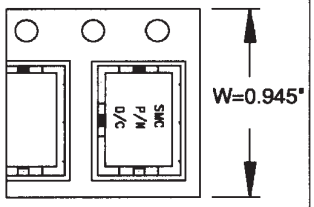
A	0.453	G	0.155
B	0.472	H	0.339
C	0.400	I	0.0135
D	0.079	J	0.059
E	0.158		
F	0.069		

129



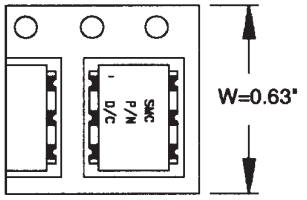
A	0.453	G	0.155
B	0.472	H	0.339
C	0.400	I	0.0135
D	0.079	J	0.059
E	0.158		
F	0.069		

133



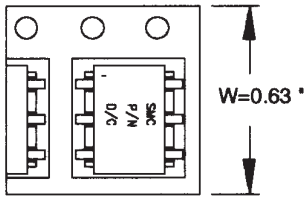
A	0.295	G	0.206
B	0.472	H	0.339
C	0.276	I	0.0135
D	0.079	J	0.059
E	0.158		
F	0.069		

134



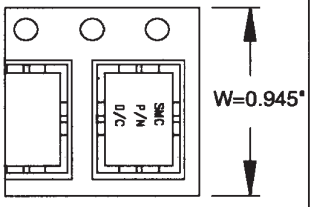
A	0.295	G	0.260
B	0.472	H	0.357
C	0.340	I	0.014
D	0.079	J	0.059
E	0.157		
F	0.069		

134S,134J



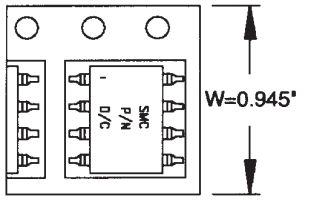
A	0.453	G	0.155
B	0.472	H	0.339
C	0.400	I	0.0135
D	0.079	J	0.059
E	0.158		
F	0.069		

139



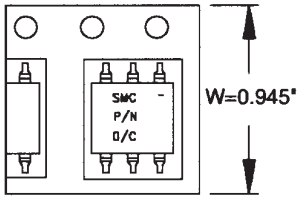
A	0.453	G	0.240
B	0.630	H	0.430
C	0.425	I	0.014
D	0.079	J	0.059
E	0.157		
F	0.069		

154



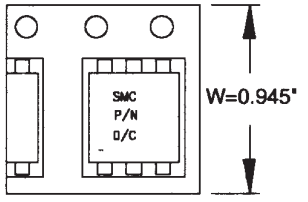
A	0.453	G	0.244
B	0.472	H	0.457
C	0.343	I	0.014
D	0.079	J	0.059
E	0.158		
F	0.069		

156



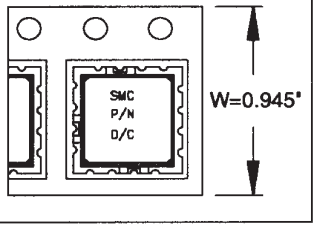
A	0.453	G	0.244
B	0.472	H	0.457
C	0.343	I	0.014
D	0.079	J	0.059
E	0.158		
F	0.069		

159



A	0.453	G	0.233
B	0.630	H	0.515
C	0.515	I	0.0135
D	0.079	J	0.059
E	0.158		
F	0.069		

174S



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VOLTAGE CONTROLLED OSCILLATORS

Introduction

In simple terms, an oscillator is an amplifier where sufficient energy is coupled back from the output to the input to become unstable and start oscillating. The output port then provides the wanted output power into the load and the overall circuit configuration determines the frequency stability and sensitivity to load changes. Figure 1 shows the feedback arrangement.

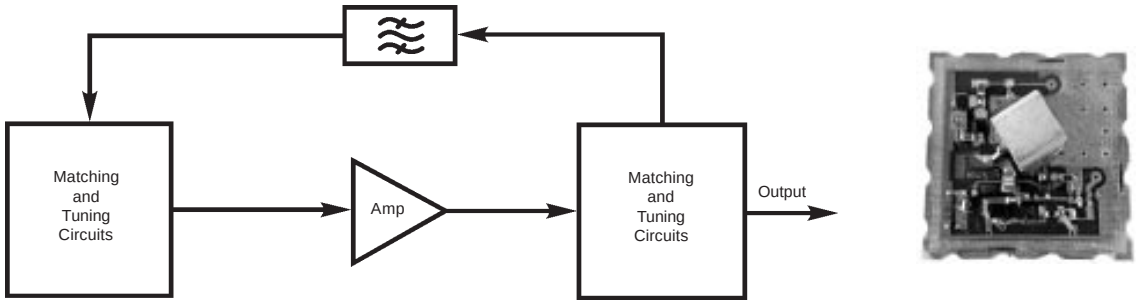


Fig. 1 — An oscillator viewed as a feed-forward amplifier with positive feedback through the resonator. Start-up of oscillation requires that the gain of the amplifier exceed the loss of the resonator and that the total phase shift through the amplifier and resonator be a multiple of 360°. To sustain oscillation, the phase shift must remain the same and the amplifier gain must be equal to or greater than the resonator loss.

While there are several configurations possible, the most popular oscillator configuration up to very high frequencies is the Clapp oscillator circuit. Practically all high performance oscillators with wide tuning range follow this basic configuration. Energy can be coupled either from the collector or from the emitter of a BJT oscillator. The same basic concept applies to an oscillator using a silicon junction FET. The use of GaAsFETs is reserved for high microwave and millimeterwave applications, typically above 10 GHz. The principle of operation of this circuit is that the feedback loop generates a negative impedance (negative resistive part) which compensates for all the losses. The sum of all the resistive elements must still be slightly negative. This condition of the modified Barkhausen equation has to be met to start and maintain oscillation.

The following is an interpretation to calculate the conditions necessary for oscillation. It is based on the fact that an ideal tuned circuit (infinite Q), once excited, will oscillate infinitely because there is no resistance element present to dissipate the energy. In the actual case (where the inductor Q is finite), the oscillations die out because energy is dissipated in the resistance. It is the function of the amplifier to maintain oscillations by supplying an amount of energy equal to that dissipated. This source of energy can be interpreted as a negative resistor in series with the tuned circuit. If the total resistance is positive, the oscillations will die out, while the oscillation amplitude will increase if the total resistance is negative. To maintain oscillations, the two resistors must be of equal magnitude. To see how a negative resistance is realized, the input impedance of the circuit in Figure 2 will be derived. Figure 3 shows an equivalent small signal circuit of Figure 2.

The steady-state loop equations are

$$V_{in} = I_{in}(X_{C_1} + X_{C_2}) - I_b(X_{C_1} - \beta X_{C_2}) \quad (1)$$

$$0 = -I_{in}(X_{C_1}) + I_b(X_{C_1} + h_{ie}) \quad (2)$$

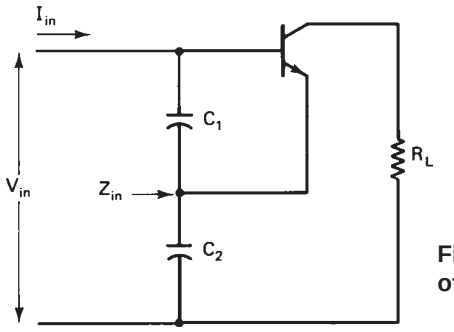


Fig. 2 — Calculation of input impedance of the negative-resistance oscillator.

After I_b is eliminated from these two equations, Z_{in} is obtained as

$$Z_{in} = \frac{V_{in}}{I_{in}} = \frac{(1+\beta)X_{C_1}X_{C_2} + h_{ie}(X_{C_1} + X_{C_2})}{X_{C_1} + h_{ie}} \tag{3}$$

if $X_{C1} \ll h_{ie}$, the input impedance is approximately equal to

$$Z_{in} \approx \frac{1+\beta}{h_{ie}} X_{C_1}X_{C_2} + (X_{C_1} + X_{C_2}) \tag{4}$$

$$Z_{in} \approx \frac{-g_m}{\omega^2 C_1 C_2} + \frac{1}{j\omega[C_1C_2/(C_1+C_2)]} \tag{5}$$

That is, the input impedance of the circuit shown in Figure 3 is a negative resistor,

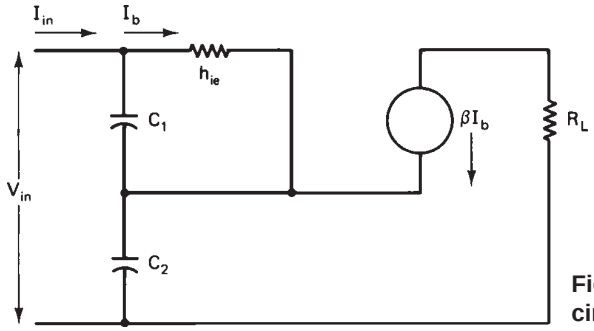


Fig. 3 - Equivalent small-signal circuit of Figure 2.

$$R = \frac{-g_m}{\omega^2 C_1 C_2} \tag{6}$$

in series with a capacitor,

$$C_{in} = \frac{C_1 C_2}{C_1 + C_2} \tag{7}$$

which is the series combination of the two capacitors. With and inductor L (with the series resistance R_s) connected across the input, it is clear that the condition for sustained oscillation is

$$R_s = \frac{g_m}{\omega^2 C_1 C_2} \tag{8}$$

and the frequency of oscillation

$$f_o = \frac{1}{2\pi\sqrt{L[C_1C_2/(C_1+C_2)]}} \tag{9}$$

This interpretation of the oscillator readily provides several guidelines which can be used in the design. First, C_1 should be as large as possible so that

$$X_{C_1} \ll h_{ie}$$

and C_2 is be large so that

$$X_{C_2} \ll \frac{1}{h_{oe}}$$

When these two capacitors are large, the transistor base-to-emitter and collector-to-emitter capacitances will have a negligible effect on the circuit's performance. However, Eq. (8) limits the maximum value of the capacitances since

$$r \le \frac{g_m}{\omega^2 C_1 C_2} \le \frac{G}{\omega^2 C_1 C_2} \tag{10}$$

where G is the maximum value of g_m. For a given product of C_1 and C_2, the series capacitances is a maximum when $C_1 = C_2 = C_m$. Thus Eq. (10) can be written

$$\frac{1}{\omega C_m} > \sqrt{\frac{r}{G}} \tag{11}$$

This equation is important in that it shows that for oscillations to be maintained, the minimum permissible reactance ($1/\omega C_m$) is a function of the resistance of the inductor and the transistor's mutual conductance g_m.

An oscillator circuit known as the *Clapp* circuit or *Clapp-Gouriet* circuit is shown in Figure 4. This oscillator is equivalent to the one just discussed, but it has the practical advantage of being able to provide another degree of design freedom by making C_o much smaller than C_1 and C_2. It is possible to use C_1 and C_2 to satisfy the condition of Eq. (10) and then adjust C_o for the desired frequency of oscillation ω_o which is determined from

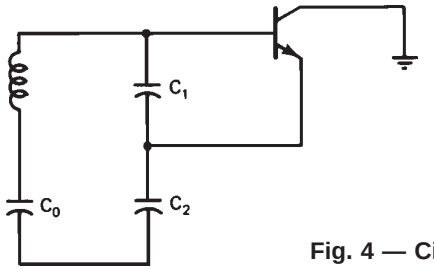
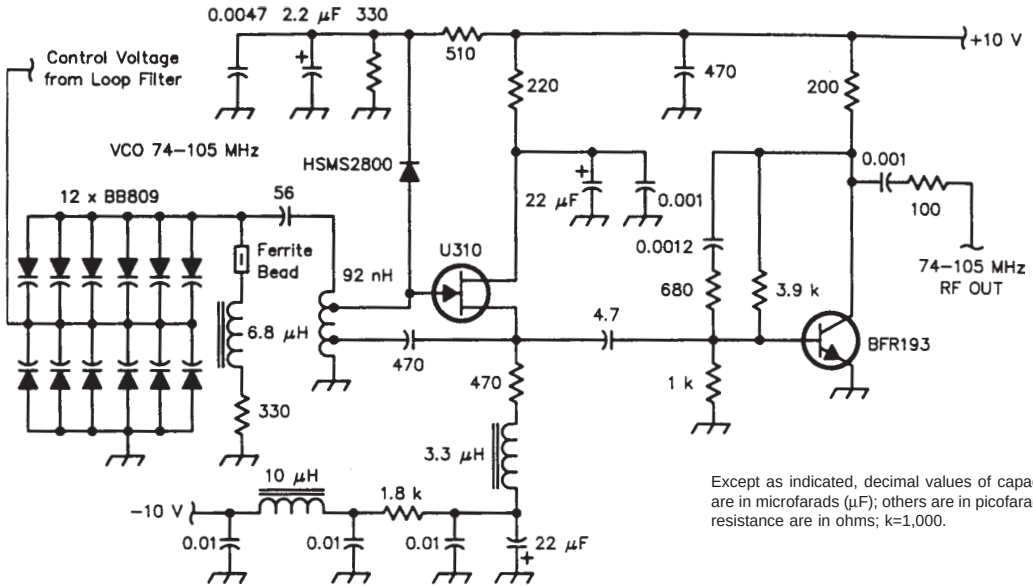


Fig. 4 — Circuit of Clapp oscillator.

For frequency applications above several hundred MHz, the discrete inductance is exchanged to be a transmission line, and for even higher frequencies (such as 800 MHz and higher), a ceramic resonator of high Q is the best choice. Also, one can use SAW oscillators (surface acoustic wave resonators) and dielectic-resonator-based oscillators.

$$\omega_o L - \frac{1}{\omega_o C_o} - \frac{1}{\omega_o C_1} - \frac{1}{\omega_o C_2} = 0 \tag{12}$$

These types of oscillators can be made voltage controlled oscillators by changing capacitor C_O from a fixed value to a voltage dependent capacitor, commonly referred to as tuning diode or varactor. The use of just a single diode is typically discouraged. For small DC voltages, the tuning diode becomes conductive in the positive half of the sine wave, and this reduces the Q and deteriorates the phase noise performance. As a minimum, a high-performance oscillator requires one set of anti-parallel diodes. A high-performance VCO is shown in Figure 5. A more detailed introduction to designing VCOs is found in References 1 and 2.



Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads(pF); resistance are in ohms; k=1,000.

Fig. 5 — Improved phase-noise performance can be obtained by using a number of tuning diodes in the antiparallel arrangement shown here. The 92-nH coil is a 4-turn coil tapped at 1 and 2 turns from the ground end.

Wideband VCOs vs. Narrowband VCOs

The tuning range of an oscillator is determined by the amount of fixed capacitance versus available capacitance in the circuit. In many cases (such as in cellular telephone applications), the tuning range required is limited to 5% (for example, 50 MHz relative to 1000 MHz). Some applications require ranges of up to 2:1, however. In these cases, tuning diodes with a high capacitance range are required. These diodes are frequently referred to as hyperabrupt diodes. The drawback of hyperabrupt diodes is that their transfer characteristics, or change of capacitance as a function of voltage, is not very linear.

Figure 6 shows the capacitance voltage characteristic for three different types of diodes. The operating range of the capacitance diode or (its useful capacitance ratio) is limited by the requirement that the diode must not be driven into forward conduction or breakdown by the RF voltage superimposed on the tuning voltage. Otherwise, rectification would take place, shifting the bias of the diode and considerably affecting its figure of merit.

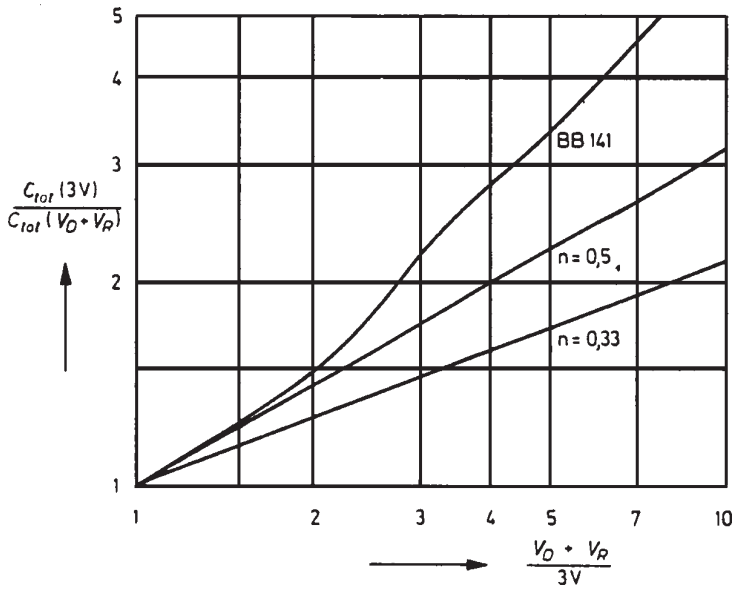


Fig. 6 — Capacitance/voltage characteristic for
a) an alloyed capacitance diode
b) a diffused capacitance diode
c) a wide-range tuner diode (BB141)

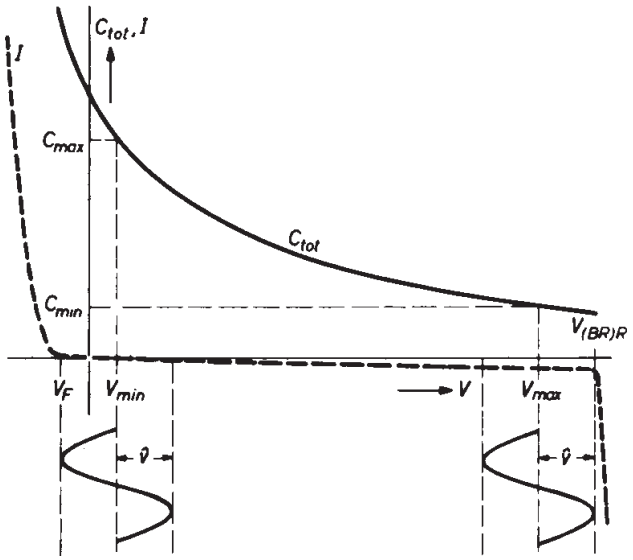


Fig. 7 — Basic current/voltage and capacitance/voltage characteristics of a tuning diode.

As a result of a high alternating voltage at the resonant circuit, capacitance contributed by tuning diodes may produce three undesirable effects:

1) The nonlinearity of the capacitance may generate more harmonics than the oscillator circuit produces by itself. The RF voltage across the diodes should therefore be kept small.

2) Even when a sinusoidal voltage is applied to the tuning diodes, their capacitance variation does not follow the sine law. Depending on the amplitude of the applied voltage, this may result in a change of the resonator frequency. Under certain conditions, this can even lead to bistable behavior, and the oscillator may show an effect called *squegging.*

3) Intermodulation, a disturbance caused by nonlinearities in the diode characteristics, is virtually independent of the oscillator amplitude. It can result in the transfer of an undesired signal (noise) to the oscillator output signal (carrier). The undesired signal is the noise internally generated by the oscillator transistor(s). This intermodulation, the mechanism of which is also referred to as *AM-to-PM conversion*, occurs in BJT PN and NP junctions and their FET equivalents.

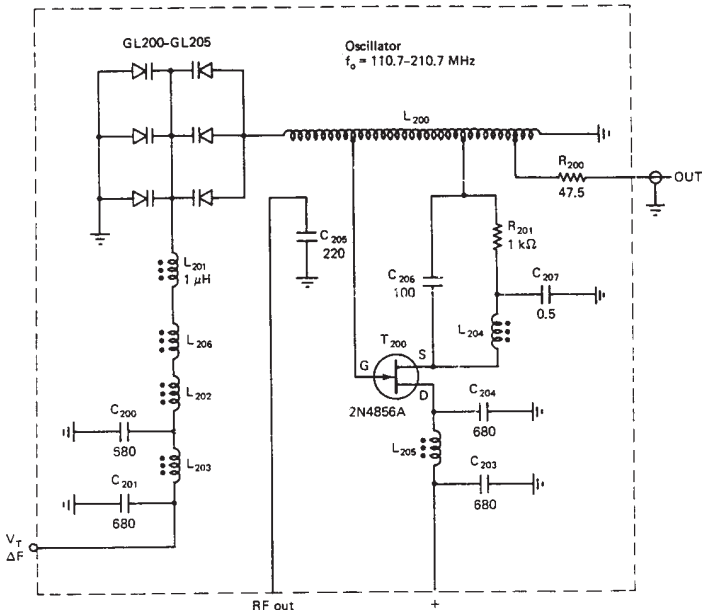


Fig. 8 — Practical circuit of a wideband VCO.

Phase Noise

One of the key characteristics of the oscillator is the oscillator noise frequently referred to as single *side-band phase noise.*

Oscillator Noise

The SSB phase noise of an oscillator is well described by the Leeson model and its enhancements. Leading engineers such as M. Driscoll of Westinghouse and Tom Parker of Raytheon have expanded the model to include the flicker-noise component even of passive components. The enhanced Leeson equation, as proposed by Parker and others, is shown in Figure 9.

$$S_\phi(f_m) = \left[\alpha_R F_o^4 + \alpha_E \left(F_o / (2Q_L)\right)^2\right] \Big/ f_m^3$$
$$+ \left[(2GFKT / P_o)\left(F_o / (2Q_L)\right)^2\right] \Big/ f_m^2$$
$$+ (2\alpha_R Q_L F_o^3) \Big/ f_m^2$$
$$+ \alpha_E / f_m + 2GFKT / P_o$$

Fig. 9 — The Leeson equation for oscillator phase noise. *G* is the compressed power gain of the loop amplifier, *F*, is the noise factor of the loop amplifier, *K* is Boltzmann's constant, *T* is the temperature in Kelvins, P_o is the carrier output power, in watts, at the output of the loop amplifier, F_o is the carrier frequency in hertz, f_m is the carrier offset frequency in hertz, Q_L is the loaded Q of the resonator in the feedback loop, and α_R and α_E are the flicker noise constants for the resonator and loop amplifier, respectively.

Numerous circuits have been developed to implement oscillators. These circuits have various advantages and disadvantages, depending on the frequency of operation and the resonator type. For circuits in the 400 to 2000 MHz range, modern oscillators tend to use transmission-line resonators and capacitive feedback of the Colpitts or Clapp type. At these frequencies, bipolar transistors are generally used, since few FETs have sufficient gain-bandwidth product for use in UHF oscillator circuits.

Requirements for Low-Noise Oscillators — The key elements that determine the phase noise of an oscillator are:

- the transistor's flicker-noise corner frequency, which depends on the device current;
- the loaded Q of the resonator, which depends on the coupling between the resonator and the transistor; and
- the ultimate signal-to-noise ratio, which depends on the RF output power of the oscillator and its large-signal noise figure.

Of these, the first two can be investigated using linear circuit analysis. But the active device's large-signal operation requires nonlinear analysis techniques, without which we can make only educated approximations of the ultimate signal-to-noise ratio.

The Linear Approach

The design goal of the linear approach is to achieve the maximum loaded Q of the resonator and to keep the bias (DC) device current to a minimum. A high Q helps restrict noise components to frequencies close to the frequency of oscillation, minimizing phase noise as we move away from that frequency. The requirement for minimum bias exists because the flicker, or 1/f, noise of the device is highly dependent on the current. Table 1 shows the flicker-noise corner frequency versus collector current for a typical bipolar transistor. JFETs have much less flicker noise than bipolar tansistors, while GaAsFETs have more.

Table 1 - Flicker Corner Frequency vs. Collector Current for a Typical Bipolar Transistor (from Note 6)

I_c (mA)	F_c (kHz)
0.25	1
0.5	2.74
1	4.3
2	6.27
5	9.3

Oscillator Operation — At start-up, the oscillator's open-loop gain must be sufficient to begin oscillation. The circuit's amplitude stabilization mechanism is responsible for sustaining oscillation. We can view the oscillator as a two-terminal negative-resistance generator, as shown in Figure 10. Here, the total resistance—the sum of the resonator resistance and the resistance of the two-terminal oscillator—must be less than or equal to zero for oscillation. The net reactance will be zero at resonance.

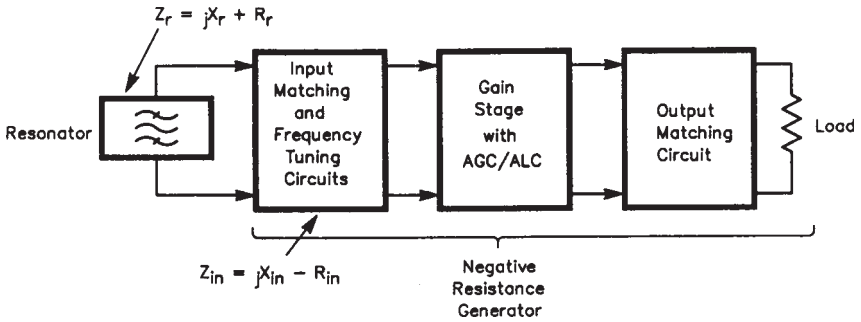


Fig. 10 - An oscillator viewed as a resonator and a negative resistance generator. At start-up, the resonator and oscillator reactances must be equal in value and opposite in sign, while the sum of the resonator and oscillator resistances must be less than 0. For sustained oscillation, the sum of the resistances must not become positive.

Although we can't precisely analyze the large-signal operation of a circuit using wholly linear techniques, we should recognize some effects that will impact our linear analysis. Chief among these is bias shift. The large signals present in the circuit in a bipolar oscillator will cause a shift in the bias current, because of the nonlinearity of the base-emitter junction. The device current may be about 10% different from the nominal (no-signal) current and may shift in either direction (more current or less). Since the flicker noise is bias-dependent, this effect is important to keep in mind.

The recommended approach to finding the bias-dependent loading of the resonator by the active device is to construct a linearized model of the device using its measured S-parameters at a particular bias point. This is especially important at higher frequencies. For simplicity, we have chosen not to do this in the example that follows, but to use a simple model.

Over a wide range of current, the device f_t remains constant. Since:

$$f_t = \frac{1}{2\pi R_d C_e} \tag{13}$$

where R_d is the emitter diffusion resistance and C_e is the emitter capacitance, and since:

$$R_d = \frac{26\ \text{mV}}{I_E} \tag{14}$$

(at room temperature), where I_E is the emitter bias current, we can therefore adjust the R_d and C_e parameters of our device model to reflect the bias current we expect to use. This will allow our linear circuit model to reflect the bias dependency of the oscillator.

As mentioned before, flicker noise is dependent largely on the bias current. But the *effect* of flicker noise can be reduced. This noise contributes to the phase noise by modulating the oscillator's frequency via AM-to-PM conversion. We can reduce this modulation by use of negative feedback. A simplified noise model of a transistor is shown in Figure 11.

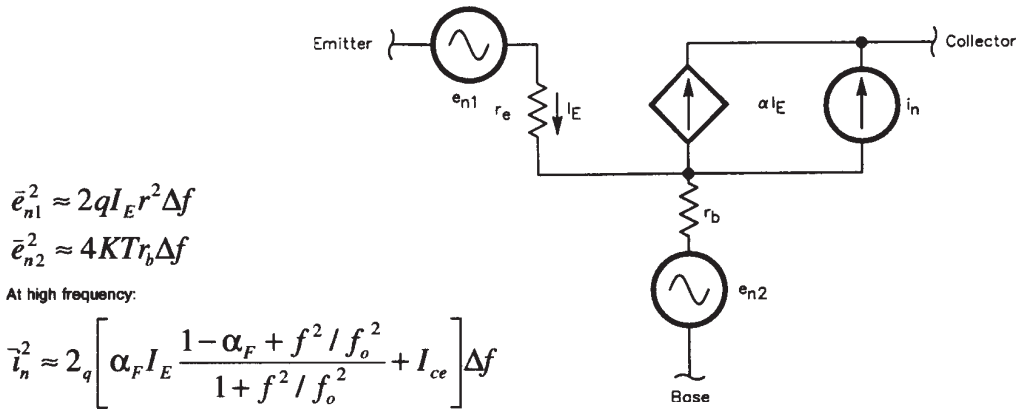


Fig. #11 — A simplified bipolar transistor noise model with white-noise sources.

The effect of applying negative feedback to reduce phase noise is shown in Figure 12.

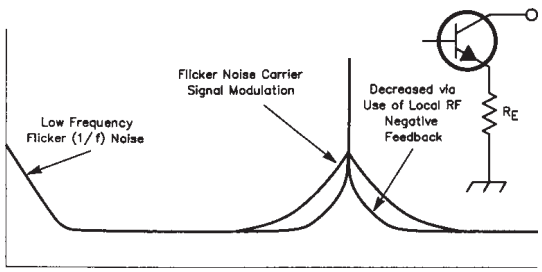


Fig. 12 — Adding negative feedback can reduce the amount of AM-to-PM modulation of the carrier by the transistor's flicker noise.

VCO Noise — So far, we have considered only the noise from the transistor. When we extend our design to become a VCO, by adding a tuning diode, we must also consider the phase noise introduced by that diode. Contrary to what you may have read elsewhere, this noise is not due solely to Q reduction from the added diode. The diode itself introduces noise that modulates the VCO frequency. The easiest way to analyze this noise is to treat the diode's noise contribution as that of an equivalent resistance, R. This resistor can then be considered to be generating the thermal noise voltage that any resistance exhibits:

$$V_n = \sqrt{4KT_0R\Delta f} \tag{15}$$

where V_n is the open-circuit RMS thermal noise voltage across the diode, K is Boltzmann's constant, T_0 is the temperature in Kelvins, R is the equivalent noise resistance of the tuning diode, and Δf is the bandwidth we wish to consider. At room temperature (about 300 K), KT_0 is 4.2×10^{-21}.

Practical values of R for tuning diodes range from about 1 kΩ to 50 kΩ. For a value of 10 kΩ, for example, we would find a noise voltage from Eq. 15 of:

$$V_n = \sqrt{4 \times 4.2 \times 1 - {}^{-21} \times 10{,}000}$$
$$= 1.265 \times 10^{-8} \ \ \mathrm{V}/\sqrt{\mathrm{Hz}}$$

This noise voltage from the tuning diode modulates the frequency of the oscillator in proportion to the oscillator's VCO gain, K_0, (the frequency swing per volt of the tuning signal):

$$(\Delta f_{\mathrm{rms}}) = K_0 \times (1.265 \times 10^{-8}\,\mathrm{V}) \tag{16}$$

in a 1-Hz bandwidth. This can be related to the peak phase deviation, θ_d :

$$\theta_d = \frac{K_0\sqrt{2}}{f_m}(1.265 \times 10^{-8}\,\mathrm{rad}) \tag{17}$$

in a 1-Hz bandwidth, where f_m is the frequency offset of the noise from the oscillator operating frequency. Applying a typical VCO gain of 100 kHz/V gives a typical peak phase deviation of:

$$\theta_d = \frac{0.00179}{f_m}\,\mathrm{rad} \tag{18}$$

in a 1-Hz bandwidth. For an offset of 25 kHz, as might be used to find the noise in an adjacent FM channel, this gives $\theta_d = 7.17 \times 10^{-8}$ rad in a 1-Hz bandwidth. Finally, we can convert this result into the SSB signal-to-noise ratio at the specified frequency offset:

$$L(f_m) = 20\log_{10}\frac{\theta_d}{2} = -149\,\mathrm{dBc/Hz} \tag{19}$$

It is also worth noting that the nonlinear capacitance vs. voltage characteristic of a tuning diode results in a tuning sensitivity—and thus a noise performance—that depends on the input tuning voltage. Modern CAD tools can help in the analysis of an oscillator.

Figure 13 shows the circuit of a typical 950 MHz ceramic resonator based oscillator.

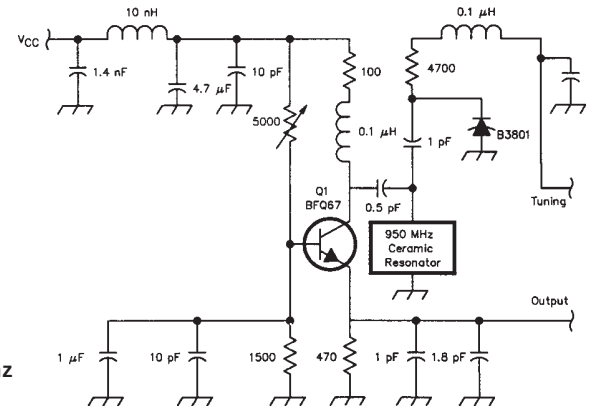


Fig. 13 — Circuit of typical 950-Mhz ceramic resonator based oscillator.

Figure 14a shows its measured performance while Figure 14b shows its CAD prediction. As can be seen from Figure 15, phase noise increases as the tuning sensitivity of the VCO is increased.

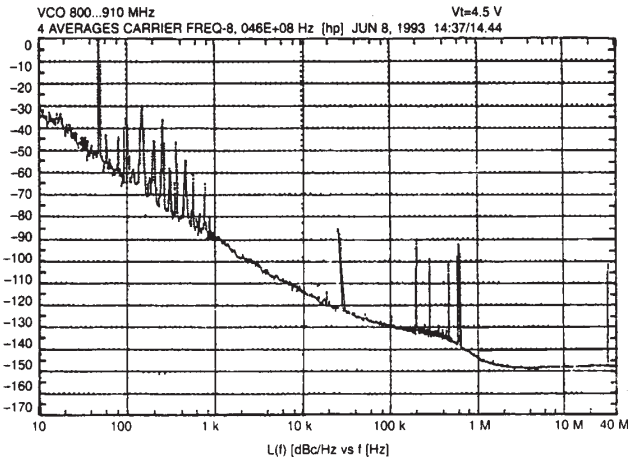


Fig. 14a — Measured phase noise of the oscillator of Figure 13.

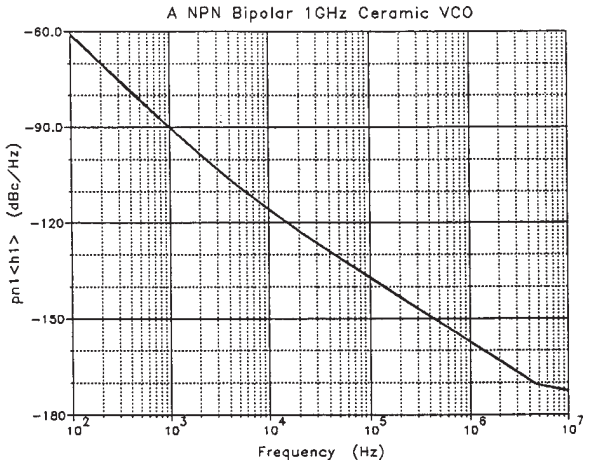


Fig. 14b — Predicted phase noise of the 1-GHz ceramic resonator VCO with the tuning diode attached. Note the good agreement between the measured and predicted phase noise.

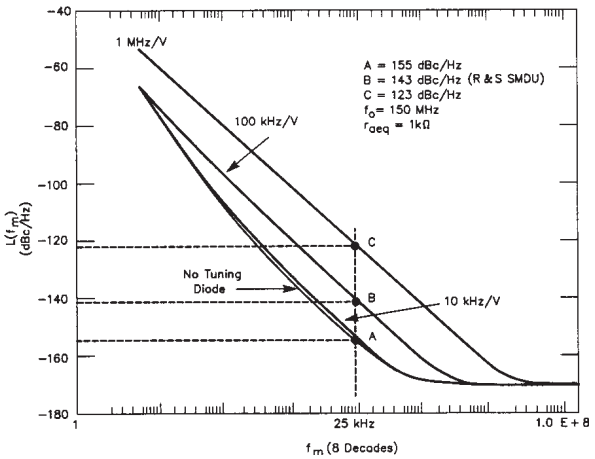


Fig. 15 — Phase noise increases as the tuning sensitivity of the VCO is increased, as shown here ($r_{aeq.}$ is the equivalent noise resistance of the tuning diode).

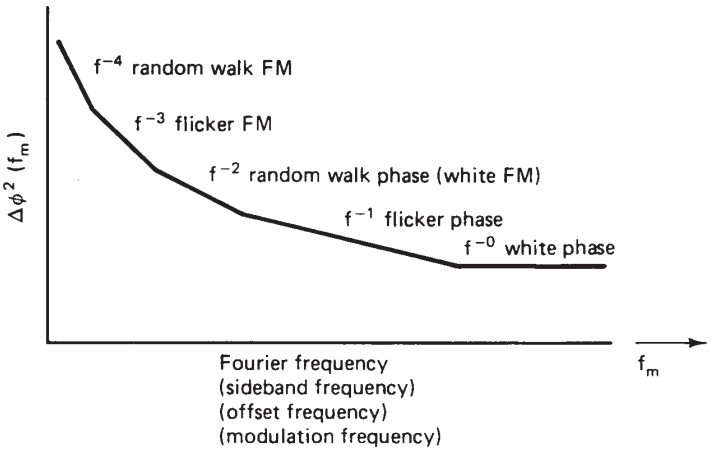


Fig. 16 — Characterization of noise sideband in the frequency domain and its contributions

While oscillator design is done at Synergy Microwave, we have extensive use of CAD tools, such as Compact Software's Microwave Harmonica.

VCO TERMINOLOGY

In specifying VCOs, the following list of definitions may help to get a better understanding of what to look for:

VCO (Voltage Controlled Oscillator): The output frequency of the oscillator is determined by a DC control voltage. This applied voltage tunes the oscillator over a specified range.

Phase noise: This term describes the "single sideband phase noise" of the oscillator. It is composed of noise close to the carrier (flicker noise) and noise measured at a spacing of 20 kHz and greater. The flicker noise measured in a VCO is generated only by the active devices, such as the transistor and the tuning diode. For silicon junction FET, the flicker corner frequency is typically at 50 Hz to 100 Hz. Microwave bipolar transistors have a flicker corner frequency of up to 5 kHz. More exotic devices, such as heterojunction bipolar transistors (HBTs), have flicker corner frequencies up to 50 kHz but also have f_T corner frequencies of up to 100 Hz. Finally, GaAsFETs have a corner frequency of several megahertz. The phase noise is measured at distances from 1 Hz off the carrier to several megahertz off the carrier in a 1-Hz bandwidth. Phase noise is the ratio of the output power divided by the noise power at a specified value and is expressed in dBc/Hz. Figure 16 shows a typical phase-noise plot. The area between the flicker corner frequency and the residual noise flow is proportional to $1/Q^2$ and is only determined by the quality of the resonator.

Output power: The output power of the oscillator, typically expresssed in dBm, is measured into a 50-Ω load. The output power is always combined with a specification for flatness or variation. A typical spec would be 0 dBm output power ±1 dB tolerance.

Output power as a function of temperature: All active circuits change in their behavior as a function of temperature. The output power over a temperature range should vary less than a specified value, such as 1 dB.

Harmonic output power: The harmonic content is measured relative to the output power. Typical values are 20 dB suppression or more relative to the fundamental. This suppression can be improved by additional filtering.

Spurious outputs: A VCO's spurious output specification, expressed in decibels, enumerates the strength of unwanted and nonharmonically related components relative to the oscillator fundamental. Because a stable, properly designed oscillator is inherently clean, such *spurs* are typically introduced only by external sources in the form of radiated or conducted interference. See **Harmonic output power**.

Frequency tuning characteristic: This shows the relationship, depicted as a graph, between a VCO's operating frequency and the tuning voltage applied. Ideally, the correspondence between operating frequency and tuning voltage is linear. See **Tuning linearity.**

Tuning linearity: For stable synthesizers, a constant deviation of frequency versus tuning voltage is desirable. It is also important to make sure that there are no breaks in the tuning range—for example, that the oscillator does not stop operating with a tuning voltage of 0. See **Frequency tuning characteristic.**

Tuning performance: This datum, typically expressed in megahertz per volt (MHz/V), enumerates how much a VCO's frequency changes per unit of tuning-voltage change.

Tuning speed: This characteristic is defined as the time necessary for the VCO to reach 90% of its final frequency on the application of a tuning-voltage step. Tuning speed depends on the internal components between the input pin and tuning diode—including, among other things, the capacitance present at the input port. The input port's parasitic elements determine the VCO's maximum possible modulation bandwidth.

Post tuning drift: After a voltage step is applied to the tuning diode input, the oscillator frequency may continue to change until it settles to a final value. This post tuning drift is one of the parameters that limits the bandwidth of the VCO input.

Temperature drift: Although the synthesizer is responsible for locking and maintaining the oscillator's frequency, the VCO's frequency change as a function of temperature is a critical parameter and must be specified. Its value varies between 10 kHz/°C to several hundred kHz/°C depending on the center frequency and tuning range.

Sensitivity to load changes: This is called *frequency pulling* and the change of frequency resulting from a partially reactive load. Dividing from 50 Ω is used as a determination. Frequency pulling must be minimized, especially in cases where power stages are close to the VCO unit and short pulses may affect the output frequency. Such feedback may make locking impossible.

Frequency pushing: This is another case of the oscillator frequency being affected by external influences, typically by supply voltage. Taking the same example as above, a sudden current surge caused by the output amplifier of a two-way radio may produce a spike on the VCO's DC power supply and a consequent frequency jump.

References:

Ulrich L. Rohde, Microwave and Wireless Synthesizers: Theory and Design*, to be published August, 1997 by John Wiley & Sons, New York, NY, ISBN: 0471-52019-5*

Ulrich L. Rohde, KA2WEU, "Designing Low-Phase-Noise Oscillators," QEX*, October 1994.*

Ulrich L. Rohde, KA2WEU, "All About Phase Noise in Oscillators, Part III - Example oscillator circuits and their noise performance," QEX*, February 1994.*

VOLTAGE CONTROLLED OSCILLATORS

MINIATURE SURFACE-MOUNT PACKAGE

174

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
40 - 100	1 - 17	+12	<35	+8	± 2	4 - 7	-100/125	10	1	5	**MFC40A**
50 - 100	0 - 17	+ 5	<35	+ 5	± 2	0 - 17	-105/-125	10	1	2.0	**MFC-S-50**
50 - 90	1 - 10	+ 12	<30	+ 7	± 1.5	5 - 8	-108/-132	12	0.35	0.5	**MFC50A12 §**
56 - 103	0 - 12	+ 12	<45	+ 8	± 2	5 - 10	-108/-132	12	1.0	5.0	**MFC56A §**
60 - 120	0 - 17	+ 5	<35	+ 5	± 2	4 - 8	-95/-115	10	2	2.0	**MFC-S-60**
100 - 200	0 - 17	+ 5	<35	+ 5	± 2	6 - 14	-112/134	10	1.0	0.4	**MFC-S-100**
104 - 176	1 - 12	+12	<30	+10	± 2	7 - 12	-105/125	15	1	1.5	**MFC104A**
150 - 300	0 - 17	+ 5	<35	+ 4	+ 2	10 - 20	-107/-132	10	1.0	0.4	**MFC-S-150**
165 - 205	1 - 12	+12	<30	+10	± 2.5	8 - 16	-105/128	25	0.5	2	**MFC165A**
200 - 400	0 - 17	+ 5	<35	+ 5	± 2	10 - 20	-95/-118	10	2.0	5.0	**MFC-S-200**
205 - 280	0.5 - 4.5	+ 5	<35	+ 1	± 2	20 - 25	-97/-120	10	2.0	5.0	**MFC205A**
210 - 230	0.5 - 3	+3	<15	0	± 2	12 - 16	-95/117	10	1	3	**MFC210B**
210 - 270	1 - 12	+ 5	<35	+ 5	± 2	5 - 6	-93/-117	10	2.0	5.0	**MFC210A**
225 - 412	0 - 12	+ 12	<45	+ 10	± 2	15 - 25	-100/-125	12	2.0	5.0	**MFC225A**
240 - 502	1 - 17	+5	<35	+5	± 2	16 - 28	-95/120	10	2	7	**MFC240A**
320 - 360	1 - 7	+5	<35	+8	±1.5	9 - 14	-100/125	15	1	5	**MFC320A**
350 - 410	2 - 10	+ 8	<35	+ 5	± 2	8 - 11	-93/-123	10	2.0	5.0	**MFC350A**
360 - 410	0.5 - 5	+ 5	<35	+ 3	± 3	12 - 18	-107/-135	15	2.0	5.0	**MFC360A**
381 - 406	1 - 5	+5	<15	+2.5	± 2.5	8 -12	-110/133	15	1	2	**MFC381A**
400 - 450	1 - 10	+ 10	<20	+ 9	± 2	6 - 10	-118/-140	10	1.0	5.0	**MFC400A**
400 - 800	0 - 15	+ 5	<35	+ 5	± 2	20 - 30	-95/-117	10	2.0	5.0	**MFC-S-400**
437 - 461	1 - 5	+5	<15	+2.5	± 2.5	8 - 12	-110/133	15	1	2	**MFC437A**
445 - 495	2 - 10	+ 12	<30	+ 5	± 2	6 - 10	-110/-135	30	1.0	5.0	**MFC445A**
445 - 470	1 - 5	+5	<15	+2.5	± 2.5	8 - 12	-110/133	15	1	2	**MFC445B**
446 - 588	0.5 - 4.5	+ 10	<25	+ 6	± 3	44 - 66	-100/-125	7	1.0	2.0	**MFC446A**
467 - 492	1 - 5	+5	<15	+2.5	± 2.5	8 -12	-110/133	15	1	2	**MFC467A**
487 - 568	0 - 12	+ 5	<35	0	± 2	8 - 12	-107/-130	10	2.0	5.0	**MFC487A**
490 - 560	0 - 4.5	+ 8	<20	0	± 2	17 - 25	-102/-125	10	1.0	2.0	**MFC490A**
500 - 1000	0.2 - 10	+5	<35	+5	± 3.5	55 - 70	-90/112	10	3	10	**MFC500A**
511 - 536	1 - 5	+ 5	<15	+ 2	± 2	8 - 10	-110/-133	10	1.0	2.0	**MFC511A**
525 - 575	0 - 5	+ 5	<35	0	± 2	13 - 17	-108/-133	10	2.0	5.0	**MFC525A**
533 - 558	1 - 5	+5	<15	+2.5	± 2.5	8 - 12	-110/133	10	1	5	**MFC533A**
550 - 590	1 - 11	+ 12	<50	+ 11	± 2	4 - 6	-107/-130	12	5.0	5.0	**MFC550A**
584 - 656	0 - 12	+ 5	<35	0	± 2	7 - 11	-102/-125	10	1.0	2.0	**MFC584A**
600 - 1200	0 - 20	+ 5	<35	+ 5	± 2	30 - 55	-97/-123	10	1.0	15	**MFC-S-600**
700 - 1400	0 - 25	+ 5	<35	+ 5	± 2	25 - 40	-100/-125	10	5.0	15	**MFC-S-700**
750 - 1350	0 - 14	+15	<35	+12	± 2	55 - 75	-95/120	10	4	10	**MFC750A**
800 - 1600	0 - 20	+ 5	<35	+ 5	± 2	30 - 60	-100/-125	10	5.0	15	**MFC-S-800**
800 - 1600	0.5 - 21	+ 11.5	<40	+ 9	± 3	30 - 60	-100/-126	20	5.0	15	**MFC800A**
860 - 1240	0.5 - 8.5	+ 10	<35	+ 10	± 2	50 - 60	-98/-123	10	1.0	15	**MFC860A**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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MINIATURE SURFACE-MOUNT PACKAGE

174

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
900 - 1650	0 - 12	+ 12	<45	+ 8	± 2	60 - 80	-95/-120	12	2.0	5	**MFC900A §**
900 - 1800	0 - 20	+ 5	<35	+ 5	± 2	30 - 60	-100/-125	10	5.0	15	**MFC-S-900**
902 - 928	0 - 2.2	+3.3	<15	0	± 2	25 - 30	- 95/120	10	2.0	10	**MFC902A**
925 - 1650	2 - 21	+ 11.5	<40	+ 8	± 3	35 - 80	-98/-123	6	1.0	10	**MFC925A**
925 - 1650	1 - 21	+ 5	<20	+ 6	± 2	40 - 80	-100/-125	6	1.0	10	**MFC925B §**
925 - 960	0.5 - 4.5	+ 5	<25	+ 6	± 2	16 - 21	-100/-125	10	1.5	2	**MFC925C §**
950 - 1175	1.5 - 7	+ 10	<35	+ 8	± 1	50 - 60	-100/-128	10	5.0	15	**MFC950A §**
950 - 1650	1 - 10	+12	<45	+6	± 2	85 - 100	-85/110	15	3.0	9	**MFC950B**
1000 - 1300	0 - 5	+ 5	<25	+ 10	+ 2	65 - 95	-97/-123	10	3.0	12	**MFC1000A**
1000 - 1357	1.5 - 10	+12	<40	+10	± 2	45 - 65	-95/115	10	3.5	8	**MFC1000B**
1005 - 1650	1 - 15	+15	<50	+12	± 2	50 - 70	-94/118	15	4.0	11	**MFC1005A**
1030 - 1130	0.5 - 5.5	+ 5	<35	+ 3	± 2	15 - 25	-93/-120	10	5.0	15	**MFC1030A**
1074 - 1442	0.8 - 7.4	+10	<20	+4.5	± 3	55 - 115	-95/-120	15	5.0	5	**MFC1074A §**
1090 - 1290	1 - 5	+5	<25	+9	± 2	55 - 75	-95/120	10	3.0	9	**MFC1090A**
1092 - 1152	1 - 4	+5	<35	+5	± 2	20 - 30	-93/-120	10	5.0	15	**MFC1092A**
1140 - 1340	1 - 11	+11	<50	+7	± 2	30 - 45	-93/-120	10	3.5	3	**MFC1140B**
1140 - 1610	0.5 - 8.5	+10	<35	+10	± 2	60 - 70	-90/-115	10	5.0	15	**MFC1140A**
1140 - 1610	0 - 8.5	+5	<20	+6	± 3	70 - 90	-92/-117	10	5.0	15	**MFC1140C**
1150 -1520	1 - 11	+12	<50	+11	± 2	55 - 75	-100/125	10	2.0	10	**MFC1150A**
1200 - 1800	1 - 10	+10	<30	0	± 2	60 - 100	-85/-110	10	2.0	5	**MFC1200A**
1200 - 1800	0 - 14	+15	<35	+12	± 2	48 - 64	-92/115	10	4.0	12	**MFC1200B**
1290 - 1450	0.5 - 4	+5	<35	+2	± 2	45 - 75	-93/-115	20	5.0	15	**MFC1290A**
1295 - 1705	1 - 10	+12	<40	+10	± 2	35 - 50	-95/120	10	4.0	12	**MFC1295A**
1300 - 1500	0.5 - 5	+5	<35	+8	± 2	40 - 60	-90/-115	10	5.0	15	**MFC1300B**
1300 - 2000	0 - 20	+8	<35	+9	± 2	35 - 55	-90/-115	10	5.0	15	**MFC1300A**
1310 - 1705	0.5 - 9.5	+12	<40	+10	± 2	48 - 65	-95/115	10	4.0	12	**MFC1310A**
1350 - 2450	0.5 - 20	+5	<35	+4	± 3	60 - 100	-92/-116	10	5.0	15	**MFC1350A**
1355 - 1405	1 - 5	+5	<40	+5	± 2	15 - 22	-95/117	15	4.0	10	**MFC1355A**
1400 - 2000	1 - 20	+8	<35	+7	± 3	35 - 47	-92/115	10	5.0	15	**MFC1400B**
1400 - 2600	0 - 25	+8	<35	+7	± 2	55 - 75	-95/120	12	5.0	15	**MFC1400A**
1420 - 2007	1 - 8	+10	<35	+6	± 2	85 - 110	-83/-108	10	2.0	15	**MFC1420A**
1420 - 1655	0.5 - 11	+8	<20	+10	± 2	28 - 40	-98/118	10	3.0	10	**MFC1420B**
1423 - 1458	1 - 4	+5	<20	0	± 2	12 - 25	-97/-122	10	5.0	15	**MFC1423A §**
1446 - 1880	0.8 - 7.4	+10	<20	+4.5	± 3	65 - 125	-92/-118	15	5.0	5	**MFC1446A §**
1510 - 1651	1.5 - 8	+8	<15	+2.5	± 2.5	18 - 36	-96/-121	12	3.0	5	**MFC1510A**
1525 - 2350	1 - 13.5	+15	<35	+12	± 2.5	75 - 100	-90/117	12	5.0	15	**MFC1525A**
1575 - 2575	0 - 20	+5	<35	+4	± 3	60 - 80	-90/-115	10	5.0	15	**MFC1575A**
1600 - 2000	1 - 10	+8	<35	+6	± 2	50 - 60	-95/-115	10	5.0	15	**MFC1600A §**
1620 - 1740	0.5 - 4.5	+8	<35	+10.5	± 2.5	32 - 45	-95/117	10	3.0	12	**MFC1620A**
1640 - 1900	1 - 10	+10	<35	+7	± 2	35 - 50	-90/115	10	3.0	10	**MFC1640A**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

MINIATURE SURFACE-MOUNT PACKAGE

174

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
1700 - 1850	2 - 10	+12	<30	+10	± 2	18 - 25	-96/-121	20	1.0	15	**MFC1700B**
1700 - 2500	0.5 - 7	+15	<35	+6.5	± 2	80 - 190	-90/-110	10	5.0	15	**MFC1700A**
1750 - 2500	1 - 12	+5	<35	+9	± 2.5	75 - 100	-90/115	10	4.0	12	**MFC1750A**
1772 - 1913	1.5 - 8	+8	<15	+2.5	± 2.5	18 - 36	-97/-121	12	3.0	5	**MFC1772A**
1780 - 2980	0 - 22	+5	<30	+6	± 2	60 - 75	-90/-115	10	5.0	10	**MFC1780A**
1805 - 1880	0.5 - 4.5	+5	<25	+6	± 2	31 - 38	-95/-120	10	1.5	2	**MFC1805A §**
1830 - 2200	2 - 10	+12	<40	+10	± 2	45 - 55	-97/118	15	4.0	14	**MFC1830A**
1900 - 1960	0 - 5	+5	<35	+2	± 2	24 - 40	-95/-120	10	5.0	15	**MFC1900B**
1900 - 2400	1 - 8	+5	<35	+6	± 3	80 - 110	-85/-110	10	5.0	15	**MFC1900A**
1950 - 2265	1 - 20	+5	<40	+7	± 2	15 - 22	-95/117	10	5.0	15	**MFC1950A**
2007 - 2595	1 - 8	+10	<35	+6.5	± 2	85 - 110	-85/-107	10	2.0	15	**MFC2007A**
2030 - 2330	0 - 5	+5	<35	+3	± 2	65 - 80	-90/115	15	4.0	12	**MFC2030A**
2050 -2850	0 - 9	+5	<25	+2	± 2	100 - 120	-70/95	10	8.0	30	**MFC2050A**
2100 - 2400	1 - 14	+12	<35	+10	± 3.5	27 - 35	-101/-125	10	4.0	18	**MFC2100A**
2130 - 2204	0 - 5	+10	<35	+4	± 2	25 - 40	-85/110	10	5.0	15	**MFC2130A**
2140 - 2200	0.5 - 5	+5	<35	0	± 3	22 - 30	-90/112	10	5.0	15	**MFC2140A**
2160 - 2480	0 - 5.5	+3.3	<15	0	± 2	68 - 85	-88/110	15	5.0	15	**MFC2160A**
2180 - 2240	0 - 5	+5	<35	+2	± 2	24 - 40	-95/-120	10	5.0	15	**MFC2180A**
2200 - 2400	0.5 - 4	+4	<30	+11	± 2.5	80 - 100	-87/113	10	5.0	15	**MFC2200A**
2200 - 2800	0.5 - 17	+15	<35	+12	± 2	42 - 55	-90/112	10	5.0	17	**MFC2200B**
2250 - 2400	2 - 12	+5	<35	+6	± 2	17 - 25	-97/118	10	5.0	15	**MFC2250A**
2265 - 2750	1 - 22	+5	<40	+7	± 2	27 - 40	-95/117	10	5.0	18	**MFC2265A**
2270 - 2540	2 - 15	+5	<35	+6	± 2	23 - 30	-100/-125	10	2.0	5	**MFC2270A**
2290 - 2590	1 - 11	+12	<30	+10	± 2	40 - 50	-100/-125	20	1.0	15	**MFC2290A**
2300 - 2500	2 - 10	+12	<30	+10	± 2	25 - 35	-100/-125	20	1.0	15	**MFC2300A**
2330 - 2550	1 - 11	+12	<35	+10	± 2	30 - 50	-95/120	15	5.0	15	**MFC2330A**
2400 - 2500	0 - 5	+5	<20	+3.5	± 2.5	20 - 30	-95/117	10	5.0	12	**MFC2400A**
2430 - 2480	0.5 - 5	+5	<35	0	± 3	18 - 28	-90/112	10	5.0	15	**MFC2430A**
2470 - 2740	2 - 15	+5	<35	+6	± 2	23 - 30	-90/115	10	5.0	15	**MFC2470A**
2500 - 2700	2 - 10	+12	<30	+10	± 2	25 - 35	-97/-119	15	1.0	15	**MFC2500A**
2500 - 2700	2 - 10	+5	<30	+10	± 2	30 - 40	-95/-120	15	1.0	15	**MFC2500B**
2520 - 2720	1 - 10	+11	<50	+7	± 2	36 - 44	-90/-115	10	3.5	3	**MFC2520A**
2560 - 2800	0.5 - 8	+5	<35	+9	± 2	35 - 50	-92/-117	10	5.0	15	**MFC2560A §**
2700 - 3100	1 - 12	+5	<35	+7	± 2	40 - 55	-90/110	10	5.0	15	**MFC2700A**
2750 - 2860	0.5 - 9	+5	<35	+8	± 2	15 - 25	-93/115	10	5.0	15	**MFC2750A**
3200 - 3320	0 - 5	+5	<35	+2	± 2	35 - 50	-85/-110	10	5.0	15	**MFC3200A**
3300 - 3400	0.5 - 10	+10	<35	+10	± 2	20 - 30	-90/-115	10	5.0	15	**MFC3300A**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

124SL

SURFACE-MOUNT PACKAGE

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
170 - 220	0 - 10	+7	<13	+3	±3.0	5 - 10	-95/-115	10	5.0	15	**VCO-S-A12**
180 - 220	0 - 5	+7	<35	0	±1.0	9 - 14	-95/-115	10	5.0	15	**VCO-S-A17**
200 - 400	0 - 17	+12	<35	+14	±2.5	10 - 20	-90/-115	10	5.0	15	**VCO-S-200**
210 - 270	1 - 12	+12	<35	+10	±3.0	5 - 6	-94/-118	10	5.0	15	**VCO210SA**
225 - 450	1 - 17	+7.0	<13	+4	±2.5	20 - 30	-95/-115	9	5.0	15	**VCO225SA**
250 - 500	2 - 22	+12	<35	+14	±2.5	10 - 20	-95/-120	10	5.0	15	**VCO-S-250**
350 - 410	2 - 10	+8	<35	+7	±2.0	7.5 - 15	-100/-125	10	1.0	15	**VCO-S-A23**
400 - 450	2 - 10	+8	<35	+7	±2.0	6.0 - 15	-98/-120	10	1.0	15	**VCO-S-A22**
400 - 650	0.5 - 5	+5	<20	+7	±3.5	50 - 80	-95/-120	10	5.0	15	**VCO400SA**
400 - 800	0.5 - 15	+12	<35	+15	±2.5	20 - 30	-95/-120	10	1.0	15	**VCO-S-400**
470 - 650	1 - 11	+12	<35	+12	±2.5	20 - 30	-97/-112	10	1.0	15	**VCO470SA**
500 - 1000	0.5 - 30	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VCO-S-500**
500 - 600	0 - 5	+7	<35	0	±1.0	20 - 30	-90/-115	10	5.0	15	**VCO-S-A18**
550 - 890	1 - 18	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VCO550SA**
600 - 1200	0.5 - 25	+12	<35	+12	±2.5	25 - 45	-95/-120	10	1.0	15	**VCO-S-600**
700 - 1400	0.5 - 25	+12	<35	+15	±3.0	35 - 60	-95/-120	10	5.0	15	**VCO-S-700**
750 - 830	1 - 4	+12	<30	+14.5	±1.5	35 - 45	-90/-117	10	5.0	15	**VCO-S-A06**
800 - 1600	0 - 25	+12	<35	+14	±3.5	40 - 60	-95/-120	10	1.0	15	**VCO-S-800**
844 - 919	1 - 4	+12	<35	+14	±1.5	25 - 40	-85/-110	18	2.0	4.5	**VCO844SA**
900 - 1800	0.5 - 20	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO-S- 900**
900 - 2200	0 - 25	+12	<35	+12	±2.5	55 - 80	-85/-110	10	8.0	15	**VCO900SA**
950 - 1175	4 - 15	+12	<35	+13	±3.0	21 - 27	-95/-118	10	1.0	15	**VCO-S-A27**
1000 - 2000	0.5 - 22	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO-S-1000**
1000 - 2000	0.5 - 22	+12	<35	+6	±2.5	50 - 70	-98/-126	10	5.0	15	**VCO1000SA**
1100 - 2200	0.5 - 25	+12	<35	+13	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO-S-1100**
1200 - 2400	0 - 26	+5	<35	+10	±3.0	40 - 100	-90/-115	10	5.0	15	**VCO 1200SA**
1500 - 2100	1 - 12	+12	<35	+10	±3.0	40 - 60	-88/-115	10	5.0	15	**VCO1500SA**
1600 - 2000	0 - 5	+5	<35	+10	±3.0	80 - 100	-90/-115	10	13	10	**VCO1600SA**
1600 - 2600	0 - 26	+5	<35	+10	±3.0	40 - 60	-90/-120	10	5.0	15	**VCO-S-A24**
1750 - 2000	1 - 9	+9.6	<30	+10	±3.0	35 - 60	-82/-110	10	8.0	30	**VCO1750SA**
2000 - 3000	0 - 25	+12	<35	+9	±2.0	40 - 70	-88/-116	10	8.0	15	**VCO-S-2000**

COMMON SPECIFICATIONS

Output Impedance:	50 ohms	Operating Temperature:	-30°C to +70°C
VSWR:	1.5:1 (Typ)	§ Operating Temperature:	-40°C to +85°C
Modulation Bandwidth:	2.5 MHz (Typ)		

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

RF OUT	V_{cc}	V_{tune}	CASE GND
1	4	16	ALL OTHERS

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

PLUG-IN PACKAGE


124

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
170 - 220	0 - 10	+7	<13	+3	±3.0	5 - 10	-95/-115	10	5.0	15	**VCO-P-A12**
180 - 220	0 - 5	+7	<35	0	±1.0	9 - 14	-95/-115	10	5.0	15	**VCO-P-A17**
200 - 400	0 - 17	+12	<35	+14	±2.5	10 - 20	-90/-115	10	5.0	15	**VCO-P-200**
210 - 270	1 - 12	+12	<35	+10	±3.0	5 - 6	-94/-118	10	5.0	15	**VCO210PA**
225 - 450	1 - 17	+7.0	<13	+4	±2.5	20 - 30	-95/-115	9	5.0	15	**VCO225PA**
250 - 500	2 - 22	+12	<35	+14	±2.5	10 - 20	-95/-120	10	5.0	15	**VCO-P-250**
350 - 410	2 - 10	+8	<35	+7	±2.0	7.5 - 15	-100/-125	10	1.0	15	**VCO-P-A23**
400 - 450	2 - 10	+8	<35	+7	±2.0	6.0 - 15	-98/-120	10	1.0	15	**VCO-P-A22**
400 - 650	0.5 - 5	+5	<20	+7	±3.5	50 - 80	-95/-120	10	5.0	15	**VCO400PA**
400 - 800	0.5 - 15	+12	<35	+15	±2.5	20 - 30	-95/-120	10	1.0	15	**VCO-P-400**
470 - 650	1 - 11	+12	<35	+12	±2.5	20 - 30	-97/-112	10	1.0	15	**VCO470PA**
500 - 600	0 - 5	+7	<35	0	±1.0	20 - 30	-90/-115	10	5.0	15	**VCO-P-A18**
500 - 1000	0.5 - 30	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VCO-P-500**
550 - 890	1 - 18	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VCO550PA**
600 - 1200	0.5 - 25	+12	<35	+12	±2.5	25 - 45	-95/-120	10	1.0	15	**VCO-P-600**
700 - 1400	0.5 - 25	+12	<35	+15	±3.0	35 - 60	-95/-120	10	5.0	15	**VCO-P-700**
750 - 830	1 - 4	+12	<30	+14.5	±1.5	35 - 45	-90/-117	10	5.0	15	**VCO-P-A06**
800 - 1600	0 - 25	+12	<35	+14	±3.5	40 - 60	-95/-120	10	1.0	15	**VCO-P- 800**
844 - 919	1 - 4	+12	<35	+14	±1.5	25 - 40	-85/-110	18	2.0	4.5	**VCO844PA**
900 - 1800	0.5 - 20	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO-P- 900**
900 - 2200	0 - 25	+12	<35	+12	±2.5	55 - 80	-85/-110	10	8.0	15	**VCO900PA**
950 - 1175	4 - 15	+12	<35	+13	±3.0	21 - 27	-95/-118	10	1.0	15	**VCO-P-A27**
1000 - 2000	0.5 - 22	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO-P-1000**
1000 - 2000	0.5 - 22	+12	<35	+6	±2.5	50 - 70	-98/-126	10	5.0	15	**VCO1000PA**
1100 - 2200	0.5 - 22	+12	<35	+13	±3.0	40 - 60	-95/-120	10	5.0	15	**VCO- P-1100**
1200 - 2400	0 - 26	+5	<35	+10	±3.0	40 - 100	-90/-115	10	5.0	15	**VCO 1200PA**
1500 - 2100	1 - 12	+12	<35	+10	±3.0	40 - 60	-88/-115	10	5.0	15	**VCO1500PA**
1600 - 2000	0 - 5	+5	<35	+10	±3.0	80 - 100	-90/-115	10	13	10	**VCO1600PA**
1600 - 2600	0 - 26	+5	<35	+10	±3.0	40 - 60	-90/-120	10	5.0	15	**VCO-P-A24**
1750 - 2000	1 - 9	+9.6	<30	+10	±3.0	35 - 60	-82/-110	10	8.0	30	**VCO1750PA**
2000 - 3000	0 - 25	+12	<35	+9	±2.0	40 - 70	-88/-116	10	8.0	15	**VCO-P-2000**

COMMON SPECIFICATIONS

Output Impedance:	50 ohms	Operating Temperature:	-30°C to +70°C
VSWR:	1.5:1 (Typ)	§ Operating Temperature:	-40°C to +85°C
Modulation Bandwidth:	2.5 MHz (Typ)		

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

RF OUT	V_{cc}	V_{tune}	CASE GND
1	4	16	ALL OTHERS

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VOLTAGE CONTROLLED OSCILLATORS

SURFACE-MOUNT PACKAGE

165S

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
180 - 260	0 - 10	+12	<30	+7.5	±2.0	8 - 15	-95/-120	10	1.0	15	**VFC180SA**
200 - 400	0 - 17	+12	<35	+14	±2.5	10 - 20	-90/-115	10	5.0	15	**VFC-S-200**
210 - 270	1 - 12	+5.0	<35	0	±2.0	5.0 - 6.0	-90/-115	10	5.0	15	**VFC210SA**
219 - 256	1 - 4.5	+5	<20	0	±2.0	12 - 20	-105/-127	10	5.0	5.0	**VFC219SA**
250 - 500	0 - 22	+12	<35	+12	±2.5	10 - 20	-95/-115	10	5.0	15	**VFC-S-250**
400 - 800	0 - 15	+12	<35	+12	±2.5	20 - 30	-95/-120	10	5.0	15	**VFC-S-400**
425 - 500	1 - 12	+12	<35	+10	±3.0	5.0 - 10	-95/-120	10	5.0	15	**VFC-S-A05**
490 - 560	0 - 4.5	+8	<20	0	±2.0	17 - 25	-100/-125	10	1.0	2.0	**VFC490SA**
500 - 1000	0.5 - 25	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VFC-S-500**
600 - 1200	0.5 - 25	+12	<35	+15	±3.0	25 - 45	-95/-120	10	1.0	15	**VFC-S-600**
700 - 1400	0.5 - 25	+12	<35	+15	±3.0	35 - 60	-95/-120	10	1.0	15	**VFC-S-700**
800 - 1600	0 - 25	+12	<35	+14	±3.5	40 - 60	-95/-120	10	5.0	15	**VFC-S-800**
900 - 1800	0.5 - 20	+12	<35	+13	±3.0	40 - 60	-95/-120	10	5.0	15	**VFC-S-900**
900 - 1735	0 - 18	+15	<45	+13	±1.5	40 - 60	-95/-120	10	5.0	16	**VFC900SA**
900 - 1200	2.5 - 10.5	+12	<35	+6	±1.5	40 - 60	-95/-120	10	5.0	15	**VFC900SB**
920 - 1455	0 - 12	+12	<35	+13	±3.0	45 - 60	-95/-120	10	5.0	15	**VFC920SA**
936 - 1636	0 - 20	+12	<35	+10	±3.0	20 - 50	-90/-115	10	5.0	15	**VFC 936SA** §
1000 - 2000	0.5 - 22	+12	<35	+13	±3.0	40 - 60	-95/-120	10	5.0	15	**VFC-S-1000** §
1200 - 1600	2.5 - 11	+12	<35	+6	±1.5	50 - 70	-95/-120	10	5.0	15	**VFC1200SA**
1225 - 2375	0 - 25	+11	<35	+12	±4.0	50 - 70	-95/-120	10	2.0	30	**VFC1225SA**
1300 - 2300	0 - 24	+15	<40	+12	±3.0	40 - 60	-90/-110	10	1.0	15	**VFC1300SA**
1305 - 1512	2 - 10	+12	<30	+10	±1.0	20 - 40	-95/-120	20	5.0	15	**VFC-S-A07** §
1355 - 1595	2 - 10	+12	<30	+10	±1.0	25 - 45	-95/-115	10	1.0	15	**VFC-S-A06**
1500 - 2100	1 - 12	+12	<35	+10	±3.0	40 - 60	-92/-117	10	5.0	15	**VFC-S-A02**
1850 - 1950	0.5 - 6.5	+8	<40	+8	±2.0	20 - 30	-95/-122	12	3.5	15	**VFC1850SA**
2300 - 2450	0.5 - 7	+8	<35	+8	±2.0	25 - 35	-95/-120	12	3.5	20	**VFC2300SA**
2355 - 2528	0.5 - 4.5	+12	<35	+5	±3.0	50 - 60	-90/-115	10	5.0	10	**VFC2355SA**
2530 - 2730	1 - 9	+12	<35	+10	±2.0	30 - 45	-90/-120	20	5.0	15	**VFC2530SA**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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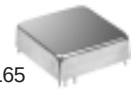
SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

PLUG-IN PACKAGE



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FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
200 - 400	0 - 17	+12	<35	+14	±2.5	10 - 20	-90/-115	10	5.0	15	**VFC-P-200**
250 - 500	0 - 22	+12	<35	+12	±2.5	10 - 20	-95/-115	10	5.0	15	**VFC-P-250**
400 - 800	0.5 - 15	+12	<35	+15	±2.5	20 - 30	-95/-120	10	1.0	15	**VFC-P-400**
500 - 1000	0.5 - 25	+12	<35	+14	±2.5	25 - 50	-95/-120	10	1.0	15	**VFC-P-500**
600 - 1200	0.5 - 25	+12	<35	+15	±3.0	25 - 45	-95/-120	10	1.0	15	**VFC-P-600**
700 - 1400	0.5 - 25	+12	<35	+15	±3.0	35 - 60	-95/-120	10	1.0	15	**VFC-P-700**
800 - 1600	0 - 25	+5	<35	+10	±3.0	40 - 60	-95/-120	10	1.0	15	**VFC-P-800**
900 - 1800	0.5 - 20	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VFC-P-900**
1000 - 2000	0.5 - 22	+12	<35	+11	±3.0	40 - 60	-95/-120	10	5.0	15	**VFC-P-1000**
1630 - 1930	2 - 22	+10	<50	+10	±2.0	15 - 30	-95/-115	10	5.0	15	**VFC-P-A02**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

CERAMIC COAXIAL RESONATOR
MINIATURE SURFACE-MOUNT PACKAGE

174

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
740 - 810	2 - 10	+8	<35	+5	±2.0	9 - 12	-107/-130	10	1.0	5.0	**MFO740A**
751 - 777	2 - 9	+8.5	<20	+5	±2.0	3.5 - 5.5	-110/-140	20	2.0	5.0	**MFO751A §**
762 - 795	2 - 9	+8	<35	+5	±2.0	5 - 8	-105/-130	16	2.0	5.0	**MFO762A**
770 - 780	0.5 - 8.5	+10	<35	-3	±1.0	1.3 - 3	-110/-135	10	1.0	15	**MFO770A**
788 - 815	2 - 9	+8	<35	+6	±3.0	3.9 - 7	-105/-130	18	2.0	5.0	**MFO788A**
816 - 846	0.5 - 3	+10	<20	0	±2.0	12 - 15	-100/-125	15	2.0	5.0	**MFO816A**
837 - 848	0.75 - 4.25	+5	<25	0	±3.0	3 - 5	-106/-126	10	1.5	2.0	**MFO837A §**
837 - 863	0.75 - 4.25	+5	<20	0	±2.5	7 - 10	-106/-125	10	1.5	3.0	**MFO837B §**
925 - 960	1 - 8	+8	<40	+3	±3.0	6 - 10	-106/-130	15	2.0	1.0	**MFO925A**
935 - 945	1 - 5	+8	<40	+3	±2.0	6 - 9	-102/-122	10	2.0	5.0	**MFO935A**
945 - 985	1 - 4.5	+12	<35	+7	±2.0	14 - 20	-100/-125	10	0.5	1.0	**MFO945A**
1079 - 1114	1 - 8	+8	<40	+5	±3.0	6 - 10	-105/-130	15	2.0	1.0	**MFO1079A**
1290 - 1310	2 - 24	+5	<35	0	±2.0	2 - 4	-105/-135	10	1.0	1.0	**MFO1290A**
1320 - 1330	1 - 8	+12	<35	10	±2.0	2 - 4	-108/-135	10	2.0	1.0	**MFO1320A**
1511 - 1586	1 - 9	+8	<40	+4	±1.0	10 - 18	-103/-125	12	2.0	1.0	**MFO1511A**
1575 - 1645	0 - 8	+8	<40	+3	±2.0	11 - 15	-100/-125	10	2.0	5.0	**MFO1575A**
1594 - 1669	1 - 9	+8	<40	+4	±1.5	10 - 18	-106/-130	15	2.0	1.0	**MFO1594A**
1701 - 1763	2 - 9	+8.5	<20	+5	±2.0	8.5 - 10.5	-96/-125	10	1.0	15	**MFO1701A §**
1719 - 1780	1 - 10	+12	<15	0	±2.0	8 - 15	-105/-130	15	2.0	2.0	**MFO1719A §**
1767 - 1827	0.5 - 4.5	+5	<20	0	±2.0	15 - 25	-100/-125	10	1.0	2.0	**MFO1767A**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

CERAMIC COAXIAL RESONATOR SURFACE-MOUNT PACKAGE

124S

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
617 - 627	1 - 5	+4.5	<40	0	±1.5	2 - 4	-110/-135	10	1.0	15	**CRO617SA**
681 - 716	1 - 8	+8	<40	+11	±1.5	5.0 - 6.0	-120/-145	10	1.0	5.0	**CRO-S-698**
700 - 730	1 - 8	+9	<26	0	±2.5	3.5 - 5.5	-118/-140	10	1.0	15	**CRO700SA**
702 - 738	1 - 8	+8	<40	+11	±1.5	5 - 7	-111/-137	10	1.0	5.0	**CRO702SA**
727 - 767	1 - 8	+9	<20	0	±2.5	4.0 - 6.0	-108/-132	10	1.0	5.0	**CRO-S-747**
750 - 850	1 - 24	+12	<40	+10	±2.5	4 - 6	-105/-130	10	5.0	15	**CRO750SA**
869 - 894	1.5 - 5	+12	<40	+6.5	±2.5	7.0 - 10	-110/-135	10	1.0	5.0	**CRO-S-A04**
889 - 970	1 - 11	+12	<35	+5	±2.0	8 - 30	-115/-140	10	1.0	15	**CRO889SA**
902 - 928	1 - 4	+5	<40	0	±2.5	5.5 - 7.5	-105/-130	10	1.0	5.0	**CRO-S-915**
917 - 950	1.5 - 5	+12	<40	0	±2.5	11 - 18	-105/-130	10	1.0	15	**CRO917SA**
923 - 962	1.5 - 6.5	+8	<25	+3	±3.0	8 - 14	-100/-130	15	5.0	15	**CRO923SA**
935 - 960	1.5 - 5	+12	<40	0	±2.5	8 - 14	-105/-130	10	1.0	15	**CRO935SA**
960 - 990	1 - 8	+5	<40	0	±2.5	4 - 6	-105/-130	10	2.0	5.0	**CRO-S-975**
1020 - 1070	1 - 10	+8	<40	+4	±2.5	5.5 - 8.0	-105/-125	10	2.0	5.0	**CRO-S-A03**
1020 - 1040	1 - 8	+12	<40	+8	±2.5	4.0 - 6.0	-105/-132	10	1.0	15	**CRO-S-1030**
1030 - 1050	1 - 4	+12	<35	+12	±1.5	7 - 10	-95/-130	10	1.0	15	**CRO-S-1040**
1055 - 1125	1 - 10	+12	<40	+10	±2.0	7 - 10	-105/-130	10	1.0	15	**CRO1055SA**
1079 - 1114	1 - 8	+8	<40	+5	±3.0	6 - 10	-115/-138	15	5.0	15	**CRO1079SA**
1160 - 1180	1 - 8	+12	<35	+7	±2.0	7 - 9	-100/-130	15	2.0	5.0	**CRO1170SA**
1175 - 1245	1 - 10	+12	<40	+10	±2.0	7 - 10	-115/-138	10	1.0	15	**CRO1175SA**
1315 - 1335	1 - 8	+5	<18	0	±2.0	4.0 - 6.0	-100/-130	10	1.0	15	**CRO-S-1325**
1511 - 1586	1 - 9	+8	<40	+4	±2.0	10 - 18	-106/-131	10	1.0	1.0	**CRO-S-1548**
1594 - 1669	1 - 8	+8	<25	+3	±3.0	11 - 17	-100/-130	15	5.0	15	**CRO1594SA**
1600 - 1630	1 - 4	+6	<40	0	±2.5	10 - 14	-100/-125	10	1.0	5.0	**CRO-S-A05**
1710 - 1770	2 - 10	+15	<40	+6	±3.0	8 - 12	-105/-135	10	1.0	15	**CRO1710SA**
1778 - 1842	0.5 - 4.5	+12	<40	+2	±2.5	18 - 25	-102/-128	10	1.0	5.0	**CRO1778SA**
1785 - 1842	2 - 10	+12	<40	+6	±3.0	8.0 - 12	-105/-130	10	1.0	15	**CRO-S-A06**
1890 - 1950	1 - 10	+8	<40	+10	±2.5	7.0 - 9.0	-88/-120	10	1.0	5.0	**CRO-S-1920**

COMMON SPECIFICATIONS

Output Impedance:	50 ohms	Operating Temperature:	-30°C to +70°C
VSWR:	1.5:1 (Typ)	§ Operating Temperature:	-40°C to +85°C
Modulation Bandwidth:	2.5 MHz (Typ)		

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

RF OUT	V_{cc}	V_{tune}	CASE GND
1	4	16	ALL OTHERS

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VOLTAGE CONTROLLED OSCILLATORS

CERAMIC COAXIAL RESONATOR PLUG-IN PACKAGE

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FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
617 - 627	1 - 5	+4.5	<40	0	±1.5	2 - 4	-110/-135	10	1.0	15	**CRO617PA**
681 - 716	1 - 8	+8	<40	+11	±1.5	4 - 6	-120/-145	10	1.0	5.0	**CRO-P-698**
700 - 730	1 - 8	+9	<26	0	±2.5	3.5 - 5.5	-118/-140	10	1.0	15	**CRO700PA**
702 - 738	1 - 8	+8	<40	+11	±1.5	5 - 7	-110/-135	10	2.0	5.0	**CRO702PA**
727 - 767	1 - 8	+9	<20	0	±2.5	4 - 6	-108/-132	10	1.0	5.0	**CRO-P-747**
750 - 850	1 - 24	+12	<40	+10	±2.5	4 - 6	-105/-130	10	5.0	15	**CRO750PA**
889 - 970	1 - 11	+12	<35	+5	±2.0	8 - 30	-115/-140	10	1.0	15	**CRO889PA**
902 - 928	1 - 4	+5	<40	0	±2.5	5.5 - 7.5	-105/-130	10	1.0	5.0	**CRO-P-915**
917 - 950	1.5 - 5	+12	<40	0	±2.5	11 - 18	-105/-130	10	1.0	15	**CRO917PA**
923 - 962	1.5 - 6.5	+8	<25	+3	±3.0	8 - 14	-100/-130	15	5.0	15	**CRO923PA**
935 - 960	1.5 - 5	+12	<40	0	±2.5	8 - 14	-105/-130	10	1.0	15	**CRO935PA**
960 - 990	1 - 8	+5	<40	0	±2.5	4 - 6	-105/-130	10	2.0	5.0	**CRO-P-975**
1020 - 1040	1 - 8	+12	<40	+8	±2.5	4.0 - 6.0	-105/-132	10	1.0	15	**CRO-P-1030**
1030 - 1050	1 - 4	+12	<35	+12	±1.5	7 - 10	-95/-130	10	1.0	15	**CRO-P-1040**
1055 - 1125	1 - 10	+12	<40	+10	±2.0	7 - 10	-105/-130	10	1.0	15	**CRO1055PA**
1079 - 1114	1 - 8	+8	<40	+5	±3.0	6 - 10	-115/-138	15	5.0	15	**CRO1079PA**
1160 - 1180	1 - 8	+12	<35	+7	±2.0	7 - 9	-100/-130	15	2.0	5.0	**CRO1170PA**
1175 - 1245	1 - 10	+12	<40	+10	±2.0	7 - 10	-115/-138	10	1.0	15	**CRO1175PA**
1315 - 1335	1 - 8	+5	<18	0	±2.0	4.0 - 6.0	-100/-130	10	1.0	15	**CRO-P-1325**
1511 - 1586	1 - 9	+8	<40	+4	±2.0	10 - 18	-106/-131	10	1.0	1.0	**CRO-P-1548**
1594 - 1669	1 - 8	+8	<25	+3	±3.0	11 - 17	-100/-130	15	5.0	15	**CRO1594PA**
1710 - 1770	2 - 10	+15	<40	+6	±3.0	8 - 12	-105/-135	10	1.0	15	**CRO1710PA**
1778 - 1842	0.5 - 4.5	+12	<40	+2	±2.5	18 - 25	-102/-128	10	1.0	5.0	**CRO1778PA**
1890 - 1950	1 - 10	+12	<40	+10	±2.5	7.0 - 9.0	-88/-120	10	1.0	5.0	**CRO-P-1920**

COMMON SPECIFICATIONS

Output Impedance:	50 ohms	Operating Temperature:	-30°C to +70°C
VSWR:	1.5:1 (Typ)	§ Operating Temperature:	-40°C to +85°C
Modulation Bandwidth:	2.5 MHz (Typ)		

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

RF OUT	V_{cc}	V_{tune}	CASE GND
1	4	16	ALL OTHERS

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SYNERGY® MICROWAVE CORPORATION

VOLTAGE CONTROLLED OSCILLATORS

CERAMIC COAXIAL RESONATOR SURFACE-MOUNT PACKAGE


165S*

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
284 - 319	2 - 12	+12	<40	+6	±2.0	4 - 10	-125/-150	10	2.0	2.0	**CFO284SA**
681 - 716	1 - 8	+8	<40	+4	±2.0	4 - 6	-117/-142	10	1.0	5.0	**CFO-S-698**
1079 - 1114	1 - 9	+8	<40	+5	±3.0	6 - 10	-105/-130	15	1.0	5.0	**CFO1079SA**
1719 - 1791	1 - 8	+8	<40	+6	±3.0	10 - 14	-105/-130	10	2.0	5.0	**CFO1719SA**
1785 - 1842	2 - 10	+12	<40	+6	±3.0	8 - 12	-105/-130	10	2.0	5.0	**CFO1785SA**

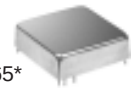
COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.
*0.440 inches, maximum cover height

CERAMIC COAXIAL RESONATOR THROUGH-HOLE PACKAGE


165*

FREQUENCY RANGE (MHz)	NOMINAL TUNING VOLTAGE (Volts)	DC BIAS REQUIREMENTS VOLTAGE (Volts)	DC BIAS REQUIREMENTS CURRENT (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	AVERAGE TUNING SENSITIVITY MHz/Volt	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION (dBc)	PUSHING (MHz/Volt) (Typ)	PULLING (@ 1.75:1 VSWR) MHz (Typ)	MODEL
681 - 716	1 - 8	+8	<40	+4	±2.0	4 - 6	-117/-142	10	1.0	5.0	**CFO-P-698**
1719 - 1791	1 - 8	+8	<40	+6	±3.0	10 - 14	-105/-130	10	2.0	5.0	**CFO1719PA**
1785 - 1842	2 - 10	+12	<40	+6	±3.0	8 - 12	-105/-130	10	2.0	5.0	**CFO1785PA**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms
VSWR: 1.5:1 (Typ)
Modulation Bandwidth: 2.5 MHz (Typ)

Operating Temperature: -30°C to +70°C
§ Operating Temperature: -40°C to +85°C

For pin location and package outline drawings, see back pages.
*0.400 inches, maximum cover height

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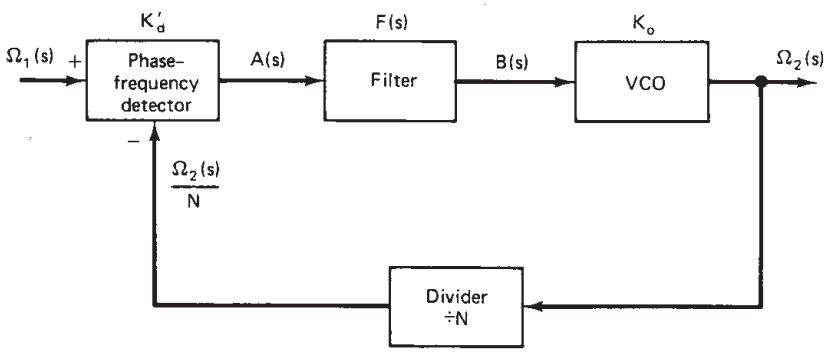
FREQUENCY SYNTHESIZERS

Voltage controlled oscillators are used as an important part of frequency synthesizers. A frequency synthesizer is a unit that stabilizes the frequency of a free-running oscillator against a stable reference, typically a crystal oscillator. Depending on the reference frequency at the phase detector and the resulting division ratio, the output frequency within the loop bandwidth reflects the properties of the reference. This means that if the division ratio is small and the reference frequency comes from an ultrastable crystal oscillator, the quality of the "locked" VCO frequency is also extremely good. Given a particular phase noise of the crystal oscillator, its performance at the phase-detector level gets multiplied up to the output frequency of the VCO by 20 dB per decade. This means that the phase noise of a 1000-MHz VCO is 20 dB or 10 times noisier than a reference crystal oscillator at 10 MHz at the phase detector. This statement is valid only within the loop bandwidth; outside the loop bandwidth, the properties of the oscillator itself dominate. A vivid example is the application of a ceramic-resonator-based oscillator, which, free-running, exhibits phase noise of -125 dBc/Hz at 10 kHz from the carrier and -153 dBc/Hz at 800 kHz from the carrier, but which, phase-locked, exhibits a phase-noise level determined by noise within the loop bandwidth of 1 kHz.

Figure 1 shows the block diagram of a digital PLL. The reason why it is referred to as "digital" is because the divider is a digital implementation and the phase frequency detector also uses a digital rather than an analog, IC. Analog phase detectors would be double-balanced mixers; a typical digital phase detector is an exclusive OR gate. Given a particular VCO and an integrated circuit as a synthesizer chip, the designer must calculate the values of the loop filter. There are several types of loop filters, and the one with the best performance typically is the type 2, third order. It consists of an active integrator based on an operational amplifier that must exhibit excellent low-noise performance.



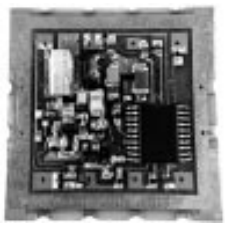


Fig. 1 — Block diagram of a digital PLL before lock is acquired.

Figure 2 shows a loop filter for a type 2 third-order loop. This loop includes *two* integrators: the VCO, and the operational amplifier and its three associated time constants.

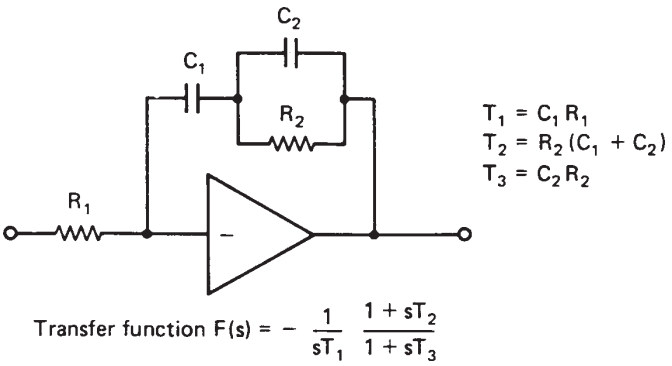


Fig. 2 — Circuit diagram of the loop filter for the third-order loop

This filter can be redrawn as shown in Figure 3. The transfer function for this filter

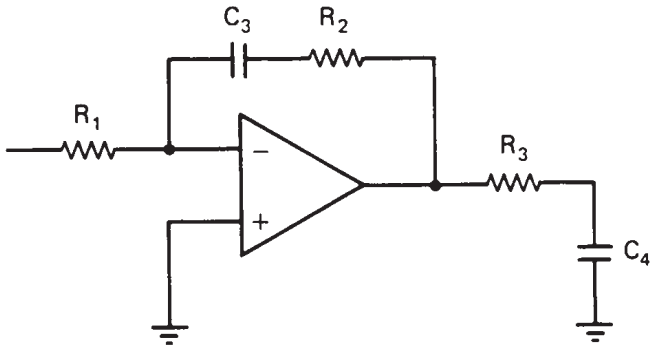
$$F(s) = \frac{-1}{s\tau_1}\frac{1+s\tau_2}{1+s\tau_3} \qquad (1)$$

with

$$\tau_1 = C_1 R_1 \qquad (2)$$

$$\tau_2 = R_2 (C_1 + C_2) \qquad (3)$$

$$\tau_3 = C_2 R_2 \qquad (4)$$



$$F(s) = -\frac{1}{C_3 R_1}\,\frac{1 + s/\omega_z'}{s(1 + s/\omega_p)} \qquad \omega_z = \frac{1}{R_2 C_3} \qquad j\omega_p = \frac{1}{R_3 C_4}$$

Fig. #3 — Circuit diagram of redrawn Figure 2. Note that this is the same type of loop filter as in the type 2 second-order loop with an additional *RC* time constant.

The actual design is best done with the computer program. A more complex filter as an application is shown in Figure 4.

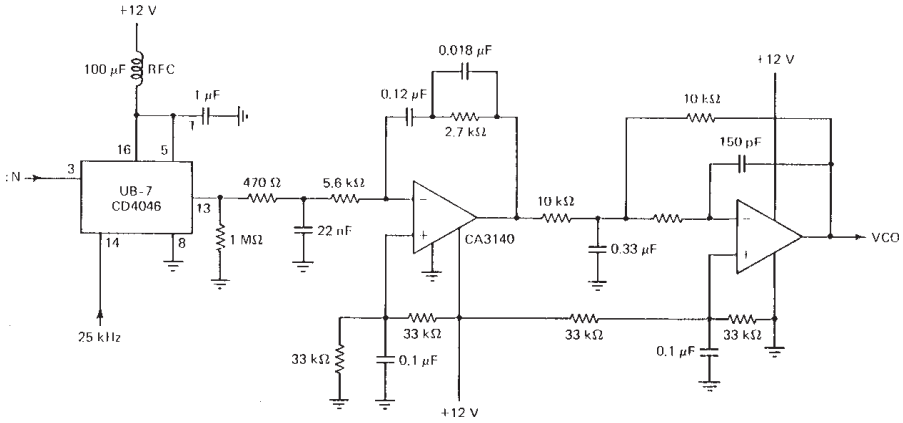


Fig. 4 — Phase/frequency comparator and loop for the 72 to 92 MHz frequency synthesizer.

A detailed overview on how to design a synthesizer is found in the book, *Microwave and Wireless Synthesizers: Theory and Design,* by Ulrich L. Rohde, to be published in August, 1997, by John Wiley & Sons, New York, NY, ISBN: 0471-52019-5.

Design pitfalls can cause noisy oscillator output. The typical positive three-terminal regulator is based on an NPN emitter follower, and therefore drives its load from a very low impedance. These devices have been known to burst into oscillation when driving capacitive loads. Installing RF choke (<1 µH) between the output pin and any bypass capacitors may prevent these spurious oscillations. Regulator circuits are now available with PNP-based, collector-driven output (Figure 5); these produce only a fraction of the output noise produced by standard NPN-emitter-follower types. Although they involve a slightly higher parts count than their emitter-follower equivalents, their better performance justifies the additional investment.

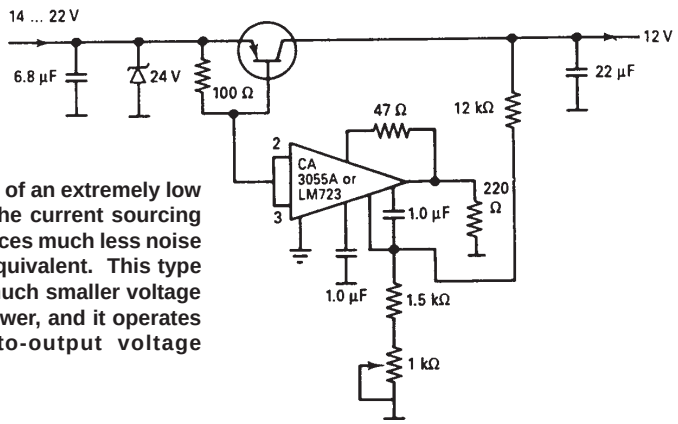
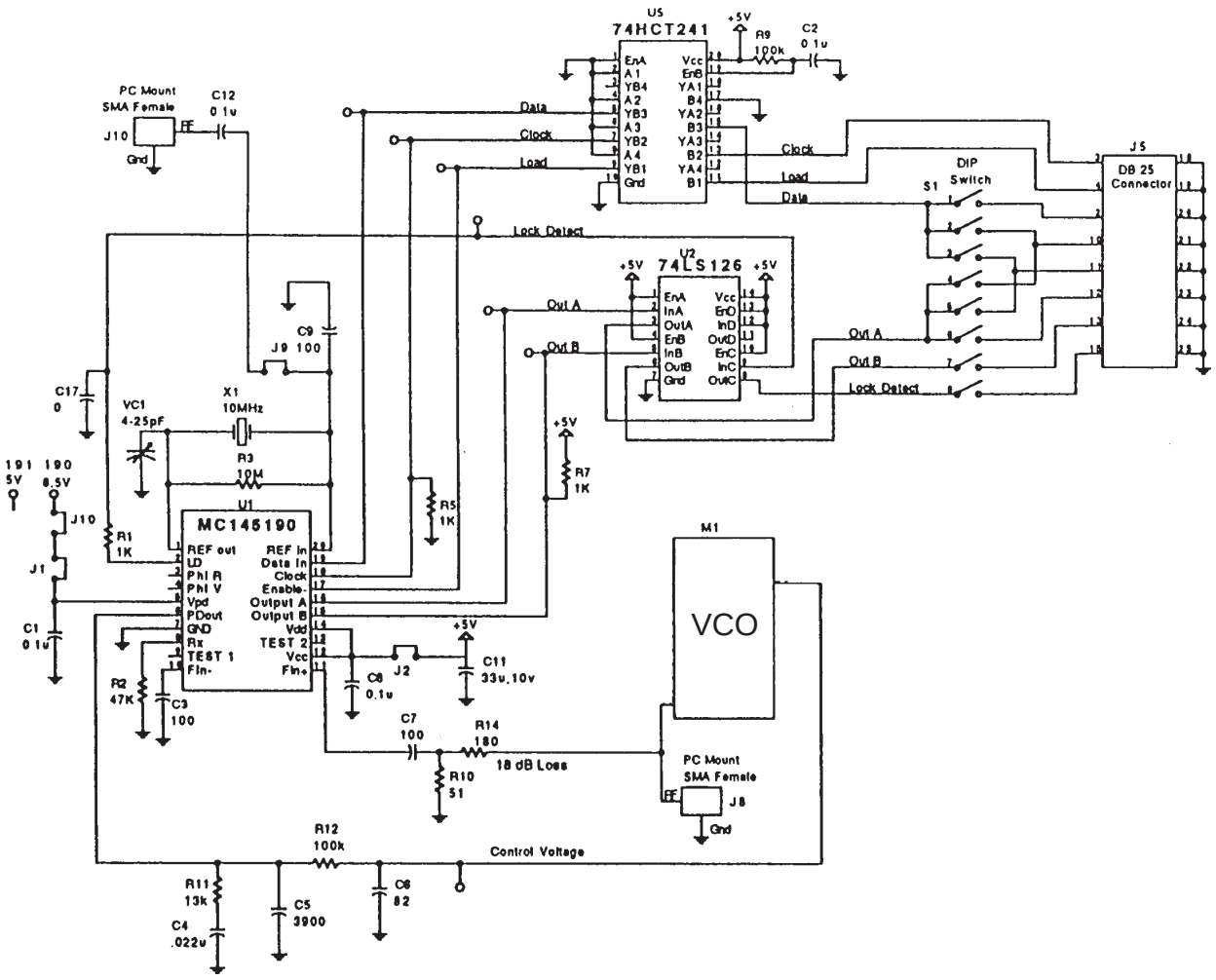


Fig. 5 - Schematic diagram of an extremely low noise output regulator. The current sourcing PNP pass transistor produces much less noise than its emitter-follower equivalent. This type of circuit also exhibits a much smaller voltage drop than the emitter follower, and it operates quite well with input-to-output voltage differentials as low as 0.7.

As far as the best application of VCOs and synthesizer chips is concerned, the factory engineers are happy to work with their customers to optimize the design. Further details are found in the previously mentioned book, *Microwave and Wireless Synthesizers: Theory and Design,* by Ulrich L. Rohde.

Finally, for those interested in building a complete synthesizer using Synergy VCOs, Figure 6 shows an evaluation circuit proposed by Motorola.



NOTES:

1. All ceramic capacitors and resistors are 1206 surface mount, 5% tolerance.
2. Default unit for capacitance is pF.
3. Default unit for resistance is ohms.
4. board material is 1/16" thick G10.
5. Test points are 0.04" diameter plated through holes.
6. Board shown in 190 version. For 191, J10 is connected to 5V. R2 is changed to 22k and U1 is MC145191.
7. As shipped, J9 isn't present and board operates in crystal mode.

Fig. 6 — Evaluation circuit for phase locked loop (courtesy of Motorola).

INTEGRATED FREQUENCY SYNTHESIZER

APPLICATION NOTE FOR SPLL, JPLL, JPLH & SPLH SERIES

FEATURES:

- Exceptional Phase Noise Performance
- Serial Input Programming
- Optimized Reference Sidebands
- Output Frequency up to 2600 MHz
- Small Size, Surface Mount

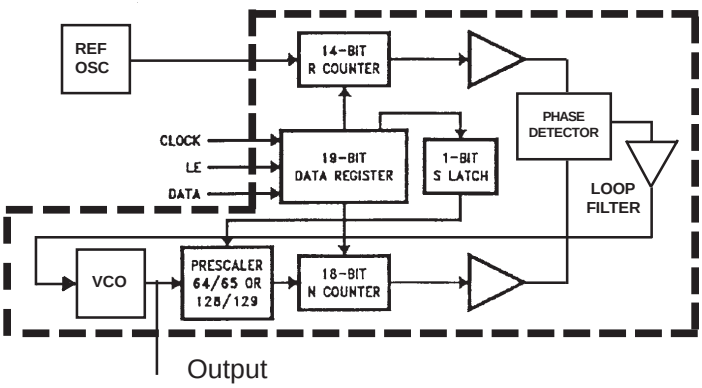
DESCRIPTION:

Synergy's integrated phase-locked synthesizers consist of the low noise Synergy miniature voltage controlled oscillator controlled by an internal integrated circuit PLL device. An external reference oscillator is divided down in the 14 bit reference divider and compared to the VCO frequency, which is divided by the 11 and 7 bit "N" counters. The error signal, which is proportional to the phase difference between the divided frequency signals, is fed to a loop filter which has been designed to give ultimate reference sideband rejection and optimized acquisition speed.

SYNTHESIZER PROGRAMMING FORMAT

The synthesizer is serially controlled and uses inputs on the Clock (Pin 1), Data (Pin 5) and Latch Enable (Pin 4) to program the one reference counter and two program counter dividers. The Clock input latches one bit of data into the synthesizer on the rising edge of each clock pulse (MSB first). The simplified block diagram of the program registers is shown below. If the Control Bit (last bit input) is HIGH, the data is transferred into the R counter (programmable reference divider) and the S Latch (prescaler select: (¥ 64/65 or 128/129) or (Φ 32/33 or 64/65). If the Control Bit (LSB) is LOW, the data is transferred into the N Counter (programmable divider).

TYPICAL BLOCK DIAGRAM



PROGRAMMABLE REFERENCE DIVIDER (R-COUNTER) AND PRESCALER SELECT (S-LATCH)

If the Control Bit (ie. last bit shifted into Data Register) is HIGH, data is transferred from the 19 bit shift register into a 14 bit latch (which sets the 14-bit R-Counter) and a 1 bit S-Latch (S15, which sets the Prescaler to either **(**¥ 64/65, Φ 32/33**)** or **(** ¥128/129, Φ64/65 **)**. The serial data format is shown below:

Control Bit (LSB) — Divide ratio of prescaler control bit (MSB)

C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Divide ratio of the programmable reference divider (R-Counter; 14 bits)

1-BIT PRESCALER SELECT (S-LATCH)

PRESCALER SELECT P		S 15
¥	128 / 129	0
Φ	64 / 65	0
¥	64 / 65	1
Φ	32 / 33	1

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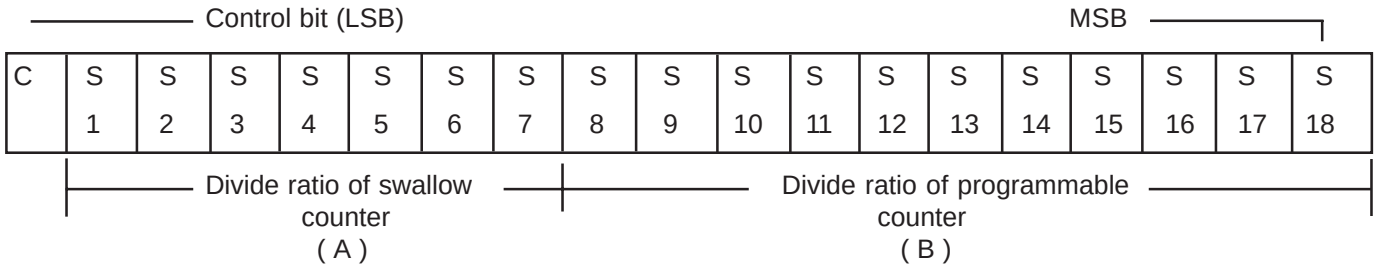
14-BIT REFERENCE DIVIDER RATIO (R-COUNTER)

Divide Ratio R	S 14	S 13	S 12	S 11	S 10	S 9	S 8	S 7	S 6	S 5	S 4	S 3	S 2	S 1
3	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4	0	0	0	0	0	0	0	0	0	0	0	1	0	0
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
16,383	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Notes:
Divide ratios less than 3 are prohibited.
Total divide ratio: 3 to 16383.
S1 to S14: These bits select the divide ratio of the programmable reference divider.
C: Control Bit - Set HIGH to load R-Counter and S-Latch
Data is shifted in MSB first.

PROGRAMMABLE DIVIDER (N-COUNTER)

The N-Counter **consists of the 7-bit swallow counter (A-Counter) and the 11 bit programable counter (B counter). If the Control** Bit (last bit shifted into the Data Register) is LOW, data is transferred from the 19-bit shift register into a 7-bit latch (which sets the 7-bit Swallow (A) Counter) and an 11-bit latch (which sets the 11-bit programmable (B) Counter). Serial data format is shown below:



7-BIT SWALLOW COUNTER DIVIDE RATIO (A-COUNTER)

Divide Ratio A	S 7	S 6	S 5	S 4	S 3	S 2	S 1
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1
•	•	•	•	•	•	•	•
127	1	1	1	1	1	1	1

Notes:
Divide ratio: 0 to 127

11-BIT PROGRAMMABLE COUNTER DIVIDER RATIO (B-COUNTER)

Divide Ratio B	S 18	S 17	S 16	S 15	S 14	S 13	S 12	S 11	S 10	S 9	S 8
3	0	0	0	0	0	0	0	0	0	1	1
4	0	0	0	0	0	0	0	0	1	0	0
•	•	•	•	•	•	•	•	•	•	•	•
2047	1	1	1	1	1	1	1	1	1	1	1

Notes:
Divide ratio less than 3 is prohibited.
Divide ratio: 3 to 2047
S1 to S7: Swallow counter divide ratio setting bit. (0 to 127)
S8 to S18: Programmable counter divide ratio setting bit. (3 to 2047)
C: Control bit (sets as low level).
Data is input from MSB side.
Contents of B counter must be larger than A counter

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PULSE SWALLOW FUNCTION

In order to program the counters with the proper division ratios, the following mathematical relationship is used:

$$f_{VCO} = \{(P \times B) + A\} \times f_{OSC}/R$$

where:

f_{VCO} = Desired output frequency from SPLL- synthesizer module.

B = Preset divide ratio of binary 11-bit programmable counter (3 to 2047). This is determined by the quotient of f_{VCO}/P

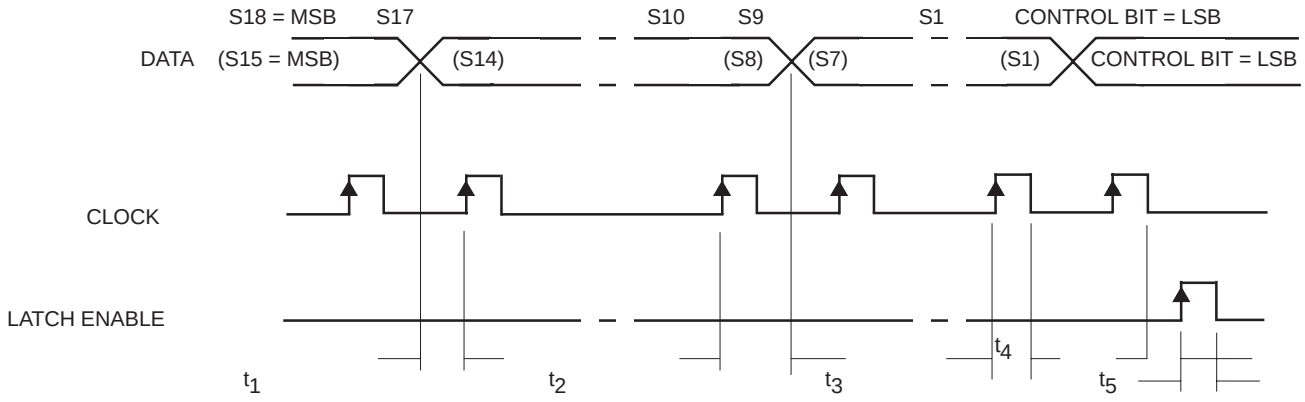
A = Preset divide ratio of binary 7-bit swallow counter ($0 \leq A \leq 127$, $A \leq B$). This is determined by the REMAINDER of (f_{VCO}/P)

f_{OSC} = Output frequency of the external Reference Oscillator.

R = Preset divide ratio of binary 14-bit programmable reference counter (3 to 16383).

P = Preset modulus of dual modulus prescaler (¥ 64, Φ 32) or (¥ 128, Φ 64)

SERIAL DATA INPUT TIMING



Notes:

Data in parentheses indicates programmable reference (R) divider data.
Data is shifted into registers on rising edge of clock pulses.
t_1..... $t_5 \geq 1$ usec.

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INTEGRATED FREQUENCY SYNTHESIZERS

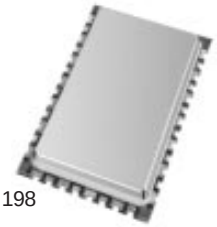
SURFACE-MOUNT


124S


188


190


197


198

FREQUENCY RANGE (MHz)	STEP SIZE (KHz)	DC BIAS REQUIREMENTS Vcc1 & 2 (Volts)	DC BIAS REQUIREMENTS CURRENT Max. (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	SETTLING TIME (mSec)	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION 2nd (dBc)	TYPICAL HARMONIC SUPPRESSION 3rd (dBc)	SPURIOUS REFERENCE SIDEBAND SUPPRESSION (dBc)	PACKAGE	MODEL
40 - 60	25	+5/+12	50	+12	±2.0	<15	-100/-120	15	15	>60	197	**SPLL40SA Φ**
120 - 176	12.5	+5/+12	40	+10	±2.0	<15	-105/-125	15	15	>60	197	**SPLL120SA Φ**
138 - 196	16	+5/+5	45	0	±3.0	<15	-95/-120	20	15	>60	124S	**SPLL138SA ¥**
290 - 325	50	+5/+5	45	0	±3.0	<15	-95/-120	20	15	>60	124S	**SPLL290SA ¥**
290 - 310	5	+5/+5	45	5	±1.0	<50	-100/-120	20	15	>60	190	**SPLL290SB ¥**
303 - 307	25	+5/+5	35	0	±3.0	<15	-110/-130	20	15	>60	124S	**SPLL303SA ¥**
375 - 383	25	+5/+5	35	0	±3.0	<15	-110/-135	20	15	>60	124S	**SPLL375SA ¥**
391 - 411	25	+5/+5	35	0	±3.0	<15	-95/-120	15	15	>60	190	**SPLL391SA ¥**
400 - 750	250	+5/+15	45	+10	±3.0	<5	-95/-120	10	15	>60	198	**SPLL400SAΦ§**
477 - 512	25	+5/+5	45	0	±1.0	<15	-95/-120	10	15	>60	124SL	**SPLL477SA ¥**
490 - 525	50	+5/+5	45	0	±3.0	<15	-110/-135	20	15	>60	124S	**SPLL490SA ¥**
550 - 850	25	+5/+15	45	0	±3.0	<15	-100/-125	10	15	>60	188	**SPLL500SA ¥**
565 - 595	50	+5/+5	45	0	±3.0	<15	-95/-120	15	15	>60	124S	**SPLL565SA ¥**
595 - 605	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL595SA ¥**
630 - 730	25	+5/+15	45	+10	±2.0	<15	-100/-120	15	15	>60	188	**SPLL630SA ¥**
695 - 705	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL695SA ¥**
779 - 806	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL779SA ¥**
800 - 900	30	+5/+5	45	+3	±3.0	<15	-100/-125	20	15	>60	188	**SPLL800SA ¥**
827 - 860	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL827SA ¥**
845 - 870	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL845SA ¥**
869 - 894	30	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL869SA ¥**
895 - 905	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL895SA ¥**
914 - 941	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL914SA ¥**
939 - 964	25	+5/+5	45	0	±3.0	<15	-95/-120	15	15	>60	124S	**SPLL939SA ¥**
950 - 1050	100	+5/+5	45	0	±3.0	<15	-95/-115	20	15	>60	124S	**SPLL950SA ¥**
950 - 1550	1000	+5/+15	45	+10	±3.0	<15	-86/-106	10	15	>60	188	**SPLL950SB Φ**
962 - 995	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL962SA ¥**
980 - 1005	25	+5/+5	35	0	±3.0	<15	-105/-130	20	15	>60	124S	**SPLL980SA ¥**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms *****Reference Input Frequency : 5 to 40 MHz Operating Temperature:-30°C to +70°C
Reference Input Voltage: >0.5 V p-p

*** - Must be a multiple of the step size**
¥ - Programming Type - Same programming as National Semiconductor LMX2320 chip
Φ - Programming Type - Same programming as National Semiconductor LMX2325 chip

PIN-OUT TABLE

RF Out	Vcc1	Vcc2	Clock In	Latch Enable Input	Data In	F_{ref} In	Lock Detect Output	§ External V_{tune}	Ground Style	Package
13	12	16	1	4	5	8	9	--	2,3,14,15	124S
13	12	16	1	4	5	8	9	--	2,3,14,15	188
11	6	8	17	2	15	4	13	--	2,3,14,15	190
25	17,23,27	2	8	12	10	19	15	33	All Other	198
5	16	18	11	12	9	14	7	--	All Other	197

Note:
§ - External V_{tune} Normally not connected

For pin location and package outline drawings, see back pages.

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INTEGRATED FREQUENCY SYNTHESIZERS

SURFACE-MOUNT

FREQUENCY RANGE (MHz)	STEP SIZE (KHz)	DC BIAS REQUIREMENTS Vcc1 & 2 (Volts)	DC BIAS REQUIREMENTS CURRENT Max. (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	SETTLING TIME (mSec)	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION 2nd (dBc)	TYPICAL HARMONIC SUPPRESSION 3rd (dBc)	SPURIOUS REFERENCE SIDEBAND SUPPRESSION (dBc)	PACKAGE	MODEL
101 - 109	100	+5/+5	40	0	±3.0	<15	-105/-125	10	10	>60	192	**JPLL101SA Φ**
136 - 146	50	+5/+5	40	0	±3.0	<15	-95/-120	20	15	>60	192	**JPLL136SA Φ**
162 - 172	50	+5/+5	40	0	±3.0	<15	-95/-120	20	15	>60	192	**JPLL162SA Φ**
700 - 730	30	+5/+5	40	0	±3.0	<15	-100/-125	15	15	>60	192	**JPLL700SA ¥**
750 - 780	30	+5/+5	40	0	±3.0	<15	-95/-120	15	15	>60	192	**JPLL750SA ¥**
820 - 850	30	+5/+5	40	0	±3.0	<15	-95/-120	15	15	>60	192	**JPLL820SA ¥**
944 - 952	25	+5/+5	45	0	±3.0	<15	-90/-125	15	15	>60	192	**JPLL944SA ¥**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms *****Reference Input Frequency: 5 to 40 MHz Operating Temperature:-30°C to +70°C
Reference Input Voltage: >0.5 V p-p

*** - Must be a multiple of the step size**
¥ - Programming Type - Same programming as National Semiconductor LMX2320 chip
Φ - Programming Type - Same programming as National Semiconductor LMX2325 chip

PIN-OUT TABLE

RF Out	Vcc1	Vcc2	Clock In	Latch Enable Input	Data In	F_{ref} In	Lock Detect Output	Ground	Package Style
7	5	1	10	12	11	3	9	2,4,6,8	192

For pin location and package outline drawings, see back pages.

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INTEGRATED FREQUENCY SYNTHESIZERS

HIGH FREQUENCY - SURFACE-MOUNT


124S


188


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FREQUENCY RANGE (MHz)	STEP SIZE (KHz)	DC BIAS REQUIREMENTS Vcc1 & 2 (Volts)	DC BIAS REQUIREMENTS CURRENT Max. (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	SETTLING TIME (mSec)	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION 2nd (dBc)	TYPICAL HARMONIC SUPPRESSION 3rd (dBc)	SPURIOUS REFERENCE SIDEBAND SUPPRESSION (dBc)	PACKAGE	MODEL
1000 - 1800	20	+5/+15	50	+10	±2.0	<15	-90/-115	15	15	>60	197	**SPLH1000SA Φ**
1000 - 2000	1000	+5/+15	35	+10	±2.0	<15	-92/-120	10	15	>60	188	**SPLH1000SB Φ**
1290 - 2000	100	+5/+15	45	+10	±2.0	<15	-95/-120	10	15	>60	188	**SPLH1290SA Φ**
1400 - 1600	100	+5/+15	45	+10	±2.0	<15	-95/-120	20	15	>60	188	**SPLH1400SA Φ**
1470 - 2070	25	+5/+15	45	+10	±3.0	<15	-90/-110	10	15	>60	188	**SPLH1470SA Φ**
1485 - 1635	250	+5/+10.5	45	+12	±3.0	<20	-95/-120	10	15	>60	197	**SPLH1485SA Φ**
1500 - 2050	1500	+5/+15	45	+10	±2.0	<15	-95/-120	10	15	>60	188	**SPLH1500SA Φ**
1525 - 1560	10	+5/+5	45	0	±3.0	<15	-100/-125	20	15	>60	124S	**SPLH1525SA ¥**
1685 - 1780	50	+5/+5	35	0	±3.0	<20	-90/-115	10	15	>60	188	**SPLH1685SA Φ**
1750 - 2250	1500	+5/+15	45	+10	±3.0	<20	-86/-106	10	15	>60	188	**SPLH1750SA Φ**
1880 - 1940	50	+5/+5	45	0	±3.0	<15	-95/-120	10	15	>60	124S	**SPLH1880SA Φ**
1885 - 1975	50	+5/+5	35	0	±3.0	<20	-90/-115	10	15	>60	188	**SPLH1885SA Φ**
1900 - 2100	1000	+5/+15	45	+10	±2.0	<15	-86/-106	10	15	>60	188	**SPLH1900SB Φ**
1900 - 2400	100	+5/+15	35	+10	±2.0	<15	-90/-110	10	15	>60	124S	**SPLH1900SA Φ**
2000 - 2060	50	+5/+5	45	0	±3.0	<15	-95/-120	10	15	>60	124S	**SPLH2000SA Φ**
2050 - 2600	1500	+5/+15	45	+10	±3.0	<15	-87/-106	10	15	>60	188	**SPLH2050SA Φ**
2115 - 2230	250	+5/+10.5	45	+12	±3.0	<20	-95/-120	10	15	>60	197	**SPLH2115SA Φ**
2330 - 2540	1000	+5/+12	45	0	±2.0	<10	-90/-115	10	15	>60	188	**SPLH2330SA Φ**
2420 - 2480	1000	+5/+5	45	0	±2.0	<10	-90/-110	10	15	>60	190	**SPLH2400SA Φ**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms *****Reference Input Frequency : 5 to 40 MHz Operating Temperature: -30°C to +70°C
Reference Input Voltage: >0.5 V p-p

*** - Must be a multiple of the step size**
¥ - Programming Type - Same programming as National Semiconductor LMX2320 chip
Φ - Programming Type - Same programming as National Semiconductor LMX2325 chip

PIN-OUT TABLE

RF Out	Vcc1	Vcc2	Clock In	Latch Enable Input	Data In	F_{ref} In	Lock Detect Output	Ground	Package Style
5	16	18	11	12	9	14	7	All Others	197
13	12	16	1	4	5	8	9	2,3,14,15	124S
13	12	16	1	4	5	8	9	2,3,14,15	188
11	6	8	17	2	15	4	13	2,3,14,15	190

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

INTEGRATED FREQUENCY SYNTHESIZERS

HIGH FREQUENCY - SURFACE-MOUNT

FREQUENCY RANGE (MHz)	STEP SIZE (KHz)	DC BIAS REQUIREMENTS Vcc1 & 2 (Volts)	DC BIAS REQUIREMENTS CURRENT Max. (mA)	OUTPUT POWER dBm	OUTPUT POWER Tolerance (dB)	SETTLING TIME (mSec)	TYPICAL PHASE NOISE dBc/Hz Offset at 10 KHz/100 KHz	TYPICAL HARMONIC SUPPRESSION 2nd (dBc)	TYPICAL HARMONIC SUPPRESSION 3rd (dBc)	SPURIOUS REFERENCE SIDEBAND SUPPRESSION (dBc)	PACKAGE	MODEL
1705 - 1780	50	+5/+5	45	0	±3.0	<15	-90/-115	10	15	>60	192	**JPLH1705SA ¥**
1710 - 1770	30	+5/+5	45	0	±3.0	<15	-90/-115	10	15	>60	192	**JPLH1710SA ¥**
1760 - 1830	50	+5/+5	45	0	±3.0	<15	-90-115	10	15	>60	192	**JPLH1760SA ¥**
1775 - 1885	625	+5/+5	40	0	±3.0	<15	-95/-120	10	15	>60	192	**JPLH1775SA Φ**
1790 - 1850	30	+5/+5	45	0	±3.0	<15	-90/-115	10	15	>60	192	**JPLH1790SA ¥**
1850 - 1910	50	+5/+5	45	0	±3.0	<15	-90/-115	10	15	>60	192	**JPLH1850SA ¥**
1880 - 1960	625	+5/+5	40	0	±3.0	<15	-95/-120	10	15	>60	192	**JPLH1880SA Φ**
2060 - 2140	50	+5/+5	45	0	±3.0	<15	-90/-115	10	15	>60	192	**JPLH2060SA ¥**
2320 - 2400	625	+5/+5	40	0	±3.0	<15	-95/-120	10	15	>60	192	**JPLH2320SA Φ**
2440 - 2470	1000	+5/+5	40	0	±2.0	<15	-90/-115	15	15	>60	192	**JPLH2440SA Φ**

COMMON SPECIFICATIONS

Output Impedance: 50 ohms *****Reference Input Frequency : 5 to 40 MHz Operating Temperature: -30ºC to +70ºC
Reference Input Voltage: >0.5 V p-p

*** - Must be a multiple of the step size**
¥ - Programming Type - Same programming as National Semiconductor LMX2320 chip
Φ - Programming Type - Same programming as National Semiconductor LMX2325 chip

PIN-OUT TABLE

RF Out	Vcc1	Vcc2	Clock In	Latch Enable Input	Data In	F_{ref} In	Lock Detect Output	Ground	Package Style
7	5	1	10	12	11	3	9	2,4,6,8	192

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

Introducton

The Mixer is of fundamental importance in the design of RF and Microwave Systems. It is basically used in frequency translation which in turn simplifies RF and Microwave Systems design. The selection of the proper mixer is a major factor affecting overall performance of these systems. When specifying a mixer, the system designer must consider key parameters, namely, frequency range, conversion loss, dynamic range, interport isolation, VSWR, intermodulation distortion, maximum power handling capability. The following is a brief description of these parameter specifications.

Dynamic Range

The dynamic range of any RF/Microwave System can be defined as the difference between the 1-dB Compression Point and the MDS (Minimum Discernible Signal). These two points are specified in units of power (dBm), giving dynamic range in dB. Mixer manufacturers cannot do a great deal to improve the MDS, since this is dependent on the fundamental characteristics of Schottky barrier diodes and the SSB Phase Noise of the Local Oscillator. The upper limit of the dynamic range (the 1-dB Compression Point) can be raised substantially by using higher level mixers which have lower distortion. When the RF input level approaches the 1-dB Compression Point, harmonic and two-tone intermodulation products begin to interfere with the system performance. High dynamic range is obviously desirable, but cost, system complexity, and reliability must also be considered.

Harmonic Intermodulation Products (HIP)

These are spurious products that are harmonically related to the F_{LO} and F_{RF} input signals.

$$HIP = M \times F_{LO} + N \times F_{RF}$$

Two-Tone Third Order Intermodulation Distortion

The non-linear switching characteristic of the mixer diodes give rise to intermodulation distortion products. If two (usually closely spaced) input signals of equal magnitude are injected into the RF port, spurious products are generated inside the mixer and appear at the output. Output intercept point is defined as the output power level where the spurious signals generated by $(2F_{RF1} \pm F_{RF2}) \pm F_{LO}$ and $(F_{RF1} \pm 2F_{RF2}) \pm F_{LO}$ are equal in amplitude to the desired output signal as shown in figure 1.

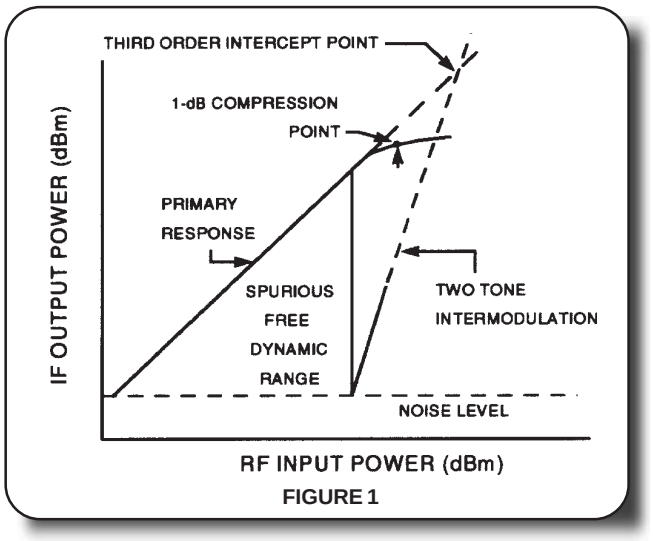


FIGURE 1

The third order intercept point is of particularly useful value and is the most commonly used "figure of merit". Input intercept point can be calculated utilizing the following equation:

$$IIP_N = IMR/(N-1) + \text{input power (dBm)}$$

Where:

IMR = The difference in dB between the desired output and the spurious signal.

N = The order in a conventional double balanced mixer, IP3 would be approximately 14 dB above the 1-dB Compression point (i.e., proximately 8 dB above the Local Oscillator power).

Conversion Loss And Noise Figure

These two terms are used interchangeably since the Noise Figure is never more than a few tenths of a dB higher than the Conversion Loss in passive mixers. "Conversion Loss" normally refers to what is actually "SSB (Single Sideband) Conversion Loss." The theoretical minimum SSB Conversion Loss is 3 dB in a passive mixer. Almost all double-balanced diode mixers have a Conversion Loss of between 3.5 and 8.5 dB, depending on the mixer frequency range and bandwidth.

Isolation

In a mixer, isolation is defined as the attenuation in dB between a signal input at any port and its level as measured at any other port. High isolation numbers are desirable. Isolation is dependent on transformer symmetry and diode unbalance.

1-dB Compression Point

This is a "figure of merit" that, at a given frequency identifies the input signal level at the point where the conversion loss of the mixer has increased 1 dB above its nominal value. This nominal value is the conversion loss when operating at relatively low input levels, where the mixer is operating linearly (i.e., output signal level varies directly with the input signal level).

The 1-dB Compression Point in a conventional double-balanced diode mixer is approximately 6 dB below the Local Oscillator power. For lower distortion mixers, it is usually 3 dB below the Local Oscillator power.

1-dB Desensitization Point

This specification is another "figure of merit" similar to the 1-dB Compression Point. However, the 1-dB Desensitization Point refers to the level of an interfering (undesired) input signal that causes a 1 -dB increase in the nominal conversion loss of the desired signal. The 1-dB Desensitization Point is usually 2 to 3 dB below the 1-dB Compression Point.

DC Offset

Isolation between ports plays a major role in reducing DC offset in a mixer. Like isolation, DC offset is a measure of the unbalance of the mixer. In phase detector applications DC offset is a critical parameter.

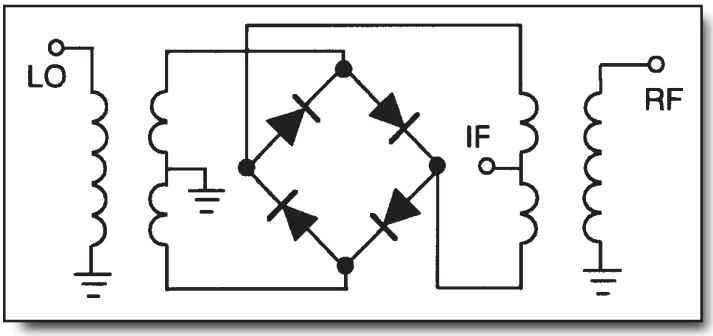
DC Polarity

Unless otherwise specified, Synergy's mixers are designed to have negative polarity when RF and LO signals are of equal phase.

MIXER BASED PRODUCTS

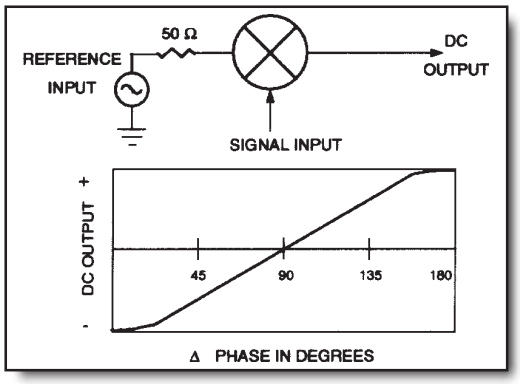
Double Balanced Mixers

Unlike single balanced mixers, double balanced mixers have the advantage of higher interport isolation due to an additional balanced transformer. Usually in double balanced mixers, the IF port is DC coupled to the diodes. The most popular application of a double balanced mixer is in frequency translation and is widely used in communications and test equipment.



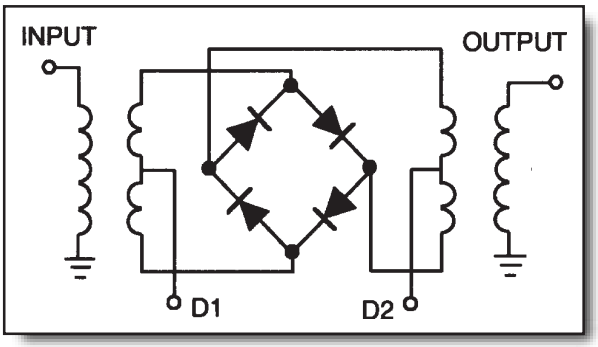
Phase Detectors

Theoretically any mixer with a DC coupled IF port can be used as a Phase Detector. When high efficiency is required Synergy has designed a specialized line of Phase Detectors having very low DC offset. When two signals of equal frequency are applied simultaneously to the reference and incoming signal ports, the Phase Detector will produce a DC output at the IF port proportional to the cosine of the phase difference.



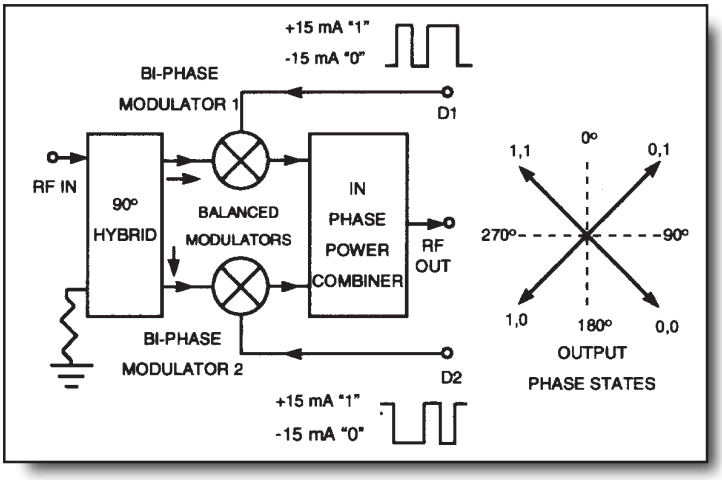
BPSK Modulators

Synergy's line of BPSK Modulators consist of double balanced mixers specifically designed for BPSK Modulation. Bi-Phase modulation occurs when a positive and negative signal current shifts the RF carrier between 0 and 180 degrees.



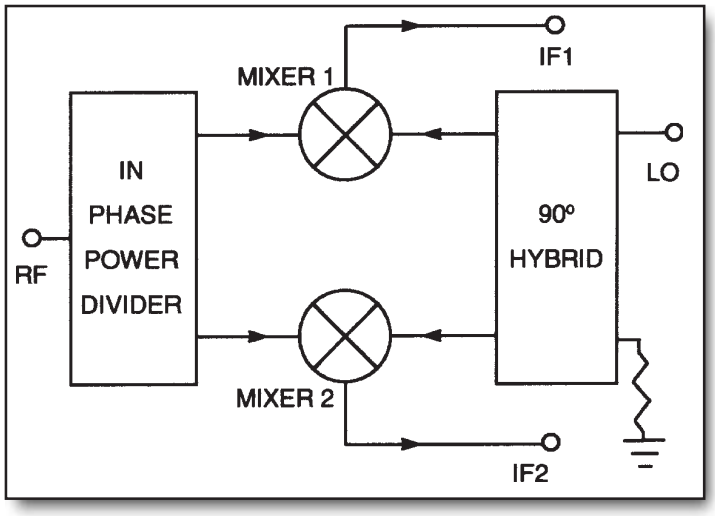
Quadraphase Shift Keying (QPSK) Modulator

A typical QPSK Modulator consists of two biphase modulators, a 90 degree divider, and an in phase power combiner as shown. Data inputs at the control ports will cause the carrier to shift between 0, 90, 180 and 270 degrees as shown in the diagram.



Quadrature IF Mixer

A Quadrature IF Mixer will produce two IF outputs in phase quadrature when fed by a LO and RF Signal. Its basic structure consists of two double balanced mixers, a 90 degree splitter and an in phase two way splitter. The basic block diagram is shown below.



Attenuator/Switches

Synergy's line of Attenuator/Switches consist of a typical double balanced mixer circuit designed specifically for use in a attenuation scheme. Maximum attenuation is achieved when the current at the control port is zero. The maximum attenuation is the isolation between the input and output port. Minimum attenuation (insertion loss) is achieved when the IF port current is 20mA.

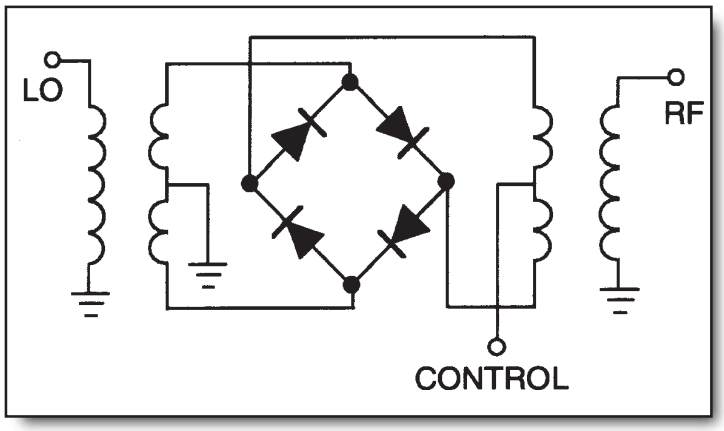
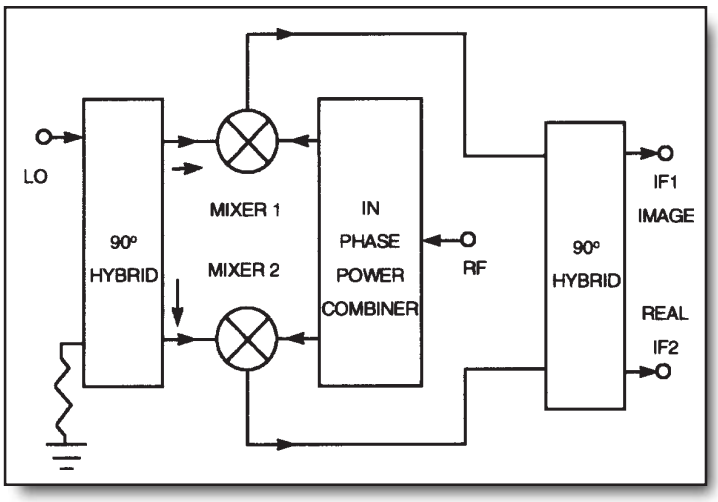


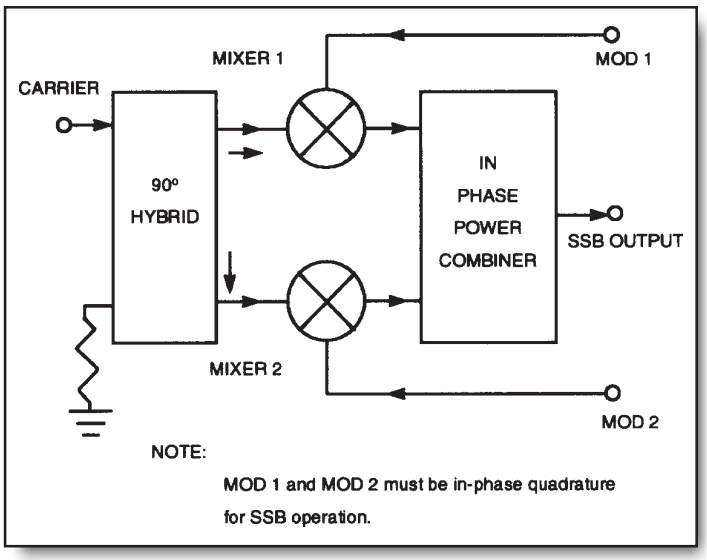
Image Reject Mixer

The Image Reject Mixer consists of a basic quadrature IF Mixer with an additional quadrature hybrid at the IF ports as shown below The primary function is to differentiate between the real signal and the image signal. This type of device is especially useful in applications where the desired and undesired RF sidebands are so close in frequency that filtering is not practical.



Single Sideband (SSB) Modulators

A Single Sideband Modulator will produce either a lower (RF-IF) or upper (RF+IF) sideband by frequency translation utilizing a carrier and a modulation input signal. The carrier and one of the sidebands will be cancelled at the output port. This sideband rejection is achieved by phase cancellation techniques and the carrier is rejected by the inherent interport isolation of the mixers.



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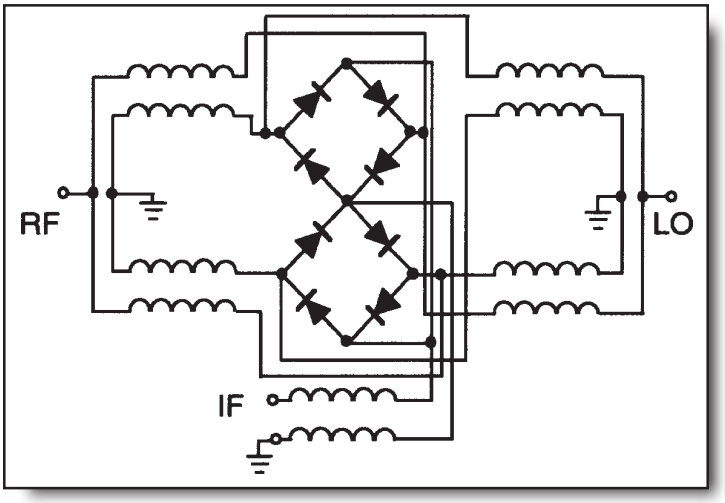
Triple-Balanced Mixers

Triple-balanced mixers (double-double balanced) by design, will offer wider LO and RF bandwidths, higher dynamic range, lower distortion, and higher interport isolation than the conventional double-balanced designs. These devices are constructed by combining two double-balanced mixers and therefore require twice the number of diodes (see figure 1). This improves the 1 dB compression point, as the RF input voltage is divided between a higher diode count.

One disadvantage to this design is that the conversion loss will increase by approximately 6 dB as the IF frequency drops below the LO and RF starting frequencies and further decreases to DC. For this reason, Synergy does not specify the conversion loss for IF frequencies lower than the LO/RF starting frequencies. Another disadvantage of the triple-balanced mixer is it is more expensive than a standard double-balanced mixer to produce. They require more components and have a higher manufacturing cost which leads to a higher unit price. They also require larger real estate, therefore, it is not possible to produce them in the smaller surface mount packages.



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MIXERS

SUB-HARMONIC

LO = +7 dBm

EXCELLENT L.O. REJECTION

EVEN-HARMONIC MIXERS

An even-harmonic mixer will, by its inherent design, convert the fundamental input L.O. frequency into its even harmonics (m=2,4 or 8 etc.). These even harmonics will mix with the fundamental R.F. frequency to basically produce m L.O. ± R. F. mixing results. Synergy specifies the 2 L.O. and 4 L.O. mixing products, as the higher L.O. even harmonics result in much higher conversion losses. The best conversion loss is achieved at the 2 L.O. x 1 R.F. mixing condition.

These models allow for lower frequency local oscillators to be used, therefore reducing costs.

SURFACE MOUNT

134S 

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FREQUENCY RANGE (MHz)			CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)	LO-IF ISOLATION (dB)	OUTLINE DRAWING	PACKAGE	MODEL
RF	LO	IF	2LO-RF TYP/MAX	4LO-RF TYP/MAX	TYP/MIN	TYP/MIN			
280-800	140-400	DC-100	11.5/13.5	17.0/26.0	45/33	30/22	159	1	**XLD-K1**
280-800	140-400	DC-100	11.5/13.5	17.0/26.0	45/33	30/22	134S	1	**XMZ-K1**
500-1800	250-900	DC-200	11.5/14.5	17.0/26.0	40/30	25/18	159	1	**XLD-K2**
500-1800	250-900	DC-200	11.5/14.5	17.0/26.0	40/30	25/18	159	1	**XMZ-K2**
800-2400	400-1200	DC-300	12.5/16.5	18.0/27.0	30/25	25/16	159	1	**XLD-K3**
800-2400	400-1200	DC-300	12.5/16.5	18.0/27.0	30/25	25/16	159	1	**XMZ-K3**

THROUGH HOLE

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120 

FREQUENCY RANGE (MHz)			CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)	LO-IF ISOLATION (dB)	OUTLINE DRAWING	PACKAGE	MODEL
RF	LO	IF	2LO-RF TYP/MAX	4LO-RF TYP/MAX	TYP/MIN	TYP/MIN			
900-2400	450-1200	DC-300	12.5/16.5	18.0/24.0	30/25	25/16	120	2	**CXP-237**
900-2400	450-1200	DC-300	12.5/16.5	18.0/24.0	30/25	25/16	106	3	**CXP-337**
900-2400	450-1200	DC-300	12.5/16.5	18.0/24.0	30/25	25/16	108	2	**CXP-437**

NOTES:

1. 1dB Compression Point = -7 dBm (Typ)
2. IP3 (Input) = +4 dBm (Typ)

PIN-OUT TABLE

	RF	LO	IF	GND
#1	4	1	5	2, 3,6
#2	1	2	3	2,5,67
#3	1	2	4	3

GND = Ground externally

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

STARVED L.O. MIXERS
DOUBLE-BALANCED

ULTRA-LOW POWER CONSUMPTION

LO = +1 dBm

SURFACE MOUNT


133


134


134S


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FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
5-500	DC-500	6.5/7.5	7.0/8.5	70/45	60/40	50/25	65/40	50/35	40/20	134	1	**SRD-KA**
5-500	DC-500	6.5/7.5	7.0/8.5	70/45	60/40	50/25	65/40	50/35	40/20	159	1	**SRL-KA**
5-500	DC-500	6.5/7.5	7.0/8.5	70/45	60/40	50/25	65/40	50/35	40/20	134S	1	**SRZ-KA**
5-500	DC-500	6.5/7.5	7.0/8.5	70/45	60/40	50/25	65/40	50/35	40/20	133	2	**SRD-CA**
800-1000	DC-200	--/--	7.0/8.5	--/--	35/25	--/--	--/--	30/20	--/--	134	1	**SRD-KB***
800-1000	DC-200	--/--	7.0/8.5	--/--	35/25	--/--	--/--	30/20	--/--	159	1	**SRL-KB***
800-1000	DC-200	--/--	7.0/8.5	--/--	35/25	--/--	--/--	30/20	--/--	134S	1	**SRZ-KB***
800-1000	DC-200	--/--	7.0/8.5	--/--	35/25	--/--	--/--	30/20	--/--	133	2	**SRD-CB***
1500-2500	DC-1000	6.0/8.5	7.5/10	27/20	--/--	27/20	15/10	--/--	13/8	134	1	**SRD-KD****
1500-2500	DC-1000	6.0/8.5	7.5/10	27/20	--/--	27/20	15/10	--/--	13/8	159	1	**SRL-KD****
1500-2500	DC-1000	6.0/8.5	7.5/10	27/20	--/--	27/20	15/10	--/--	13/8	134S	1	**SRZ-KD****
1500-2500	DC-1000	6.0/8.5	7.5/10	27/20	--/--	27/20	15/10	--/--	13/8	133	2	**SRD-CD****

THROUGH HOLE


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FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-500	DC-500	6.5/7.5	7.0/8.5	70/45	60/35	50/25	65/40	50/30	40/20	105	3	**CRP-301**
800-1000	DC-200	--/--	7.0/8.5	--/--	35/25	--/--	--/--	30/20	--/--	106	3	**CRP-334***
1500-2500	DC-1000	6.0/8.5	7.5/10	27/20	--/--	27/20	15/10	--/--	13/8	106	3	**CRP-337****

XMB = 2LF to HF/2
FULL BAND = LF to HF
LB = LF to 10LF
MB =10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2, 3,6	--
#2	1	2	3	4,5,6	--
#3	1	4	2	3	3

GND = Ground externally
For pin location and package outline drawings, see back pages.

NOTES:

1. 1dB Compression Point = -4 dBm (Min)
2. IP3 (Input) = +7 dBm (Typ)

* MB = 800-1000 MHz

** XMB=1700-2100 MHz; LB = 1500-2000 MHz; UB = 2000-2500 MHz

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SYNERGY® MICROWAVE CORPORATION

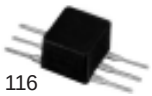
MIXERS

DOUBLE-BALANCED

SOURCE-LINE (LOW COST)


102


106


116


120

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO DRIVE	1dB COMP.	IP3 (INPUT)	ISOLATION L-R (dB)			ISOLATION L-I (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND				LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	(dBm)	(dBm) TYP	(dBm) TYP	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
1-500	DC-500	5.5/7.0	6.5/8.0	+7	0	+13	60/45	45/35	40/25	45/35	40/25	30/20	120	1	**S-1****
1-500	DC-500	5.5/7.0	6.5/8.0	+17	+6	+21	60/45	45/35	40/25	45/35	40/25	30/20	120	1	**S-1H****
1-500	DC-500	6.0/7.5	7.0/8.5	+7	0	+13	60/45	45/35	40/25	45/35	40/25	30/20	120	1	**S-2****
.5-500	DC-500	5.5/7.0	6.5/8.5	+7	0	+13	50/45	45/30	35/25	45/35	40/25	30/20	102	2	**S-3**
.5-500	DC-500	5.5/7.0	6.5/8.5	+7	0	+13	50/45	45/30	35/25	45/35	40/25	30/20	102	3	**S-3Z**
.5-500	DC-500	5.5/7.5	6.5/8.5	+17	9	+22	55/45	45/30	45/25	45/35	40/30	30/20	102	2	**S-3H**
1-600	DC-600	5.5/7.0	6.0/8.5	+7	0	+13	50/30	35/25	30/20	45/35	30/20	25/15	116	5	**S-5****
1-1000	DC-1000	7.0/8.0	8.0/9.8	+7	0	+13	60/40	35/18	26/16	50/30	25/17	15/10	116	5	**S-5E****
.5-800	DC-800	5.5/7.0	6.0/8.5	+17	+9	+22	70/40	45/35	40/30	60/40	40/30	30/25	102	7	**S-7H**
10-1000	5-600	6.0/7.5	7.0/8.0	+7	0	+9	50/40	40/30	30/20	50/45	40/35	35/25	120	4	**S-4****
10-1000	5-600	6.0/7.5	7.0/8.0	+7	0	+9	50/40	40/30	30/20	50/45	40/35	35/25	120	1	**S-4A****
1-1000	DC-1000	6.0/7.5	7.0/8.5	+7	0	+13	50/45	40/25	30/25	45/40	35/25	25/20	106	6	**S-6**
1-1000	DC-1000	6.0/7.5	7.0/8.5	+7	0	+13	50/45	40/25	30/25	45/40	35/25	25/20	106	6	**S-6P** ■
.5-500	DC-500	5.5/7.0	6.5/8.5	+7	+1	+13	50/45	45/30	35/25	45/35	40/25	30/20	102	2	**S-8**
2-600	DC-600	5.5/7.0	7.0/8.0	+7	+1	+13	60/50	42/30	37/25	60/45	47/30	36/22	106	6	**TOP-1**
50-1000	DC-1000	6.0/7.0	7.8/9.0	+7	+1	+13	58/45	45/30	38/25	50/35	40/20	35/18	106	6	**TOP-2**
0.15-400	DC-400	5.0/7.0	5.5/8.0	+7	+1	+13	60/50	46/30	35/25	60/40	47/25	35/20	106	6	**TOP-3**
20-1500	DC-1000	7.5/8.0	8.5/9.0	+7	+1	+13	54/40	42/30	39/25	40/25	32/18	23/8	106	6	**TOP-5**

NOTES:

■ Phase Detection, Polarity Positive
** Non - Hermetic

XMB = 2LF to HF/2
FULL BAND = LF to HF
LB = LF to 10LF
MB =10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	1	8	*3,4	2,5,6,7	--
#2	1	8	*3,4	2,5,6,7	2
#3	7	1	*3,4	2,5,6,8	2.5.6
#4	*3,4	8	1	2,5,6,7	2,5,6,7
#5	4	1	5	2,3,6	--
#6	1	4	2	3	3
#7	1	8	*3,4	2,5,6,7	2,5,6,7

* Pins must be connected together externally
GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +7 dBm

LOW POWER CONSUMPTION

SURFACE MOUNT

134 

134S 

159 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-500	DC-500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	159	1	**SLD-K1***
0.5-500	DC-500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	134	1	**SMD-K1***
0.5-500	DC-500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	134S	1	**SMZ-K1***
2-750	DC-750	6.0/7.5	6.0/8.5	70/45	45/28	38/22	60/45	40/25	30/20	159	1	**SLD-K1W***
2-750	DC-750	6.0/7.5	6.0/8.5	70/45	45/28	38/22	60/45	40/25	30/20	134	1	**SMD-K1W***
2-750	DC-750	6.0/7.5	6.0/8.5	70/45	45/28	38/22	60/45	40/25	30/20	134S	1	**SMZ-K1W***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	159	1	**SLD-K2***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	134	1	**SMD-K2***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	134S	1	**SMZ-K2***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/30	33/22	55/30	40/22	30/20	159	1	**SLD-K2D***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/30	33/22	55/30	40/22	30/20	134	1	**SMD-K2D***
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/30	33/22	55/30	40/22	30/20	134S	1	**SMZ-K2D***
10-1000	10-750	6.5/8.0	8.0/9.5	55/40	40/30	30/25	55/30	35/25	30/22	159	1	**SLD-K2U***
10-1000	10-750	6.5/8.0	8.0/9.5	55/40	40/30	30/25	55/30	35/25	30/22	134	1	**SMD-K2U***
10-1000	10-750	6.5/8.0	8.0/9.5	55/40	40/30	30/25	55/30	35/25	30/22	134S	1	**SMZ-K2U***
5-1500	DC-1000	6.5/7.5	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	159	1	**SLD-K3***
5-1500	DC-1000	6.5/7.5	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	134	1	**SMD-K3***
5-1500	DC-1000	6.5/7.5	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	134S	1	**SMZ -K3***

NOTES:

* Phase Detection, Polarity Positive
1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND
#1	4	1	5	2,3,6

GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +7 dBm

LOW POWER CONSUMPTION

SURFACE MOUNT


106B


133


134


134S


154


156


159

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
5-1900	5-1000	7.2/8.2	8.5/9.8	58/45	35/22	30/20	56/45	37/20	27/20	159	2	**SLD-K11X***
5-1900	5-1000	7.2/8.2	8.5/9.8	58/45	35/22	30/20	56/45	37/20	27/20	134	2	**SMD-K11X***
5-1900	5-1000	7.2/8.2	8.5/9.8	58/45	35/22	30/20	56/45	37/20	27/20	134S	2	**SMZ-K11X***
1500-1900	40-400	--/--	7.8/9.0	25/17	25/17	25/17	23/15	23/15	23/15	159	2	**SLD-K11A***
1500-1900	40-400	--/--	7.8/9.0	25/17	25/17	25/17	23/15	23/15	23/15	134	2	**SMD-K11A***
1500-1900	40-400	--/--	7.8/9.0	25/17	25/17	25/17	23/15	23/15	23/15	134S	2	**SMZ-K11A***
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	159	1	**SLD-K4**
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134	1	**SMD-K4**
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134S	1	**SMZ-K4**
200-3000	DC-1000	6.5/9.0	9.0/9.8	27/17	27/17	27/17	20/7	20/7	20/7	159	1	**SLD-K6***
200-3000	DC-1000	6.5/9.0	9.0/9.8	27/17	27/17	27/17	20/7	20/7	20/7	134	1	**SMD-K6***
200-3000	DC-1000	6.5/9.0	9.0/9.8	27/17	27/17	27/17	20/7	20/7	20/7	134S	1	**SMZ-K6***
1-1000	DC-1000	6.5/7.5	7.5/9.5	70/45	45/30	40/25	60/40	35/23	30/15	133	3	**SMD-C1**
1-500	DC-500	6.0/7.0	6.5/8.0	60/40	45/35	40/30	50/40	45/35	40/25	133	3	**SMD-C1X**
20-1500	DC-1500	7.0/8.5	8.5/9.0	50/35	40/25	20/10	40/25	30/18	15/8	133	3	**SMD-C2**
20-2500	20-600	8.0/9.0	9.0/10.5	45/30	30/23	30/15	40/20	25/15	25/12	133	3	**SMD-C3**
15-2000	DC-1500	7.0/9.0	8.0/10.5	70/30	30/20	20/13	50/30	20/15	20/10	133	3	**SMD-C4♦**
1-500	DC-500	5.5/7.0	6.5/8.5	60/45	45/35	40/25	45/35	40/25	30/20	154	4	**SSM-1**
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	154	4	**SSM-2**
1-600	DC-600	5.5/7.0	6.0/8.5	50/30	35/25	30/20	45/35	30/20	20/15	156	1	**SM-5**
5-1000	DC-1000	6.5/8.0	7.0/9.0	60/40	35/18	26/16	50/30	25/17	15/10	156	1	**SM-5E**
2-600	DC-600	5.5/7.0	7.0/8.0	60/50	42/30	37/25	60/45	47/30	36/22	106B	5	**TOP-1Z**
50-1000	DC-1000	6.0/7.0	7.8/9.0	58/45	45/30	38/25	50/35	40/20	35/18	106B	5	**TOP-2Z**
20-1500	DC-1000	7.5/8.0	8.5/9.0	54/40	42/30	39/25	40/25	32/18	23/8	106B	5	**TOP-5Z**

NOTES:

1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)
* Phase Detection, Polarity Positive
♦ Specifications apply when RF > LO

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2,3,6	--
#2	5	1	4	2,3,6	--
#3	1	2	3	All Other	--
#4	1	8	**3,4	2,5,6,7	--
#5	1	4	2	3	3

GND = Ground externally
** Connect pins 3,4 together externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +7 dBm

LOW POWER CONSUMPTION

FLAT-PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			Package	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	101	1	**CLF-102**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	101	1	**CLF-112**
0.04-400	DC-400	5.3/7.0	6.0/8.0	60/50	50/35	35/25	45/40	35/25	25/20	101	1	**CLF-1R3**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	101	1	**CLF-101**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	101	1	**CLF-103**
10-1500	DC-1500	6.0/7.0	7.0/10	55/40	45/35	30/20	50/40	40/25	20/12	101	1	**CLF-1A5**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	101	1	**CLF-111**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	101	1	**CLF-109**
700-2000	DC-300	--/--	6.0/8.0	35/20	35/20	35/20	20/12	20/12	20/12	101	1	**CLF-1F6**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	101	1	**CLF-104**

NOTES:

1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND
#1	1	4	5	All Other

GND = Ground externally
For pin location and package outline drawings, see back pages.

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MIXERS

DOUBLE-BALANCED

LO = +7 dBm

LOW POWER CONSUMPTION

THROUGH HOLE (RELAY)


102


103


120

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.0005-10	DC-10	6.5/7.5	7.0/8.5	60/50	50/40	45/35	60/50	50/40	45/35	102	1	**CLP-2D1**
0.003-100	DC-100	5.5/7.5	6.5/8.5	60/50	45/30	35/25	60/45	40/25	30/20	102	1	**CLP-2C1**
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	102	2	**CLP-202**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	103	2	**CLP-212**
0.025-200	DC-200	5.5/7.5	6.5/8.5	60/50	45/35	35/25	45/35	40/30	30/20	102	2	**CLP-2C2**
0.025-200	DC-200	5.5/7.5	6.5/8.5	55/50	45/30	35/25	45/35	40/30	30/20	120	1	**CLP-2B2****
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	103	2	**CLP-201**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	103	3	**CLP-203**
1-750	DC-750	5.5/7.5	6.5/8.5	50/45	45/30	35/25	45/30	40/25	30/20	102	3	**CLP-2D4**
1-1000	0.5-500	5.5/7.5	6.5/8.5	45/30	35/20	30/20	45/30	30/20	30/20	102	4	**CLP-2F4**
5-1000	DC-1000	6.0/7.0	6.5/8.5	60/50	35/30	30/25	50/45	30/25	25/20	102	3	**CLP-2G4**
10-1000	DC-500	6.5/7.5	7.0/9.0	50/40	35/25	25/20	40/25	25/18	19/15	120	5	**CLP-2C4****
5-1250	0.5-500	5.5/7.5	6.5/8.5	50/40	40/20	30/20	50/40	40/20	30/20	102	4	**CLP-2D5**
5-1500	10-600	7.0/8.0	7.5/8.5	50/45	35/30	30/20	45/40	30/25	25/15	120	6	**CLP-2E5**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	102	3	**CLP-211**
5-2000	10-600	7.0/8.5	7.5/9.0	50/45	35/25	30/20	45/40	30/20	25/15	120	6	**CLP-2A6**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	120	6	**CLP-209**
100-2000	DC-600	6.0/9.5	7.0/9.5	37/20	37/20	37/20	30/20	30/20	30/20	120	6	**CLP-2C6**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	120	5	**CLP-204**

NOTES:

1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)

** Non-hermetic

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN
#1	*3,4	8	1	2,5,6,7	2,5,6,7	--
#2	1	8	*3,4	2,5,6,7	2	--
#3	1	8	*3,4	2,5,6,7	2,5,6,7	--
#4	*3,4	8	1	2,5,6,7	2,5,6,7	--
#5	8	1	3	2,5,6,7	2,5,6,7	4
#6	1	8	3	2,5,6,7	2,5,6,7	4

GND = Ground externally
* Connect pins 3,4 together externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +7 dBm

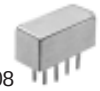
LOW POWER CONSUMPTION

THROUGH HOLE (MINI-RELAY)

105 

106 

107 

108 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	105	1	**CLP-302**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	105	1	**CLP-312**
0.04-400	DC-400	5.5/7.0	6.0/8.0	60/50	50/35	35/25	55/40	45/30	35/25	106	1	**CLP-3P3**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	106	1	**CLP-301**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	106	1	**CLP-303**
5-1250	DC-1250	6.0/7.5	7.5/8.5	50/45	40/30	30/25	45/40	35/25	25/20	106	1	**CLP-3M5**
5-1500	DC-1000	6.5/8.5	8.0/9.5	60/45	35/25	30/25	60/40	35/15	25/14	106	1	**CLP-3L5**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	106	1	**CLP-311**
1-2000	5-600	7.0/8.5	7.5/9.0	50/45	35/25	25/10	45/40	27/20	25/20	105	1	**CLP-3D6**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	105	1	**CLP-309**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	106	1	**CLP-304**
1000-3500	DC-1000	--/--	7.5/9.5	30/17	30/17	30/17	20/8	20/8	20/8	106	1	**CLP-307**
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	107	2	**CLP-402**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	107	2	**CLP-412**
0.1-500	DC-500	5.5/7.0	6.5/8.5	60/50	50/35	35/30	50/40	45/30	30/20	107	2	**CLP-4A3**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	108	2	**CLP-401**
1-600	DC-600	6.0/7.5	6.5/8.5	60/45	45/35	35/25	55/45	40/30	35/25	108	2	**CLP-4N4**
1-600	DC-600	5.5/7.0	6.5/8.5	55/45	45/30	35/20	50/40	40/25	30/20	107	2	**CLP-4A4**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	108	3	**CLP-403**
1-1000	DC-1000	6.0/7.5	7.0/9.5	55/45	40/25	35/20	50/40	40/25	30/25	107	3	**CLP-4B4**
1-1000	DC-1000	6.0/7.5	7.0/10	55/45	40/20	35/18	50/40	40/20	25/18	108	2	**CLP-4Q4**
5-1250	0.5-1000	6.5/8.5	6.5/8.5	55/40	35/25	30/20	50/40	35/25	30/20	107	4	**CLP-4B5**
5-1500	0.5-1000	6.5/7.5	6.5/8.5	55/40	35/25	30/20	50/40	35/25	30/20	107	4	**CLP-4C5**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	107	3	**CLP-411**

NOTES:

1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	1	4	2	3	3
#2	1	8	*3,4	2,5,6,7	2
#3	1	8	*3,4	2,5,6,7	2,5,6,7
#4	*3,4	8	1	2,5,6,7	2,5,6,7

* Pins must be connected together externally
GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +7 dBm

LOW POWER CONSUMPTION

PLUG-IN (TO-CAN)

104 

122 

126 

127 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	104	1	**CLP-502**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	104	1	**CLP-512**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	104	1	**CLP-501**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	104	1	**CLP-503**
800-2500	DC-400	--/--	6.6/8.5	30/20	30/20	30/20	20/10	20/10	20/10	104	1	**CLP-504**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	122	2	**CLP-612**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	122	2	**CLP-603**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	122	2	**CLP-611**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	122	2	**CLP-609**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	122	2	**CLP-604**
0.2-200	DC-200	5.5/6.0	5.5/6.0	45/35	40/30	35/25	45/35	40/30	35/25	127	3	**CLP-8T3**
5-500	DC-500	5.7/6.5	6.5/7.0	40/35	40/30	35/25	35/30	35/30	30/25	127	3	**CLP-8S3**
1-1000	DC-1000	6.5/7.5	7.0/8.5	50/40	40/25	30/20	45/40	35/25	25/20	126	4	**CLP-8A4**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	110	5	**CLK-702***
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	110	5	**CLK-712***
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	110	5	**CLK-701***
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	110	5	**CLK-703***
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	110	5	**CLK-711S**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	110	5	**CLK-709S**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	110	5	**CLK-704S**
800-4200	DC-1000	--/--	6.5/10	25/13	25/13	25/13	20/10	20/10	20/10	110	5	**CLK-215S**

NOTES:

1. 1dB Compression Point = +1 dBm (Typ)
2. IP3 (Input) = +13 dBm (Typ)

* Connector style: "B" = BNC, "T" = TNC, N" = Type N, "S" = SMA

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	2	5	11	All Others	All Others
#2	1	3	2	4	--
#3	4,1	2	3	5	5
#4	4	2	3	1	1
#5	1	3	2	--	--

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +10 dBm

IMPROVED DYNAMIC RANGE

SURFACE MOUNT

106B 

134 

134S 

159 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5 - 500	DC - 500	5.4/7.0	6.0/8.0	58/45	44/25	30/20	55/40	40/25	28/17	159	1	**SLD-K1L***
0.5 - 500	DC - 500	5.4/7.0	6.0/8.0	58/45	44/25	30/20	55/40	40/25	28/17	134	1	**SMD-K1L***
0.5 - 500	DC - 500	5.4/7.0	6.0/8.0	58/45	44/25	30/20	55/40	40/25	28/17	134S	1	**SMZ-K1L***
5 - 1000	DC - 1000	6.4/8.0	7.0/9.5	58/40	39/20	22/16	52/30	30/17	18/11	159	1	**SLD-K2L***
5 - 1000	DC - 1000	6.4/8.0	7.0/9.5	58/40	39/20	22/16	52/30	30/17	18/11	134	1	**SMD-K2L***
5 - 1000	DC - 1000	6.4/8.0	7.0/9.5	58/40	39/20	22/16	52/30	30/17	18/11	134S	1	**SMZ-K2L***
5 - 1500	DC - 900	6.5/8.0	7.6/9.8	58/35	38/20	25/18	56/30	38/14	17/6	159	1	**SLD-K3L***
5 - 1500	DC - 900	6.5/8.0	7.6/9.8	58/35	38/20	25/18	56/30	38/14	17/6	134	1	**SMD-K3L***
5 - 1500	DC - 900	6.5/8.0	7.6/9.8	58/35	38/20	25/18	56/30	38/14	17/6	134S	1	**SMZ -K3L***
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	159	1	**SLD-K4L**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134	1	**SMD-K4L**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134S	1	**SMZ-K4L**
2-600	DC-600	5.5/7.0	7.0/8.0	60/50	42/30	37/25	60/45	47/30	36/22	106B	2	**TOP-1LZ**
50-1000	DC-1000	6.0/7.0	7.8/9.0	58/45	45/30	38/25	50/35	40/20	35/18	106B	2	**TOP-2LZ**
20-1500	DC-1000	7.5/8.0	8.5/9.0	54/40	42/30	39/25	40/25	32/18	23/8	106B	2	**TOP-5LZ**

NOTES:

***** Phase Detection, Polarity Positive
1. 1dB Compression Point = +5 dBm (Typ)
2. IP3 (Input) = +18 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2, 3,6	--
#2	1	4	2	3	3

GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +13 dBm

HIGH DYNAMIC RANGE

SURFACE MOUNT

106B 

134 

134S 

159 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.5 - 500	DC - 500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	159	1	**SLD-K1RM***
0.5 - 500	DC - 500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	134	1	**SMD-K1RM***
0.5 - 500	DC - 500	5.5/7.0	6.0/8.5	55/50	35/25	30/20	55/45	30/25	25/20	134S	1	**SMZ-K1RM***
5 - 1000	DC - 1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	159	1	**SLD-K2RM***
5 - 1000	DC - 1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	134	1	**SMD-K2RM***
5 - 1000	DC - 1000	6.5/8.0	7.0/9.0	60/40	40/20	25/20	55/30	30/20	20/12	134S	1	**SMZ-K2RM***
10 - 1000	20 - 500	6.5/8.0	7.5/9.5	52/40	43/30	33/25	53/30	44/25	39/22	159	1	**SLD-K2URM***
10 - 1000	20 - 500	6.5/8.0	7.5/9.5	52/40	43/30	33/25	53/30	44/25	39/22	134	1	**SMD-K2URM***
10 - 1000	20 - 500	6.5/8.0	7.5/9.5	52/40	43/30	33/25	53/30	44/25	39/22	134S	1	**SMZ-K2URM***
5 - 1500	DC - 1000	6.5/8.0	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	159	1	**SLD-K3RM***
5 - 1500	DC - 1000	6.5/8.0	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	134	1	**SMD-K3RM***
5 - 1500	DC - 1000	6.5/8.0	7.5/9.5	60/40	40/20	30/18	55/30	30/18	15/8	134S	1	**SMZ -K3RM***
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	159	1	**SLD-K4RM**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134	1	**SMD-K4RM**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134S	1	**SMZ-K4RM**
2-600	DC-600	5.5/7.0	7.0/8.0	60/50	42/30	37/25	60/45	47/30	36/22	106B	2	**TOP-1RMZ**
50-1000	DC-1000	6.0/7.0	7.8/9.0	58/45	45/30	38/25	50/35	40/20	35/18	106B	2	**TOP-2RMZ**
20-1500	DC-1000	7.5/8.0	8.5/9.0	54/40	42/30	39/25	40/25	28/18	20/8	106B	2	**TOP-5RMZ**

NOTES:

***** Phase Detection, Polarity Positive
1. 1dB Compression Point = +7 dBm (Typ)
2. IP3 (Input) = +20 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2, 3,6	--
#2	1	4	2	3	3

GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

DOUBLE-BALANCED

LO = +13 dBm

HIGH DYNAMIC RANGE

THROUGH HOLE (RELAY)


102


106


120

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-500	DC-500	5.5/7.0	6.5/8.5	50/45	45/30	35/25	45/35	40/25	30/20	102	1	**CMP-2D3**
1-500	DC-500	5.5/7.5	6.5/8.5	50/35	45/30	35/25	35/30	40/25	30/20	120	2	**CMP-2C3***
10-2000	DC-600	7.0/8.5	7.5/9.0	55/45	45/30	40/30	50/45	35/30	35/25	102	3	**CMP-256**
1-250	DC-200	5.0/7.0	6.0/8.5	50/45	40/30	28/23	45/40	35/25	26/20	106	4	**CMP-3H2**
2-500	DC-500	6.0/7.5	7.0/8.5	50/45	40/30	30/20	45/40	35/25	25/20	106	4	**CMP-3H3**

FLAT-PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			OUTLINE DRAWING	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-500	DC-500	6.0/7.0	7.0/9.0	45/40	45/40	40/30	45/40	40/35	35/25	101	5	**CMF-1A3**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5 - 2000	0.2 - 600	5.8/8.0	7.2/9.5	60/45	35/30	30/25	55/40	30/25	25/20	110	4	**CMK-7A6S**

NOTES:

1. 1dB Compression Point = +7 dBm (Typ)
2. IP3 (Input) = +18 dBm (Typ)

* Non-Hermetic

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	1	8	*3,4	2,5,6,7	2
#2	1	8	*3,4	2,5,6,7	--
#3	1	8	3	2,5,6,7	2,5,6,7
#4	1	4	2	3	3
#5	1	4	5	All Other	All Other
#6	1	3	2	--	--

GND = Ground externally

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS
DOUBLE-BALANCED

LO = +17 dBm

VERY HIGH DYNAMIC RANGE

SURFACE MOUNT

106B 

133 

134 

134S 

159 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-500	DC-500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	159	1	**SLD-K1M***
0.5-500	DC-500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	134	1	**SMD-K1M***
0.5-500	DC-500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	134S	1	**SMZ-K1M***
1-1000	DC-1000	6.5/7.5	7.5/9.5	70/45	45/30	40/25	60/40	35/23	30/15	133	1	**SMD-C1M**
2-600	DC-600	5.5/7.0	7.0/8.0	60/50	42/30	37/25	60/45	47/30	36/22	106B	2	**TOP-1MZ**
5-1000	DC-900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/20	39/22	159	1	**SLD-K2M***
5-1000	DC-900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/20	39/22	134	1	**SMD-K2M***
5-1000	DC-900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/20	39/22	134S	1	**SMZ-K2M***
5-1500	DC-900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	159	1	**SLD-K3M***
5-1500	DC-900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	134	1	**SMD-K3M***
5-1500	DC-900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	134S	1	**SMZ-K3M***
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	159	1	**SLD-K4M**
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134	1	**SMD-K4M**
5-2500	3-600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134S	1	**SMZ-K4M**
10-1000	10-750	6.5/8.0	7.0/9.5	50/40	38/30	30/23	50/30	40/25	34/22	159	1	**SLD-K2UM***
10-1000	10-750	6.5/8.0	7.0/9.5	50/40	38/30	30/23	50/30	40/25	34/22	134	1	**SMD-K2UM***
10-1000	10-750	6.5/8.0	7.0/9.5	50/40	38/30	30/23	50/30	40/25	34/22	134S	1	**SMZ-K2UM***
20-1500	DC-1000	7.5/8.0	8.5/9.0	54/40	42/30	39/25	40/25	29/18	20/8	106B	2	**TOP-5MZ**
20-1500	DC-1500	7.0/8.5	8.5/9.0	50/35	40/25	20/10	40/25	30/18	15/8	133	1	**SMD-C2M**
20-2500	20-600	8.0/9.0	9.0/10.5	45/30	30/23	30/15	40/20	25/15	25/12	133	1	**SMD-C3M**
50-1000	DC-1000	6.0/7.0	7.8/9.0	58/45	45/30	38/25	50/35	4/20	28/18	106B	2	**TOP-2MZ**

NOTES:

* Phase Detection, Positive Polarity
1. 1dB Compression Point = +10 dBm (Typ)
2. IP3 (Input) = +22 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2, 3,6	--
#2	1	4	2	3	3

GND = Ground externally
For pin location and package outline drawings, see back pages.

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DOUBLE-BALANCED

LO = +17 dBm

VERY HIGH DYNAMIC RANGE

THROUGH-HOLE (RELAY)


102


103


120

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	102	4	**CMP-202**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	103	4	**CMP-212**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	103	4	**CMP-201**
1-750	DC-750	5.5/7.5	6.5/8.5	50/40	45/25	35/25	45/35	40/30	30/20	102	1	**CMP-2E4**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	103	1	**CMP-203**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	102	1	**CMP-211**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	120	2	**CMP-209**

THROUGH-HOLE (MINI-RELAY)


105


106


107


108

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	105	3	**CMP-302**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	105	3	**CMP-312**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	106	3	**CMP-301**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	106	3	**CMP-303**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	106	3	**CMP-311**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	105	3	**CMP-309**
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	107	4	**CMP-402**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	107	4	**CMP-412**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	108	4	**CMP-401**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	108	1	**CMP-403**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	107	1	**CMP-411**

NOTES:

1. 1dB Compression Point = +10 dBm (Typ)
2. IP3 (Input) = +22 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN
#1	1	8	*3,4	2,5,6,7	2,5,6,7	--
#2	1	8	3	2,5,6,7	2,5,6,7	4
#3	1	4	2	3	3	--
#4	1	8	*3,4	2,5,6,7	2	--

GND = Ground externally
* Pins must be tied together externally
For pin location and package outline drawings, see back pages.

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LO = +17 dBm

VERY HIGH DYNAMIC RANGE

THROUGH-HOLE (RELAY)


102


103


105


106

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05-300	DC-300	5.0/7.0	6.0/8.5	55/45	40/30	30/25	50/40	35/25	25/20	103	1	**CMP-2P2**
1-500	DC-500	5.5/7.0	6.0/7.0	40/30	50/40	40/35	30/23	40/30	35/30	102	2	**CMP-221**
2-500	DC-500	6.0/7.5	7.0/8.5	50/40	40/30	30/25	45/35	35/25	25/20	103	1	**CMP-2Q3**
5-750	DC-750	6.2/7.5	7.0/9.0	50/40	40/30	30/25	45/35	35/25	30/20	103	3	**CMP-2R4**
0.1-250	DC-250	5.0/7.0	6.0/8.5	50/45	40/30	28/23	45/40	35/25	26/20	106	4	**CMP-3G2**
2-500	DC-500	6.0/7.5	7.0/8.5	50/45	40/30	30/20	45/40	35/25	25/20	106	4	**CMP-3G3**
5-1000	DC-1000	6.2/7.0	7.0/10	50/45	40/30	30/20	45/40	35/25	20/17	106	4	**CMP-3M4**
5-1200	DC-1200	6.5/8.0	7.0/9.0	50/40	35/25	30/20	50/40	35/20	30/20	105	4	**CMP-3J5**

THROUGH-HOLE (TO CAN)


104


122

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	104	5	**CMP-502**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	104	5	**CMP-512**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	104	5	**CMP-501**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	104	5	**CMP-503**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	122	6	**CMP-612**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	122	6	**CMP-603**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	122	6	**CMP-611**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	122	6	**CMP-609**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	122	6	**CMP-604**

NOTES:

1. 1dB Compression Point = +14 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN
#1	1	8	*3,4	2,5,6,7	2	--
#2	1	8	3	2,5,6,7	2,5,6,7	4
#3	1	8	*3,4	2,5,6,7	2,5,6,7	--
#4	1	4	2	3	3	--
#5	2	5	11	All other	All other	--
#6	1	3	2	4	4	--

* Pins must be tied together
GND = Ground externally
For pin location and package outline drawings, see back pages.

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MIXERS

DOUBLE-BALANCED

LO = +17 dBm

VERY HIGH DYNAMIC RANGE

FLAT-PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	101	1	**CMF-102**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	101	1	**CMF-112**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	101	1	**CMF-101**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	101	1	**CMF-103**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	101	1	**CMF-111**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	101	1	**CMF-109**
800-2500	DC-400	--/--	5.5/7.0	30/20	30/20	30/20	20/10	20/10	20/10	101	1	**CMF-104**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	110	2	**CMK-702***
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	110	2	**CMK-712***
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	110	2	**CMK-701***
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	110	2	**CMK-703***
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	110	2	**CMK-711S**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	110	2	**CMK-709S**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	110	2	**CMK-704S**
800-4200	DC-1000	--/--	6.0/10	25/13	25/13	25/13	20/10	20/10	20/10	110	2	**CMK-215S**
0.05-300	DC-300	5.0/7.0	6.0/8.5	55/45	45/30	30/25	50/40	35/25	25/20	110	2	**CMK-7N2***
5-1000	DC-1000	6.2/7.0	7.0/10	50/40	40/30	30/20	45/40	35/25	25/17	110	2	**CMK-7Q4***
5-1200	DC-1200	6.5/8.0	7.0/9.0	50/40	35/25	30/20	50/40	35/20	30/20	110	2	**CMK-7L5S**

NOTES:

1. 1dB Compression Point = +14 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

* Connector style: "B" = BNC, "T" = TNC, "N" = Type N, "S" = SMA

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	1	4	5	2,3,6,7,8	2,3,6,7,8
#2	1	3	2	--	--

GND = Ground externally
For pin location and package outline drawings, see back pages.

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LO = +23 dBm

Super-High Dynamic Range

SURFACE MOUNT

133 

134 

134S 

159 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5 - 500	DC - 500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	159	1	**SLD-K1H***
0.5 - 500	DC - 500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	134	1	**SMD-K1H***
0.5 - 500	DC - 500	6.2/7.0	6.4/8.5	55/44	44/25	33/20	50/34	45/25	37/22	134S	1	**SMZ-K1H***
1-1000	DC-1000	6.5/7.5	7.5/9.5	70/45	45/30	40/25	60/40	35/23	30/15	133	1	**SMD-C1H**
5 - 1000	DC - 900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/22	39/22	159	1	**SLD-K2H***
5 - 1000	DC - 900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/22	39/22	134	1	**SMD-K2H***
5 - 1000	DC - 900	7.0/8.5	7.8/9.3	55/40	39/22	33/20	52/30	45/22	39/22	134S	1	**SMZ-K2H***
5 - 1500	DC - 900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	159	1	**SLD-K3H***
5 - 1500	DC - 900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	134	1	**SMD-K3H***
5 - 1500	DC - 900	6.3/8.0	7.5/9.8	65/40	36/20	22/15	50/30	30/18	17/7	134S	1	**SMZ -K3H***
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	159	1	**SLD-K4H**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134	1	**SMD-K4H**
5 - 2500	3 - 600	8.0/9.5	10.5/12	60/35	40/25	35/20	50/35	30/20	25/15	134S	1	**SMZ-K4H**
20-1500	DC-1500	7.0/8.5	8.5/9.0	50/35	40/25	20/10	40/25	30/18	15/8	133	1	**SMD-C2H**
20-2500	20-600	8.0/9.0	9.0/10.5	45/30	30/23	30/15	40/20	25/15	25/12	133	1	**SMD-C3H**

FLAT PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC - 125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	101	2	**CHF-102**
0.025-200	DC - 200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	101	2	**CHF-112**
0.1 - 500	DC - 500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	101	2	**CHF-101**
0.5 - 1000	DC - 1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	101	2	**CHF-103**
10 - 2000	5 - 600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	101	2	**CHF-109**
20 - 1500	DC - 1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	101	2	**CHF-111**
800-2500	DC - 400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	101	2	**CHF-104**

NOTES:

* Phase Detection, Polarity Positive
1. 1dB Compression Point = +15 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	4	1	5	2, 3,6	--
#2	1	4	5	2,3,6,7,8	2,3,6,7,8

GND = Ground externally
For pin location and package outline drawings, see back pages.

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MIXERS

DOUBLE-BALANCED

LO = +23 dBm

Super-High Dynamic Range

THROUGH HOLE (RELAY)


102


103


120

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	102	1	**CHP-202**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	103	1	**CHP-212**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	103	1	**CHP-201**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	103	2	**CHP-203**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	102	2	**CHP-211**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	120	3	**CHP-209**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	120	3	**CHP-204**

THROUGH HOLE (MINI-RELAY)


105


106


107


108

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	105	4	**CHP-302**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	105	4	**CHP-312**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	106	4	**CHP-301**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	106	4	**CHP-303**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	106	4	**CHP-311**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	105	4	**CHP-309**
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	107	1	**CHP-402**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	107	1	**CHP-412**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	108	1	**CHP-401**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	108	2	**CHP-403**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	107	2	**CHP-411**

NOTES:

1. 1dB Compression Point = +17 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	1	8	*3,4	2,5,6,7	2	--
#2	1	8	*3,4	2,5,6,7	2,5,6,7	--
#3	1	8	3	2,5,6,7	2,5,6,7	4
#4	1	4	2	3	3	--

GND = Ground externally

For pin location and package outline drawings, see back pages.

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LO = +23 dBm

Super-High Dynamic Range

THROUGH HOLE (TO-CAN)


104


122

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	104	1	**CHP-502**
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	104	1	**CHP-512**
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	104	1	**CHP-501**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	104	1	**CHP-503**
5-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	122	2	**CHP-612**
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	122	2	**CHP-603**
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	122	2	**CHP-611**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	122	2	**CHP-609**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	122	2	**CHP-604**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.01-125	DC-125	5.5/6.0	6.0/6.5	60/50	50/40	40/35	60/45	50/35	40/30	110	3	**CHK-702***
0.025-200	DC-200	5.5/6.0	6.0/7.0	65/55	55/45	45/35	60/50	45/35	35/30	110	3	**CHK-712***
0.1-500	DC-500	6.0/7.0	7.0/8.0	65/40	60/40	50/30	45/30	50/35	35/20	110	3	**CHK-701***
0.5-1000	DC-1000	5.5/7.0	7.0/8.5	70/40	45/35	40/25	60/40	40/30	30/20	110	3	**CHK-703***
20-1500	DC-1000	7.5/8.5	8.0/9.0	60/35	40/25	25/20	50/30	40/25	20/12	110	3	**CHK-711S**
10-2000	5-600	7.0/8.5	7.5/9.0	60/35	40/25	40/20	50/30	30/20	25/15	110	3	**CHK-709S**
800-2500	DC-400	--/--	6.5/8.5	30/20	30/20	30/20	20/10	20/10	20/10	110	3	**CHK-704S**
800-4200	DC-1000	--/--	6.0/10	25/13	25/13	25/13	20/10	20/10	20/10	110	3	**CHK-215S**

NOTES:

1. 1dB Compression Point = +17 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

* Connector style: "B" = BNC, "T" = TNC, "N" = Type N, "S" = SMA

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	2	5	11	All Others	All Others
#2	1	3	2	4	4
#3	1	3	2	--	--

GND = Ground externally

For pin location and package outline drawings, see back pages.

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LO = +10 dBm

IMPROVED DYNAMIC RANGE

SURFACE MOUNT


133


159

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
5 - 1000	5 - 1000	6.5/8.0	7.5/9.5	35/20	40/30	30/23	30/20	30/20	25/20	159	1	**SLD-K5**
25 - 1800	25 - 1000	7.5/8.5	8.0/9.0	50/30	45/25	35/20	30/15	25/15	23/15	133	2	**SMD-C5**
750 - 2500	50 - 880	7.0/8.5	8.0/9.2	44/35	--/--	40/30	38/28	--/--	25/20	133	2	**SMD-C7***
800 - 3550♦	800 - 2500	--/--	10.0/11.8	--/--	--/--	28/20	--/--	--/--	23/15	133	2	**SMD-C9****

♦ LO Frequency is specified from 600 to 2595 MHz
** UB identifies the full bandwidth specification
*XMB = 750 - 1000 MHz
*LB = 750 - 1200 MHz
*UB = 1200 - 2500 MHz

THROUGH HOLE (RELAY)


102


103


105

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	102	3	**CLP-206**
10 - 1000	5 - 500	6.0/7.5	7.0/8.0	50/40	40/30	30/20	40/25	30/18	25/15	102	4	**CLP-2P4**
0.05 - 1500	0.05 - 500	6.0/7.5	7.0/9.0	25/20	35/25	30/20	25/20	35/25	25/15	102	3	**CLP-2H5**
0.05 - 2000	0.05 - 500	6.0/8.0	7.0/9.0	25/20	40/30	30/20	25/20	40/30	25/15	102	3	**CLP-2B6**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	35/20	27/20	103	3	**CLP-205**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	103	3	**CLP-210**
10 - 2000	10 - 1000	6.0/8.0	6.5/8.0	32/25	35/25	35/25	33/20	30/20	30/20	105	5	**CLP-3E6**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	105	6	**CLP-305**
10 - 3000	10 - 800	6.3/8.0	6.5/8.5	35/25	35/25	35/25	30/20	30/20	30/20	105	5	**CLP-3B8**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	105	6	**CLP-310**

NOTES:

1. 1dB Compression Point = +5 dBm (Typ)
2. IP3 (Input) = +18 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

ALL MODELS	MODEL SMD-C7
XMB= 2LF to HF/2 FULL BAND = LF to HF LB= LF to 10LF MB = 10LF to HF/2 UB= HF/2 to HF	XMB = 750 - 1000 MHz LB = 750 - 1200 MHz UB =1200 - 2500 MHz

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	4	1	5	2,3,6	--	--
#2	1	2	3	4,5,6	--	--
#3	1	8	3	2,5,6,7	2,5,6,7	4
#4	8	1	3	2,5,6,7	2,5,6,7	4
#5	4	1	2	3	3	--
#6	1	4	2	3	3	--

GND = Ground externally
For pin location and package outline drawings, see back pages.
*Connect pins together externally.

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TRIPLE-BALANCED

LO = +10 dBm

IMPROVED DYNAMIC RANGE

THROUGH HOLE (TO -CAN)

104 

122 

123 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5-200	0.5-200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	123	1	**CLP-506**
10-2500	10-1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	104	1	**CLP-505**
10-2500	10-1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	122	2	**CLP-605**
500-3700	500-1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	122	2	**CLP-610**

FLAT PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
10 - 1500	DC - 1500	6.0/7.0	6.0/10	45/40	35/30	25/20	40/35	35/25	20/12	101	3	**CLF-1B5**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	101	3	**CLF-105**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	101	3	**CLF-110**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			OUTLINE DRAWING	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	110	4	**CLK-706***
10 - 2000	10 - 1000	6.0/8.0	6.5/8.5	32/25	35/25	35/20	33/20	30/20	25/20	110	4	**CLK-7A6S** ■
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/20	35/20	30/20	27/20	110	4	**CLK-705S**
10 - 3000	10 - 800	6.3/8.0	6.5/8.5	35/25	35/25	35/25	30/20	30/20	30/20	110	4	**CLK-7B8S**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	110	4	**CLK-710S**

NOTES:

1. 1dB Compression Point = +5 dBm (Typ)
2. IP3 (Input) = +18 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum

* Connector style: "B" = BNC, "T" = TNC, "N" = Type N, "S" = SMA

■ Double Balanced Model (IP3 & 1dB comp. pt. 3 dB lower than specified.)

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	2	5	11	All Others	All Others	--
#2	1	3	2	4	4	--
#3	1	4	5	All Others	All Others	--
#4	1	3	2	--	--	

GND = Ground externally

For pin location and package outline drawings, see back pages.

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LO = +13 dBm

HIGH DYNAMIC RANGE

THROUGH HOLE (RELAY)

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.5 - 2000	0.2 - 600	5.8/8.0	7.2/9.5	60/45	35/30	30/25	55/40	30/25	25/20	105	1	**CMP-3A6**
10 - 4200	10 - 1000	7.5/8.5	7.5/11	35/25	40/25	35/25	35/20	35/25	27/20	105	2	**CMP-3A8**

THROUGH HOLE (TO-CAN)

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
5 - 2500	10 - 1000	6.4/8.5	7.0/9.5	33/25	35/25	25/20	33/20	30/25	27/20	104	3	**CMP-6A7**

NOTES:

1. 1dB Compression Point = +10 dBm (Typ)
2. IP3 (Input) = +20 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	1	4	2	3	3	--
#2	4	1	2	3	3	--
#3	2	8	11	All Others	--	--

GND = Ground externally
For pin location and package outline drawings, see back pages.

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LO = +17 dBm

VERY HIGH DYNAMIC RANGE

SURFACE MOUNT


133


159

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
5 - 1000	5 - 1000	6.5/8.0	7.5/9.5	35/20	40/30	30/23	30/20	30/20	25/20	159	1	**SLD-K5M**
25 - 1800	25 - 1000	7.5/8.5	8.0/9.0	50/30	45/25	35/20	35/15	25/15	23/15	133	2	**SMD-C5M**
750 - 2500	50 - 880	7.0/8.5	8.0/9.2	44/35	--/--	40/30	38/28	--/--	25/20	133	2	**SMD-C7M***

*XMB = 750 - 1000 MHz
*LB = 750 - 1200 MHz
*UB = 1200 - 2500 MHz

THROUGH HOLE (RELAY)


102


103


105

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND	LB	MB	UB	LB	MB	UB			
RF/LO	IF	TYP/MAX	TYP/MAX	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN	TYP/MIN			
0.5-200	0.5-200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/20	102	3	**CMP-206**
5-1200	1-200	6.0/7.0	7.0/8.5	50/35	45/30	40/25	40/30	35/25	35/20	102	4	**CMP-231**
10-2500	10-1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	103	3	**CMP-205**
10-3000	10-1000	8.0/11.0	10/12	29/20	25/18	23/14	27/20	25/12	23/16	102	3	**CMP-2A8**
500-3700	500-1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	103	3	**CMP-210**
10-2500	10-1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	105	5	**CMP-305**
500-3700	500-1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	105	5	**CMP-310**

NOTES:
1. 1dB Compression Point = +14 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	4	1	5	2,3,6	--	--
#2	1	2	3	4,5,6	--	--
#3	1	8	3	2,5,6,7	2,5,6,7	4
#4	1	*2,6	8	3,4,5,7	3,4,5,7	--
#5	1	4	2	3	3	--

* Pins must be grounded together
GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

TRIPLE-BALANCED

LO = +17 dBm

VERY HIGH DYNAMIC RANGE

THROUGH HOLE
(TO-CAN)


104


122


123

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND									
RF/LO	IF	TYP/MAX	TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	123	1	**CMP-506**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	104	1	**CMP-505**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	122	2	**CMP-605**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	122	2	**CMP-610**

FLAT-PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND									
RF/LO	IF	TYP/MAX	TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	101	3	**CMF-105**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	101	3	**CMF-110**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
		XMB	FULL BAND									
RF/LO	IF	TYP/MAX	TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	110	4	**CMK-706***
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	110	4	**CMK-705S**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	110	4	**CMK-710S**

NOTES:
1. 1dB Compression Point = +14 dBm (Typ)
2. IP3 (Input) = +26 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

* Connector style: "B" = BNC, "T" = TNC, N" = Type N, "S" = SMA

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	2	5	11	All Others	All Others
#2	1	3	2	4	4
#3	1	4	5	2,3,6,7,8	2,3,6,7,8
#4	1	3	2	--	--

GND = Ground externally
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

TRIPLE-BALANCED

LO = +23 dBm

SUPER HIGH DYNAMIC RANGE

SURFACE MOUNT


133


159

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
5 - 1000	5 - 1000	6.5/8.0	7.5/9.5	35/20	40/30	30/23	30/20	30/20	25/20	159	1	**SLD-K5H**
25 - 1800	25 - 1000	7.5/8.5	8.0/9.0	50/30	45/25	35/20	35/15	25/15	23/15	133	2	**SMD-C5H**
750 - 2500	50 - 880	7.0/8.5	8.0/9.2	44/35	--/--	40/30	38/28	--/--	25/20	133	2	**SMD-C7H***

*XMB = 750 - 1000 MHz
*LB = 750 - 1200 MHz
*UB = 1200 - 2500 MHz

THROUGH HOLE (RELAY)


102


103


105

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	102	3	**CHP-206**
0.1 - 500	0.5 - 500	5.3/6.0	5.3/7.5	40/20	46/35	40/30	37/23	46/35	40/30	102	3	**CHP-2B3**
0.1 - 1000	0.01 - 500	5.3/7.5	7.5/9.5	40/20	40/30	30/25	37/23	40/25	25/20	102	3	**CHP-2A4**
10 - 2400	5 - 1000	7.0/8.5	8.0/10	28/20	26/20	25/20	28/20	26/20	25/20	102	3	**CHP-2B7**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	103	3	**CHP-205**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	103	3	**CHP-210**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	105	4	**CHP-305**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	105	4	**CHP-310**

NOTES:
1. 1dB Compression Point = +20 dBm (Typ)
2. IP3 (Input) = +30 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	4	1	5	2,3,6	--	--
#2	1	2	3	4,5,6	--	--
#3	1	8	3	2,5,6,7	2,5,6,7	4
#4	1	4	2	3	3	--

GND = Ground externally
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SYNERGY® MICROWAVE CORPORATION

MIXERS

TRIPLE-BALANCED

LO = +23 dBm

SUPER HIGH DYNAMIC RANGE

THROUGH HOLE (TO-CAN)

104 

122 

123 

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	123	1	**CHP-506**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	104	1	**CHP-505**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	122	2	**CHP-605**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	122	2	**CHP-610**

FLAT-PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	101	3	**CHF-105**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	101	3	**CHF-110**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	110	4	**CHK-706***
0.1 - 500	0.01 - 500	5.3/6.0	5.3/7.5	47/20	46/35	40/30	47/40	46/35	40/30	110	4	**CHK-7M3***
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	110	4	**CHK-705S**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	110	4	**CHK-710S**

NOTES:

1. 1dB Compression Point = +20 dBm (Typ)
2. IP3 (Input) = +30 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

*Connector style: "B" = BNC, "T" = TNC, "N" = Type N, "S" = SMA

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	2	5	11	All Others	All Others	--
#2	1	3	2	4	4	--
#3	1	4	5	2,3,6,7,8	2,3,6,7,8	--
#4	1	3	2	--	--	

GND = Ground externally

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

MIXERS

TRIPLE-BALANCED

LO = +27 dBm

ULTRA HIGH DYNAMIC RANGE

THROUGH HOLE (RELAY)


102


103


105

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	102	1	**CVP-206**
0.5 - 500	0.2 - 500	6.0/7.5	7.5/8.5	47/40	46/35	35/25	47/40	46/35	35/25	102	1	**CVP-2K3**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	103	1	**CVP-205**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	103	1	**CVP-210**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	105	2	**CVP-305**
500 - 3700	500 - 1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	105	2	**CVP-310**

THROUGH HOLE (TO-CAN)


104


122


123

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	123	3	**CVP-506**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	104	3	**CVP-505**
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	122	4	**CVP-605**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	122	4	**CVP-610**

NOTES:

1. 1dB Compression Point = +24 dBm (Typ)
2. IP3 (Input) = +34 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND	NO CONN.
#1	1	8	3	2,5,6,7	2,5,6,7	4
#2	1	4	2	3	3	--
#3	2	5	11	all others	all others	--
#4	1	3	2	4	4	--

GND = Ground externally
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MIXERS

TRIPLE-BALANCED

LO = +27 dBm

ULTRA HIGH DYNAMIC RANGE

FLAT PACK

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	101	1	**CVF-105**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	101	1	**CVF-110**

COAXIAL

FREQUENCY RANGE (MHz)		CONVERSION LOSS (dB)		LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			PACKAGE	PIN OUT	MODEL
RF/LO	IF	XMB TYP/MAX	FULL BAND TYP/MAX	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN			
0.05 - 200	0.05 - 200	5.5/6.5	6.5/7.0	45/30	50/45	45/40	35/25	40/35	35/30	110	2	**CVK-706***
10 - 2500	10 - 1000	7.0/8.0	7.5/8.5	55/35	45/30	35/25	35/20	30/20	27/20	110	2	**CVK-705S**
500 - 3700	500 -1000	--/--	9.5/11.5	45/25	45/25	45/25	40/20	40/20	40/20	110	2	**CVF-710S**

NOTES:

1. 1dB Compression Point = +24 dBm (Typ)
2. IP3 (Input) = +34 dBm (Typ)
3. As IF frequency decrease below LF towards DC, conversion loss increases up to 8 dB higher than maximum.

XMB= 2LF to HF/2
FULL BAND = LF to HF
LB= LF to 10LF
MB = 10LF to HF/2
UB= HF/2 to HF

* Connector style: "B" = BNC, "T" = TNC, "N" = Type N, "S" = SMA

PIN-OUT TABLE

	RF	LO	IF	GND	CASE GND
#1	1	4	5	2,3,6,7,8	2,3,6,7,8
#2	1	3	2	--	--

GND = Ground externally

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

IMAGE REJECT MIXERS

THROUGH HOLE MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS (dB)		IMAGE REJECTION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	ISOLATION (dB)		PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	TYP	MAX	TYP	MIN	MAX	MIN	MIN	LO/RF TYP/MIN	LO/IF TYP/MIN			
40 - 80	20 - 100	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	124	1	**IMP-921**
40 - 80	10 - 110	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	124	1	**IMP-931**
80 - 160	60 - 180	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124	1	**IMP-922**
80 - 160	50 - 190	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124	1	**IMP-932**
80 - 160	40 - 200	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124	1	**IMP-942**
80 - 160	20 - 220	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124	1	**IMP-962**
80 - 160	10 - 230	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124	1	**IMP-972**
100 - 200	80 - 220	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124	1	**IMP-923**
100 - 200	70 - 230	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124	1	**IMP-933**
100 - 200	60 - 240	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124	1	**IMP-943**
100 - 200	40 - 260	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124	1	**IMP-963**
100 - 200	30 - 270	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124	1	**IMP-973**
150 - 300	130 - 320	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124	1	**IMP-924**
150 - 300	120 - 330	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124	1	**IMP-934**
150 - 300	110 - 340	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124	1	**IMP-944**
150 - 300	90 - 360	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124	1	**IMP-964**
150 - 300	80 - 370	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124	1	**IMP-974**
200 - 400	180 - 420	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124	1	**IMP-925**
200 - 400	170 - 430	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124	1	**IMP-935**
200 - 400	160 - 440	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124	1	**IMP-945**
200 - 400	140 - 460	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124	1	**IMP-965**
200 - 400	130 - 470	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124	1	**IMP-975**
400 - 550	400 - 550	50 - 90	+ 13	7.0	9.0	25	17	1.5:1	+ 6	+ 18	43/35	35/25	124	2	**IMP-916**
550 - 750	550 - 750	50 - 90	+ 13	7.0	9.0	25	17	1.5:1	+ 6	+ 18	42/35	35/25	124	2	**IMP-926**
750 - 1000	750 - 1000	50 - 90	+ 13	7.5	9.0	25	17	1.5:1	+ 6	+ 18	40/35	35/25	124	2	**IMP-936**
1358 - 1453	1428 - 1523	70	+ 10	7.0	9.0	20	15	2.0:1	- 4	+ 10	30/25	20/15	124	1	**IMP-917**
2238 - 2410	2308 - 2480	70	+ 10	7.0	9.0	20	15	2.0:1	- 4	+ 10	25/20	20/15	124	1	**IMP-928**

Notes:
IF_1 is rejected when the RF frequency is lower than the LO frequency.
IF_2 is rejected when the RF frequency is higher than the LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	1	16	4	13	All Other
#2	3	16	1	5	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

IMAGE REJECT MIXERS


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153

COAXIAL CONNECTOR MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS (dB)		IMAGE REJECTION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	ISOLATION (dB)		PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	TYP	MAX	TYP	MIN	MAX	MIN	MIN	LO/RF TYP/MIN	LO/IF TYP/MIN			
3 - 30	3 - 30	10.7	+ 13	7.0	9.0	20	17	2.0:1	+ 6	+ 18	60/35	55/35	153	2	**IRK3A-10**
20 - 500	20 - 500	10 - 11	+ 10	7.0	9.5	20	15	2.0:1	+ 3	+ 15	38/35	30/25	153	2	**IRK20A-25**
30 - 450	30 - 450	21.4	+ 13	7.0	10.0	20	15	2.0:1	+ 6	+ 18	38/35	30/25	153	2	**IRK30A-15**
40 - 80	20 - 100	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	113	1	**IMK-721***
40 - 80	10 - 110	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	113	1	**IMK-731***
80 - 160	60 - 180	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	113	1	**IMK-722***
80 - 160	50 - 190	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	113	1	**IMK-732***
80 - 160	40 - 200	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	113	1	**IMK-742***
80 - 160	20 - 220	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	113	1	**IMK-762***
80 - 160	10 - 230	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	113	1	**IMK-772***
100 - 200	80 - 220	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	113	1	**IMK-723***
100 - 200	70 - 230	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	113	1	**IMK-733***
100 - 200	60 - 240	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	113	1	**IMK-743***
100 - 200	40 - 260	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	113	1	**IMK-763***
100 - 200	30 - 270	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	113	1	**IMK-773***
150 - 300	130 - 320	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	113	1	**IMK-724***
150 - 300	120 - 330	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	113	1	**IMK-734***
150 - 300	110 - 340	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	113	1	**IMK-744***
150 - 300	90 - 360	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	113	1	**IMK-764***
150 - 300	80 - 370	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	113	1	**IMK-774***
200 - 400	180 - 420	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	113	1	**IMK-725***
200 - 400	170 - 430	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	113	1	**IMK-735***
200 - 400	160 - 440	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	113	1	**IMK-745***
200 - 400	140 - 460	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	113	1	**IMK-765***
200 - 400	130 - 470	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	113	1	**IMK-775***
500 - 1110	500 - 1110	10 -11	+ 10	7.0	10.0	20	15	2.0:1	+ 2	+ 12	38/25	32/20	153	2	**IRK500A-2**
600 - 900	890 - 910	10 - 300	+ 23	7.0	10.0	23	20	1.8:1	+ 16	+ 25	30/20	25/20	153	2	**IRK600A-1**
658	660 - 680	2 - 22	+ 10	7.0	9.0	23	17	1.8:1	+ 2	+ 13	40/35	35/27	153	2	**IRK658A-1**
800 - 2000	800 - 2000	21.4	+ 13	7.0	10.0	20	15	2.0:1	+ 5	+ 16	35/30	30/20	153	2	**IRK800A-2**
2200 - 2414	2483 - 2500	225	+ 10	7.0	10.0	23	18	2.0:1	+ 2	+ 12	35/30	28/20	113	1	**IMK-718S**
2500 - 2750	2435 - 2685	65 - 75	+ 10	7.0	9.0	20	15	2.2:1	+ 2	+ 12	30/25	25/20	113	1	**IMK-738S**

Notes:
IF_1 is rejected when the RF frequency is lower than the LO frequency.
IF_2 is rejected when the RF frequency is higher than the LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC.
All other models numbers are available with SMA connectors only.

PORT CONFIGURATION TABLE

	RF	LO	IF_1	IF_2
#1	1	3	2	4
#2	3	1	2	4

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

IMAGE REJECT MIXERS

FLAT PACK MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS (dB)		IMAGE REJECTION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_2 (dBm)	ISOLATION (dB)		PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	TYP	MAX	TYP	MIN	MAX	MIN	MIN	LO/RF TYP/MIN	LO/IF TYP/MIN			
40 - 80	20 - 100	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	115	1	**IMF-221**
40 - 80	10 - 110	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	115	1	**IMF-231**
80 - 160	60 - 180	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	115	1	**IMF-222**
80 - 160	50 - 190	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	115	1	**IMF-232**
80 - 160	40 - 200	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	115	1	**IMF-242**
80 - 160	20 - 220	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	115	1	**IMF-262**
80 - 160	10 - 230	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	115	1	**IMF-272**
100 - 200	80 - 220	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	115	1	**IMF-223**
100 - 200	70 - 230	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	115	1	**IMF-233**
100 - 200	60 - 240	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	115	1	**IMF-243**
100 - 200	40 - 260	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	115	1	**IMF-263**
100 - 200	30 - 270	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	115	1	**IMF-273**
150 - 300	130 - 320	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	115	1	**IMF-224**
150 - 300	120 - 330	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	115	1	**IMF-234**
150 - 300	110 - 340	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	115	1	**IMF-244**
150 - 300	90 - 360	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	115	1	**IMF-264**
150 - 300	80 - 370	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	115	1	**IMF-274**
200 - 400	180 - 420	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	115	1	**IMF-225**
200 - 400	170 - 430	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	115	1	**IMF-235**
200 - 400	160 - 440	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	115	1	**IMF-245**
200 - 400	140 - 460	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	115	1	**IMF-265**
200 - 400	130 - 470	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	115	1	**IMF-275**

Notes:
IF_1 is rejected when the RF frequency is lower than the LO frequency.
IF_2 is rejected when the RF frequency is higher than the LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	1	14	3	10	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

IMAGE REJECT MIXERS

SURFACE-MOUNT MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS (dB)		IMAGE REJECTION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	ISOLATION (dB)		PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	TYP	MAX	TYP	MIN	MAX	MIN	MIN	LO/RF TYP/MIN	LO/IF TYP/MIN			
40 - 80	20 - 100	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	124S	1	**IMS-921**
40 - 80	10 - 110	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	60/35	55/30	124S	1	**IMS-931**
80 - 160	60 - 180	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124S	1	**IMS-922**
80 - 160	50 - 190	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124S	1	**IMS-932**
80 - 160	40 - 200	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124S	1	**IMS-942**
80 - 160	20 - 220	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124S	1	**IMS-962**
80 - 160	10 - 230	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	55/35	50/30	124S	1	**IMS-972**
100 - 200	80 - 220	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124S	1	**IMS-923**
100 - 200	70 - 230	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124S	1	**IMS-933**
100 - 200	60 - 240	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124S	1	**IMS-943**
100 - 200	40 - 260	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124S	1	**IMS-963**
100 - 200	30 - 270	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	50/35	45/30	124S	1	**IMS-973**
150 - 300	130 - 320	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124S	1	**IMS-924**
150 - 300	120 - 330	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124S	1	**IMS-934**
150 - 300	110 - 340	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124S	1	**IMS-944**
150 - 300	90 - 360	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124S	1	**IMS-964**
150 - 300	80 - 370	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	45/35	40/30	124S	1	**IMS-974**
200 - 400	180 - 420	20	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124S	1	**IMS-925**
200 - 400	170 - 430	30	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124S	1	**IMS-935**
200 - 400	160 - 440	40	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124S	1	**IMS-945**
200 - 400	140 - 460	60	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124S	1	**IMS-965**
200 - 400	130 - 470	70	+ 10	7.5	9.0	30	20	1.5:1	+ 3	+ 15	40/35	35/30	124S	1	**IMS-975**
400 - 550	400 - 550	50-90	+ 13	7.0	9.0	25	17	1.5:1	+ 6	+ 18	43/35	35/28	124S	2	**IMS-916**
550 - 750	550 - 750	50-90	+ 13	7.0	9.0	25	17	1.5:1	+ 6	+ 18	42/35	35/28	124S	2	**IMS-926**
750 - 1000	750 - 1000	50-90	+ 13	7.5	9.0	25	17	1.5:1	+ 6	+ 18	40/35	35/23	124S	2	**IMS-936**
1358 - 1453	1428 - 1523	70	+ 10	7.0	9.0	20	15	2.0:1	- 4	+ 10	30/25	20/15	124S	1	**IMS-917**
2238 - 2410	2308 - 2480	70	+ 10	7.0	9.0	20	15	2.0:1	- 4	+ 10	25/20	20/15	124S	1	**IMS-928**

Notes:
IF_1 is rejected when the RF frequency is lower than the LO frequency.
IF_2 is rejected when the RF frequency is higher than the LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	1	16	4	13	All Other
#2	3	16	1	5	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

NOVEL I/Q MODULATORS MIX CELLULAR SIGNALS

Shankar R. Joshi, Chief Engineer, Synergy Microwave Corp.

Single Sideband (SSB) or in-phase (I)/quadrature (Q) modulators are used extensively in communications systems, including cellular and personal-communications-systems (PCS) networks. Although the basic design is fairly mature, it has been completely revamped thanks to an innovative technique developed by Synergy Microwave Corp. The novel approach is based on subharmonic mixing techniques and is applicable from about 140 to 3000 MHz.

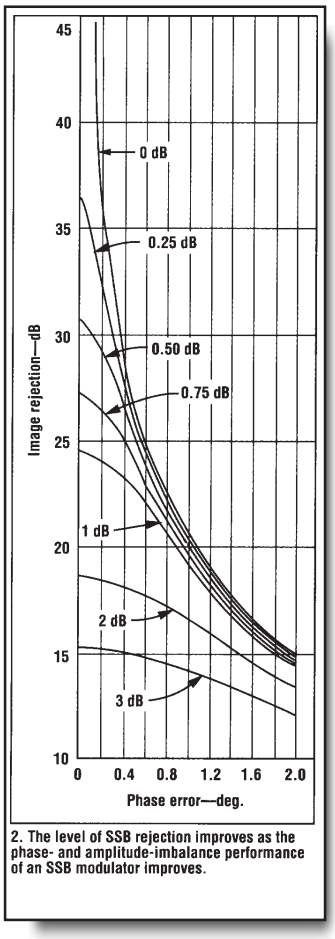
In a communications receiver, SSB or I/Q modulators are useful in discriminating and removing the lower sideband (LSB) or upper sideband (USB) generated during frequency conversion, especially when the sidebands are very close in frequency and attenuation of one of the sidebands cannot be achieved with filtering. This is the case with audio and video modulation, where signals from DC to 10 MHz must be converted to a higher frequency that is appropriate for transmission. In such cases, both sidebands will be very close in frequency to the carrier frequency. With an I/Q modulator, one of the sidebands is easily canceled or attenuated along with its carrier.

Attenuation of the carrier has been the most troublesome aspect in the design of passive I/Q modulators. Isolation between the local-oscillator (LO) port and the RF port of the mixers, which is the main parameter in determining carrier rejection, is usually insufficient at frequencies above 200 MHz.

I/Q modulator designs were basically comprised of two double-balanced mixers (Fig. 1). The mixers are fed at the LO ports by a carrier phase-shifted through a 90 deg. hybrid. Thus, the carrier signal's relative phase is 0 deg. to one mixer and 90 deg. to the other mixer. Modulation signals are fed externally in phase quadrature to the two mixers' IF ports. The mixers' modulated output signals are combined through a two-way, in-phase power divider/combiner.

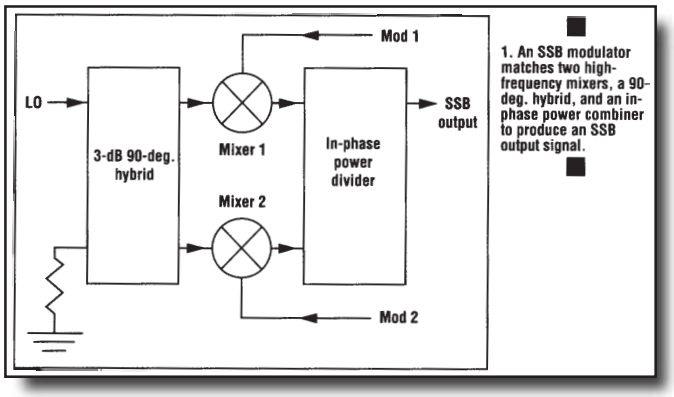
The circuit forms a phase-cancellation network to one of the sidebands and a phase-addition network to the other sideband. The carrier is somewhat attenuated and is directly dependent on the inherent LO-to-RF isolation of the mixers and the modulating signal level. In a standard line of I/Q modulators from Synergy, USB suppression results when the first modulation port (MOD 1) is fed with a signal that is 90 deg. in advance of the signal feeding the second modulation port (MOD 2). Opposite phasing can be arranged by changing the internal phase polarity of the mixers or by interchanging the 90-deg. hybrid output ports to the LO ports of the mixers.

The phase and amplitude imbalances between the various components used in the manufacturing of the I/Q modulators must be tightly maintained for optimum SSB rejection. Matching of the two mixers for conversion loss and insertion phase is extremely critical, since differences in these parameters will add to amplitude- and phase-imbalance errors. The 90-deg. hybrid in the LO port must be in nearly perfect phase quadrature.



2. The level of SSB rejection improves as the phase- and amplitude-imbalance performance of an SSB modulator improves.

Phase- and amplitude-imbalance errors adversely affect sideband suppression (Fig. 2). In most cases, a typical passive I/Q modulator operates with a carrier input level of +10dBm, which is required to drive the diodes in the mixers to operate in the linear range. The dynamic range of these mixers can be significantly improved by using diodes with a higher barrier height. The LO signal in this case must be increased in order to drive these diodes into conduction in their linear range.



1. An SSB modulator matches two high-frequency mixers, a 90-deg. hybrid, and an in-phase power combiner to produce an SSB output signal.

Carrier rejection is also a problem when designing an SSB modulator, since only a few decibels of suppression can be achieved in standard high-frequency models. In the past, the major contributor to carrier suppression was the inherent LO-to-RF isolation through the mixers. Unfortunately, this isolation is usually poor at cellular frequencies (800 to 1000 MHz), where at least 25-dB carrier rejection is necessary. In some cases, designers feed a small amount of DC into the IF ports to control the carrier rejection, which complicates

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the driver circuitry and calls for temperature compensation when operating at different temperatures.

As an example, an SSB modulator is assumed to operate with +10-dBm LO drive with each modulating signal at -10 dBm and in phase quadrature to each other when applied to the modulating ports (MOD 1 and MOD 2). The result will be a modulated signal at -16 dBm, assuming 6-dB conversion loss. For 20-dB carrier rejection with respect to the desired modulated signal, the carrier must be at -36 dBm, which translates to LO-to-RF isolation of 46 dB.

By employing a the sub-harmonic approach, the engineers at Synergy have extended the performance of SSB modulators beyond the limits of conventional designs. The approach is based on the use of subharmonic mixers in place of fundamental-frequency mixers. Subharmonic mixers use anti-parallel diode pairs in their construction. [1-3] Matched anti-parallel diode pairs used in single-ended or single-balanced mixer configurations cancel even-order intermodulation products (such as 2LO x 2RF, 3LO x 3RF, etc.) at all ports.

Single-ended mixers lack the port-to-port isolation needed for SSB modulator applications. Odd-order products of the RF and LO frequencies (even LO x odd RF) and (odd LO x even RF) appear on all ports, requiring extensive filtering for satisfactory performance. For a single-balanced mixer, even harmonics of the LO combining with odd harmonics of the RF appear at the IF port, whereas odd harmonics of the LO combining with even harmonics of the RF appear at the RF and IF ports. This assumes that a balanced transformer is placed at the LO port, which is a logical choice due to the fact that the highest level signal appears at the LO port. Since the desired odd-order IF products appear at both the RF and IF ports, a need arises for a diplexing network to isolate the RF and IF signals.

The subharmonic modulator design provides a unique way to isolate the RF and IF signals. A single-balanced harmonic mixer offers good LO-to-RF and LO-to-IF isolation but poor RF-to-IF isolation. Fortunately, harmonically-related signals are spaced well apart in the frequency spectrum, simplifying filtering of harmonically-related signals.

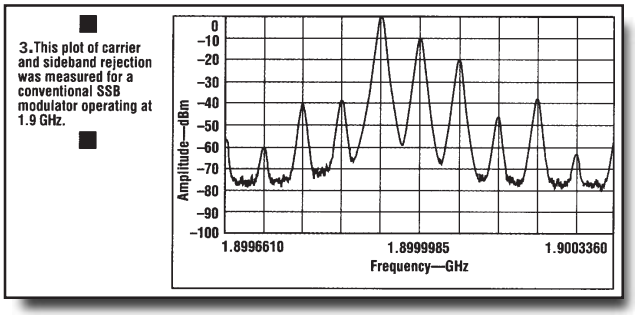
Harmonic mixing also works well with low LO power levels, with somewhat lower 1-dB compression on the RF port than with fundamental-frequency mixing. The ability to operate with LO frequencies that are a fraction of the carrier frequen*cy* (1/2, 1/4, 1/6, etc.) significantly reduces the cost of an LO source, especially at higher frequencies. Also, using lower-frequency LO sources helps avoid the signal-leakage problems inherent with higher-frequency LO sources. Minimizing signal leakage, especially at higher frequencies, becomes expensive and bulky. Subharmonic mixing offers several advantages:

(1) The technique offers the ability to operate at LO frequencies that are 1/2, 1/4, or 1/6 of the carrier frequency. For example, for an IF of 100 MHz at an RF of 2 GHz, the LO can be (2000-100)/2 = 950 or 1050 MHz.
(2) The LO's even harmonics are strongly attenuated.
(3) The filtering requirements for fundamental frequency and odd harmonic signals of the LO are not critical.
(4) The cost of generating the LO is reduced due to the fact that the LO frequency need only be a fraction of the carrier frequency.

The novel design approach has opened the way for a new line of products specifically designed for applications in the cellular bands. Models for cellular frequency coverage extend from 810 to 2500 MHz with applications in a wide range of systems, including the Advanced Mobile Phone Service (AMPS), the Digital European Cordless Telephone (DECT) system, the European Global System for Mobile Communications (GSM), the Nordic Mobile Telephone (NMT) system, the North American Digital Cellular (IS-54 and IS-95 standards) system, the Japanese Personal Handy Phone (PHP), and the Total Access Communications System (TACS). As an example of the performance improvements possible with the subharmonic mixers, units were evaluated at both cellular (935 to 960-MHz) and PCN/PCS (1.8-to-1.9GHz) bands. For a conventional SSB modulator at 1.9 GHz fed with +10dBm modulation signals, carrier rejection is barely 10 dB (Fig. 3).

Sideband rejection can be improved by tuning, but the carrier rejection is controlled by the LO-to-RF isolation of the double-balanced mixers. Conventional double-balanced mixers with high isolation at cellular and PCN bands are very expensive and large when special techniques are used to improve LO to-RF isolation. In contrast, the subharmonic nature of the new approach allows the use of lower-frequency, less-expensive components in the modulators' construction.

The subharmonic modulators offer an improvement of more than 15 dB in carrier suppression compared to the conventional approach.



3. This plot of carrier and sideband rejection was measured for a conventional SSB modulator operating at 1.9 GHz.

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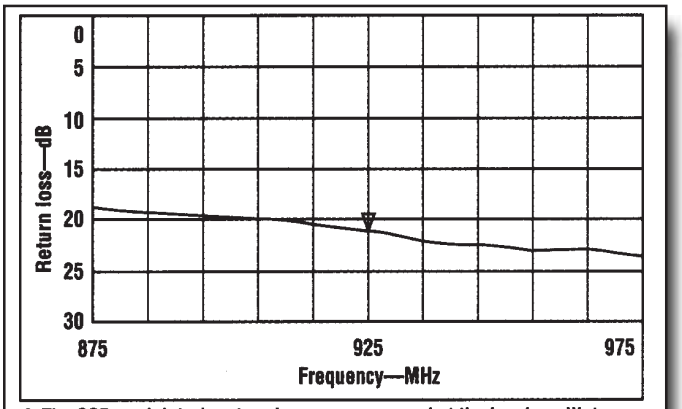
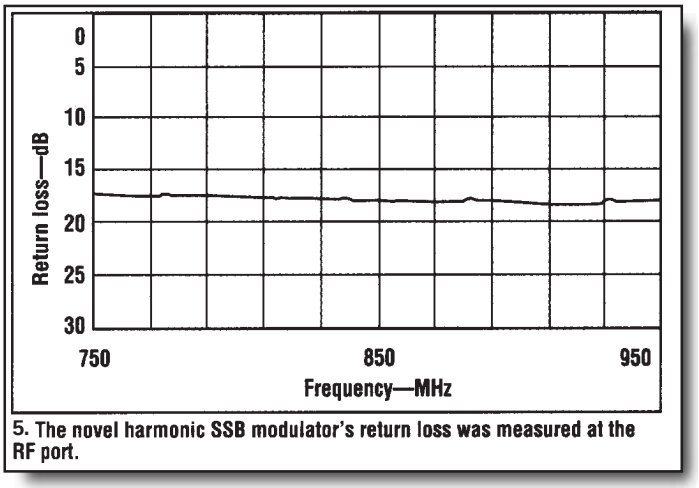
The measured VSWR (return loss) at the LO and RF ports is better than 1.50:1 (Figs. 4 and 5). Measurements made on a cellular-band SSB modulator reveal carrier rejection on the order of 40 dB. Typical insertion loss is 7 dB while sideband rejection is 30 dB (Fig. 6).



4. The SSB modulator's return loss was measured at the local-oscillator (LO) port.

By the virtue of harmonic mixing, even-order mixing products are attenuated by about 30 dB with respect to the desired modulated output signal. The fundamental-frequency feed through into the output port is approximately 5 dB lower than the desired modulated signal, whereas the fourth harmonic mixing with the modulating signal is approximately 10 dB lower. Typical loss for fourth-harmonic mixing is 17 to 19 dB while maintaining 30 dB of carrier rejection.

Since harmonically-related products are well-spaced in frequency, filtering undesired signals is relatively inexpensive using standard octaveband bandpass filters. Low-cost commercial bandpass filters typically offer better than 40-to-50-dB attenuation of unwanted harmonic signals. Constant-impedance bandpass filters offering good impedance match at desired stopbands can also be used in cases where harmonically related products require impedance termination within a system.

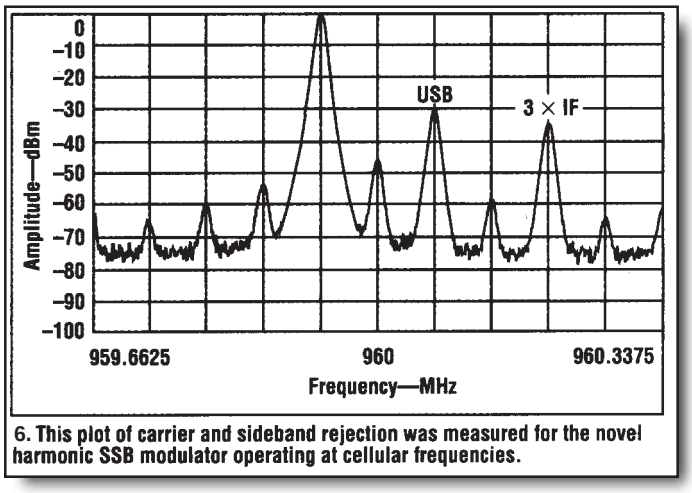


5. The novel harmonic SSB modulator's return loss was measured at the RF port.

The subharmonic modulator design is easily retrofitted to custom frequencies. Conversion of an SSB modulator with output frequency corresponding to twice the LO frequency to one with output corresponding to four times the LO frequency requires only one component change, in the form of a signal-combining network at the modulator's output. Although the conversion loss of the fourth-harmonic LO component mixing with the modulating signal is in the vicinity of 18 dB, the cost of generating the LO is drastically reduced with the subharmonic modulator. In spite of higher signal loss, the carrier rejection is still at least 30 dB at the fourth harmonic, and harmonically related products can be eliminated with an inexpensive filter.

References:

1. Joseph T. Lee, "*Balanced Subharmonic Mixers*" *Microwave Journal*, August 1983.
2. Don Neuf, "*Fundamental versus Harmonic Mixing*" *Microwave Journal*, 1984.
3. Bert Henderson, "*Full-Range Orthogonal Circuit Mixers Reach 2 to 26 GHz*", *Microwave Systems News*, January, 1982.



6. This plot of carrier and sideband rejection was measured for the novel harmonic SSB modulator operating at cellular frequencies.

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I&Q SUB-HARMONIC MODULATORS

8 PIN - RELAY HEADER

RF OUTPUT FREQUENCY (MHz)	CARRIER FREQUENCY (MHz)	NOMINAL CARRIER POWER (dBm)	CONVERSION LOSS (dB) MAX	SSB REJECTION (dB) MIN	CARRIER REJECTION (dB) MIN	HARMONIC REJECTION (dB) MIN	PACKAGE	PIN-OUT (See Below)	MODEL
810 - 830	405 - 415	+10	11.0	30	30	33	102	1	**HSMR-810**
825 - 875	412 - 438	+10	11.0	30	30	33	102	1	**HSMR-825**
869 - 894	434 - 447	+10	11.0	30	30	33	102	1	**HSMR-869**
935 - 970	467 - 485	+10	11.0	30	30	33	102	1	**HSMR-935**
1000 - 1070	500 - 535	+10	11.0	30	30	33	102	1	**HSMR-1000**
1200 - 1280	600 - 640	+10	11.0	30	30	33	102	1	**HSMR-1200**
1400 - 1500	700 - 750	+10	11.0	30	30	33	102	1	**HSMR-1400**
1500 - 1650	750 - 825	+10	11.0	30	30	33	102	1	**HSMR-1500**
1800 - 1900	900 - 950	+10	12.0	25	25	30	102	1	**HSMR-1800**
1805 - 1880	902 - 940	+10	12.0	25	25	30	102	1	**HSMR-1805**
1920 - 2000	960 - 1000	+10	12.0	25	25	30	102	1	**HSMR-1930**
2000 - 2200	1000 - 1100	+10	12.0	25	25	30	102	1	**HSMR-2000**
2200 - 2500	1100 - 1250	+10	12.0	25	25	30	102	1	**HSMR-2250**

LEADLESS SURFACE-MOUNT MODELS

RF OUTPUT FREQUENCY (MHz)	CARRIER FREQUENCY (MHz)	NOMINAL CARRIER POWER (dBm)	CONVERSION LOSS (dB) MAX	SSB REJECTION (dB) MIN	CARRIER REJECTION (dB) MIN	HARMONIC REJECTION (dB) MIN	PACKAGE	PIN-OUT (See Below)	MODEL
810 - 830	405 - 415	+10	11.0	30	30	33	161	2	**HSMD-810**
825 - 875	412 - 438	+10	11.0	30	30	33	161	2	**HSMD-825**
869 - 894	434 - 447	+10	11.0	30	30	33	161	2	**HSMD-869**
935 - 970	467 - 485	+10	11.0	30	30	33	161	2	**HSMD-935**
1000 - 1070	500 - 535	+10	11.0	30	30	33	161	2	**HSMD-1000**
1200 - 1280	600 - 640	+10	11.0	30	30	33	161	2	**HSMD-1200**
1400 - 1500	700 - 750	+10	11.0	30	30	33	161	2	**HSMD-1400**
1500 - 1650	750 - 825	+10	11.0	30	30	33	161	2	**HSMD-1500**
1800 - 1900	900 - 950	+10	12.0	25	25	30	161	2	**HSMD-1800**
1805 - 1880	902 - 940	+10	12.0	25	25	30	161	2	**HSMD-1805**
1920 - 2000	960 - 1000	+10	12.0	25	25	30	161	2	**HSMD-1930**
2000 - 2200	1000 - 1100	+10	12.0	25	25	30	161	2	**HSMD-2000**
2200 - 2500	1100 - 1250	+10	12.0	25	25	30	161	2	**HSMD-2250**

Notes:
- USB is suppressed when MOD.1 is +90° ref to MOD. 2.
- LSB is suppressed when MOD.1 is -90° ref to MOD. 2.
- 1 dB Comp. Point: -5 dBm (Nom)
- Modulation Frequency = DC to 20 MHz
- Harmonic and Carrier rejection is guaranteed with -10 dBm input at MOD. 1 and MOD. 2.
- Conversion Loss is the difference between total power of both modulation inputs and desired sideband output.

This product is protected under United States Patent Number 5,416,449.

PIN-OUT TABLE

	CARRIER	MOD.1	MOD.2	SSB OUTPUT	CASE GND
#1	8	3	4	1	All Other
#2	3	1	4	2	All Other

For pin location and package outline drawings, see back pages.

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I&Q DEMODULATORS

LEADLESS SURFACE-MOUNT MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS♦ (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Degrees)	ISOLATION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	MAX	TYP/MAX	TYP/MAX	LO/RF MIN	LO/IF MIN	MAX	MIN	TYP			
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102S	1	**QMS-201**
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102S	1	**QMS-202**
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102S	1	**QMS-203**
52-88	52-88	DC-35	+10	7.0	0.2/0.5	2.0/4.0	40	35	1.5:1	+3	+15	102S	1	**QMS-210**
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102S	1	**QMS-204**
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102S	1	**QMS-205**
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102S	1	**QMS-206**
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102S	1	**QMS-207**
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102S	1	**QMS-214**
850-950	850-950	DC-100	+10	8.0	0.8/1.3	3.0/6.0	35	30	1.8:1	+3	+15	102S	1	**QMS-213**
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102S	1	**QMS-224**
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102S	1	**QMS-234**
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	102S	1	**QMS-244**

LEADED SURFACE-MOUNT MODELS

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS♦ (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Degrees)	ISOLATION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	MAX	TYP/MAX	TYP/MAX	LO/RF MIN	LO/IF MIN	MAX	MIN	TYP			
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102L	1	**QML-201**
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102L	1	**QML-202**
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102L	1	**QML-203**
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102L	1	**QML-204**
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102L	1	**QML-205**
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102L	1	**QML-206**
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102L	1	**QML-207**
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102L	1	**QML-214**
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102L	1	**QML-224**
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102L	1	**QML-234**
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	102L	1	**QML-244**

♦ Conversion loss = RF input power (dBm) minus IF1 and IF2 power (dBm).

Notes:

IF_1 is +90° ref to IF_2 when RF < LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	1	8	3	4	All Other

For pin location and package outline drawings, see back pages.

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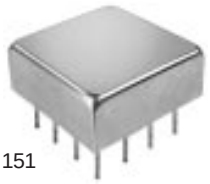
THROUGH-HOLE MOUNT
8 PIN - RELAY CAN

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS♦ (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Degrees)	ISOLATION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	MAX	TYP/MAX	TYP/MAX	LO/RF MIN	LO/IF MIN	MAX	MIN	TYP			
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102	1	**QMR-201**
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102	1	**QMR-202**
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102	1	**QMR-203**
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102	1	**QMR-204**
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	102	1	**QMR-205**
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102	1	**QMR-206**
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	102	1	**QMR-207**
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102	1	**QMR-214**
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102	1	**QMR-224**
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	102	1	**QMR-234**
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	102	1	**QMR-244**

6 PIN (Wideband) AND 16 PIN

124



151

FREQUENCY (MHz)			LO LEVEL (dBm)	CONVERSION LOSS♦ (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Degrees)	ISOLATION (dB)		VSWR	INPUT 1 dB COMP. PT. (dBm)	INPUT IP_3 (dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
LO	RF	IF	NOM	MAX	TYP/MAX	TYP/MAX	LO/RF MIN	LO/IF MIN	MAX	MIN	TYP			
15-50	15-50	DC-10	+10	7.0	0.3/0.5	2.0/5.0	40	35	1.5:1	+3	+15	151	3	**QMP-15-50**
15-510	15-510	DC-250	+10	7.0	0.7/1.5	5.0/10	35	20	2.0:1	+3	+15	151	3	**QMP-34-15**
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	124	2	**QMP-901**
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	124	2	**QMP-902**
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	124	2	**QMP-903**
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	124	2	**QMP-904**
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	124	2	**QMP-905**
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	124	2	**QMP-906**
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	124	2	**QMP-907**
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	124	2	**QMP-914**
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	124	2	**QMP-924**
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	124	2	**QMP-934**
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	124	2	**QMP-944**

Notes:

IF_1 is +90° ref to IF_2 when RF < LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	1	8	3	4	All Other
#2	1	16	4	13	All Other
#3	1	6	3	2	4,5

♦ Conversion loss = RF input power (dBm) minus IF1 and IF2 power (dBm).

For pin location and package outline drawings, see back pages.

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I&Q DEMODULATORS

FLAT PACK MODELS

FREQUENCY (MHz) LO	RF	IF	LO LEVEL (dBm) NOM	CONVERSION LOSS♦ (dB) MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) LO/RF MIN	LO/IF MIN	VSWR MAX	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	115	1	**QMF-201**
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	115	1	**QMF-202**
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	115	1	**QMF-203**
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	115	1	**QMF-204**
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	115	1	**QMF-205**
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	115	1	**QMF-206**
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	115	1	**QMF-207**
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	115	1	**QMF-214**
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	115	1	**QMF-224**
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	115	1	**QMF-234**
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	115	1	**QMF-244**

COAXIAL CONNECTOR MODELS

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FREQUENCY (MHz) LO	RF	IF	LO LEVEL (dBm) NOM	CONVERSION LOSS♦ (dB) MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) LO/RF MIN	LO/IF MIN	VSWR MAX	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
15-510	15-510	DC-250	+10	7.0	0.7/1.5	5.0/10	35	20	2.0:1	+3	+15	153	3	**QMK-34-15**
19-21	10-30	DC-10	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	113	2	**QMK-701***
28.5-31.5	15-45	DC-15	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	113	2	**QMK-702***
38-42	20-60	DC-20	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	113	2	**QMK-703***
57-63	30-90	DC-30	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	113	2	**QMK-704***
67.5-73.5	35-105	DC-35	+10	7.0	0.2/0.4	1.0/2.0	40	35	1.5:1	+3	+15	113	2	**QMK-705***
80-160	80-160	DC-40	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	113	2	**QMK-706***
100-200	100-200	DC-50	+10	8.0	0.6/1.0	1.0/3.0	35	30	1.5:1	+3	+15	113	2	**QMK-707***
810-830	810-830	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	113	2	**QMK-714***
869-894	869-894	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	113	2	**QMK-724***
935-960	935-960	DC-50	+10	8.0	0.6/1.0	1.0/4.0	35	30	1.8:1	+3	+15	113	2	**QMK-734***
1805-1880	1805-1880	DC-50	+10	8.0	0.8/1.2	2.0/6.0	25	20	2.0:1	+3	+15	113	2	**QMK-744***
2450	2400-2500	DC-100	+10	7.0	0.3/0.5	2.0/5.0	17	20	2.0:1	+2	+13	153	2	**QMK2450A**
3410-3590	3410-3590	DC-100	+10	9.0	0.5/1.0	3.0/6.0	17	10	2.0:1	+2	+13	153	2	**QMK2490A**

Notes:

IF_1 is +90° ref to IF_2 when RF < LO frequency.
Nominal impedance = 50 ohms.
Maximum RF input power without damage 200 mW.

*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC.
All other models numbers are available with SMA connectors only.

♦Conversion loss = RF input power (dBm) minus IF1 and IF2 power (dBm).

PIN-OUT TABLE

	RF	LO	IF_1	IF_2	CASE GND
#1	14	1	10	5	All Other
#2	3	1	2	4	-

For pin location and package outline drawings, see back pages.

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I&Q MODULATORS

LEADLESS SURFACE-MOUNT

CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	102S	1	**SMS-201**
57 - 63	DC-30	+10	8.0	30	45	0	+15	102S	1	**SMS-202**
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	102S	1	**SMS-203**
40 - 80	DC-40	+10	8.0	30	45	0	+15	102S	1	**SMS-204**
80 - 160	DC-80	+10	8.0	30	45	0	+15	102S	1	**SMS-205**
100 - 200	DC-100	+10	8.0	30	45	0	+15	102S	1	**SMS-206**
810 - 830	DC-40	+10	8.5	30	35	0	+15	102S	1	**SMS-214**
869 - 894	DC-80	+10	8.5	30	35	0	+15	102S	1	**SMS-224**
935 - 960	DC-100	+10	8.5	30	35	0	+15	102S	1	**SMS-234**
1805 - 1880	DC-100	+10	8.5	25	25	0	+15	102S	1	**SMS-244**

LEADED SURFACE-MOUNT

CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	102L	1	**SML-201**
57 - 63	DC-30	+10	8.0	30	45	0	+15	102L	1	**SML-202**
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	102L	1	**SML-203**
40 - 80	DC-40	+10	8.0	30	45	0	+15	102L	1	**SML-204**
80 - 160	DC-80	+10	8.0	30	45	0	+15	102L	1	**SML-205**
100 - 200	DC-100	+10	8.0	30	45	0	+15	102L	1	**SML-206**
810 - 830	DC-40	+10	8.5	30	35	0	+15	102L	1	**SML-214**
869 - 894	DC-80	+10	8.5	30	35	0	+15	102L	1	**SML-224**
935 - 960	DC-100	+10	8.5	30	35	0	+15	102L	1	**SML-234**
1805 - 1880	DC-100	+10	8.5	25	25	0	+15	102L	1	**SML-244**

Notes:
- SSB rejection based on optimum input quadrature signals.
- Conversion Loss is the difference between total power of both modulation inputs, and desired sideband output.
- USB is suppressed when MOD.1 is +90° ref to MOD.2.
- LSB is suppressed when MOD.1 is -90° ref to MOD.2.
- Nominal impedance = 50 ohms.
- Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	CARRIER	OUTPUT	MOD_1	MOD_2	CASE GND
#1	8	1	3	4	All Other

For pin location and package outline drawings, see back pages.

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I&Q MODULATORS

THROUGH HOLE MODELS

8 PIN - RELAY HEADER

CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	102	1	**SMR-201**
57 - 63	DC-30	+10	8.0	30	45	0	+15	102	1	**SMR-202**
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	102	1	**SMR-203**
40 - 80	DC-40	+10	8.0	30	45	0	+15	102	1	**SMR-204**
80 - 160	DC-80	+10	8.0	30	45	0	+15	102	1	**SMR-205**
100 - 200	DC-100	+10	8.0	30	45	0	+15	102	1	**SMR-206**
810 - 830	DC-40	+10	8.5	30	35	0	+15	102	1	**SMR-214**
869 - 894	DC-80	+10	8.5	30	35	0	+15	102	1	**SMR-224**
935 - 960	DC-100	+10	8.5	30	35	0	+15	102	1	**SMR-234**
1805 - 1880	DC-100	+10	8.5	25	25	0	+15	102	1	**SMR-244**

PLUG-IN (6 PIN (WIDEBAND) AND 16 PIN)

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CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
15 - 510	DC-250	+10	9.0	15	35	0	+15	151	3	**SMP-34-15**
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	124	2	**SMP-901**
57 - 63	DC-30	+10	8.0	30	45	0	+15	124	2	**SMP-902**
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	124	2	**SMP-903**
40 - 80	DC-40	+10	8.0	30	45	0	+15	124	2	**SMP-904**
80 - 160	DC-80	+10	8.0	30	45	0	+15	124	2	**SMP-905**
100 - 200	DC-100	+10	8.0	30	45	0	+15	124	2	**SMP-906**
275 - 550	DC-10	+10	8.5	15	35	0	+15	124	2	**SMP-907**
810 - 830	DC-40	+10	8.5	30	35	0	+15	124	2	**SMP-914**
869 - 894	DC-80	+10	8.5	30	35	0	+15	124	2	**SMP-924**
935 - 960	DC-100	+10	8.5	30	35	0	+15	124	2	**SMP-934**
1805 - 1880	DC-100	+10	8.5	25	25	0	+15	124	2	**SMP-944**

Notes:
- SSB rejection based on optimum input quadrature signals.
- Conversion Loss is the difference between total power of both modulation inputs, and desired sideband output.
- USB is suppressed when MOD.1 is +90° ref to MOD.2.
- LSB is suppressed when MOD.1 is -90° ref to MOD.2.
- Nominal impedance = 50 ohms.
- Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	CARRIER	OUTPUT	MOD_1	MOD_2	CASE GND
#1	8	1	3	4	All other
#2	16	1	4	13	All other
#3	6	1	3	2	4,5

For pin location and package outline drawings, see back pages.

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FLAT PACK MODELS

CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	115	1	**SMF-201**
57 - 63	DC-30	+10	8.0	30	45	0	+15	115	1	**SMF-202**
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	115	1	**SMF-203**
40 - 80	DC-40	+10	8.0	30	45	0	+15	115	1	**SMF-204**
80 - 160	DC-80	+10	8.0	30	45	0	+15	115	1	**SMF-205**
100 - 200	DC-100	+10	8.0	30	45	0	+15	115	1	**SMF-206**

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COAXIAL (SMA) CONNECTOR MODELS

CARRIER FREQUENCY (MHz)	MODULATION FREQUENCY (MHz)	CARRIER POWER (dBm) NOM	CONVERSION LOSS (dB) MIN	SSB REJECTION (dB) MIN	LO/RF ISOLATION (dB) MIN	INPUT 1 dB COMP. PT. (dBm) MIN	INPUT IP_3 (dBm) TYP	PACKAGE	PIN-OUT (See Below)	MODEL
15 - 510	DC-250	+10	9.0	15	35	0	+15	153	2	**SMK-34-15**
28.5 - 31.5	DC-15	+10	8.0	30	45	0	+15	113	2	**SMK-701***
57 - 63	DC-30	+10	8.0	30	45	0	+15	113	2	**SMK-702***
66.5 - 73.5	DC-35	+10	8.0	30	45	0	+15	113	2	**SMK-703***
40 - 80	DC-40	+10	8.0	30	45	0	+15	113	2	**SMK-704***
80 - 160	DC-80	+10	8.0	30	45	0	+15	113	2	**SMK-705***
100 - 200	DC-100	+10	8.0	30	45	0	+15	113	2	**SMK-706***

*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC.
All other models numbers are available with SMA connectors only.

Notes:
- SSB rejection based on optimum input quadrature signals.
- Conversion Loss is the difference between total power of both modulation inputs, and desired sideband output.
- USB is suppressed when MOD.1 is +90° ref to MOD.2.
- LSB is suppressed when MOD.1 is -90° ref to MOD.2.
- Nominal impedance = 50 ohms.
- Maximum RF input power without damage 200 mW.

PIN-OUT TABLE

	CARRIER	OUTPUT	MOD_1	MOD_2	CASE GND
#1	1	14	10	5	All Other
#2	1	3	2	4	-

For pin location and package outline drawings, see back pages.

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BPSK MODULATORS

SURFACE-MOUNT MODELS


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INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 200	3.5/4.5	0.4	4.0	+ 1	1.8:1	134	1	**SBM-K1**
2 - 600	4.5/5.5	0.4	4.0	+ 1	1.8:1	134	1	**SBM-K2**
1 - 200	2.5/4.5	0.4	2.0	+ 1	2.0:1	129	2	**SBM-C1**
2 - 600	2.5/4.5	0.4	2.0	+ 1	2.0:1	129	2	**SBM-C2**

THROUGH HOLE MODELS

8 PIN - RELAY CAN

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 400	1.5/3.0	0.2	2.0	+ 1	1.5:1	103	3	**MP-205**
1 - 400	1.5/3.0	0.2	2.0	+ 10	1.5:1	103	3	**MP-215**
10 - 900	2.5/4.5	0.4	2.0	+ 1	2.0:1	103	3	**MP-207**
10 - 900	2.5/4.5	0.4	2.0	+ 10	2.0:1	103	3	**MP-217**

TO-8 (12 PIN)

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 400	1.5/3.0	0.2	2.0	+ 1	1.5:1	104	4	**MP-201**
1 - 400	1.5/3.0	0.2	2.0	+ 10	1.5:1	104	4	**MP-211**
10 - 900	2.5/4.5	0.4	2.0	+ 1	2.0:1	104	4	**MP-203**
10 - 900	2.5/4.5	0.4	2.0	+ 10	2.0:1	104	4	**MP-213**

Notes:
Logic 1 corresponds to +20 mA and Logic 0 corresponds to -20 mA.
Nominal input/output impedance = 50 ohms.
Maximum RF input power without damage 75 mW or 40 mA.

PIN-OUT TABLE

	INPUT	OUTPUT	D1	D2	CASE GND	NO CONN.
#1	1	4	5	2	3,6	
#2	1	3	6	4	7,8,9,10	2,5
#3	8	1	*3,4	*5,6	2,7	
#4	11	8	2	5	All other	

For pin location and package outline drawings, see back pages.
*Connect pins together externally.

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BPSK MODULATORS

Flat Pack Models

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 400	1.5/3.0	0.2	2.0	+ 1	1.5:1	101	1	**MF-206**
1 - 400	1.5/3.0	0.2	2.0	+ 10	1.5:1	101	1	**MF-216**
10 - 900	2.5/4.5	0.4	2.0	+ 1	2.0:1	101	1	**MF-208**
10 - 900	2.5/4.5	0.4	2.0	+ 10	2.0:1	101	1	**MF-218**
40 - 1150	3.9/4.5	0.4	4.0	+ 1	3.0:1	101	2	**MF-210✦**
40 - 1150	3.9/4.5	0.4	4.0	+ 10	3.0:1	101	2	**MF-220✦**

Coaxial (SMA) Connector Models

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INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 400	1.5/3.0	0.2	2.0	+ 1	1.5:1	113	3	**MK-701S**
1 - 400	1.5/3.0	0.2	2.0	+ 10	1.5:1	113	3	**MK-711S**
10 - 900	2.5/4.5	0.4	2.0	+ 1	2.0:1	113	3	**MK-702S**
10 - 900	2.5/4.5	0.4	2.0	+ 10	2.0:1	113	3	**MK-712S**
40 - 1150	3.9/4.5	0.4	4.0	+ 1	3.0:1	110	4	**MK-703S✦**
40 - 1150	3.9/4.5	0.4	4.0	+ 10	3.0:1	110	4	**MK-713S✦**

✦ Require external bipolar squarewave driver capable of generating +/-20 mA .

Notes:
Logic 1 corresponds to +20 mA and Logic 0 corresponds to -20 mA.
Nominal input/output impedance = 50 ohms.
Maximum RF input power without damage 75 mW or 40 mA.

PIN-OUT TABLE

	INPUT	OUTPUT	D1	D2	CASE GND
#1	4	1	5	8	2,3,6,7
#2	4	1	5	-	2,3,6,7,8
#3	1	3	2	4	
#4	1	3	2	-	

For pin location and package outline drawings, see back pages.

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QPSK MODULATORS


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Coaxial Connector Models

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) Fc MAX	PHASE UNBALANCE (Degrees) FULL BAND MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
15 - 510	11.0	1.5	10	10	+4	2.5:1	153	1	**MK-34-15**
28.5 - 31.5	7.0	0.4	2.0	3.5	+4	1.7:1	113	1	**MK-751***
52 - 88	8.0	1.0	2.0	5.0	+4	1.7:1	113	1	**MK-757***
57 - 63	7.0	0.4	2.0	3.5	+4	1.7:1	113	1	**MK-753***
66.5 - 73.5	7.0	0.4	2.0	3.5	+4	1.7:1	113	1	**MK-755***
104 - 176	8.0	1.0	2.0	5.0	+4	1.7:1	113	1	**MK-758***
133 - 147	7.0	0.4	2.0	3.5	+4	1.7:1	113	1	**MK-756***
190 - 210	7.0	0.4	2.0	3.5	+4	1.7:1	113	1	**MK-759***
285 - 315	7.5	0.4	2.0	5.0	+4	1.7:1	113	1	**MK-760***
810 - 830	8.0	0.6	4.0	5.0	+4	2.0:1	113	1	**MK-714S**
869 - 894	8.5	0.6	4.0	5.0	+4	2.0:1	113	1	**MK-724S**
935 - 960	8.0	0.6	4.0	5.0	+4	2.0:1	113	1	**MK-734S**
1805 - 1880	9.5	1.0	6.0	7.0	+4	2.2:1	113	1	**MK-736S**

Notes:
Logic 1 corresponds to +20 mA and Logic 0 corresponds to -20 mA.
Requires external bipolar squarewave driver capable of generating +/-20 mA to drive D1 and D3.
Nominal input/output impedance = 50 ohms.
Maximum RF input power without damage 200 mW and 40 mA at D1 and D3.

*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC.
All other models numbers are available with SMA connectors only.

PIN-OUT TABLE

	CARRIER	OUTPUT	D1	D3
#1	1	3	2	4

For pin location and package outline drawings, see back pages.

LOGIC TABLE

PHASE	D1	D3
0°	1	1
90°	1	0
180°	0	0
270°	0	1

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SYNERGY® MICROWAVE CORPORATION

QPSK MODULATORS

SURFACE-MOUNT MODELS

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) Fc MAX	PHASE UNBALANCE (Degrees) FULL BAND MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10.165 - 11.235	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-202**
20.33 - 22.47	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-204**
28.5 - 31.5	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-201**
52 - 88	8.0	1.0	2.0	5.0	+4	1.7:1	102S	1	**MS-207**
57 - 63	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-203**
66.5 - 73.5	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-205**
104 - 176	8.0	1.0	2.0	5.0	+4	1.7:1	102S	1	**MS-208**
133 - 147	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-206**
190 - 210	7.0	0.4	2.0	3.5	+4	1.7:1	102S	1	**MS-209**
285 - 315	7.5	0.4	2.0	5.0	+4	1.7:1	102S	1	**MS-210**
810 - 830	8.0	0.6	4.0	5.0	+4	2.0:1	102S	1	**MS-214**
869 - 894	8.5	0.6	4.0	5.0	+4	2.0:1	102S	1	**MS-224**
935 - 960	8.0	0.6	4.0	5.0	+4	2.0:1	102S	1	**MS-234**
1805 - 1880	9.5	1.0	6.0	7.0	+4	2.2:1	102S	1	**MS-236**

FLAT PACK MODELS

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) Fc MAX	PHASE UNBALANCE (Degrees) FULL BAND MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
28.5 - 31.5	7.0	0.4	2.0	3.5	+4	1.7:1	115	2	**MF-111**
52 - 88	8.0	1.0	2.0	5.0	+4	1.7:1	115	2	**MF-117**
57 - 63	7.0	0.4	2.0	3.5	+4	1.7:1	115	2	**MF-113**
66.5 - 73.5	7.0	0.4	2.0	3.5	+4	1.7:1	115	2	**MF-115**
104 - 176	8.0	1.0	2.0	5.0	+4	1.7:1	115	2	**MF-118**
133 - 147	7.0	0.4	2.0	3.5	+4	1.7:1	115	2	**MF-116**
190 - 210	7.0	0.4	2.0	3.5	+4	1.7:1	115	2	**MF-119**
285 - 315	7.5	0.4	2.0	5.0	+4	1.7:1	115	2	**MF-120**

Notes:
Logic 1 corresponds to +20 mA and Logic 0 corresponds to -20 mA.
Above models do not include Logic complimentary drivers.
Nominal input/output impedance = 50 ohms.
Maximum RF input power without damage 200 mW and 40 mA.

PIN-OUT TABLE

	CARRIER	OUTPUT	D1	D2	D3	D4	CASE GND
#1	8	1	3	5	4	6	2,7
#2	1	14	5	3	12	10	All Other

For pin location and package outline drawings, see back pages.

LOGIC TABLE

PHASE	D1	D2	D3	D4
0°	1	0	1	0
90°	1	0	0	1
180°	0	1	0	1
270°	0	1	1	0

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QPSK MODULATORS

THROUGH-HOLE

8 PIN - RELAY CAN

INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) Fc MAX	PHASE UNBALANCE (Degrees) FULL BAND MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10.165 - 11.235	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-202**
20.33 - 22.47	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-204**
28.5 - 31.5	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-201**
52 - 88	8.0	1.0	2.0	5.0	+4	1.7:1	102	1	**MR-207**
57 - 63	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-203**
66.5 - 73.5	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-205**
104 - 176	8.0	1.0	2.0	5.0	+4	1.7:1	102	1	**MR-208**
133 - 147	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-206**
190 - 210	7.0	0.4	2.0	3.5	+4	1.7:1	102	1	**MR-209**
285 - 315	7.5	0.4	2.0	5.0	+4	1.7:1	102	1	**MR-210**
810 - 830	8.0	0.6	4.0	5.0	+4	2.0:1	102	1	**MR-214**
869 - 894	8.5	0.6	4.0	5.0	+4	2.0:1	102	1	**MR-224**
935 - 960	8.0	0.6	4.0	5.0	+4	2.0:1	102	1	**MR-234**
1805 - 1880	9.5	1.0	6.0	7.0	+4	2.2:1	102	1	**MR-236**

PLUG-IN 6 PIN (Wideband) AND 16 PIN

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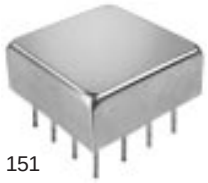

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INPUT CARRIER FREQUENCY (MHz)	INSERTION LOSS (dB) MAX	AMPLITUDE UNBALANCE (dB) MAX	PHASE UNBALANCE (Degrees) Fc MAX	PHASE UNBALANCE (Degrees) FULL BAND MAX	INPUT 1 dB COMP. PT. (dBm) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
15 - 510	11.0	1.5	10	10	+4	2.5:1	151	3	***MP-34-15**
28.5 - 31.5	7.0	0.4	2.0	3.5	+4	1.7:1	124	2	**MP-901**
52 - 88	8.0	1.0	2.0	5.0	+4	1.7:1	124	2	**MP-907**
57 - 63	7.0	0.4	2.0	3.5	+4	1.7:1	124	2	**MP-903**
66.5 - 73.5	7.0	0.4	2.0	3.5	+4	1.7:1	124	2	**MP-905**
104 - 176	8.0	1.0	2.0	5.0	+4	1.7:1	124	2	**MP-908**
133 - 147	7.0	0.4	2.0	3.5	+4	1.7:1	124	2	**MP-906**
190 - 210	7.0	0.4	2.0	3.5	+4	1.7:1	124	2	**MP-909**
285 - 315	7.5	0.4	2.0	5.0	+4	1.7:1	124	2	**MP-910**
810 - 830	8.0	0.6	4.0	5.0	+4	2.0:1	124	2	**MP-914**
869 - 894	8.5	0.6	4.0	5.0	+4	2.0:1	124	2	**MP-924**
935 - 960	8.0	0.6	4.0	5.0	+4	2.0:1	124	2	**MP-934**
1805 - 1880	9.5	1.0	6.0	7.0	+4	2.2:1	124	2	**MP-936**

Notes:
Logic 1 corresponds to +20 mA and Logic 0 corresponds to -20 mA.
Above models do not include Logic complimentary drivers.
Nominal input/output impedance = 50 ohms.
Maximum RF input power without damage 200 mW and 40 mA.
The logic table for the MP-34-15 is the same as for the coaxial connector models.

LOGIC TABLE

PHASE	D1	D2	D3	D4
0°	1	0	1	0
90°	1	0	0	1
180°	0	1	0	1
270°	0	1	1	0

PIN-OUT TABLE

	CARRIER	OUTPUT	D1	D2	D3	D4	CASE GND
#1	8	1	3	5	4	6	2,7
#2	16	1	13	5	3	4	All Other
#3	6	1	3	-	2	-	4,5

For pin location and package outline drawings, see back pages.

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POWER DIVIDERS AND COMBINERS

There are several classes of devices that can be used to divide or combine RF/Microwave power. Generally, they are classitied according to the number of output ports and the relative phase difference between the output signals. The appropriate device must be carefully selected based on the device type and specifications. Particular care must be taken in specifying devices where the application calls for power combining.

The following is a description of the key characteristics normally used in specifying Power Divider performance, and the various types of Power Dividers available.

PARAMETER DEFINITIONS

Insertion Loss

Insertion loss is, simply, the difference in excess of the theoretical splitting loss (in dB) between the amplitude of any output signal and the amplitude of the input signal. The theoretical splitting loss is 3 dB for 2-way dividers, 6 dB for 4-way dividers, 9 dB for 8-way, etc.

Amplitude Balance

Amplitude Balance (in dB) refers to the maximum amplitude difference between any two output signals.

Phase Balance

Phase Balance (in degrees) refers to the maximum phase deviation from theoretical, measured betweenany two output signals (i.e., net phase difference in an in-phase device, net phase difference less 90 degrees in a quadrature device, etc.)

Isolation

Isolation (in dB), in a Power Divider, is defined as the attenuation between a signal present at any Output port and its level as measured at any other Output port, with the input port terminated in 50 ohms. This is a critical parameter that allows the design engineer to estimate "crosstalk" between the various outputs.

Internal Power Dissipation

Internal Power Dissipation is simply the power rating of the internal terminations. When the Power Divider is utilized in the recommended manner, these ratings would not be exceeded. However, some system configurations may allow, for example, the possibility of various outputs being disconnected. In this case, high power levels are "dumped" across the internal terminations. Obviously, in this case, care should be taken with respect to the Internal Power Dissipation rating.

DEVICE TYPES

In Phase: N-way Dividers

These devices deliver output signals in-phase with each other. The most common types are 2-, 4-, 8-, and 16-way dividers. Odd-numbered power division circuits, by design, have a narrower bandwidth. The following table contains number of output and corresponding coupling loss.

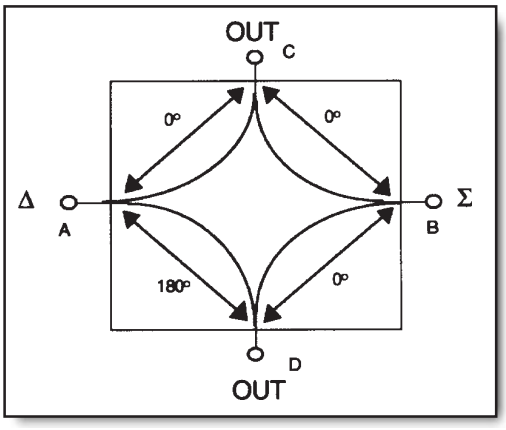
No. of output (N)	Coupling Loss (dB)
2	3.01
3	4.77
4	6.02
5	7.00
6	7.78
8	9.03
10	10.0
12	10.8

Extreme caution must be used when combining signals. Proper combining requires that all signals have the same frequency phase, and amplitude. If dissimilar signals are combined, make sure that the resistors used are capable of handling the required power.

180 Degree Hybrids

A 180 degree hybrid is a 4 port device which provides two (C&D) equal amplitude in phase signals when fed from its sum port (Σ), and two (C&D) equal amplitude 180 degrees out of phase signals when fed from its difference port (Δ).

If port B is terminated, then the 180 degree hybrid becomes a 3 port device.



90 Degree (Quadrature) Hybrids

These devices split or combine in quadrature (one output signal being 90 degrees out of phase with theother), and have many uses in signal processing. Even though they are reciprocal devices, the same care must be taken in combiner applications as with in-phase combiners. Bandwidth is the most important limitation of the quadrature ("quad") hybrid. "Crossover" quads have a bandwidth of 10% and can be manufactured to have excellent amplitude and phase balance as well as low loss, high isolation, and good VSWR. They are very useful for processing signal frequencies and their applications are numerous.

Synergy's Quadrature Hybrids are available in bandwidths of 10%, octave, 3:1, 5:1, and 10:1 in various package styles.

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POWER DIVIDERS

0°: 2-WAY

LEADLESS SURFACE-MOUNT


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133


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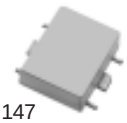
147


124S

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2 - 300	25/20	30/20	25/20	0.5/0.9	0.6/0.8	0.8/1.0	3.0	4.0	5.0	0.4	0.5	0.5	134	1	**SD-1**
5 - 500	25/20	30/20	25/20	0.4/0.7	0.5/0.8	0.6/1.0	3.0	4.0	5.0	0.4	0.4	0.6	134	2	**SD-2**
10 - 1000	25/20	30/17	25/17	0.5/0.8	0.6/1.0	1.0/1.5	2.0	4.0	7.0	0.4	0.5	0.7	134	2	**SD-3**
0.1 - 100	25/20	25/22	23/20	0.2/0.4	.25/0.6	0.4/1.0	2.0	2.0	2.0	0.2	0.2	0.2	133	3	**SPD-C2**
1 - 500	35/25	32/25	30/20	0.3/0.6	.35/0.7	0.6/1.0	2.0	3.0	4.0	0.2	0.3	0.3	133	3	**SPD-C1**
10 - 1000	22/19	19/17	18/15	0.4/0.8	0.7/1.2	1.2/1.5	2.0	3.0	5.0	0.2	0.3	0.5	133	3	**SPD-C5**
500 - 1500	20/15	20/15	20/15	0.6/0.8	0.7/0.8	0.8/1.0	3.0	4.0	5.0	0.3	0.4	0.5	133	3	**SPD-C4**
700 - 1000	20/15	20/15	20/15	0.6/0.8	0.6/0.8	0.8/1.0	3.0	4.0	5.0	0.3	0.4	0.5	133	3	**SPD-C3**
850 - 960	-/-	-/-	27/20	-/-	-/-	0.6/1.0	-/-	-/-	5.0	-/-	-/-	0.4	133	3	**SPD-C1-2†**
10 - 1000	25/20	30/20	25/17	0.5/0.8	0.6/1.0	1.0/1.5	2.0	4.0	7.0	0.4	0.5	0.7	147	4	**SPD-M-3**
1600 - 1700	-/-	-/-	26/21	-/-	-/-	0.8/1.2	-/-	-/-	3.0	-/-	-/-	0.6	129	3	**SPD-C7†**
2000 - 2100	-/-	-/-	26/21	-/-	-/-	0.4/0.6	-/-	-/-	3.0	-/-	-/-	0.6	129	3	**SPD-C8†**
1725 - 1900	-/-	-/-	25/20	-/-	-/-	0.4/0.6	-/-	-/-	4.0	-/-	-/-	0.4	124S	5	**DSS-927†**
2000 - 2200	-/-	-/-	25/20	-/-	-/-	0.8/1.2	-/-	-/-	3.0	-/-	-/-	0.6	124S	5	**DSS-928†**
2200 - 2400	-/-	-/-	25/20	-/-	-/-	0.8/1.2	-/-	-/-	3.0	-/-	-/-	0.6	124S	5	**DSS-929†**

LEADED SURFACE-MOUNT


134S


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FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2 - 300	25/20	30/20	25/20	0.5/0.9	0.6/0.8	0.8/1.0	3.0	4.0	5.0	0.4	0.5	0.5	159	1	**SDL-1**
2 - 500	35/18	35/25	27/20	0.3/0.8	0.3/0.6	0.5/1.0	1.0	2.0	3.0	0.15	0.2	0.3	159	2	**SDL-173 ■**
5 - 500	25/20	30/20	25/20	0.4/0.7	0.5/0.8	0.6/1.0	3.0	4.0	5.0	0.4	0.4	0.6	159	2	**SDL-2**
5 - 750	25/18	30/23	23/17	0.6/1.4	0.8/1.6	1.5/1.8	1.0	3.0	5.0	0.2	0.3	0.5	159	2	**SDL-174 ■**
2 - 1000	35/25	27/17	23/17	0.5/0.6	0.7/0.9	1.2/1.5	1.0	2.0	4.0	0.2	0.3	0.6	159	2	**SDL-100**
10 - 1000	25/20	30/17	25/17	0.5/0.8	0.6/1.0	1.0/1.5	2.0	4.0	7.0	0.4	0.5	0.7	159	2	**SDL-3**
500 -1500	20/15	20/15	18/13	0.6/0.8	0.7/0.8	1.0/1.4	3.0	4.0	7.0	0.3	0.4	0.7	159	2	**SDL-4 ♦**
1200 -1600	-/-	-/-	25/18	-/-	-/-	1.0/1.5	-/-	-/-	3.0	-/-	-/-	0.3	159	2	**SDL-5†**
1700 -2500	-/-	-/-	20/16	-/-	-/-	0.8/1.3	-/-	-/-	10	-/-	-/-	0.9	159	2	**SDL-7†**
5 - 500	25/20	30/20	25/20	0.4/0.7	0.5/0.8	0.6/1.0	3.0	4.0	5.0	0.4	0.4	0.6	134S	2	**SDZ-2**
10 - 1000	25/20	30/17	25/17	0.5/0.8	0.6/1.0	1.0/1.5	2.0	4.0	7.0	0.4	0.5	0.7	134S	2	**SDZ-3**
700 - 900	-/-	-/-	23/20	-/-	-/-	0.5/0.8	-/-	-/-	2.0	-/-	-/-	0.5	134S	2	**SDZ-125†**

Notes: ■ 75 Ohm Model
Power Rating(All Models) = 1 watt, max
♦ LB = 500-700 MHz, MB = 750-1000 MHz, UB = 1000-1500 Mhz
† (UB) - Denotes full bandwidth specification
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	*GROUND
#1	2	4,6	1,3,5
#2	6	3,4	1,2,5
#3	3	1,2	4,5,6
#4	1	2,4	3
#5	1	4,16	All other

*GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0° : 2-WAY

THROUGH HOLE MOUNT (8 Pin-Relay Can)


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FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.004-60	27/20	30/20	27/20	0.3/0.6	0.3/0.6	0.6/1.0	2.0	3.0	4.0	.15	.25	0.3	102	1	**DSP-2B1**
0.01-100	30/20	27/20	25/20	0.3/0.6	0.3/0.5	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.2	102	1	**DSP-201**
0.1-400	20/15	25/20	25/20	0.2/0.6	0.4/.75	0.6/1.0	2.0	3.0	4.0	.15	0.2	0.3	102	1	**DSP-2A3**
0.25-300	20/15	30/20	20/15	0.4/.75	0.4/.75	0.4/1.0	2.0	3.0	5.0	.15	0.2	0.3	102	1	**DSP-2A2** ■
0.5-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	3.0	0.2	0.2	0.2	103	1	**DSP-202**
1-400	28/20	28/20	25/20	0.4/.65	0.5/0.8	0.7/1.0	3.0	3.0	4.0	0.3	0.3	0.3	102	1	**DSP-209**
1-650	30/20	28/20	25/20	0.4/0.5	0.4/0.8	0.8/1.0	2.0	3.0	5.0	.15	0.2	0.3	102	1	**DSP-222**
5-2000	21/16	22/18	19/9	0.6/0.8	0.8/1.2	0.9/1.8	1.0	3.0	6.0	0.2	0.4	1.0	102	1	**DSP-2A6**
10-850	31/20	32/23	23/15	0.3/0.5	0.4/0.6	0.5/1.0	2.0	5.0	10.0	0.1	0.2	0.5	102	1	**DSP-2D4** ■
10-1000	30/20	28/20	25/20	0.2/0.5	0.6/1.0	0.9/1.2	2.0	4.0	6.0	0.2	0.2	0.4	102	1	**DSP-212**
10-1000	30/25	25/20	25/20	0.6/1.0	0.6/1.2	0.7/1.2	2.0	8.0	10.0	.15	0.2	0.4	102	1	**DSP-2C4**
10-1400	28/18	22/17	24/17	0.3/0.6	0.6/1.0	0.9/1.6	2.0	3.0	4.0	.15	0.2	0.4	102	1	**DSP-2A5**

MINI RELAY HEADER (4-Pin and 8 Pin)


105


106


107

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-400	30/25	30/25	30/20	.25/0.5	0.5/.75	0.7/1.0	2.0	3.0	4.0	.15	0.2	0.6	106	2	**DSP-3C3**
1-400	28/20	28/20	25/20	0.4/.65	0.5/0.8	0.7/1.0	3.0	3.0	4.0	0.3	0.3	0.3	105	2	**DSP-309**
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.3	105	2	**DSP-302**
0.1-450	20/15	30/20	30/20	0.3/0.5	0.4/.75	0.6/1.0	2.0	3.0	4.0	.15	0.2	0.3	107	1	**DSP-4B4**
1-400	28/20	28/20	25/20	0.4/.65	0.5/0.8	0.7/1.0	3.0	3.0	4.0	0.3	0.3	0.3	107	1	**DSP-409**
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/2.0	2.0	2.0	2.0	0.2	0.2	0.3	107	1	**DSP-402**
2-650	22/18	30/20	22/18	0.3/0.5	0.5/0.8	0.8/1.2	1.0	2.0	4.0	0.3	0.2	0.3	107	1	**DSP-4A4**
5-1500	18/16	20/16	20/14	0.6/0.8	0.6/0.8	0.6/1.1	2.0	3.0	5.0	0.2	0.3	0.4	107	1	**DSP-4A5**

FLAT-PACK

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-500	25/20	30/20	30/20	0.4/0.7	0.4/0.7	0.5/1.2	2.0	2.0	3.0	0.2	0.2	0.2	101	3	**DSF-102**
2-1500	25/20	25/20	18/15	0.8/1.3	0.5/1.0	1.0/1.5	2.0	4.0	8.0	0.2	0.3	0.4	101	3	**DSF-103**
5-1000	30/20	30/23	25/20	0.3/0.5	0.5/0.8	0.6/1.0	3.0	2.0	5.0	0.2	0.2	0.2	101	3	**DSF-109**

Notes: ■ 75 Ohm Model
Power Rating(All Models) = 1 watt, max
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND
#1	1	5,6	All Other
#2	1	2,4	3
#3	8	1,5	All other

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0°: 2-WAY

COAXIAL CONNECTOR


110


144


164

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-100	30/20	27/20	25/20	0.3/0.6	0.3/0.5	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.2	110	1	**DSK-701***
0.25-300	20/15	30/25	25/20	0.4/.75	0.4/.75	0.4/1.0	2.0	3.0	5.0	.15	0.2	0.3	110	1	**DSK-7A2B** ■
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	3.0	0.2	0.2	0.2	110	1	**DSK-702***
1-750	30/20	28/20	25/20	0.2/0.5	0.4/0.8	0.8/1.0	2.0	4.0	4.0	.15	.15	0.3	110	1	**DSK-7E4***
2-200	35/30	35/30	35/30	0.2/0.5	0.3/0.5	0.4/0.5	1.0	1.0	1.0	0.2	0.2	0.2	110	1	**DSK-7M2***
2-1500	25/20	25/20	25/20	0.8/1.3	0.6/1.2	0.5/1.5	2.0	4.0	6.0	0.2	0.2	0.3	110	1	**DSK-703***
5-400	40/30	38/30	35/30	0.2/0.4	0.3/0.5	0.4/0.5	2.0	2.0	2.0	0.2	0.2	0.2	110	1	**DSK-718***
5-500	35/30	40/30	35/30	0.3/0.5	0.3/0.5	0.4/.65	2.0	2.0	3.0	0.2	0.2	0.2	110	1	**DSK-717***
10-1000	30/20	30/20	25/20	0.2/0.5	0.5/1.0	0.9/1.2	2.0	3.0	5.0	.15	.15	0.3	110	1	**DSK-712***
10-1000	30/25	33/25	30/25	0.2/0.5	0.4/0.7	0.6/0.8	2.0	2.0	3.0	0.2	0.2	0.25	110	1	**DSK-709***
5-2000	25/20	25/20	23/15	0.6/0.9	0.9/1.4	1.2/1.8	2.0	3.0	5.0	0.2	0.3	0.4	144	2	**DSK-726S**
700-900	-/-	-/-	30/24	-/-	-/-	0.3/1.0	-	-	5.0	-	-	0.5	164	2	**DSK-724S**✞

THROUGH HOLE (TO-8 and TO-5)


104


122


126


127

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.2	104	3	**DSP-502**
0.01-100	30/20	27/20	25/20	0.3/0.6	0.3/0.5	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.2	122	5	**DSP-601**
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	3.0	0.2	0.2	0.2	122	5	**DSP-602**
10-1000	25/20	30/20	25/20	0.2/0.5	0.5/0.8	0.6/1.0	3.0	2.0	4.0	0.2	0.2	0.3	122	5	**DSP-609**
1-100	37/30	35/30	35/30	0.2/0.5	0.3/0.5	0.4/0.5	1.0	1.0	1.0	0.1	0.1	0.1	127	4	**DSP-8D1**
1-500	25/20	30/23	30/20	0.4/0.6	0.4/0.7	0.5/1.0	2.0	2.0	2.0	0.2	0.2	0.2	126	5	**DSP-802**

Power Rating (All Models) = 1 Watt, max
* Select female connector suffix: "B" = BNC, "S" = SMA, "N" = Type N, "T" = TNC
■75 Ohm Model
✞ (UB) - Denotes full bandwidth specification
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND
#1	2	1,3	-
#2	1	2,3	1,5
#3	8	11,5	All Other
#4	3	2,4	1,5
#5	3	2,4	1

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0°: 3-WAY

LEADED SURFACE-MOUNT

134S 

 159

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2-200	30/23	27/20	23/18	0.6/0.8	0.4/0.7	0.7/1.0	3.0	3.0	3.0	0.4	0.3	0.4	159	1	**SDL-110**
5-750	25/18	25/20	23/18	0.6/1.4	0.8/1.6	1.5/1.8	3.0	5.0	7.0	0.3	0.5	0.75	159	1	**SDL-135**
5-750	25/18	25/20	23/18	0.6/1.4	0.8/1.6	1.5/1.8	3.0	5.0	7.0	0.3	0.5	0.75	134S	1	**SDZ-135**
720-800	---/---	18/15	---/---	---/---	0.4/0.7	---/---	--	5.0	--	--	0.7	--	159	1	**SDL-115**✞
850-950	---/---	17/13	---/---	---/---	1.0/1.4	---/---	--	5.0	--	--	0.7	--	159	1	**SDL-137**✞

THROUGH HOLE MOUNT (8 Pin-Relay Can)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-30	35/30	40/25	30/25	.25/.45	.15/.45	.45/.75	1.0	2.0	4.0	0.2	0.3	0.4	102	2	**DCP-2A1**
1-200	45/27	40/30	40/25	0.6/1.0	0.4/0.7	0.6/1.0	1.0	2.0	4.0	0.2	0.2	0.4	102	2	**DCP-2B2**
1-200	35/23	35/25	35/25	0.6/1.0	0.3/0.7	0.6/1.0	2.0	3.0	4.0	0.2	0.2	0.3	102	2	**DCP-2C2** ■
5-500	25/20	31/15	25/15	0.4/0.8	0.4/1.4	0.8/1.4	6.0	8.0	10	0.2	0.3	0.6	102	3	**DCP-2B3**
10-1000	25/20	23/18	23/18	0.6/1.0	0.8/1.3	1.2/2.0	6.0	8.0	12	0.2	0.4	0.8	102	3	**DCP-2B4**

COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-200	45/30	48/35	37/30	0.25/0.5	.35/0.6	.35/0.6	1.0	3.0	5.0	0.1	0.2	0.2	113	4	**DCK-7K2***
1-500	30/20	30/20	25/18	0.4/0.75	0.5/0.9	0.8/1.2	2.0	3.0	4.0	0.2	0.3	0.4	113	4	**DCK-7J2***
2-750	30/20	30/20	25/18	0.4/0.75	0.5/1.0	1.0/1.6	3.0	5.0	7.0	0.2	0.3	0.5	113	4	**DCK-7D3***
10-1000	25/20	20/17	20/17	0.5/0.75	0.7/1.0	1.2/2.0	3.0	5.0	7.0	0.3	0.4	0.7	113	4	**DCK-703S**

Power Rating (All Models) = 1 Watt, max

* Select female connector suffix: "B" = BNC, "S" = SMA, "N" = Type N, "T" = TNC

■75 Ohm Model

✞ (UB) - Denotes full bandwidth specification

For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND
#1	6	1,3,4	2,5
#2	6	1,2,5	3,4,7,8
#3	1	5,7,8	2,3,4,6
#4	1	2,3,4	-

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POWER DIVIDERS

0°: 4-WAY

SURFACE-MOUNT MODELS


129


159

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	23/20	---/---	25/20	0.7/1.0	---/---	0.5/1.0	3	-	3	0.4	-	0.4	159	1	**SDL-140**
20-400	25/18	---/---	20/17	1.0/1.3	---/---	1.4/1.8	3	-	5	0.4	-	0.75	159	1	**SDL-120**
700-900	---/---	---/---	25/23	---/---	---/---	1.0/1.4	-	-	6	---	-	0.8	129	2	**SPD-C6**✞

THROUGH HOLE MOUNT (8 Pin-Relay Header)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-40	35/20	32/25	25/20	0.4/0.8	0.3/0.5	0.5/1.0	3	3	4	0.2	.15	0.2	102	3	**DSP-206**
0.1-200	33/20	30/20	27/20	0.4/0.6	0.5/.75	0.7/1.0	4	6	8	0.15	0.2	.25	102	3	**DSP-2D2**
0.25-250	33/20	30/20	27/20	0.4/0.7	0.5/.75	0.7/1.2	4	6	8	0.15	0.2	.25	102	3	**DSP-2F2**
1-200	30/20	25/20	25/20	0.4/0.7	0.5/0.9	0.7/1.2	4	6	10	0.15	0.2	0.3	102	3	**DSP-2E2** ■
1-250	33/20	30/20	27/20	0.4/0.7	0.5/.75	0.7/1.2	3	3	4	0.25	0.2	0.3	102	3	**DSP-204**
1-500	25/20	27/20	25/20	0.6/1.2	0.8/1.5	1.4/2.2	4	4	6	0.5	0.4	0.5	102	3	**DSP-207** ■
10-1000	25/20	24/20	24/20	1.2/1.7	1.2/1.9	1.6/2.3	5	7	10	0.2	0.5	0.8	102	3	**DSP-2E4**
1900-2130	---/---	---/---	25/20	---/---	---/---	1.8/2.4	-	-	6	-	-	0.7	102	3	**DSP-247**✞

THROUGH HOLE MOUNT (TO-8)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-40	35/20	32/25	25/20	0.4/0.8	0.3/0.5	0.5/1.0	3	3	4	0.2	0.15	0.2	123	4	**DSP-506**
1-250	33/20	30/20	27/20	0.4/0.7	0.5/.75	0.7/1.2	3	3	4	0.25	0.2	0.3	123	4	**DSP-504**
1-500	25/20	27/20	25/20	0.6/1.2	0.8/1.5	1.4/2.2	4	4	6	0.5	0.4	0.5	123	4	**DSP-507**

Power Rating (All Models) = 1 Watt, max

■ 75 Ohm Model

✞ (UB) - Denotes full bandwidth specification

For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND
#1	5	1,3,4,6	2
#2	2	1,3,4,6	All other
#3	4	1,2,7,8	All other
#4	2	4,6,10,12	All Other

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POWER DIVIDERS

0° : 4-WAY

THROUGH HOLE MOUNT (16 Pin-Header)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10-800	30/20	33/20	25/18	0.4/0.7	0.7/0.9	1.3/1.6	5.0	7.0	10	0.2	0.4	0.8	124	1	**DSP-9E4** ■
10-1000	25/20	21/15	18/15	0.5/0.8	0.8/1.8	1.5/2.5	4.0	6.0	10	0.2	0.5	0.7	124	1	**DSP-9D4**
10-1000	25/20	25/18	20/15	0.8/1.5	1.0/2.0	1.5/2.5	4.0	6.0	10	0.4	0.5	0.7	124	1	**DSP-908**

COAXIAL CONNECTOR

111

169

128

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-40	35/20	32/25	25/20	0.4/0.8	0.3/0.5	0.5/1.0	3.0	3.0	4.0	0.2	0.15	0.2	111	2	**DSK-706***
1-200	30/20	25/20	25/20	0.4/0.7	0.5/0.9	0.7/1.2	4.0	6.0	10.0	0.15	0.2	0.3	169	2	**DSK-7E2B** ■
1-250	33/20	30/20	27/20	0.4/0.7	0.5/.75	0.7/1.2	3.0	3.0	4.0	.25	0.2	0.3	111	2	**DSK-704***
1-500	25/20	25/20	23/20	0.8/1.2	0.6/1.2	1.0/1.5	4.0	3.0	5.0	0.4	0.3	0.4	111	2	**DSK-707***
1-1000	25/15	25/20	20/15	0.6/1.5	1.0/2.0	1.5/2.5	5.0	6.0	8.0	0.5	0.5	0.5	111	2	**DSK-708***
10-500	33/25	30/25	28/25	0.5/0.7	0.7/.85	.85/1.0	2.0	4.0	6.0	0.2	0.2	0.4	128	2	**DSK-711S**
20-1000	30/25	30/23	25/20	0.6/1.2	0.8/1.3	1.0/1.5	3.0	4.0	8.0	0.3	0.4	0.5	128	2	**DSK-713S**
30-1000	30/25	30/25	30/25	0.8/1.0	0.8/1.0	0.8/1.1	2.0	3.5	8.0	0.3	0.3	0.5	128	2	**DSK-705S**

Power Rating (All Models) = 1 Watt, max
* Select female connector suffix: "B" = BNC, "S" = SMA, "N" = Type N, "T" = TNC
■ 75 Ohm Model
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND
#1	2	5,8,9,12	All other
#2	1	2,3,4,5	All other

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0° : 5-WAY

SURFACE MOUNT

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.05-30	28/20	30/25	25/20	0.4/0.8	0.3/0.7	0.6/1.0	4.0	4.0	4.0	0.3	0.3	0.3	124S	1	**DES-901**
1-300	25/20	23/18	20/17	0.2/0.5	0.6/1.0	1.5/2.0	2.0	4.0	8.0	0.2	0.3	0.6	124S	1	**DES-9G2**

THROUGH HOLE MOUNT(16-Pin)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.05-30	28/20	30/25	25/20	0.4/0.8	0.3/0.7	0.6/1.0	4.0	4.0	4.0	0.3	0.3	0.3	124	2	**DEP-901**
1-300	25/20	23/18	20/17	0.2/0.5	0.6/1.0	1.5/2.0	2.0	4.0	8.0	0.2	0.3	0.6	124	2	**DEP-9G2**

COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.05-30	25/20	30/25	25/20	0.5/0.9	0.3/0.7	0.6/1.0	4.0	4.0	4.0	0.3	0.3	0.3	157	3	**DEK-701***
1-300	25/20	23/18	20/17	0.2/0.5	0.6/1.0	1.5/2.0	2.0	4.0	8.0	0.2	0.3	0.6	157	3	**DEK-7G2***

Power Rating (All Models) = 1 Watt, max
* Select female connector suffix: "B" = BNC, "S" = SMA, "N" = Type N, "T" = TNC
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND	NO CONN.
#1	1	4,8,12,15,16	2,5,13,14	3,9
#2	1	4,8,12,15,16	2,5,7,11,13,14	3,6,9,10
#3	1	2,3,4,5,6	-	-

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0°:6-WAY

SURFACE MOUNT

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	30/25	28/25	25/23	0.5/0.8	0.7/1.0	0.7/1.2	2.0	4.0	8.0	0.2	0.3	0.5	124S	1	**DFS-9B1**
1-175	30/24	26/18	26/18	0.5/0.8	0.7/1.0	1.0/1.5	4.0	6.0	12	0.2	0.4	0.8	124S	1	**DFS-9H2**
5-200	30/25	28/23	25/20	0.4/0.7	0.5/0.8	0.8/1.2	2.0	3.0	4.0	0.2	0.3	0.4	124S	1	**DFS-902**
5-500	30/20	25/20	25/20	0.5/0.8	0.7/0.8	0.8/1.4	3.0	4.0	6.0	0.3	0.5	0.7	124S	1	**DFS-903**

THROUGH HOLE MOUNT(16 -Pin)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	30/25	28/25	25/23	0.5/0.8	0.7/1.0	0.7/1.2	2.0	4.0	8.0	0.2	0.3	0.5	124	2	**DFP-9B1**
1-175	30/24	26/18	26/18	0.5/0.8	0.7/1.0	1.0/1.5	4.0	6.0	12	0.2	0.4	0.8	124	2	**DFP-9H2**
5-200	30/25	28/23	25/20	0.4/0.7	0.5/0.8	0.8/1.2	2.0	3.0	4.0	0.2	0.3	0.4	124	2	**DFP-902**
5-500	30/20	25/20	25/20	0.5/0.8	0.7/0.8	0.8/1.4	3.0	4.0	6.0	0.3	0.5	0.7	124	2	**DFP-903**

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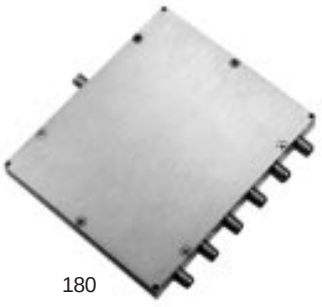

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COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
5-200	30/25	28/23	25/20	0.4/0.7	0.5/0.8	0.8/1.2	2.0	3.0	4.0	0.2	0.3	0.4	142	3	**DFK-702S**
5-500	26/23	30/23	25/20	0.4/0.7	0.6/0.9	1.2/1.6	2.0	4.0	7.0	0.2	0.3	0.4	142	3	**DFK-703S**
800-1000	**---/---**	**---/---**	30/20	**---/---**	**---/---**	1.4/1.8	-	-	8.0	-	-	0.8	180	3	**DFK-764S**✞

Power Rating (All Models) = 1 Watt, max

✞ (UB) - Denotes full bandwidth specification

For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND	NOT USED
#1	1	3,4,8,12,15,16	2, 5,9,13,14	
#2	1	3,4,8,12,15,16	2,5,7,11,13,14	6,9,10
#3	1	2,3,4,5,6,7	-	-

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0° : 8-WAY

SURFACE MOUNT

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-10	40/20	40/25	28/23	0.3/0.7	0.5/1.0	0.6/1.1	1.0	2.5	4.0	0.1	0.2	0.3	124S	1	**DSS-9C1**
0.01-30	33/20	30/25	35/23	0.3/0.6	0.7/0.9	0.8/1.0	1.5	3.0	4.0	0.3	0.2	0.3	124S	1	**DSS-914**
0.5-175	30/25	30/20	25/18	0.8/1.2	0.8/1.2	1.0/1.6	1.0	2.5	5.0	0.2	0.3	0.5	124S	1	**DSS-9L2**
1-200	30/25	30/20	25/20	0.8/1.2	0.8/1.2	1.0/1.5	1.5	3.0	6.0	0.2	0.3	0.4	124S	1	**DSS-915**
1-500	25/20	30/20	30/20	1.0/1.8	1.8/2.0	1.8/2.7	3.0	6.0	12.0	0.2	0.3	0.5	124S	1	**DSS-916**

THROUGH HOLE MOUNT(16 - Pin)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-10	40/20	40/25	28/23	0.3/0.7	0.5/1.0	0.6/1.1	1.0	2.5	4.0	0.1	0.2	0.3	124	2	**DSP-9C1**
0.01-30	33/20	30/25	35/23	0.3/0.6	0.7/0.9	0.8/1.0	1.5	3.0	4.0	0.3	0.2	0.3	124	3	**DSP-914**
0.5-175	30/25	30/20	25/18	0.8/1.2	0.8/1.2	1.0/1.6	1.0	2.5	5.0	0.2	0.3	0.5	124	2	**DSP-9L2**
1-200	30/25	30/20	25/20	0.8/1.2	0.8/1.2	1.0/1.5	1.5	3.0	6.0	0.2	0.3	0.4	124	3	**DSP-915**
1-500	25/20	30/20	30/20	1.0/1.8	1.8/2.0	1.8/2.7	3.0	6.0	12.0	0.2	0.3	0.5	124	2	**DSP-916**

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COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
0.01-30	33/20	30/25	35/23	0.3/0.6	0.7/0.9	0.8/1.0	1.5	3.0	4.0	0.3	0.2	0.3	112	4	**DSK-714***
1-200	30/25	30/20	25/20	0.8/1.2	0.8/1.2	1.0/1.5	1.5	3.0	6.0	0.2	0.3	0.3	112	4	**DSK-715***
1-500	25/20	30/20	30/20	1.0/1.8	1.8/2.0	1.8/2.7	3.0	6.0	10.0	0.2	0.3	0.5	112	4	**DSK-716***
5-200	30/20	25/20	25/20	0.4/0.7	0.5/0.9	0.7/1.2	4.0	6.0	10.0	0.15	0.2	0.3	170	2	**DSK-773B■**
30-1000	23/20	25/20	23/20	0.8/1.2	1.6/2.1	2.5/2.8	3.0	8.0	12.0	0.3	0.4	0.7	112	4	**DSK-810S**

Power Rating (All Models) = 1 Watt, max
* Select female connector suffix:
"B" = BNC, "S" = SMA, "N" = Type N, "T" = TNC
■ 75 Ohm Model
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CASE GROUND	NOT USED
# 1	2	1,4,5,8,9,12,13,16	3, 14,15	-
# 2	2	1,4,5,8,9,12,13,16	3,6,7,14,15	10,11
# 3	2	1,4,5,8,9,12,13,16	All Other	-
# 4	1	2,3,4,5,6,7,8,9	-	-

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SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0° : 10-WAY

THROUGH HOLE MOUNT (16 -Pin)

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
1-150	36/23	27/23	23/18	0.3/0.6	0.4/0.8	1.0/1.3	1	4	10	0.1	0.2	0.3	124	1	**DXP-9A2**

COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
5-200	25/20	32/23	25/18	0.8/1.3	0.9/1.2	1.2/1.6	4.0	6.0	8.0	0.5	0.6	0.8	171	2	**DXK-772B** ■
5-200	25/20	32/25	25/20	0.7/1.2	0.9/1.1	1.2/1.5	4.0	6.0	8.0	0.5	0.6	0.8	171	2	**DXK-702B**

Power Rating (All Models) = 1 Watt, max

■ 75 Ohm Model

For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUTS	CASE GROUND
#1	1	2,3,4,8,9,12,13,14,15,16	5,6,7,10,11
#2	1	2,3,4,5,6,7,8,9,10,11	-

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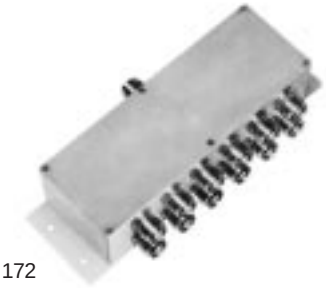
SYNERGY® MICROWAVE CORPORATION

POWER DIVIDERS

0°: 12-WAY

THROUGH HOLE MOUNT(16 - Pin)

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2-100	25/20	33/20	34/20	0.4/0.8	0.4/0.8	0.6/1.0	2.0	2.0	3.0	0.4	0.4	0.6	124	1	**DLP-901**



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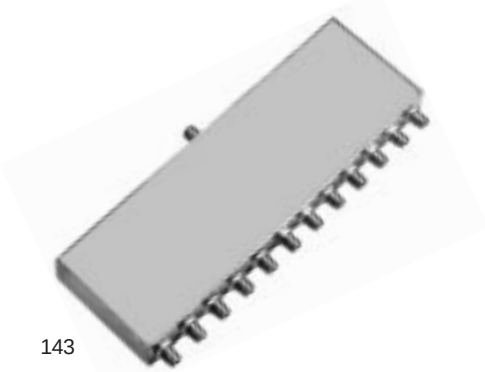

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COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
3-250	25/20	32/25	30/23	1.0/1.3	0.9/1.2	1.6/2.0	3.0	6.0	10	0.3	0.4	0.8	143	2	**DLK-712S**
5-200	25/20	32/25	25/20	0.7/1.2	0.9/1.1	1.2/1.5	4.0	6.0	8.0	0.5	0.6	0.8	172	2	**DLK-702B**
5-200	25/20	32/23	25/18	0.8/1.3	0.9/1.2	1.2/1.6	4.0	6.0	8.0	0.5	0.6	0.8	172	2	**DLK-772B** ■
850-1000	---/---	---/---	20/15	---/---	---/---	3.0/4.0	-	-	8.0	-	-	2.0	143	2	**DLK-7L4S**⌖

Power Rating (All Models) = 1 Watt, max
■75 Ohm Model
⌖ (UB) - Denotes full bandwidth specification
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUTS	CASE GROUND
#1	6	1,2,3,4,5,8,9,12,13,14,15,16	7,10,11
#2	1	2,3,4,5,6,7,8,9,10,11,12,13	-

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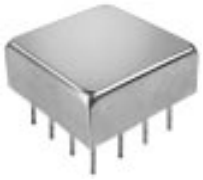
PHASE COMPARATORS

SURFACE-MOUNT MODELS

FREQUENCY RANGE (MHz) LO/RF	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	LO POWER LEVEL (dBm)	RF POWER LEVEL (dBm)	PHASE ERROR MAX	PHASE RANGE NOM.	DC OUTPUT (mV p-p) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10-20	50	500	+10	0	+/-2°	360°	300	0.3/1.0	124S	1	**PCS-901**
20-40	50	500	+10	0	+/-2°	360°	300	0.4/1.0	124S	1	**PCS-902**
55-90	50	500	+10	0	+/-2°	360°	300	0.5/2.0	124S	1	**PCS-904**
80-160	50	500	+10	0	+/-3°	360°	300	1.0/2.0	124S	1	**PCS-908**
100-200	50	500	+10	0	+/-3°	360°	300	1.0/3.0	124S	1	**PCS-910**
160-320	50	500	+10	0	+/-4°	360°	300	1.0/3.0	124S	1	**PCS-916**
225-400	50	500	+10	0	+/-4°	360°	300	1.0/4.0	124S	1	**PCS-922**
300-500	50	500	+10	0	+/-4°	360°	300	2.0/5.0	124S	1	**PCS-930**
400-600	50	500	+10	0	+/-5°	360°	300	2.0/6.0	124S	1	**PCS-940**
700-900	50	500	+10	0	+/-5°	360°	300	2.0/8.0	124S	1	**PCS-970**
800-1000	50	500	+10	0	+/-5°	360°	300	3.0/10.0	124S	1	**PCS-980**



THROUGH HOLE MODELS

FREQUENCY RANGE (MHz) LO/RF	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	LO POWER LEVEL (dBm)	RF POWER LEVEL (dBm)	PHASE ERROR MAX	PHASE RANGE NOM.	DC OUTPUT (mV p-p) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10-20	50	500	+10	0	+/-2°	360°	300	0.3/1.0	136	2	**PCP-901**
20-40	50	500	+10	0	+/-2°	360°	300	0.4/1.0	136	2	**PCP-902**
55-90	50	500	+10	0	+/-2°	360°	300	0.5/2.0	136	2	**PCP-904**
80-160	50	500	+10	0	+/-3°	360°	300	1.0/2.0	136	2	**PCP-908**
100-200	50	500	+10	0	+/-3°	360°	300	1.0/3.0	136	2	**PCP-910**
160-320	50	500	+10	0	+/-4°	360°	300	1.0/3.0	136	2	**PCP-916**
225-400	50	500	+10	0	+/-4°	360°	300	1.0/4.0	136	2	**PCP-922**
300-500	50	500	+10	0	+/-4°	360°	300	2.0/5.0	136	2	**PCP-930**
400-600	50	500	+10	0	+/-5°	360°	300	2.0/6.0	136	2	**PCP-940**
700-900	50	500	+10	0	+/-5°	360°	300	2.0/8.0	136	2	**PCP-970**
800-1000	50	500	+10	0	+/-5°	360°	300	3.0/10.0	136	2	**PCP-980**

NOTE:
1. Output polarity is negative on all models.
2. Maximum RF input power, 100 mW. Peak IF current, 40mA.

PIN-OUT TABLE

	LO	RF	SINE	COSINE	CASE GND
#1	16	1	13	1	All Other
# 2	1	7	8	3	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

PHASE COMPARATORS

FLAT PACK MODELS

FREQUENCY RANGE (MHz) LO/RF	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	LO POWER LEVEL (dBm)	RF POWER LEVEL (dBm)	PHASE ERROR MAX	PHASE RANGE NOM.	DC OUTPUT (mV p-p) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10-20	50	500	+10	0	+/-2°	360°	300	0.3/1.0	115	1	**PCF-101**
20-40	50	500	+10	0	+/-2°	360°	300	0.4/1.0	115	1	**PCF-102**
55-90	50	500	+10	0	+/-2°	360°	300	0.5/2.0	115	1	**PCF-104**
80-160	50	500	+10	0	+/-3°	360°	300	1.0/2.0	115	1	**PCF-108**
100-200	50	500	+10	0	+/-3°	360°	300	1.0/3.0	115	1	**PCF-110**
160-320	50	500	+10	0	+/-4°	360°	300	1.0/3.0	115	1	**PCF-116**
225-400	50	500	+10	0	+/-4°	360°	300	1.0/4.0	115	1	**PCF-122**
300-500	50	500	+10	0	+/-4°	360°	300	2.0/5.0	115	1	**PCF-130**
400-600	50	500	+10	0	+/-5°	360°	300	2.0/6.0	115	1	**PCF-140**
700-900	50	500	+10	0	+/-5°	360°	300	2.0/8.0	115	1	**PCF-170**
800-1000	50	500	+10	0	+/-5°	360°	300	3.0/10.0	115	1	**PCF-180**

COAXIAL (SMA-F) CONNECTOR MODELS

FREQUENCY RANGE (MHz) LO/RF	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	LO POWER LEVEL (dBm)	RF POWER LEVEL (dBm)	PHASE ERROR MAX	PHASE RANGE NOM.	DC OUTPUT (mV p-p) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
10-20	50	500	+10	0	+/-2°	360°	300	0.3/1.0	113	2	**PCK-701S**
20-40	50	500	+10	0	+/-2°	360°	300	0.4/1.0	113	2	**PCK-702S**
55-90	50	500	+10	0	+/-2°	360°	300	0.5/2.0	113	2	**PCK-704S**
80-160	50	500	+10	0	+/-3°	360°	300	1.0/3.0	113	2	**PCK-708S**
100-200	50	500	+10	0	+/-3°	360°	300	1.0/3.0	113	2	**PCK-710S**
160-320	50	500	+10	0	+/-4°	360°	300	1.0/4.0	113	2	**PCK-716S**
225-400	50	500	+10	0	+/-4°	360°	300	2.0/5.0	113	2	**PCK-722S**
300-500	50	500	+10	0	+/-4°	360°	300	2.0/6.0	113	2	**PCK-730S**
400-600	50	500	+10	0	+/-5°	360°	300	2.0/6.0	113	2	**PCK-740S**
700-900	50	500	+10	0	+/-5°	360°	300	2.0/8.0	113	2	**PCK-770S**
800-1000	50	500	+10	0	+/-5°	360°	300	3.0/10.0	113	2	**PCK-780S**

NOTE:
1. Output polarity is negative on all models.
2. Maximum RF input power, 200 mW. Peak IF current, 40mA.

PIN-OUT TABLE

	LO	RF	SINE	COSINE	CASE GND
# 1	14	1	10	3	All Other
# 2	3	1	2	4	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

PHASE DETECTORS

SURFACE-MOUNT

FREQUENCY RANGE (MHz) LO/RF	FREQUENCY RANGE (MHz) OUTPUT	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	POWER LEVEL (dBm)	ISOLATION (dB) LO/RF MIN	DC OUTPUT (mV) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	DC-50	50	500	+7	40	1000/750	0.2/1.0	134S	1	**PDZ-K1**
10-200	DC-50	50	500	+7	40	1000/750	0.3/1.0	134S	1	**PDZ-K2**

THROUGH HOLE MOUNT

MINI 8 PIN - RELAY CAN

FREQUENCY RANGE (MHz) LO/RF	FREQUENCY RANGE (MHz) OUTPUT	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	POWER LEVEL (dBm)	ISOLATION (dB) LO/RF MIN	DC OUTPUT (mV) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	DC-50	50	500	+7	40	1000/750	0.2/1.0	108	2	**PDP-403**
10-200	DC-50	50	500	+7	40	1000/750	0.3/1.0	108	2	**PDP-402**
50-400	DC-50	50	500	+7	35	600/500	0.5/1.0	108	2	**PDP-413**

8 PIN - RELAY CAN

FREQUENCY RANGE (MHz) LO/RF	FREQUENCY RANGE (MHz) OUTPUT	IMPEDANCE (Ohm) LO/RF	IMPEDANCE (Ohm) OUTPUT	POWER LEVEL (dBm)	ISOLATION (dB) LO/RF MIN	DC OUTPUT (mV) TYP/MIN	DC OFFSET (mV) TYP/MAX	PACKAGE	PIN-OUT (See Below)	MODEL
1-100	DC-50	50	500	+7	40	1000/750	0.2/1.0	102	2	**PDP-201**
5-150	DC-50	50	500	+7	40	1000/750	0.3/1.0	102	2	**PDP-202**

NOTE:
1. Output polarity is negative on all models.
2. Maximum RF input power, 100 mW. Peak IF current, 40mA.

PIN-OUT TABLE

	LO	RF	DC OUTPUT	GROUND	CASE GND
# 1	1	4	5	2,3,6	---
# 2	8	1	*3,4	2,5,6,7	2

*Pins must be connected together externally.
For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

PHASE SHIFTERS

THROUGH HOLE MODELS

INPUT FREQUENCY (MHz)	INPUT POWER (dBm) MAX	INSERTION LOSS (dB) TYP	INSERTION LOSS (dB) MAX	PHASE SHIFT RANGE (Degrees) MIN	CONTROL VOLTAGE (Vdc)	CONTROL BANDWIDTH (KHz) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
5.7 - 6.3	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-900**
10 - 20	-10	2.0	3.5	0 to 180	0 to +24	DC - 50	1.7:1	124	1	**PP-921**
19 - 21	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-909**
20 - 40	-10	2.5	4.0	0 to 180	0 to +15	DC - 50	2.0:1	124	1	**PP-924**
24 - 48	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-925**
28.5 - 31.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-901**
35 - 60	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-926**
38 - 42	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-920**
40 - 80	-10	1.5	2.0	0 to 180	0 to +24	DC - 50	2.0:1	124	1	**PP-927**
47.5 - 52.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-908**
57 - 63	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-902**
66.5 - 73.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-904**
80 - 160	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-922**
100 - 200	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-923**
106.5 - 119.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-905**
133 - 147	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-906**
152 - 168	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124	1	**PP-907**
870 - 900	-10	1.5	2.0	0 to 50	0 to +10	DC - 50	1.7:1	124	1	**PP-919**

FLAT PACK MODELS

INPUT FREQUENCY (MHz)	INPUT POWER (dBm) MAX	INSERTION LOSS (dB) TYP	INSERTION LOSS (dB) MAX	PHASE SHIFT RANGE (Degrees) MIN	CONTROL VOLTAGE (Vdc)	CONTROL BANDWIDTH (KHz) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
19 - 21	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-109**
28.5 - 31.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-101**
38 - 42	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-120**
57 - 63	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-102**
66.5 - 73.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-104**
80 - 160	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-122**
100 - 200	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-123**
106.5 - 119.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-105**
133 - 147	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-106**
152 - 168	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	115	2	**PF-107**

Note: Nominal impedance is 50 Ohms.

PIN-OUT TABLE

	INPUT	OUTPUT	CONTROL	CASE GROUND
#1	1	13	4	All Other
#2	14	7	1,8	All Other

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

PHASE SHIFTERS

SURFACE-MOUNT MODELS

INPUT FREQUENCY (MHz)	INPUT POWER (dBm) MAX	INSERTION LOSS (dB) TYP	INSERTION LOSS (dB) MAX	PHASE SHIFT RANGE (Degrees) MIN	CONTROL VOLTAGE (Vdc)	CONTROL BANDWIDTH (KHz) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
19 - 21	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-909**
28.5 - 31.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-901**
38 - 42	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-920**
57 - 63	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-902**
66.5 - 73.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-904**
80 - 160	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-922**
100 - 200	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-923**
106.5 - 119.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-905**
133 - 147	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-906**
152 - 168	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	124S	1	**PS-907**

COAXIAL CONNECTOR MODELS

INPUT FREQUENCY (MHz)	INPUT POWER (dBm) MAX	INSERTION LOSS (dB) TYP	INSERTION LOSS (dB) MAX	PHASE SHIFT RANGE (Degrees) MIN	CONTROL VOLTAGE (Vdc)	CONTROL BANDWIDTH (KHz) MIN	VSWR MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2.375 - 2.675	-10	1.2	2.0	0 to 180	0 to +30	DC - 50	1.5:1	110	2	**PK-710***
4.75 - 5.25	-10	1.2	2.0	0 to 180	0 to +30	DC - 50	1.5:1	110	2	**PK-711***
19 - 21	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-709***
28.5 - 31.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-701***
35 - 70	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-712***
38 - 42	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-720***
57 - 63	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-702***
66.5 - 73.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-704***
80 - 160	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-722***
100 - 200	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-723***
106.5 - 119.5	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-705***
133 - 147	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-706***
152 - 168	-10	1.2	1.5	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-707***
190 - 210	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.7:1	110	2	**PK-714***
500	-10	1.5	2.0	0 to 180	0 to +30	DC - 50	1.8:1	110	2	**PK-715***

*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC.
Note: Nominal impedance is 50 Ohms.

PIN-OUT TABLE

	INPUT	OUTPUT	CONTROL	CASE GND
#1	1	13	4	All Other
#2	1	3	2	

For pin location and package outline drawings, see back pages.

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

LEADLESS SURFACE MOUNT

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
0.5 - 1	0.3/0.6	0.4/0.75	1.0/3.0	25/17	1.1:1	129	1	**SMQ-C31**
7- 14	0.3/0.6	0.4/0.75	1.0/3.0	25/17	1.1:1	129	1	**SMQ-CB1**
7 - 21	0.3/0.6	0.6/1.0	1.0/3.0	23/20	1.2:1	129	1	**SMQ-C08**
10 - 20	0.3/0.6	0.4/0.75	1.0/3.0	25/17	1.1:1	129	1	**SMQ-C06**
10.2-11.2	0.1/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C51**
14 - 42	0.3/0.6	0.4/0.75	1.0/3.0	25/17	1.1:1	129	1	**SMQ-C09**
19 - 21	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C57**
20 - 40	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	129	1	**SMQ-C01**
20.3 - 22.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C52**
28.5 - 31.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C53**
38 - 42	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C58**
40 - 80	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	129	1	**SMQ-C02**
50 - 100	0.3/0.6	0.4/0.75	1.0/3.0	25/17	1.1:1	129	1	**SMQ-C10**
52 - 88	0.3/0.6	0.2/0.6	1.0/2.5	25/17	1.1:1	129	1	**SMQ-C20**
55 - 90	0.3/0.7	0.6/1.2	1.0/3.0	30/17	1.2:1	129	1	**SMQ-C23**
57 - 63	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C54**
60 - 80	0.2/0.6	0.2/0.6	1.0/2.5	30/17	1.1:1	129	1	**SMQ-C22**
66.5 - 73.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C56**
76 - 84	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	129	2	**SMQ-C61**
80 - 160	0.4/0.75	0.5/1.0	1.0/3.0	25/17	1.3:1	129	1	**SMQ-C03**
95 - 105	0.2/0.3	0.2/0.6	1.0/3.0	25/17	1.1:1	129	2	**SMQ-C62**
100 - 200	0.4/0.75	0.5/1.0	1.0/3.0	25/18	1.1:1	129	1	**SMQ-C04**
100 - 230	0.4/0.7	0.8/1.2	2.0/4.0	23/17	1.3:1	129	1	**SMQ-C11**
104 - 176	0.3/0.6	0.2/0.6	1.0/2.5	25/17	1.3:1	129	1	**SMQ-C21**
114 - 126	0.2/0.3	0.5/0.8	1.0/3.0	25/17	1.1:1	129	2	**SMQ-C66**
133 - 147	0.2/0.3	0.5/0.8	1.0/3.0	25/17	1.1:1	129	2	**SMQ-C63**
150 - 300	0.4/0.75	0.5/1.0	1.0/3.0	25/17	1.3:1	129	1	**SMQ-C05**
190 - 210	0.2/0.4	0.5/0.8	1.0/3.0	25/17	1.2:1	129	2	**SMQ-C64**
200 - 400	0.4/0.75	1.0/1.5	2.0/4.0	25/17	1.3:1	129	1	**SMQ-C07**
285 - 315	0.2/0.4	0.5/0.8	2.0/3.0	25/17	1.2:1	129	2	**SMQ-C65**
350 - 450	0.5/0.8	0.6/1.0	2.0/4.0	25/17	1.3:1	129	1	**SMQ-C13**
428 - 473	0.2/0.4	0.5/0.9	1.0/3.0	25/17	1.3:1	129	2	**SMQ-C67**
475 - 525	0.2/0.4	0.5/0.9	1.0/3.0	25/17	1.3:1	129	2	**SMQ-C74**
570 - 630	0.2/0.3	0.5/0.7	1.0/3.0	25/17	1.2:1	129	2	**SMQ-C68**

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**	NO CONN.
#1	5	1	2	6	7,8,9,10	3,4
#2	1	6	3	4	7,8,9,10	2,5

*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

LEADED SURFACE- MOUNT

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	MODEL
5.5-16.5	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.2:1	159	**SLQ-301**
10.2-11.2	0.1/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-51**
19 - 21	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-57**
20 - 40	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	159	**SLQ-K01**
20 - 60	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.2:1	159	**SLQ-302**
20.3 - 22.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-52**
25 - 50	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.2:1	159	**SLQ-KF1**
28.5 - 31.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-53**
30 - 60	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.2:1	159	**SLQ-KH1**
30 - 90	0.3/0.6	0.8/1.2	1.0/3.0	23/18	1.2:1	159	**SLQ-303**
38 - 42	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-58**
40 - 80	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.2:1	159	**SLQ-K02**
40 - 120	0.3/0.6	0.8/1.2	2.0/4.0	23/17	1.3:1	159	**SLQ-305**
50 - 100	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.2:1	159	**SLQ-K20**
57 - 63	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-54**
60 - 120	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.2:1	159	**SLQ-KA2**
66.5 - 73.5	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-56**
70 - 140	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.2:1	159	**SLQ-KA3**
76 - 84	0.2/0.3	0.5/0.8	1.0/3.0	25/20	1.1:1	159	**SLQ-61**
80 - 160	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.2:1	159	**SLQ-KA4**
90 - 270	0.4/0.7	0.8/1.3	2.0/4.0	23/17	1.3:1	159	**SLQ-304**
95 - 105	0.2/0.3	0.5/0.8	1.0/3.0	25/17	1.1:1	159	**SLQ-62**
100 - 200	0.4/0.75	0.5/1.0	1.0/3.0	25/18	1.2:1	159	**SLQ-K04**
115 - 345	0.5/0.8	0.8/1.4	2.0/4.0	23/17	1.3:1	159	**SLQ-310**
114 - 126	0.2/0.3	0.5/0.8	1.0/3.0	25/17	1.1:1	159	**SLQ-66**
133 - 147	0.2/0.3	0.5/0.8	1.0/3.0	25/17	1.1:1	159	**SLQ-63**
150 - 300	0.4/0.75	0.5/1.0	1.0/3.0	25/17	1.3:1	159	**SLQ-K05**
190 - 210	0.2/0.4	0.5/0.8	1.0/3.0	25/17	1.2:1	159	**SLQ-64**
225 - 400	0.4/0.75	0.6/1.2	2.0/4.0	25/17	1.3:1	159	**SLQ-K07**
240-720	0.7/1.0	1.2/1.8	3.0/5.0	23/15	1.35:1	159	**SLQ-330**
250 - 500	0.5/0.8	0.6/1.2	2.0/4.0	25/15	1.3:1	159	**SLQ-K08**
285 - 315	0.2/0.4	0.5/0.8	2.0/3.0	25/17	1.2:1	159	**SLQ-65**
300 - 600	0.5/0.8	0.6/1.2	3.0/6.0	25/15	1.3:1	159	**SLQ-K09**
428 - 473	0.2/0.4	0.5/0.9	1.0/3.0	25/17	1.3:1	159	**SLQ-67**
500-1000	0.6/0.9	1.0/1.5	4.0/8.0	20/13	1.5:1	159	**SLQ-K10**
736 - 814	0.2/0.4	0.5/0.9	2.0/4.0	25/15	1.3:1	159	**SLQ-78**
779 - 861	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.3:1	159	**SLQ-68**
836 - 924	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.3:1	159	**SLQ-69**
900 - 994	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.3:1	159	**SLQ-70**
1420 - 1570	0.3/0.6	0.7/1.0	3.0/5.0	17/13	1.3:1	159	**SLQ-71**
1496 - 1654	0.3/0.6	0.7/1.0	3.0/5.0	17/13	1.3:1	159	**SLQ-72**
1748 - 1932	0.3/0.6	0.7/1.0	3.0/5.0	17/13	1.3:1	159	**SLQ-73**

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**
6	1	2	5	3,4

*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally

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90° HYBRIDS

WIDEBAND SURFACE- MOUNT (8 Pin-Relay Header)

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	MODEL
3-32	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102S	**DQS-3-32**
5-50	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102S	**DQS-5-50**
10-50	0.8/1.0	0.5/0.9	1.5/3.0	30/20	1.3:1	102S	**DQS-10-50**
10-100	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102S	**DQS-10-100**
15-150	1.2/1.7	0.9/1.2	2.5/4.0	25/17	1.3:1	102S	**DQS-15-150**
20-100	0.8/1.0	0.5/0.8	1.5/3.0	30/20	1.3:1	102S	**DQS-20-100**
20-200	1.3/1.8	0.9/1.2	2.5/4.0	25/17	1.3:1	102S	**DQS-20-200**
25-250	1.5/2.0	0.9/1.2	2.5/4.0	25/17	1.3:1	102S	**DQS-25-250**
30-150	0.8/1.0	0.5/0.9	1.5/3.0	30/20	1.3:1	102S	**DQS-30-150**
30-300	1.5/2.0	1.0/1.4	3.0/5.0	25/16	1.3:1	102S	**DQS-30-300**
40-200	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102S	**DQS-40-200**
40-400	1.7/2.2	1.0/1.5	3.0/5.0	25/16	1.3:1	102S	**DQS-40-400**
45-450	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102S	**DQS-45-450**
50-250	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102S	**DQS-50-250**
50-500	1.7/2.2	1.0/1.5	3.0/5.0	23/13	1.3:1	102S	**DQS-50-500**
60-300	0.9/1.0	0.6/1.0	2.0/4.0	30/18	1.3:1	102S	**DQS-60-300**
70-350	1.1/1.5	0.6/1.2	2.5/5.0	28/16	1.4:1	102S	**DQS-70-350**
80-400	1.2/1.5	0.6/1.25	3.0/5.0	25/16	1.4:1	102S	**DQS-80-400**
90-450	1.2/1.5	0.7/1.25	3.0/5.0	23/16	1.4:1	102S	**DQS-90-450**
100-500	1.2/1.5	0.8/1.25	3.0/5.0	25/16	1.4:1	102S	**DQS-100-500**

WIDEBAND LEADED SURFACE MOUNT (8 Pin-Relay Header)

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	MODEL
3-32	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102L	**DQL-3-32**
5-50	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102L	**DQL-5-50**
10-50	0.8/1.0	0.5/0.9	1.5/3.0	30/20	1.3:1	102L	**DQL-10-50**
10-100	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102L	**DQL-10-100**
15-150	1.2/1.7	0.9/1.2	2.5/4.0	25/17	1.3:1	102L	**DQL-15-150**
20-100	0.8/1.0	0.5/0.8	1.5/3.0	30/20	1.3:1	102L	**DQL-20-100**
20-200	1.3/1.8	0.9/1.2	2.5/4.0	25/17	1.3:1	102L	**DQL-20-200**
25-250	1.5/2.0	0.9/1.2	2.5/4.0	25/17	1.3:1	102L	**DQL-25-250**
30-150	0.8/1.0	0.5/0.9	1.5/3.0	30/20	1.3:1	102L	**DQL-30-150**
30-300	1.5/2.0	1.0/1.4	3.0/5.0	25/16	1.3:1	102L	**DQL-30-300**
40-200	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102L	**DQL-40-200**
40-400	1.7/2.2	1.0/1.5	3.0/5.0	25/16	1.3:1	102L	**DQL-40-400**
45-450	1.7/2.2	1.0/1.5	3.0/5.0	25/16	1.3:1	102L	**DQL-45-450**
50-250	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102L	**DQL-50-250**
50-500	1.7/2.2	1.0/1.5	3.0/5.0	23/13	1.3:1	102L	**DQL-50-500**
60-300	0.9/1.0	0.6/1.0	2.0/4.0	30/18	1.3:1	102L	**DQL-60-300**
70-350	1.1/1.5	0.6/1.2	2.5/5.0	28/16	1.4:1	102L	**DQL-70-350**
80-400	1.2/1.5	0.6/1.25	3.0/5.0	25/16	1.4:1	102L	**DQL-80-400**
90-450	1.2/1.5	0.7/1.25	3.0/5.0	23/16	1.4:1	102L	**DQL-90-450**
100-500	1.2/1.5	0.8/1.25	3.0/5.0	25/16	1.4:1	102L	**DQL-100-500**

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**
1	8	7	2	3,4,5,6

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

WIDE BANDWIDTH

THROUGH HOLE MOUNT


151


102

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
2-32	0.8/1.0	0.9/1.0	1.0/3.0	23/20	1.2:1	151	4	**DQP-2-16**
2-250	1.8/2.0	1.1/1.3	4.0/6.0	18/15	1.2:1	151	4	**DQP-2-125**
3-23	0.6/1.0	0.7/0.9	1.5/2.0	25/20	1.3:1	102	1	**DQP-2E2**
3-32	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102	3	**DQP-3-32**
5-50	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102	3	**DQP-5-50**
5.5-16.5	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	102	2	**DQP-301**
10-20	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	102	1	**DQP-206**
10-50	0.8/1.0	0.5/0.8	1.5/3.0	30/20	1.3:1	102	3	**DQP-10-50**
10-100	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	102	3	**DQP-10-100**
15-150	1.2/1.7	0.9/1.2	2.5/4.0	25/17	1.3:1	102	3	**DQP-15-150**
20-40	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	102	1	**DQP-201**
20-60	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	102	2	**DQP-302**
20-100	0.8/1.0	0.5/0.8	1.5/3.0	30/20	1.3:1	102	3	**DQP-20-100**
20-200	1.3/1.8	0.9/1.2	2.5/4.0	25/17	1.3:1	102	3	**DQP-20-200**
20-400	2.4/3.0	1.4/1.8	6.0/10	18/15	1.7:1	151	4	**DQP-2-200**
25-50	0.3/0.7	0.7/1.5	1.0/3.0	30/20	1.1:1	102	1	**DQP-2F1**
25-250	1.5/2.0	0.9/1.2	2.5/4.0	25/17	1.3:1	102	3	**DQP-25-250**
30-90	0.3/0.6	0.8/1.0	1.0/3.0	23/20	1.3:1	102	2	**DQP-303**
30-150	0.8/1.0	0.5/1.0	1.5/3.0	30/20	1.3:1	102	3	**DQP-30-150**
30-300	1.5/2.0	1.0/1.4	3.0/5.0	25/16	1.3:1	102	3	**DQP-30-300**
40-70	0.3/0.7	0.4/1.5	1.0/3.0	30/20	1.1:1	102	1	**DQP-2H1**
40-80	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	102	1	**DQP-202**
40-120	0.3/0.6	0.8/1.2	2.0/4.0	23/17	1.4:1	102	2	**DQP-305**
40-200	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	102	3	**DQP-40-400**
45-450	1.7/2.2	1.0/1.4	3.0/5.0	25/15	1.3:1	102	3	**DQP-45-450**
50-250	0.9/1.0	0.5/0.8	2.0/4.0	30/18	1.3:1	102	3	**DQP-50-250**
50-500	1.7/2.2	1.0/1.4	3.0/5.0	23/13	1.3:1	102	3	**DQP-50-500**
52-88	0.3/0.6	0.2/0.5	1.0/2.5	25/20	1.1:1	102	1	**DQP-220**
55-90	0.3/0.7	0.6/1.2	1.0/3.0	30/20	1.2:1	102	1	**DQP-223**
60-80	0.2/0.6	0.2/0.45	1.0/2.5	30/20	1.1:1	102	1	**DQP-222**
60-300	0.9/1.0	0.6/0.8	2.0/4.0	30/18	1.3:1	102	3	**DQP-60-300**
70-350	1.1/1.5	0.6/1.0	2.5/5.0	28/16	1.3:1	102	3	**DQP-70-350**
80-120	0.3/0.7	0.7/1.5	1.0/3.0	25/18	1.1:1	102	1	**DQP-2A2**
80-160	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	102	1	**DQP-203**
90-270	0.4/0.7	0.8/1.2	2.0/4.0	23/17	1.5:1	102	2	**DQP-304**
90-450	1.2/1.5	0.7/1.0	3.0/5.0	23/16	1.3:1	102	3	**DQP-90-450**
100-200	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	102	1	**DQP-204**
100-500	1.2/1.5	0.8/1.0	3.0/5.0	25/16	1.3:1	102	3	**DQP-100-500**
104-176	0.3/0.6	0.2/0.6	1.0/2.5	25/20	1.1:1	102	1	**DQP-221**
115-345	0.5/0.8	0.8/1.4	2.0/4.0	20/17	1.5:1	102	2	**DQP-310**
150-300	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	102	1	**DQP-205**
225-400	0.5/0.8	1.0/1.5	2.0/4.0	22/17	1.2:1	102	1	**DQP-207**
240-720	0.7/1.0	1.2/1.6	3.0/5.0	20/15	1.5:1	102	2	**DQP-330**

PIN-OUT TABLE

	INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**
#1	1	2	5	6	3,4,7,8
#2	1	6	2	5	3,4,7,8
#3	1	8	7	2	3,4,5,6
#4	1	3	4	2	5,6

*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally

Power Rating: 1 Watt, max.
All specifications assume 50 ohm impedance of all ports
For pin location and package outline drawings, see back pages.

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MINIATURE LEADLESS SURFACE-MOUNT

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.2-11.2	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-51**
19-21	0.2.0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-57**
20.4-22.4	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-52**
28.5-31.5	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-53**
38-42	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-58**
57-63	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-54**
66.5-73.5	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-56**
76-84	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-61**
95-105	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-62**
114-126	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-66**
133-147	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	134	1	**SQ-63**
190-210	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.2:1	134	1	**SQ-64**
285-315	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.2:1	134	1	**SQ-65**
427.5-477.5	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.2:1	134	1	**SQ-67**
779 - 861	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.2:1	134	1	**SQ-68**
836 - 924	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.2:1	134	1	**SQ-69**
900 - 994	0.2/0.5	0.5/0.9	2.0/4.0	25/15	1.2:1	134	1	**SQ-70**

THROUGH HOLE MOUNT (8 Pin-Relay Header)

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
1.13-1.38	0.4/0.7	0.6/1.2	1.0/3.0	29/25	1.1:1	102	2	**DQP-2A1**
9-11	0.4/0.7	0.6/1.2	1.0/3.0	25/20	1.1:1	102	2	**DQP-2B1**
10.2-11.2	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-251**
16-19	0.6/0.7	0.7/1.6	1.0/3.0	28/25	1.1:1	102	2	**DQP-2C1**
19-21	0.2.0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-257**
20-23	0.4/0.7	0.6/1.2	1.0/3.0	35/20	1.1:1	102	2	**DQP-2E1**
20.4-22.4	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-252**
57-63	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-254**
66.5-73.5	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-256**
76-84	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-261**
95-105	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-262**
114-126	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-266**
133-147	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-263**
190-210	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-264**
285-315	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-265**
427.5-477.5	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.1:1	102	2	**DQP-267**

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**
#1	6	1	2	5	3,4
#2	1	2	5	6	3,4,7,8

*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

FLAT-PACK

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
5.5-16.5	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	101	1	**DQF-301**
7-14	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	101	1	**DQF-1B1**
10-20	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	101	1	**DQF-106**
10.2-11.2	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-151**
19-21	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-157**
20-40	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	101	1	**DQF-101**
20-60	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	101	1	**DQF-302**
20.33-22.47	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-152**
28.5-31.5	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-153**
30-90	0.3/0.6	0.8/1.0	1.0/3.0	23/20	1.3:1	101	1	**DQF-303**
38-42	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-158**
40-80	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	101	1	**DQF-102**
40-120	0.3/0.6	0.8/1.2	2.0/4.0	23/17	1.4:1	101	1	**DQF-305**
52-88	0.3/0.6	0.2/0.5	1.0/2.5	25/20	1.1:1	101	1	**DQF-120**
55-90	0.3/0.7	0.6/1.2	1.0/3.0	30/20	1.2:1	101	1	**DQF-123**
57-63	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-154**
60-80	0.2/0.6	0.2/0.45	1.0/2.5	30/20	1.1:1	101	1	**DQF-122**
66.5-73.5	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-156**
76-84	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-161**
80-160	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	101	1	**DQF-103**
90-270	0.4/0.7	0.8/1.2	2.0/4.0	23/17	1.5:1	101	1	**DQF-304**
95-105	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-162**
100-200	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	101	1	**DQF-104**
104-176	0.3/0.6	0.2/0.6	1.0/2.5	25/20	1.1:1	101	1	**DQF-121**
115-345	0.5/0.8	0.8/1.4	2.0/4.0	20/17	1.5:1	101	1	**DQF-310**
114-126	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-166**
133-147	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-163**
150-300	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	101	1	**DQF-105**
190-210	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-164**
240-720	0.7/1.0	1.2/1.6	3.0/5.0	20/15	1.5:1	101	1	**DQF-330**
285-315	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-165**
430-470	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	101	1	**DQF-167**

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*	GROUND**
#1	1	8	5	4	2,3,6,7

*Terminate isolated port with 50 ohms externally
**GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

OPTIMIZED AND OCTAVE BANDWIDTH

COAXIAL CONNECTOR

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.2-10.5	0.2.0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-751***
5.5-16.5	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	113	2	**DQK-301***
10-20	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	113	1	**DQK-706***
19-21	0.2.0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-757***
20-40	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	113	1	**DQK-701***
20-60	0.3/0.5	0.8/1.0	1.0/3.0	23/20	1.3:1	113	2	**DQK-302***
20.35-22.4	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-752***
28.5-31.5	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-753***
30-90	0.3/0.6	0.8/1.0	1.0/3.0	23/20	1.3:1	113	2	**DQK-303***
38-42	0.2.0.3	0.5-0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-758***
40-80	0.3/0.6	0.4/0.75	1.0/3.0	25/20	1.1:1	113	1	**DQK-702***
40-120	0.3/0.6	0.8/1.2	2.0/4.0	23/17	1.4:1	113	2	**DQK-305***
52-88	0.3/0.6	0.2/0.5	1.0/2.5	25/20	1.1:1	113	1	**DQK-720***
55-90	0.3/0.7	0.6/1.2	1.0/3.0	30/20	1.2:1	113	1	**DQK-723***
57-63	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-754***
60-80	0.2/0.6	0.2/0.45	1.0/2.5	30/20	1.1:1	113	1	**DQK-722***
66.5-73.5	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-756***
76-84	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-761***
80-160	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	113	1	**DQK-703***
90-270	0.4/0.7	0.8/1.3	2.0/4.0	23/17	1.5:1	113	2	**DQK-304***
95-105	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-762***
100-200	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	113	1	**DQK-704***
104-176	0.3/0.6	0.2/0.6	1.0/2.5	25/20	1.1:1	113	1	**DQK-721***
115-345	0.5/0.8	0.8/1.4	2.0/4.0	20/17	1.5:1	113	2	**DQK-310***
114-126	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-766***
133-147	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-763***
150-300	0.4/0.75	0.5/1.0	1.0/3.0	25/20	1.1:1	113	1	**DQK-705***
190-210	0.2/0.3	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-764***
240-720	0.7/1.0	1.2/1.6	3.0/5.0	20/15	1.5:1	113	2	**DQK-330***
285-315	0.2/0.4	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-765***
430-470	0.2/0.6	0.5/0.7	1.0/3.0	25/20	1.1:1	113	1	**DQK-767***

Power Rating: 1 Watt, max.
All specifications assume 50 ohms impedance of all ports
*Select Connector Sufix: "B" = BNC, "S = SMA, 'N" = TYPE N, "T" = TNC
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	+90° OUTPUT	0° OUTPUT	ISOLATED*
#1	1	2	4	3
#2	1	3	2	4

*Terminate isolated port with 50 ohms externally

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SYNERGY® MICROWAVE CORPORATION

90° HYBRIDS

MULTI-OCTAVE BANDWIDTH

COAXIAL CONNECTOR MODELS


113


150

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) TYP/MAX	AMPLITUDE UNBALANCE (dB) TYP/MAX	PHASE UNBALANCE (Degrees) TYP/MAX	ISOLATION (dB) TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
2-32	0.8/1.0	0.9/1.0	1.0/3.0	23/20	1.3:1	150	2	**DQK-2-16B**
2-250	1.8/2.0	1.1/1.3	4.0/6.0	18/15	1.4:1	150	2	**DQK-2-125B**
3-32	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	113	1	**DQK-3-32S**
5-50	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	113	1	**DQK-5-50S**
10-50	0.8/1.0	0.5/0.8	1.5/3.0	30/20	1.3:1	113	1	**DQK-10-50S**
10-100	1.0/1.5	0.9/1.2	2.0/3.0	25/20	1.3:1	113	1	**DQK-10-100S**
15-150	1.2/1.7	0.9/1.2	2.5/4.0	25/17	1.3:1	113	1	**DQK-15-150S**
20-100	0.8/1.0	0.5/1.0	1.5/3.0	30/20	1.3:1	113	1	**DQK-20-100S**
20-200	1.3/1.8	0.9/1.2	2.5/4.0	25/17	1.3:1	113	1	**DQK-20-200S**
20-400	2.4/3.0	1.4/1.8	6.0/10	18/15	1.7:1	150	2	**DQK-2-200B**
25-250	1.5/2.0	0.9/1.2	2.5/4.0	25/17	1.3:1	113	1	**DQK-25-250S**
30-150	0.8/1.0	0.5/1.0	1.5/3.0	30/20	1.3:1	113	1	**DQK-30-150S**
30-300	1.5/2.0	1.0/1.4	3.0/5.0	25/16	1.3:1	113	1	**DQK-30-300S**
40-200	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	113	1	**DQK-40-400S**
45-450	1.7/2.2	1.0/1.5	3.0/5.0	25/15	1.3:1	113	1	**DQK-45-450S**
50-250	0.9/1.0	0.5/1.0	2.0/4.0	30/18	1.3:1	113	1	**DQK-50-250S**
50-500	1.7/2.2	1.0/1.5	3.0/5.0	23/13	1.3:1	113	1	**DQK-50-500S**
60-300	0.9/1.0	0.6/1.0	2.0/4.0	30/18	1.3:1	113	1	**DQK-60-300S**
70-350	1.1/1.5	0.6/1.0	2.5/5.0	28/16	1.3:1	113	1	**DQK-70-350S**
90-450	1.2/1.5	0.7/1.2	3.0/5.0	23/16	1.3:1	113	1	**DQK-90-450S**
100-500	1.2/1.5	0.8/1.2	3.0/5.0	25/16	1.3:1	113	1	**DQK-100-500S**

Power Rating (All Models) = 1 Watt, max
Connector Sufix: "B" = BNC, "S = SMA, (Last letter in Model number)
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	0° OUTPUT	+90° OUTPUT	*ISOLATED
# 1	1	4	3	2
# 2	1	2	3	4

*Terminate isolated port with 50 ohms externally.

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SYNERGY® MICROWAVE CORPORATION

180° HYBRIDS

SURFACE-MOUNT

3 - PORT

FREQUENCY RANGE (MHz) LF-HF	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
5 - 400	28/23	28/23	25/20	1.1/1.6	1.5/2.0	1.9/2.3	2.0	4.0	4.0	0.3	0.5	0.7	152	2	**SMJ-C2**
50 - 750	22/17	20/15	18/13	1.5/2.2	1.6/2.4	1.9/2.7	4.0	4.0	4.0	0.5	0.4	0.7	152	2	**SMJ-C4**
20 - 1000	21/16	17/12	15/10	2.5/3.2	2.2/3.0	2.5/3.2	3.5	5.5	7.5	1.0	0.6	1.0	152	2	**SMJ-C5**

LEADED SURFACE-MOUNT

3 - PORT

FREQUENCY RANGE (MHz) LF-HF	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2 - 200	25/20	30/20	25/20	1.0/1.3	0.8/1.0	1.0/1.3	1.0	3.0	5.0	0.3	0.3	0.3	159	1	**SJL-113**

LEADED SURFACE-MOUNT

4 - PORT

FREQUENCY RANGE (MHz) LF-HF	ISOLATION (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	PHASE UNBALANCE (Degrees) LB MAX	MB MAX	UB MAX	AMPLITUDE UNBALANCE (dB) LB MAX	MB MAX	UB MAX	PACKAGE	PIN-OUT (See Below)	MODEL
2 - 200	25/20	30/20	25/20	1.0/1.3	0.8/1.0	1.0/1.3	1.0	3.0	5.0	0.3	0.3	0.3	159	3	**SJL-123**

Power Rating (All Models) = 1 Watt, max.
Impedance is 50 Ohms

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	0° OUTPUT	180° OUTPUT	ISOLATED*	GROUND
#1	6	4	3	---	1,2,5
#2	3	1	2	---	4,5,6
#3	6	4	3	1	2,5

*Terminate Isolated Port in 50 Ohms
GROUND = Ground externally

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180° HYBRIDS

THROUGH HOLE MOUNT(8-Pin Relay Header)

3 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
0.01-20	25/20	30/25	27/23	0.5/0.8	0.3/0.5	0.5/0.7	2.0	2.0	2.0	0.2	0.2	0.2	102	1	**DJP-201**
1-200	35/30	35/25	30/23	.75/1.0	0.5/0.8	.75/1.2	2.0	2.5	4.0	.15	.15	0.3	102	1	**DJP-2A2**
5-200	30/25	30/25	30/25	1.0/1.2	1.0/1.2	1.0/1.4	2.0	3.0	4.0	0.1	0.2	0.2	102	1	**DJP-203**
5-400	28/23	28/23	25/20	0.9/1.4	1.2/1.7	1.7/2.0	1.5	3.0	6.0	0.3	0.4	0.5	102	1	**DJP-204**

THROUGH HOLE MOUNT(TO-8)

3 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
0.01-20	25/20	30/25	27/23	0.5/0.8	0.3/0.5	0.5/0.7	2	2	2	0.2	0.2	0.2	122	2	**DJP-601**
5-200	30/25	30/25	30/25	1.0/1.2	1.0/1.2	1.0/1.4	2	3	4	0.1	0.2	0.2	122	2	**DJP-603**
5-400	28/23	28/23	25/20	0.9/1.4	1.2/1.7	1.7/2.0	1.5	3	6	0.3	0.4	0.5	122	2	**DJP-604**

THROUGH HOLE MOUNT(8 Pin Relay Header)

4 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
2-200	30/25	28/23	25/20	0.5/0.9	0.7/1.0	0.8/1.2	1	2	3	0.1	0.2	0.3	102	3	**DJP-202**
2-400	22/18	23/18	20/15	1.4/1.8	1.2/2.0	1.6/2.5	1	3	5	0.1	0.2	0.3	102	3	**DJP-205**

Power Rating (All Models) = 1 Watt, max
Impedance is 50 Ohms
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	0° OUTPUT	180° OUTPUT	ISOLATED*	GROUND
#1	1	5	6	---	All other
#2	2	1	4	---	3
#3	1	5	6	2	All other

*Terminate Isolated Port in 50 Ohms
GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

180° HYBRIDS

FLAT-PACK

3 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
5-200	30/25	30/25	30/25	1.0/1.2	1.0/1.2	1.0/1.4	2	3	4	0.1	0.2	0.2	101	1	**DJF-103**
5-400	28/23	28/23	25/20	0.9/1.4	1.2/1.7	1.7/2.0	1.5	3	6	0.3	0.4	0.5	101	1	**DJF-104**

FLAT-PACK

4 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
2-200	30/25	28/23	25/20	0.5/0.9	0.7/1.0	0.8/1.2	1	2	3	0.1	0.2	0.3	101	2	**DJF-102**
2-400	22/15	23/18	20/15	1.4/1.8	1.2/2.0	1.6/2.5	1	3	5	0.1	0.2	0.3	101	2	**DJF-105**

Power Rating (All Models) = 1 Watt, max.
Impedance is 50 Ohms.
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	0° OUTPUT	180° OUTPUT	ISOLATED*	GROUND
#1	1	4	8	---	All other
#2	1	4	8	5	All other

*Terminate Isolated Port in 50 Ohms
GROUND = Ground externally

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SYNERGY® MICROWAVE CORPORATION

180° HYBRIDS

COAXIAL CONNECTOR

3 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
0.01-20	25/20	30/25	27/23	0.5/0.8	0.3/0.5	0.5/0.7	2	2	2	0.2	0.2	0.2	110	1	**DJK-701***
5-200	30/25	30/25	30/25	1.0/1.2	1.0/1.2	1.0/1.4	2	3	4	0.1	0.2	0.2	110	1	**DJK-703***
5-400	28/23	28/23	25/20	0.9/1.4	1.2/1.7	1.7/2.0	1.5	3	6	0.3	0.4	0.5	110	1	**DJK-704***
50 -1000	23/15	20/15	18/12	1.9/2.8	2.3/2.8	2.5/2.8	5	7	10	0.5	0.7	1.0	110	1	**DJK-706***

COAXIAL CONNECTOR

4 - PORT

FREQUENCY RANGE (MHz)	ISOLATION (dB)			INSERTION LOSS (dB)			PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)			PACKAGE	PIN-OUT (See Below)	MODEL
LF-HF	LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	LB MAX	MB MAX	UB MAX	LB MAX	MB MAX	UB MAX			
2-200	30/25	28/23	25/20	0.5/0.9	0.7/1.0	0.8/1.2	1	2	3	0.1	0.2	0.3	113	2	**DJK-702***
2-400	22/18	23/18	20/15	1.4/1.8	1.2/2.0	1.6/2.5	1	3	5	0.1	0.2	0.3	113	2	**DJK-705***

*Select Connector Sufix: "B" = BNC, "S = SMA, 'N" = TYPE N, "T" = TNC
Power Rating (All Models) = 1 Watt, max
Impedance is 50 Ohms.
For pin location and package outline drawings, see back pages.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

PIN-OUT TABLE

	INPUT	0° OUTPUT	180° OUTPUT	ISOLATED*	GROUND
#1	2	1	3	-	-
#2	1	2	4	3	-

*Terminate Isolated Port in 50 Ohms
GROUND = Ground externally

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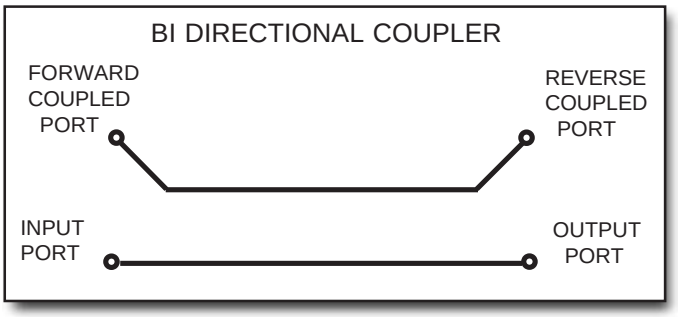
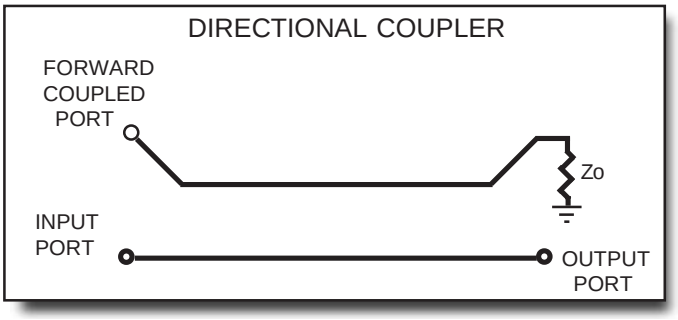
SYNERGY® MICROWAVE CORPORATION

COUPLERS

Synergy's line of couplers consist of directional & bidirectional types with frequencies ranging from 10 KHz to 2 GHz. A bidirectional coupler is a 4 port device that produces two unequal amplitude outputs when a signal is fed through the input port and cancels the signal at the reverse coupled port. A directional coupler has the reverse coupled port internally terminated.

Couplers are categorized by the low signal level output. A 10 dB directional coupler will provide an output of 10 dB below the input signal level, and a "Main Line" signal level which has very little loss (0.46 dB theoretically). Listed below are the functional diagrams for both types.





PARAMETER DEFINITIONS

Coupling

Coupling is the attenuation in dB of a signal at a coupled port relative to the input port.

Coupling Flatness

Coupling flatness is the peak to peak variation in coupling over the specified frequency range.

Insertion Loss

Insertion loss is the unrecoverable power in dB dissipated within the circuit.

Coupling Loss

Theoretically, the RF power will split unevenly between the mainline and coupling port. Listed in Table 1 is the coupling loss for Synergy's line of directional couplers.

Mainline Loss

Mainline loss is equal to insertion loss plus the coupling loss.

Table 1

Coupling Value	Coupling loss
6 dB	1.25 dB
10 dB	0.46 dB
15 dB	0.140 dB
20 dB	0.044 dB

Directivity

Directivity is a measure of the coupler's ability to direct energy only to the desired port. Directivity is equal to the isolation value minus the coupling value.

VSWR

The voltage standing wave ratio is a term used to indicate how well the device is matched to the system impedance.

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DIRECTIONAL COUPLERS

SURFACE-MOUNT


195


133


147

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.0 ± 0.5	1600 - 2000	± 0.6	---/---	---/---	0.2/0.3	---/---	---/---	22/15	1.2:1	195	5	**SDC-C6**
10.5 ± 1.0	0.5 - 500	± 0.7	1.0/1.4	0.8/1.4	1.0/1.6	28/23	25/20	20/15	1.3:1	133	2	**SDC-C1**
10.5 ± 0.5	10 - 500	± 0.4	0.8/1.2	0.8/1.3	1.0/1.5	33/23	25/20	20/15	1.3:1	133	2	**SDC-C2**
10.7 ± 1.0	800 -1550	± 1.0	---/---	---/---	2.0/3.5	---/---	---/---	20/10	1.5:1	147	4	**SDC-M-3**
11.0 ± 1.0	100 -1000	± 0.6	---/---	1.5/1.8	1.6/2.0	---/---	25/20	20/15	1.3:1	147	4	**SDC-M-2**
11.5 ± 0.5	5 - 1000	± 0.5	1.5/1.8	1.6/1.9	1.7/2.0	25/20	24/18	22/15	1.3:1	133	2	**SDC-C3**
11.5 ± 0.5	850 - 950	± 0.4	---/---	---/---	1.6/2.0	---/---	---/---	25/20	1.2:1	133	2	**SDC-C1-1**
15.0 ± 0.75	40 - 860	± 0.7	1.0/1.5	---/---	1.0/1.5	18/15	---/---	18/15	1.35:1	133	2	**SDC-C4**
20.0 ± 1.0	100 - 1000	± 0.75	0.3/0.6	0.5/0.9	0.9/1.5	35/25	28/20	20/13	1.3:1	147	4	**SDC-M-1**
21.5 ± 1.0	800 - 1000	± 0.6	---/---	---/---	0.5/0.3	---/---	---/---	22/15	1.2:1	133	2	**SDC-C5**

LEADED SURFACE-MOUNT


159


134S

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.0 ± 0.5	30 - 1000	± 0.6	1.5/1.8	1.5/1.8	1.5/1.8	20/15	20/15	20/15	1.5:1	159	1	**SCL-4B-75■**
10.0 ± 0.5	30 - 1000	± 0.6	1.5/1.8	1.5/1.8	1.5/1.8	20/15	20/15	20/15	1.5:1	134S	1	**SCZ-4B-75■**
10.5 ± 0.5	10 - 500	± 0.4	0.8/1.2	0.8/1.3	1.0/1.5	33/23	25/20	20/15	1.3:1	134S	1	**SCZ-2B**
11.5 ± 0.5	5 - 1000	± 0.5	1.5/1.8	1.6/1.9	1.7/2.0	25/20	24/18	22/15	1.3:1	134S	1	**SCZ-3B**
11.5 ± 0.5	5 - 1000	± 0.5	1.5/1.8	1.6/1.9	1.7/2.0	25/20	24/18	22/15	1.3:1	159	1	**SCL-3B**
11.5 ± 0.5	850 - 950	± 0.4	---/---	---/---	1.6/2.0	---/---	---/---	25/20	1.2:1	134S	1	**SCZ-1-1**
11.5 ± 0.5	950 -1525	± 0.7	---/---	---/---	2.0/2.8	---/---	---/---	20/15	1.3:1	159	3	**SCL-7B-75■**
11.5 ± 0.5	950 -1525	± 0.7	---/---	---/---	2.0/2.8	---/---	---/---	20/15	1.3:1	134S	3	**SCZ-7B-75■**
15.0 ± 0.75	40 - 860	± 0.7	1.0/1.5	---/---	1.0/1.5	18/15	---/---	18/15	1.35:1	134S	1	**SCZ-4C**
20.0 ± 1.0	50 - 750	± 1.0	0.2/0.5	0.2/0.5	0.2/0.5	20/15	20/15	20/15	1.5:1	159	1	**SCL-4D-75■**
20.0 ± 1.0	50 - 750	± 1.0	0.2/0.5	0.2/0.5	0.2/0.5	20/15	20/15	20/15	1.5:1	134S	1	**SCZ-4D-75■**
20.0 ± 1.0	800 - 900	± 0.4	---/---	---/---	1.0/1.8	---/---	---/---	15/10	1.3:1	159	3	**SCL-6D**

Power rating (all models) = 1 Watt, max
■ 75 Ohm Models
Impedance, unless otherwise noted is 50 ohms.
For pin location and package outline drawings, see back pages.

LB=LF to 10 LF
MB=10 LF to HF/2
UB=HF/2 to HF

PIN-OUT TABLE

	IN	OUT	COUPLED	GND	NO CONN.	* ISOLATED
#1	6	1	4	2,5	3	-
#2	1	2	3	4,5,6	-	-
#3	1	2	5	6,4,3	-	-
#4	1	2	3	-	4	-
#5	1	2	5	3,6	-	4

* Terminate isolated port with 50 ohms.

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SYNERGY® MICROWAVE CORPORATION

DIRECTIONAL COUPLERS

COAXIAL CONNECTOR

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.0 ± 1.0	2 - 100	± 0.5	0.6/0.8	0.7/0.9	0.8/1.0	36/30	38/30	36/30	1.2:1	110	1	**KBK-701***
10.5 ± 0.5	1 - 2000	± 1.0	1.2/1.9	1.3/1.9	2.0/2.5	38/25	30/18	22/18	1.3:1	110	1	**KBK-7A6S*****
10.5 ± 0.5	1 - 250	± 0.75	0.7/1.0	0.9/1.2	1.0/1.5	35/25	35/20	25/20	1.2:1	110	1	**KBK-7A2B■**
10.75 ± 0.25	1 - 500	± 0.6	1.0/1.3	0.9/1.2	1.1/1.3	25/20	25/18	22/15	1.3:1	110	1	**KBK-703***
11.0 ± 1.0	5 - 1000	± 1.0	1.8/2.0	1.6/2.0	1.4/2.0	32/25	28/23	26/20	1.4:1	110	1	**KBK-704***
11.0 ± 0.5	1 - 1000	± 0.5	1.2/1.7	1.2/1.7	1.6/2.0	40/30	25/20	25/20	1.2:1	110	1	**KBK-7C4***
11.5 ± 0.5	10 - 1000	± 0.75	1.4/1.6	1.4/1.7	1.5/1.7	40/30	35/25	28/23	1.5:1	110	1	**KBK-705***
15.0 ± 0.5	0.01 - 35	± 0.5	0.3/0.6	0.2/0.4	0.3/0.6	38/30	35/25	28/20	1.15:1	110	1	**KCK-7C1***
15.0 ± 1.0	2 - 100	± 0.5	.25/0.4	.25/0.4	.25/0.4	37/30	35/30	33/28	1.09:1	110	1	**KCK-701***
15.0 ± 1.0	10 - 500	± 0.75	0.6/0.9	0.6/1.0	.75/1.15	33/25	35/25	30/25	1.3:1	110	1	**KCK-703***
15.0 ± 1.0	5 - 1000	± 0.75	0.6/0.9	0.9/1.3	1.2/1.65	30/23	33/23	25/20	1.3:1	110	1	**KCK-704***
19.5 ± 0.5	0.2 - 250	± 0.25	0.2/0.4	0.2/0.4	.22/0.6	40/30	40/25	35/20	1.1:1	110	1	**KDK-702***
19.8 ± 0.5	1 - 1000	± 0.5	0.3/0.6	.35/0.7	1.2/1.5	35/28	32/25	24/18	1.3:1	110	1	**KDK-704***
20.0 ± 1.0	0.5 - 120	± 0.5	.15/.20	.18/.23	.21/.25	40/30	35/30	33/30	1.08:1	110	1	**KDK-701***
20.0 ± 1.0	10 - 500	± 0.8	0.2/0.4	0.2/0.6	0.3/0.8	35/30	35/28	35/25	1.2:1	110	1	**KDK-703***
20.0 ± 1.0	1 - 1000	± 0.5	0.3/0.6	0.3/0.7	0.9/1.2	35/28	32/25	24/18	1.3:1	110	1	**KDK-705***

Power rating (all models) = 1 Watt, max
* Select female connector suffix: "S" = SMA, "B" = BNC, "N" = Type N, "T" = TNC
*** Input Power = 0.5 Watts Max.
For pin location and package outline drawings, see back pages.

■ 75 Ohm models

LB=LF to 10 LF
MB=10 LF to HF/2
UB=HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	COUPLED	CASE GND	NO CONN
#1	3	1	2	-	-

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SYNERGY® MICROWAVE CORPORATION

DIRECTIONAL COUPLERS

THROUGH HOLE (8 Pin Relay)

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
6.0 ± 0.5	10 - 100	± 0.25	1.6/1.8	---/---	1.8/2.0	40/30	---/---	30/25	1.5:1	102	1	**KAP-201**
10.5 ± 0.5	1 - 2000	+ 1.0	1.2/1.9	1.3/1.9	2.0/2.5	38/25	30/18	22/18	1.3:1	102	1	**KBP-2A6*** **
10.5 ± 0.5	1 - 250	± 0.75	1.1/1.5	---/---	1.1/1.5	30/20	---/---	30/20	2.0:1	102	1	**KBP-2A2**
10.5 ± 0.5	250 -1000	± 0.6	1.4/1.6	---/---	1.6/2.0	30/25	30/20	25/15	1.5:1	102	1	**KBP-2A4****
11.0 ± 0.5	5 - 750	± 0.5	1.1/1.6	1.2/1.7	1.6/1.9	35/30	25/20	25/20	1.25:1	102	1	**KBP-2B4**
11.0 ± 0.75	5 - 1000	± 0.5	1.5/1.8	1.6/1.9	1.7/2.0	40/30	25/20	25.20	1.2:1	102	1	**KBP-204**
11.5 ± 0.5	0.5 - 500	± 0.6	.85/1.3	.65/1.0	.85/1.3	32/15	32/25	22/15	1.2:1	102	1	**KBP-2A1**
11.5 ± 0.5	1 - 500	± 0.6	0.9/1.2	0.8/1.2	1.1/1.3	25/20	25/18	23/15	1.2:1	102	1	**KBP-203**
15.0 ± 0.5	0.01 - 35	± 0.5	0.3/0.6	0.2/0.4	0.3/0.6	38/30	35/25	28/20	1.15:1	102	1	**KCP-2B1**
15.0 ± 0.75	0.5 - 1000	± 0.7	0.8/1.2	0.6/1.2	1.0/1.5	33/25	25/20	18/15	1.35:1	102	1	**KCP-204**
19.5 ± 0.5	1 - 150	± 0.75	.35/0.8	.35/0.8	.35/0.8	25/20	25/20	25/20	2.0:1	102	1	**KDP-2B2■**
19.5 ± 0.5	0.2 - 250	± 0.5	0.2/0.5	0.2/0.4	0.3/0.6	40/28	38/25	32/20	1.2:1	102	1	**KDP-202**
20.0 ± 0.5	0.5 - 1000	± 0.8	0.2/0.6	0.4/1.0	1.0/1.7	27/20	20/15	20/15	1.3:1	102	1	**KDP-204**
20.0 ± 1.0	5 - 500	± 0.7	0.2/0.5	0.3/0.8	0.4/1.0	35/25	25/18	20/15	1.3:1	102	1	**KDP-203**
21.0 ± 0.75	25 - 400	± 0.5	0.2/.25	---/---	.35/0.5	25/20	---/---	25/20	1.25:1	102	1	**KDP-213****

THROUGH HOLE (4-Pin Mini Relay)

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
6.0 ± 0.5	10 - 100	± 0.25	1.6/1.8	---/---	1.8/2.0	40/30	---/---	30/25	1.5:1	106	2	**KAP-301**
6.3 ± 0.4	10 - 400	± 0.4	2.0/2.4	2.0/2.4	2.0/2.5	36/30	30/25	20/15	1.5:1	106	2	**KAP-302**
10.5 ± 0.5	1 - 400	± 0.5	0.8/1.0	0.9/1.2	1.0/1.5	30/23	25/20	20/15	1.4:1	106	2	**KBP-313**
10.5 ± 1.0	0.5 - 500	± 0.7	1.0/1.2	0.8/1.2	1.0/1.3	28/20	25/18	18/15	1.4:1	106	2	**KBP-303**
11.0 ± 0.5	5 - 1000	± 0.6	1.4/1.8	1.5/1.8	1.6/2.0	35/25	25/20	20/15	1.5:1	106	2	**KBP-314**
20.0 ± 1.0	5 - 500	± 0.7	0.2/0.5	0.3/0.8	0.4/1.0	35/25	25/18	20/15	1.3:1	106	2	**KDP-303**

Power rating (all models) = 1 Watt, max
** LB = 250 - 500 MHz, MB = 500 - 750 MHz, UB = 750 - 1000 MHz
*** Input Power = 0.5 Watts Max.
■ 75 Ohm models
For pin location and package outline drawings, see back pages.

LB=LF to 10 LF
MB=10 LF to HF/2
UB=HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	COUPLED	CASE GND	NO CONN
#1	1	4	3	2,5,7,8	6
#2	1	2	4	3	-

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SYNERGY® MICROWAVE CORPORATION

BI-DIRECTIONAL COUPLERS

THROUGH HOLE (8 Pin Relay Header)

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
6.0 ± 0.5	10 - 100	± 0.25	1.5/2.0	1.5/2.0	1.5/2.0	30/25	30/25	30/25	1.2:1	120	1	**KAP-241**
11.5 ± 1.0	0.5 - 400	± 1.0	0.8/1.0	0.7/0.9	0.9/1.0	37/25	25/20	20/15	1.2:1	120	1	**KBP-243**
19.5 ± 1.0	0.5 - 400	± 1.0	0.3/0.5	0.4/0.5	0.5/0.6	35/25	33/20	25/15	1.5:1	120	1	**KDP-243**

THROUGH HOLE (TO-5 &TO-8)

104

127

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
6.0 ± 0.5	10 - 100	± 0.25	1.5/2.0	1.5/2.0	1.5/2.0	30/25	30/25	30/25	1.2:1	104	2	**KAP-541**
6.0 ± 0.5	10 - 100	± 0.25	1.5/2.0	1.5/2.0	1.5/2.0	30/25	30/25	30/25	1.2:1	127	3	**KAP-841**
10.8 ± 1.0	10 - 500	± 0.7	0.6/1.0	0.8/1.2	0.8/1.6	30/25	25/20	25/17	1.3:1	104	2	**KBP-543**
10.8 ± 1.0	10 - 500	± 0.7	0.6/1.0	0.8/1.2	0.8/1.6	30/25	25/20	25/17	1.3:1	127	3	**KBP-843**
20.0 ± 1.0	10 - 500	± 0.5	0.3/0.5	0.4/0.5	0.5/0.6	35/28	35/25	30/17	1.4:1	104	2	**KDP-543**
20.0 ± 1.0	10 - 500	± 0.5	0.3/0.5	0.4/0.5	0.5/0.6	35/28	35/25	30/17	1.4:1	127	3	**KDP-843**

Power rating (all models) = 1 Watt, max
Impedance, unless otherwise noted is 50 ohms.
For pin location and package outline drawings, see back pages.

LB=LF to 10 LF
MB=10 LF to HF/2
UB=HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	FORWARD COUPLED	REVERSE COUPLED	CASE GND
#1	6	3	4	1	All Other
#2	8	5	11	2	All Other
#3	1	2	4	3	5

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SYNERGY® MICROWAVE CORPORATION

BI-DIRECTIONAL COUPLERS

COAXIAL CONNECTOR

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
6.0 ± 0.5	10 - 100	± 0.25	1.5/2.0	1.5/2.0	1.5/2.0	30/25	30/25	30/25	1.2:1	113	1	**KAK-741***
10.0 ± 1.0	2 - 100	± 0.5	0.9/1.0	0.9/1.0	0.9/1.0	45/35	37/33	35/30	1.2:1	113	1	**KBK-741***
10.8 ± 0.5	10 - 500	± 0.5	0.6/1.0	0.8/1.2	0.8/1.6	30/25	25/23	25/20	1.3:1	113	1	**KBK-743***
11.5 ± 0.5	10 - 1000	± 1.1	1.5/1.8	1.6/1.9	1.6/2.0	45/30	28/23	20/15	1.4:1	113	1	**KBK-744***
15.0 ± 1.0	2 - 100	± 0.5	0.4/0.5	0.3/0.5	0.4/0.6	35/30	35/30	33/30	1.3:1	113	1	**KCK-741***
15.0 ± 1.0	10 - 500	± 0.75	0.5/0.8	0.7/1.0	0.8/1.2	35/25	33/25	30/25	1.3:1	113	1	**KCK-743***
15.0 ± 1.0	5 - 1000	± 0.75	0.5/1.0	0.8/1.3	1.0/1.65	30/25	28/23	25/20	1.5:1	113	1	**KCK-744***
20.0 ± 1.0	2 - 100	± 0.5	.15/.25	0.1/0.2	0.1/.25	43/33	38/33	33/30	1.06:1	113	1	**KDK-741***
20.0 ± 1.0	10 - 500	± 0.5	0.3/0.6	0.4/0.8	0.5/1.0	35/28	35/25	35/25	1.3:1	113	1	**KDK-743***
20.0 ± 1.0	10 - 1000	± 1.0	0.1/0.2	0.3/1.0	1.0/1.5	30/23	25/18	20/15	1.3:1	113	1	**KDK-744***

FLAT-PACK

COUPLING (dB) NOM	FREQUENCY RANGE LF-HF (MHz)	COUPLING FLATNESS (dB)	MAINLINE LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	DIRECTIVITY (dB) LB TYP/MIN	MB TYP/MIN	UB TYP/MIN	VSWR TYP	PACKAGE	PIN-OUT (See Below)	MODEL
10.8 ± 0.7	10 - 500	± 0.5	1.0/1.3	1.0/1.4	1.2/1.6	28/23	28/24	23/20	1.2:1	101	2	**KBF-143**
20.3 ± 0.7	10 - 500	± 0.5	0.3/0.4	0.3/0.5	0.4/0.5	35/28	35/25	30/20	1.35:1	101	2	**KDF-143**

Power rating (all models) = 1 Watt, max
* Select connector suffix: "S" = SMA, "B" = BNC, "N" = Type N, "T" = TNC
Impedance, unless otherwise noted is 50 ohms.
For pin location and package outline drawings, see back pages.

LB=LF to 10 LF
MB=10 LF to HF/2
UB=HF/2 to HF

PIN-OUT TABLE

	INPUT	OUTPUT	FORWARD COUPLED	REVERSE COUPLED	CASE GND
#1	1	4	2	3	-
#2	1	5	4	8	All Other

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SYNERGY® MICROWAVE CORPORATION

FREQUENCY DOUBLERS

LEADED SURFACE-MOUNT MODELS

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 500	2 - 1000	+ 4	+ 10	13.5/16.5	25/15	40/25	159	1	**SLX-K3**
50 - 750	100 - 1500◆	+ 6	+ 15	10.5/13.5	25/15	35/20	159	1	**SLX-K5**
50 - 1250	150 - 2500◆	+ 6	+ 15	10.5/13.5	30/20	35/20	159	1	**SLX-K7**
75 - 1500	150 - 3000◆	+ 10	+ 16	12.0/14.0	25/17	25/17	159	1	**SLX-K8**

LEADEDLESS SURFACE-MOUNT MODELS

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
0.003 - 2.5	0.06 - 5	+ 4	+ 13	11.5/15.0	35/20	40/20	152	1	**SMX-C1**
0.005 - 25	0.01 - 50	+ 4	+ 13	11.5/15.0	35/20	40/20	152	1	**SMX-C2**
0.05 - 150	1 - 300	+ 4	+ 13	11.5/15.0	35/20	40/20	152	1	**SMX-C3**
1 - 500	2 - 1000	+ 4	+ 10	13.5/16.5	25/15	40/25	133	2	**SMX-C4**
50 - 750	100 - 1500◆	+ 6	+ 15	10.5/13.5	25/15	35/20	133	2	**SMX-C5**
50 - 1000	100 - 2000◆	+ 10	+ 20	12.5/16.0	30/12	35/16	133	2	**SMX-C6**
50 - 1250	100 - 2500◆	+ 6	+ 15	10.5/13.5	30/20	35/20	133	2	**SMX-C7**
75 - 1500	150 - 3000◆	+ 10	+ 16	12.0/14.0	25/17	25/17	133	2	**SMX-C8**
500 - 2000	1000 - 4000◆	+ 10	+ 16	12.0/17.0	15/10	20/15	133	2	**SMX-C9**

COAXIAL CONNECTOR MODELS

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
0.05 - 150	0.1 - 300	0	+ 13	11.5/15.0	35/20	40/20	118	3	**XK-703***
1 - 500	2 - 1000	+ 1	+ 15	13.5/16.5	25/15	40/25	118	3	**XK-702***
50 - 1250	100 - 2500◆	+ 4	+ 20	10.5/13.5	30/20	35/20	118	3	**XK-701***

◆Specifications are for operation at +13 dBm (nominal) input power.
Nominal impedance is 50 ohms.
*Select female connector suffix: S=SMA, B=BNC, N=Type N, T=TNC
For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	OUTPUT	GROUND	NO CONN.
# 1	1	4	2,3,5,6	---
# 2	1	2	4,5,6	3
# 3	1	2	---	---

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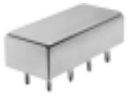
FREQUENCY DOUBLERS

THROUGH HOLE MOUNT

8 PIN - RELAY HEADER

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
0.003 - 2.5	0.006 - 5	0	+ 10	11.5/15.0	35/20	40/20	102	1	**XP-214**
0.005 - 25	0.01 - 50	0	+ 10	11.5/15.0	35/20	40/20	102	1	**XP-224**
0.05 - 150	0.1 - 300	0	+ 13	11.5/15.0	35/20	40/20	102	2	**XP-203**
1 - 500	2 - 1000	+ 1	+ 15	13.5/16.5	25/15	40/25	102	1	**XP-212**
50 - 750	100 - 1500◆	+ 4	+ 20	10.5/13.5	25/15	35/20	102	3	**XP-204**

MINI RELAY HEADER (4-pin and 8-pin)


103


106


107

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
1 - 500	2 - 1000	+ 1	+ 15	13.5/16.5	25/15	40/25	107	1	**XP-402**
1 - 500	2 - 1000	+ 1	+ 15	13.5/16.5	25/15	40/25	106	4	**XP-322**
75 - 1500	150 - 3000◆	+ 10	+ 16	12.0/14.0	25/17	25/17	103	3	**XP-316**

TO-8 and TO-5


122


126

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
50 - 1000	100 - 2000◆	+ 4	+ 20	10.5/13.5	30/20	35/20	122	5	**XP-601**
50 - 1000	100 - 2000◆	+ 4	+ 20	10.5/13.5	30/20	35/20	126	5	**XP-801**

FLAT PACK

FREQUENCY RANGE (MHz) INPUT	OUTPUT	INPUT POWER (dBm) MIN	MAX	CONVERSION LOSS (dB) TYP/MAX	SPURIOUS (dB) F1 TYP/MIN	F3 TYP/MIN	PACKAGE	PIN-OUT (See Below)	MODEL
50 - 1250	100 - 2500◆	+ 4	+ 20	10.5/13.5	30/18	35/20	101	6	**XF-111**

* Pins must be connected together externally

◆Specifications are for operation at +13 dBm (nominal) input power.

Nominal impedance is 50 ohms.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	INPUT	OUTPUT	GROUND	CASE GROUND
# 1	*1,3,4	8	2,5,6,7	2,5,6,7
# 2	*1,3,4	8	2,5,6,7	2
# 3	1	8	All Other	All Other
# 4	*1,2	4	3	3
# 5	1	3	2,4	2,4
# 6	5	4	All Other	All Other

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SYNERGY® MICROWAVE CORPORATION

FIXED ATTENUATORS

8-PIN MINI - RELAY HEADER

FREQUENCY RANGE (MHz)	ATTENUATION (dB) NOM.	FLATNESS (dB), MAX.			VSWR MAX.			PACKAGE	PIN-OUT (See Below)	MODEL
		LB	MB	UB	LB	MB	UB			
DC-1500	3 ± 0.2	0.3	0.6	1.0	1.3	1.5	1.7	108	1	**AFP-403**
DC-1500	6 ± 0.3	0.3	0.6	1.0	1.3	1.5	1.7	108	1	**AFP-406**
DC-1500	10 ± 0.4	0.3	0.6	1.0	1.3	1.5	1.7	108	1	**AFP-410**
DC-1500	15 ± 0.4	0.4	0.7	1.1	1.3	1.5	1.7	108	1	**AFP-415**
DC-1500	20 ± 0.5	0.4	0.8	1.3	1.3	1.6	1.8	108	1	**AFP-420**
DC-1000	30 ± 0.5	0.5	1.0	-	1.3	1.6	-	108	1	**AFP-430**
DC-500	40 ± 0.6	1.0	-	-	1.5	-	-	108	1	**AFP-440**

NOTE: Maximum RF power is 1/2 Watt.

8-PIN - RELAY HEADER

FREQUENCY RANGE (MHz)	ATTENUATION (dB) NOM.	FLATNESS (dB), MAX.			VSWR MAX.			PACKAGE	PIN-OUT (See Below)	MODEL
		LB	MB	UB	LB	MB	UB			
DC-1500	3 ± 0.2	0.3	0.6	1.0	1.3	1.5	1.7	103	1	**AFP-203**
DC-1500	6 ± 0.3	0.3	0.6	1.0	1.3	1.5	1.7	103	1	**AFP-206**
DC-1500	10 ± 0.4	0.3	0.6	1.0	1.3	1.5	1.7	103	1	**AFP-210**
DC-1500	15 ± 0.4	0.4	0.7	1.1	1.3	1.5	1.7	103	1	**AFP-215**
DC-1500	20 ± 0.5	0.4	0.8	1.3	1.3	1.6	1.8	103	1	**AFP-220**
DC-1000	30 ± 0.5	0.5	1.0	-	1.3	1.6	-	103	1	**AFP-230**
DC-500	40 ± 0.6	1.0	-	-	1.5	-	-	103	1	**AFP-240**

NOTE: Maximum RF power is 1/2 Watt.

LB=LOW (DC-500 MHz)
MB=MID (DC-1000 MHz)
UB=UPPER (DC-1500 MHz)

PIN-OUT TABLE

	INPUT	OUTPUT	GROUND
# 1	1	8	2,3,4,5,6,7

For pin location and package outline drawings, see back pages.

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TRANSFORMERS

LEADLESS SURFACE-MOUNT MODELS

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:1	No	Yes	.003-300	.02-50	.01-150	.003-300	1	134	1	**ST-K1**
1:1.5	No	No	.075-400	.370-185	.120-300	.075-400	2	134	2	**ST-K2**
1:2	No	No	.650-525	-	2.2-400	.650-525	2	134	2	**ST-K3**
1:2.5	No	Yes	.070-300	.780-175	.140-225	.070-300	1	134	1	**ST-K4**
1:3	No	No	.270-500	3.6-160	.490-430	.270-500	2	134	2	**ST-K5**
1:4	No	Yes	.2-350	2-100	.35-300	.2-350	1	134	1	**ST-K6**
1:5	No	Yes	.3-300	.5-100	.6-200	.3-300	1	134	1	**ST-K7**
1:6	No	No	.3-200	.3-200	.5-150	5-50	2	134	2	**ST-K8**

NOTE: All devices shown have 1 Watt Power Rating
Temperature range for plastic package is -25°C to +85°C

LEADLESS SURFACE-MOUNT MODELS

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	INSERTION LOSS (dB),MAX	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:4	No	Yes	60-250	1.5	1	129	1	**SMT-C1**
1:4	No	Yes	350-600	2.5	1	129	1	**SMT-C2**
1:16	No	Yes	60-250	3.5	1	129	1	**SMT-C3**
1:16	No	Yes	350-600	5.5	1	129	1	**SMT-C4**

NOTE: All devices shown have 1 Watt Power Rating
Temperature range for plastic package is -25°C to +85°C

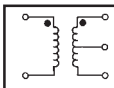

FIGURE 1

FIGURE 2

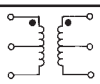

FIGURE 3

FIGURE 4

FIGURE 5

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	Primary DOT	Primary	Primary Center-Tap	Secondary DOT	Secondary	Secondary Center-Tap
# 1	4	6	-	3	1	2
# 2	4	6	-	3	1	-

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TRANSFORMERS

LEADED SURFACE-MOUNT MODELS

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:1	No	Yes	.04-140	.100-55	.05-100	.04-140	1	156	1	**TW-207**
1:1	No	Yes	.05-200	.2-80	.08-150	.05-200	1	156	1	**TW-2Q2**
1:1	No	Yes	.003-300	.02-50	.01-150	.003-300	1	156	1	**TW-2A2**
1:1	No	Yes	5-450	12-150	7-300	5-450	1	156	1	**TW-206**
1:1	No	No	.028-1000	.055-450	.035-900	.028-1000	2	156	2	**TW-205**
1:1	No	No	9.0-1200	20-150	12-790	9.0-1200	2	156	2	**TW-204**
1:1.5	No	Yes	.480-175	2-54	.135-120	.480-175	1	156	1	**TW-209**
1:1.5	No	No	.075-400	.370-185	.120-300	.075-400	2	156	2	**TW-208**
1:1.5	No	No	.100-400	.250-200	.140-300	.100-400	2	156	2	**TW-211**
1:1.5	Yes	Yes	.075-500	1.0-50	.2-100	.075-500	3	156	3	**TW-2A3**
1:2	No	Yes	.060-250	1.7-55	.100-190	.060-250	1	156	1	**TW-216**
1:2	No	No	.100-275	1.0-85	.200-195	.100-275	2	156	2	**TW-215**
1:2	No	No	.650-525	-	2.2-400	.650-525	2	156	2	**TW-210**
1:2	No	No	.050-600	.5-200	.1-400	.050-600	4	156	4	**TW-2A4**
1:2.5	No	Yes	.01-100	.50-20	.02-50	.01-100	1	156	1	**TW-2A1**
1:2.5	No	Yes	.070-300	.780-175	.140-225	.070-300	1	156	1	**TW-219**
1:2.5	No	Yes	.300-300	-	.700-200	.300-300	1	156	1	**TW-218**
1:2.5	No	No	.230-495	4.8-175	.400-425	.230-495	2	156	2	**TW-217**
1:3	No	Yes	.05-250	.5-70	.1-200	.05-250	1	156	1	**TW-2B2**
1:3	No	Yes	.080-340	.550-150	.160-295	.080-340	1	156	1	**TW-220**
1:3	No	No	.270-500	3.6-160	.490-430	.270-500	2	156	2	**TW-225**
1:4	No	No	.02-200	.1-100	.05-150	.02-200	2	156	2	**TW-2C2**
1:4	No	No	.115-200	12.0-50	.240-155	.115-200	2	156	2	**TW-227**
1:4	No	Yes	.245-425	5.5-215	.475-350	.245-425	1	156	1	**TW-226**
1:4	No	Yes	.2-350	2-100	.35-300	.2-350	1	156	1	**TW-2C3**
1:5	No	Yes	.3-300	.5-100	.6-200	.3-300	1	156	1	**TW-2E2**
1:8	No	No	.15-250	2-100	.25-200	.15-250	4	156	4	**TW-2G2**
1:9	No	No	.15-200	2.0-40	.3-150	.15-200	2	156	2	**TW-2D2**
1:13	No	Yes	.3-120	5.0-20	.7-80	.3-120	1	156	1	**TW-2F2**
1:16	No	No	.3-120	5.0-20	.7-80	.3-120	2	156	2	**TW-2H2**
1:36	No	No	.03-20	.1-5.0	.05-10	.03-20	2	156	2	**TW-2B1**
1:4	No	Yes	.02-250	.1-100	.05-150	.02-250	1	156	1	**TW-2K1**

NOTE: All devices shown have 1 Watt Power Rating
Temperature range for plastic package is -25°C to +85°C

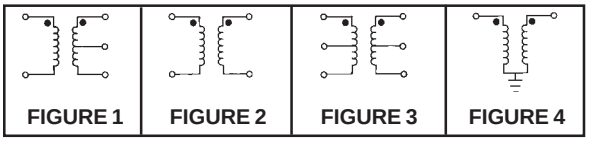

FIGURE 1 **FIGURE 2** **FIGURE 3** **FIGURE 4**

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	Primary DOT	Primary	Primary Center-Tap	Secondary DOT	Secondary	Secondary Center-Tap
# 1	4	6	-	3	1	2
# 2	4	6	-	3	1	-
# 3	4	6	5	3	1	2
# 4	6	*3	-	1	*3	-

* Pin must be grounded

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SYNERGY® MICROWAVE CORPORATION

TRANSFORMERS

MINIATURE 8 PIN - RELAY HEADER

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:1	No	Yes	.04-140	.100-55	.05-100	.04-140	1	108	2	**TP-207**
1:1	No	Yes	5-450	12-150	7-300	5-450	1	108	2	**TP-206**
1:1	No	No	1-800	-	2-500	1-800	2	108	4	**TP-2C4**
1:1	No	No	.028-1000	.055-450	.035-900	.028-1 000	2	108	3	**TP-205**
1:1	No	No	9.0-1200	20-150	12-790	9.0-1200	2	108	3	**TP-204**
1:1.5	No	Yes	.480-175	2-54	.135-120	.480-175	1	108	2	**TP-209**
1:1.5	No	No	.1-300	.5-8	.2-150	.1-300	2	108	3	**TP-2R2**
1:1.5	No	No	.075-400	.370-1 85	.1 20-300	.075-400	2	108	3	**TP-208**
1:1.5	No	No	.100-400	.250-200	.140-300	.100-400	2	108	3	**TP-211**
1:2	No	Yes	.07-200	0.5-50	.1-100	.07-200	1	108	2	**TP-2J2**
1:2	No	Yes	.060-250	1.7-55	.100-190	.060-250	1	108	2	**TP-216**
1:2	No	No	.100-275	1.0-85	.200-195	.100-275	2	108	3	**TP-215**
1:2	No	No	.650-525	-	2.2-400	.650-525	2	108	3	**TP-210**
1:2	No	No	.050-600	.5-200	.1-400	.060-600	4	108	1	**TP-2B4**
1:2.5	No	Yes	.070-300	.780-175	.140-225	.070-300	1	108	2	**TP-219**
1:2.5	No	Yes	.300-300	-	.700-200	.300-300	1	108	2	**TP-218**
1:2.5	No	No	.230-495	4.8-175	.400-425	.230-495	2	108	3	**TP-217**
1:3	No	Yes	.080-340	.550-150	.1 60-295	.080-340	1	108	2	**TP-220**
1:3	No	No	.270-500	3.6-160	.490-430	.270-500	2	108	3	**TP-225**
1:4	No	No	115-200	12.0-50	.240-155	.115-200	2	108	3	**TP-227**
1:4	No	Yes	.2-350	2-100	.35-300	.2-350	1	108	2	**TP-2D3**
1:4	No	Yes	.245-425	5.5-215	.475-350	245-425	1	108	2	**TP-226**
1:5	No	Yes	.3-300	5-100	.6-200	3-300	1	108	2	**TP-2M2**
1:6	No	No	.3-200	.3-200	.5-150	5-50	2	108	3	**TP-2T2**
1:8	No	No	.15-250	2-100	.25-200	.15-250	4	108	1	**TP-2L2**
1:9	No	No	.15-200	2.0-40	.3-150	.15-200	2	108	3	**TP-2N2**
1:16	No	No	.3-120	5.0-20	.7-80	.3-120	2	108	3	**TP-2P2**

NOTE: All devices shown have 1 Watt Power Rating

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	Primary DOT	Primary	Primary Center-Tap	Secondary DOT	Secondary	Secondary Center-Tap	Case Ground
#1	1	*6	-	2	*6	-	7,8
#2	1	5	-	2	6	4	7,8
#3	1	5	-	2	6	-	7,8
#4	1	3	-	2	4	-	7,8

* Pin must be grounded

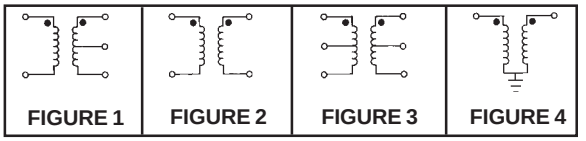

FIGURE 1 | FIGURE 2 | FIGURE 3 | FIGURE 4

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SYNERGY® MICROWAVE CORPORATION

TRANSFORMERS

8 Pin - Miniature Relay Header

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:2.5	No	Yes	.01-100	.05-20	.02-50	.01-100	1	107	1	**TP-2C1**
1:4	No	No	.02-200	.1-100	.05-150	.02-200	2	107	2	**TP-2K2**

NOTE: All devices shown have 1 Watt Power Rating

Connectorized Package

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:1.5	No	No	0.1-400	5-100	1-200	0.1-400	4	118	4	**TK-701B**
1:1	No	No	0.01-125	0.1-25	0.05-50	0.01-125	5	118	3	**TK-702B**
1:1	No	No	0.2-500	1-100	0.5-300	0.2-500	5	118	3	**TK-703B**

NOTE: All devices shown have 1 Watt Power Rating

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	Primary DOT	Primary	Primary Center-Tap	Secondary DOT	Secondary	Secondary Center-Tap	Case Ground
# 1	1	5	-	2	6	4	7,8
# 2	1	5	-	2	6	-	7,8
# 3	-	Balanced	-	-	Unbalanced	-	-
# 4	1	*6	-	2	*6	-	7.8

* Pin must be grounded

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

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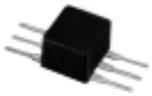
TRANSFORMERS



PLASTIC FLAT-PACK MODELS

IMPEDANCE RATIO PRI : SEC	CENTER TAP PRI	CENTER TAP SEC	FREQUENCY (MHz)	BANDWIDTH (MHz) for INSERTION-LOSS 1dB	2dB	3dB	FIGURE (See Below)	PACKAGE	PIN-OUT (See Below)	MODEL
1:1	No	Yes	.04-140	.100-55	.05-100	.04-140	1	116	1	**TX-207**
1:1	No	Yes	.05-200	.2-80	.08-150	.05-200	1	116	1	**TX-202**
1:1	No	Yes	.003-300	.02-50	.01-150	.003-300	1	116	1	**TX-2A2**
1:1	No	Yes	5-450	12-150	7-300	5-450	1	116	1	**TX-206**
1:1	No	No	.028-1000	.055-450	.035-900	.028-1000	2	116	4	**TX-205**
1:1	No	No	9.0-1200	20-150	12-790	9.0-1200	2	116	4	**TX-204**
1:1.5	No	Yes	.480-175	2-54	.135-120	.480-175	1	116	1	**TX-209**
1:1.5	No	No	.075-400	.370-185	.120-300	.075-400	2	116	4	**TX-208**
1:1.5	No	No	.100-400	.250-200	.140-300	.100-400	2	116	4	**TX-211**
1:1.5	Yes	Yes	.075-500	1.0-50	.2-100	.075-500	3	116	3	**TX-2A3**
1:2	No	Yes	.060-250	1.7-55	.100-190	.060-250	1	116	1	**TX-216**
1:2	No	No	.100-275	1.0-85	.200-195	.100-275	2	116	4	**TX-215**
1:2	No	No	.650-525	-	2.2-400	.650-525	2	116	4	**TX-210**
1:2	No	No	.050-600	.5-200	.1-400	.050-600	4	116	2	**TX-2A4**
1:2.5	No	Yes	.01-100	.50-20	.02-50	.01-100	1	116	1	**TX-2A1**
1:2.5	No	Yes	.070-300	.780-175	.140-225	.070-300	1	116	1	**TX-219**
1:2.5	No	Yes	.300-300	-	.700-200	.300-300	1	116	1	**TX-218**
1:2.5	No	No	.230-495	4.8-175	.400-425	.230-495	2	116	4	**TX-217**
1:3	No	Yes	.05-250	.5-70	.1-200	.05-250	1	116	1	**TX-2B2**
1:3	No	Yes	.080-340	.550-1 50	.160-295	.080-340	1	116	1	**TX-220**
1:3	No	No	.270-500	3.6-160	.490-430	.270-500	2	116	4	**TX-225**
1:4	No	No	.02-200	.1-100	.05-150	.02-200	2	116	4	**TX-2C2**
1:4	No	No	.115-200	12.0-50	.240-1 55	.115-200	2	116	4	**TX-227**
1:4	No	Yes	.245-425	5.5-215	.475-350	.245-425	1	116	1	**TX-226**
1:4	No	Yes	.2-350	2-100	.35-300	.2-350	1	116	1	**TX-2C3**
1:5	No	Yes	.3-300	.5-100	.6-200	.3-300	1	116	1	**TX-2E2**
1:8	No	No	.15-250	2-100	.25-200	.15-250	4	116	2	**TX-2G2**
1:9	No	No	.15-200	2.0-40	.3-150	.15-200	2	116	4	**TX-2D2**
1:1 3	No	Yes	.3-120	5.0-20	.7-80	.3-120	1	116	1	**TX-2F2**
1:1 6	No	No	.3-120	5.0-20	.7-80	.3-120	2	116	4	**TX-2H2**
1:36	No	No	.03-20	.1-5.0	.05-10	.03-20	2	116	4	**TX-2B1**

NOTE: All devices shown have 1 Watt Power Rating
Temperature range for plastic package is -25ºC to +85ºC

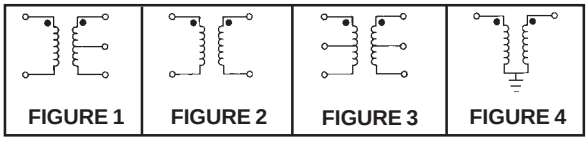


FIGURE 1 **FIGURE 2** **FIGURE 3** **FIGURE 4**

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

	Primary DOT	Primary	Primary Center-Tap	Secondary DOT	Secondary	Secondary Center-Tap
# 1	4	6	-	3	1	2
# 2	6	*3	-	1	*3	-
# 3	4	6	5	3	1	2
# 4	4	6	-	3	1	-

* Pin must be grounded

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SYNERGY® MICROWAVE CORPORATION

FILTERS
LOW PASS

Leadless Surface-Mount Models
Low Cost

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
12	DC-10.7	21	19	16	1.70:1	102S	1	**FLS-12**
24	DC-21.4	42	37	32	1.70:1	102S	1	**FLS-24**
33	DC-30	58	51	44	1.70:1	102S	1	**FLS-33**
55	DC-50	96	85	74	1.70:1	102S	1	**FLS-55**
66	DC-60	115	102	89	1.70:1	102S	1	**FLS-66**
77	DC-70	135	120	103	1.70:1	102S	1	**FLS-77**
100	DC-92	175	155	133	1.70:1	102S	1	**FLS-100**
154	DC-140	270	235	208	1.70:1	102S	1	**FLS-154**
220	DC-200	385	340	300	1.70:1	102S	1	**FLS-220**
330	DC-300	575	510	445	1.70:1	102S	1	**FLS-330**
495	DC-450	865	765	665	1.70:1	102S	1	**FLS-495**
570	DC-520	995	880	765	1.70:1	102S	1	**FLS-570**
660	DC-600	1160	1020	890	1.70:1	102S	1	**FLS-660**
770	DC-700	1345	1185	1000	1.70:1	102S	1	**FLS-770**
825	DC-750	1445	1360	1275	1.70:1	102S	1	**FLS-825**
850	DC-780	1485	1315	1130	1.70:1	102S	1	**FLS-850**
965	DC-875	1690	1595	1495	1.70:1	102S	1	**FLS-965**
1100	DC-1000	1925	1815	1700	1.70:1	102S	1	**FLS-1100**

Leaded Surface-Mount Models
Low Cost

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
12	DC-10.7	21	19	16	1.70:1	102L	1	**FLL-12**
24	DC-21.4	42	37	32	1.70:1	102L	1	**FLL-24**
33	DC-30	58	51	44	1.70:1	102L	1	**FLL-33**
55	DC-50	96	85	74	1.70:1	102L	1	**FLL-55**
66	DC-60	115	102	89	1.70:1	102L	1	**FLL-66**
77	DC-70	135	120	103	1.70:1	102L	1	**FLL-77**
100	DC-92	175	155	133	1.70:1	102L	1	**FLL-100**
154	DC-140	270	235	208	1.70:1	102L	1	**FLL-154**
220	DC-200	385	340	300	1.70:1	102L	1	**FLL-220**
330	DC-300	575	510	445	1.70:1	102L	1	**FLL-330**
495	DC-450	865	765	665	1.70:1	102L	1	**FLL-495**
570	DC-520	995	880	765	1.70:1	102L	1	**FLL-570**
660	DC-600	1160	1020	890	1.70:1	102L	1	**FLL-660**
770	DC-700	1345	1185	1000	1.70:1	102L	1	**FLL-770**
825	DC-750	1445	1360	1275	1.70:1	102L	1	**FLL-825**
850	DC-780	1485	1315	1130	1.70:1	102L	1	**FLL-850**
965	DC-875	1690	1595	1495	1.70:1	102L	1	**FLL-965**
1100	DC-1000	1925	1815	1700	1.70:1	102L	1	**FLL-1100**

NOTE: All units meet or exceed applicable MIL-F-18327.

For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	8	All Other

For pin location and package outline drawings, see back pages.

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FILTERS
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8 PIN - RELAY HEADER
LOW COST

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
12	DC-10.7	21	19	16	1.70:1	102	1	**FLP-12**
24	DC-21.4	42	37	32	1.70:1	102	1	**FLP-24**
33	DC-30	58	51	44	1.70:1	102	1	**FLP-33**
55	DC-50	96	85	74	1.70:1	102	1	**FLP-55**
66	DC-60	115	102	89	1.70:1	102	1	**FLP-66**
77	DC-70	135	120	103	1.70:1	102	1	**FLP-77**
100	DC-92	175	155	133	1.70:1	102	1	**FLP-100**
154	DC-140	270	235	208	1.70:1	102	1	**FLP-154**
220	DC-200	385	340	300	1.70:1	102	1	**FLP-220**
330	DC-300	575	510	445	1.70:1	102	1	**FLP-330**
495	DC-450	865	765	665	1.70:1	102	1	**FLP-495**
570	DC-520	995	880	765	1.70:1	102	1	**FLP-570**
660	DC-600	1160	1020	890	1.70:1	102	1	**FLP-660**
770	DC-700	1345	1185	1000	1.70:1	102	1	**FLP-770**
825	DC-750	1445	1360	1275	1.70:1	102	1	**FLP-825**
850	DC-780	1485	1315	1130	1.70:1	102	1	**FLP-850**
965	DC-875	1690	1595	1495	1.70:1	102	1	**FLP-965**
1100	DC-1000	1925	1815	1700	1.70:1	102	1	**FLP-1100**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	8	All Other

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High Suppression

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 2 dB (MHz)	STOP BAND FREQUENCY (MHz) >50 dB	>30 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
12	DC-10.7	21	19	16	1.70:1	124S	1	**FLHS-12**
24	DC-21.4	42	37	32	1.70:1	124S	1	**FLHS-24**
33	DC-30	58	51	44	1.70:1	124S	1	**FLHS-33**
55	DC-50	96	85	74	1.70:1	124S	1	**FLHS-55**
66	DC-60	115	102	89	1.70:1	124S	1	**FLHS-66**
77	DC-70	135	120	103	1.70:1	124S	1	**FLHS-77**
154	DC-140	270	235	208	1.70:1	124S	1	**FLHS-154**
220	DC-200	385	340	300	1.70:1	124S	1	**FLHS-220**
330	DC-300	575	510	445	1.70:1	124S	1	**FLHS-330**
495	DC-450	865	765	665	1.70:1	124S	1	**FLHS-495**
660	DC-600	1160	1020	890	1.70:1	124S	1	**FLHS-660**
825	DC-750	1445	1360	1275	1.70:1	124S	1	**FLHS-825**
965	DC-875	1690	1595	1495	1.70:1	124S	1	**FLHS-965**
1100	DC-1000	1925	1815	1700	1.70:1	124S	1	**FLHS-1100**

24 Pin - Through Hole Mount
High Suppression

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 2 dB (MHz)	STOP BAND FREQUENCY (MHz) >50 dB	>30 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
12	DC-10.7	21	19	16	1.70:1	124	1	**FLH-12**
24	DC-21.4	42	37	32	1.70:1	124	1	**FLH-24**
33	DC-30	58	51	44	1.70:1	124	1	**FLH-33**
55	DC-50	96	85	74	1.70:1	124	1	**FLH-55**
66	DC-60	115	102	89	1.70:1	124	1	**FLH-66**
77	DC-70	135	120	103	1.70:1	124	1	**FLH-77**
154	DC-140	270	235	208	1.70:1	124	1	**FLH-154**
220	DC-200	385	340	300	1.70:1	124	1	**FLH-220**
330	DC-300	575	510	445	1.70:1	124	1	**FLH-330**
495	DC-450	865	765	665	1.70:1	124	1	**FLH-495**
660	DC-600	1160	1020	890	1.70:1	124	1	**FLH-660**
825	DC-750	1445	1360	1275	1.70:1	124	1	**FLH-825**
965	DC-875	1690	1595	1495	1.70:1	124	1	**FLH-965**
1100	DC-1000	1925	1815	1700	1.70:1	124	1	**FLH-1100**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	16	All Other

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SYNERGY® MICROWAVE CORPORATION

FILTERS
HIGH PASS

LEADLESS SURFACE-MOUNT MODELS
LOW COST

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
10	10.7-50	5	6	7	1.70:1	102S	1	**FHS-10**
20	21.4-100	10	13	15	1.70:1	102S	1	**FHS-20**
27	30-150	14	17	20	1.70:1	102S	1	**FHS-27**
45	50-250	23	29	34	1.70:1	102S	1	**FHS-45**
55	60-300	28	35	41	1.70:1	102S	1	**FHS-55**
64	70-300	32	40	48	1.70:1	102S	1	**FHS-64**
127	140-630	65	80	95	1.70:1	102S	1	**FHS-127**
182	200-850	90	110	135	1.70:1	102S	1	**FHS-182**
270	300-1200	135	170	200	1.70:1	102S	1	**FHS-270**
410	450-1400	205	255	305	1.70:1	102S	1	**FHS-410**
545	600-1600	225	320	410	1.70:1	102S	1	**FHS-545**
680	750-1900	340	425	510	1.70:1	102S	1	**FHS-680**
795	875-2000	400	500	600	1.70:1	102S	1	**FHS-795**

LEADED SURFACE-MOUNT MODELS
LOW COST

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
10	10.7-50	5	6	7	1.70:1	102L	1	**FHL-10**
20	21.4-100	10	13	15	1.70:1	102L	1	**FHL-20**
27	30-150	14	17	20	1.70:1	102L	1	**FHL-27**
45	50-250	23	29	34	1.70:1	102L	1	**FHL-45**
55	60-300	28	35	41	1.70:1	102L	1	**FHL-55**
64	70-300	32	40	48	1.70:1	102L	1	**FHL-64**
127	140-630	65	80	95	1.70:1	102L	1	**FHL-127**
182	200-850	90	110	135	1.70:1	102L	1	**FHL-182**
270	300-1200	135	170	200	1.70:1	102L	1	**FHL-270**
410	450-1400	205	255	305	1.70:1	102L	1	**FHL-410**
545	600-1600	225	320	410	1.70:1	102L	1	**FHL-545**
680	750-1900	340	425	510	1.70:1	102L	1	**FHL-680**
795	875-2000	400	500	600	1.70:1	102L	1	**FHL-795**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	8	All Other

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SYNERGY® MICROWAVE CORPORATION

FILTERS

HIGH PASS

8 PIN - RELAY HEADER
LOW COST

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 1 dB (MHz)	STOP BAND FREQUENCY (MHz) >35 dB	>23 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
10	10.7-50	5	6	7	1.70:1	102	1	**FHP-10**
20	21.4-100	10	13	15	1.70:1	102	1	**FHP-20**
27	30-150	14	17	20	1.70:1	102	1	**FHP-27**
45	50-250	23	29	34	1.70:1	102	1	**FHP-45**
55	60-300	28	35	41	1.70:1	102	1	**FHP-55**
64	70-300	32	40	48	1.70:1	102	1	**FHP-64**
127	140-630	65	80	95	1.70:1	102	1	**FHP-127**
182	200-850	90	110	135	1.70:1	102	1	**FHP-182**
270	300-1200	135	170	200	1.70:1	102	1	**FHP-270**
410	450-1400	205	255	305	1.70:1	102	1	**FHP-410**
545	600-1600	225	320	410	1.70:1	102	1	**FHP-545**
680	750-1900	340	425	510	1.70:1	102	1	**FHP-680**
795	875-2000	400	500	600	1.70:1	102	1	**FHP-795**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	8	All Other

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SYNERGY® MICROWAVE CORPORATION

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HIGH PASS

HIGH SUPPRESSION

Leadless Surface-Mount Models

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 2 dB (MHz)	STOP BAND FREQUENCY (MHz) >50 dB	>30 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
10	10.7-50	5	6	7	1.70:1	124S	1	**FHHS-10**
20	21.4-100	10	12	14	1.70:1	124S	1	**FHHS-20**
27	30-150	14	17	20	1.70:1	124S	1	**FHHS-27**
45	50-250	23	29	34	1.70:1	124S	1	**FHHS-45**
55	60-300	28	35	41	1.70:1	124S	1	**FHHS-55**
64	70-300	32	40	48	1.70:1	124S	1	**FHHS-64**
127	140-630	65	80	95	1.70:1	124S	1	**FHHS-127**
182	200-850	90	110	135	1.70:1	124S	1	**FHHS-182**
270	300-1200	135	170	200	1.70:1	124S	1	**FHHS-270**
410	450-1400	205	255	305	1.70:1	124S	1	**FHHS-410**
545	600-1600	225	320	410	1.70:1	124S	1	**FHHS-545**
680	750-1900	340	425	510	1.70:1	124S	1	**FHHS-680**
795	875-2000	400	500	600	1.70:1	124S	1	**FHHS-795**

24 Pin - Through Hole Mount

Fc (MHz) LOSS = 3 dB (Nom)	PASSBAND LOSS < 2 dB (MHz)	STOP BAND FREQUENCY (MHz) >50 dB	>30 dB	>20 dB	PASS BAND V SWR (TYP)	PACKAGE	PIN-OUT (See Below)	MODEL
10	10.7-50	5	6	7	1.70:1	124	1	**FHH-10**
20	21.4-100	10	12	14	1.70:1	124	1	**FHH-20**
27	30-150	14	17	20	1.70:1	124	1	**FHH-27**
45	50-250	23	29	34	1.70:1	124	1	**FHH-45**
55	60-300	28	35	41	1.70:1	124	1	**FHH-55**
64	70-300	32	40	48	1.70:1	124	1	**FHH-64**
127	140-630	65	80	95	1.70:1	124	1	**FHH-127**
182	200-850	90	110	135	1.70:1	124	1	**FHH-182**
270	300-1200	135	170	200	1.70:1	124	1	**FHH-270**
410	450-1400	205	255	305	1.70:1	124	1	**FHH-410**
545	600-1600	225	320	410	1.70:1	124	1	**FHH-545**
680	750-1900	340	425	510	1.70:1	124	1	**FHH-680**
795	875-2000	400	500	600	1.70:1	124	1	**FHH-795**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	16	All Other

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24 PIN - THROUGH HOLE MOUNT
HIGH SUPPRESSION

Fc (MHz)	LOSS (dB)	1 dB RIPPLE BW (MHz)	20 dB BW (MHz)	40 dB BW (MHz) (50dB on low end)	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	3.5	0.5	9.63-11.8	8.5-12.85	124	1	**FBP-11**
21.4	3.5	1.0	19.26-23.6	17-25.70	124	1	**FBP-21**
30.0	3.5	1.5	27-33	24-36	124	1	**FBP-30**
45.0	3.5	2.2	40-50	35-56	124	1	**FBP-45**
50.0	4.0	2.5	45-56	40-62	124	1	**FBP-50**
60.0	4.0	3.0	54-67	48-74	124	1	**FBP-60**
70.0	4.6	3.5	63-77	56-86	124	1	**FBP-70**
140	5.0	8.0	125-160	110-175	124	1	**FBP-140**
200	6.0	12.0	180-230	155-250	124	1	**FBP-200**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies, please contact Synergy directly.

LEADLESS SURFACE-MOUNT MODELS
HIGH SUPPRESSION

Fc (MHz)	LOSS (dB)	1 dB RIPPLE BW (MHz)	20 dB BW (MHz)	40 dB BW (MHz) (50dB on low end)	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	3.5	0.5	9.63-11.8	8.5-12.85	124S	1	**FBS-11**
21.4	3.5	1.0	19.26-23.6	17-25.70	124S	1	**FBS-21**
30.0	3.5	1.5	27-33	24-36	124S	1	**FBS-30**
45.0	3.5	2.2	40-50	35-56	124S	1	**FBS-45**
50.0	4.0	2.5	45-56	40-62	124S	1	**FBS-50**
60.0	4.0	3.0	54-67	48-74	124S	1	**FBS-60**
70.0	4.6	3.5	63-77	56-86	124S	1	**FBS-70**
140	5.0	8.0	125-160	110-175	124S	1	**FBS-140**
200	6.0	12.0	180-230	155-250	124S	1	**FBS-200**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
Impedance is 50 Ohms for all models.

For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	16	All Other

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LEADLESS SURFACE-MOUNT MODELS

CENTER FREQUENCY (MHz)	INSERTION LOSS (dB) Max	PASSBAND (MHz)	35 dB BANDWIDTH (MHz)	VSWR	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	1.7	10.2 - 11.2	5.1 - 22.5	1.5:1	124S	1	**FNS-10.7**
21.4	1.7	20.3 - 22.5	10.2 - 45.0	1.5:1	124S	1	**FNS-21.4**
30.0	1.7	28.5 - 31.5	14.3 - 63.0	1.5:1	124S	1	**FNS-30**
45.0	1.7	42.8 - 47.3	21.3 - 94.5	1.5:1	124S	1	**FNS-45**
50.0	1.7	47.5 - 52.5	23.8 - 105	1.5:1	124S	1	**FNS-50**
60.0	1.7	57.0 - 63.0	28.4 - 126	1.5:1	124S	1	**FNS-60**
70.0	1.7	66.5 - 73.5	33.3 - 147	1.5:1	124S	1	**FNS-70**
100	2.7	95.0 - 105	47.5 - 210	1.5:1	124S	1	**FNS-100**
120	2.7	114 - 126	57.0 - 252	1.5:1	124S	1	**FNS-120**
140	2.7	133 - 147	66.5 - 294	1.5:1	124S	1	**FNS-140**
160	2.7	152 - 168	76.0 - 336	1.5:1	124S	1	**FNS-160**
180	2.7	171 - 189	85.5 - 378	1.5:1	124S	1	**FNS-180**
200	2.7	190 - 210	95 - 420	1.5:1	124S	1	**FNS-200**
250	3.0	238 - 262.5	119 - 525	1.5:1	124S	1	**FNS-250**
300	3.0	285.7 - 315	142.8 - 630	1.5:1	124S	1	**FNS-300**
350	3.0	333.3 - 367.5	166.7 - 735	1.5:1	124S	1	**FNS-350**
400	3.0	380.9 - 420	190.5 - 840	1.5:1	124S	1	**FNS-400**
450	3.0	428.6 - 472.5	214.3 - 945	1.5:1	124S	1	**FNS-450**
500	3.0	476.2 - 525	238.1 - 1050	1.5:1	124S	1	**FNS-500**

24 PIN - THROUGH HOLE MOUNT

CENTER FREQUENCY (MHz)	INSERTION LOSS (dB) Max	PASSBAND (MHz)	35 dB BANDWIDTH (MHz)	VSWR	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	1.7	10.2 - 11.2	5.1 - 22.5	1.5:1	124	1	**FNP-10.7**
21.4	1.7	20.3 - 22.5	10.2 - 45.0	1.5:1	124	1	**FNP-21.4**
30.0	1.7	28.5 - 31.5	14.3 - 63.0	1.5:1	124	1	**FNP-30**
45.0	1.7	42.8 - 47.3	21.3 - 94.5	1.5:1	124	1	**FNP-45**
50.0	1.7	47.5 - 52.5	23.8 - 105	1.5:1	124	1	**FNP-50**
60.0	1.7	57.0 - 63.0	28.4 - 126	1.5:1	124	1	**FNP-60**
70.0	1.7	66.5 - 73.5	33.3 - 147	1.5:1	124	1	**FNP-70**
100	2.7	95.0 - 105	47.5 - 210	1.5:1	124	1	**FNP-100**
120	2.7	114 - 126	57.0 - 252	1.5:1	124	1	**FNP-120**
140	2.7	133 - 147	66.5 - 294	1.5:1	124	1	**FNP-140**
160	2.7	152 - 168	76.0 - 336	1.5:1	124	1	**FNP-160**
180	2.7	171 - 189	85.5 - 378	1.5:1	124	1	**FNP-180**
200	2.7	190 - 210	95 - 420	1.5:1	124	1	**FNP-200**

NOTE: All units meet or exceed applicable MIL-F-18327.
For other frequencies and impedances please contact us.
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For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	16	All Other

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LEADLESS SURFACE-MOUNT MODELS

CENTER FREQUENCY (MHz)	INSERTION LOSS (dB) Max	PASSBAND (MHz)	20 dB BANDWIDTH (MHz)	40 dB BANDWIDTH (MHz)	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	1.5	9.80 - 11.6	7.49 - 13.9	3.40 - 32.1	102S	1	**FIS-10.7**
21.4	1.5	19.6 - 23.2	14.9 - 27.8	6.80 - 64.2	102S	1	**FIS-21.4**
30.0	1.5	27.5 - 32.5	21.0 - 39.0	9.30 - 90.0	102S	1	**FIS-30**
45.0	1.5	41.2 - 48.8	31.5 - 58.5	13.0 - 135	102S	1	**FIS-45**
50.0	1.5	45.8 - 54.3	35.0 - 65.0	15.8 - 150	102S	1	**FIS-50**
60.0	1.5	54.9 - 65.1	42.0 - 78.0	19.0 - 180	102S	1	**FIS-60**
70.0	1.5	64.0 - 75.9	49.0 - 91.0	20.3 - 210	102S	1	**FIS-70**
100	1.5	91.5 - 108.5	70.0 - 130	30.3 - 300	102S	1	**FIS-100**
120	1.5	109.8 - 130.2	84.0 - 156	36.0 - 360	102S	1	**FIS-120**
140	1.5	128.1 - 151.9	98.0 - 182	42.7 - 420	102S	1	**FIS-140**

LEADED SURFACE-MOUNT MODELS

CENTER FREQUENCY (MHz)	INSERTION LOSS (dB) Max	PASSBAND (MHz)	20 dB BANDWIDTH (MHz)	40 dB BANDWIDTH (MHz)	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	1.5	9.80 - 11.6	7.49 - 13.9	3.40 - 32.1	102L	1	**FIL-10.7**
21.4	1.5	19.6 - 23.2	14.9 - 27.8	6.80 - 64.2	102L	1	**FIL-21.4**
30.0	1.5	27.5 - 32.5	21.0 - 39.0	9.30 - 90.0	102L	1	**FIL-30**
45.0	1.5	41.2 - 48.8	31.5 - 58.5	13.0 - 135	102L	1	**FIL-45**
50.0	1.5	45.8 - 54.3	35.0 - 65.0	15.8 - 150	102L	1	**FIL-50**
60.0	1.5	54.9 - 65.1	42.0 - 78.0	19.0 - 180	102L	1	**FIL-60**
70.0	1.5	64.0 - 75.9	49.0 - 91.0	20.3 - 210	102L	1	**FIL-70**
100	1.5	91.5 - 108.5	70.0 - 130	30.3 - 300	102L	1	**FIL-100**
120	1.5	109.8 - 130.2	84.0 - 156	36.0 - 360	102L	1	**FIL-120**
140	1.5	128.1 - 151.9	98.0 - 182	42.7 - 420	102L	1	**FIL-140**

8 PIN - RELAY HEADER

CENTER FREQUENCY (MHz)	INSERTION LOSS (dB) Max	PASSBAND (MHz)	20 dB BANDWIDTH (MHz)	40 dB BANDWIDTH (MHz)	PACKAGE	PIN-OUT (See Below)	MODEL
10.7	1.5	9.80 - 11.6	7.49 - 13.9	3.40 - 32.1	102	1	**FIP-10.7**
21.4	1.5	19.6 - 23.2	14.9 - 27.8	6.80 - 64.2	102	1	**FIP-21.4**
30.0	1.5	27.5 - 32.5	21.0 - 39.0	9.30 - 90.0	102	1	**FIP-30**
45.0	1.5	41.2 - 48.8	31.5 - 58.5	13.0 - 135	102	1	**FIP-45**
50.0	1.5	45.8 - 54.3	35.0 - 65.0	15.8 - 150	102	1	**FIP-50**
60.0	1.5	54.9 - 65.1	42.0 - 78.0	19.0 - 180	102	1	**FIP-60**
70.0	1.5	64.0 - 75.9	49.0 - 91.0	20.3 - 210	102	1	**FIP-70**
100	1.5	91.5 - 108.5	70.0 - 130	30.3 - 300	102	1	**FIP-100**
120	1.5	109.8 - 130.2	84.0 - 156	36.0 - 360	102	1	**FIP-120**
140	1.5	128.1 - 151.9	98.0 - 182	42.7 - 420	102	1	**FIP-140**

NOTE: All units meet or exceed applicable MIL-F-18327.

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For pin location and package outline drawings, see back pages.

PIN-OUT TABLE

INPUT	OUTPUT	CASE GROUND
1	8	All Other

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SYNERGY® MICROWAVE CORPORATION

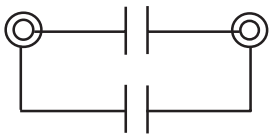
DC BLOCK

158

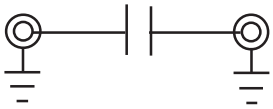
FREQUENCY RANGE: 1 - 1000 MHz

DC BLOCK

Because of their inherent high breakdown potential, the DC Blocks are ideal for applications where a high voltage, DC or AC up to 20 KHz, must be rejected from the RF signal path. Leakage from modulating signals can occur via AC power lines, through ground loops, or along poorly grounded coaxial cables. These leakages can impair the accuracy of RF measurements, and or signal purity.



DUAL BLOCK



SINGLE BLOCK

FREQUENCY RANGE (MHz)	INSERTION LOSS (dB) LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	VOLTAGE BREAKDOWN (Vdc)	VSWR LB TYP/MAX	MB TYP/MAX	UB TYP/MAX	TYPE	MODEL
3-500	0.06/0.20	0.04/0.20	0.10/0.20	2500	1.12:1/1.20:1	1.08:1/1.20:1	1.12:1/1.25:1	Single	**BLK-711N**
5-500	0.12/0.20	0.10/0.20	0.12/0.25	2500	1.18:1/1.25:1	1.12:1/1.20:1	1.20:1/1.30:1	Dual	**BLK-721N**
1-1000	0.20/0.30	0.10/0.20	0.40/0.50	2500	1.40:1/1.50:1	1.10:1/1.20:1	1.40:1/1.50:1	Single	**BLK-712N**
3-900	0.25/0.40	0.15/0.30	0.30/0.40	2500	1.18:1/1.25:1	1.23:1/1.32:1	1.35:1/1.45:1	Dual	**BLK-722N**

NOTE: For different connector requirements, please contact Synergy.
Impedance is 50 Ohms for all models.

LB = LF to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF

For package outline drawing, see back pages.

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SYNERGY® MICROWAVE CORPORATION

SILICON BIPOLAR MONOLITHIC AMPLIFIERS

ELECTRICAL SPECIFICATIONS


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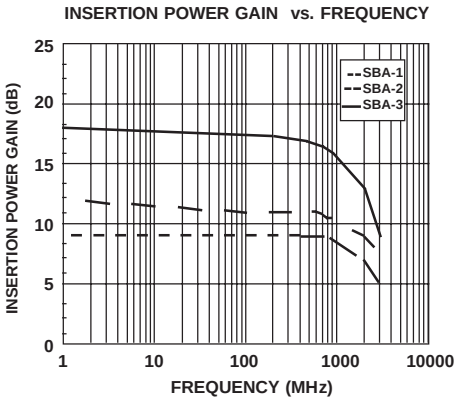
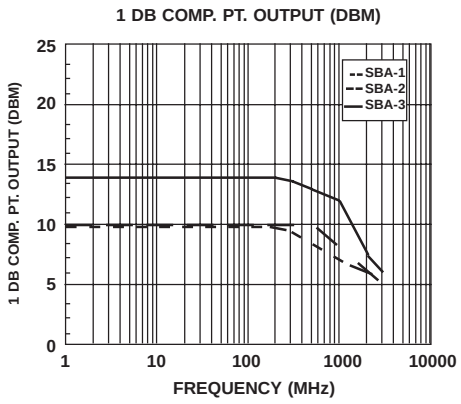
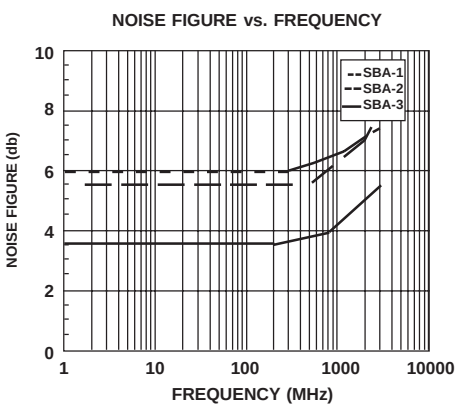
MODEL	SBA-1	SBA-2	SBA-3
Operating Frequency:	DC - 2000 MHz	DC - 2000 MHz	DC - 2000 MHz
Gain (dB):	Typ / Min	Typ / Min	Typ / Min
100 MHz:	9.0 / 7.0	11.0 / 10.5	18.0 / 12.0
500 MHz:	9.0 / 7.0	10.5 / 10.0	16.5 / 11.0
1000 MHz:	8.5 / 6.5	9.5 / 9.0	15.0 / 10.0
2000 MHz:	6.8 / 5.5	7.8 / 6.0	10.0 / 7.5
Typical Output 1 dB Comp Pt.:			
100 MHz:	+12 dBm	+9 dBm	+14.8 dBm
500 MHz:	+12 dBm	+9 dBm	+13.7 dBm
1000 MHz:	+9.5 dBm	+8.5 dBm	+11.8 dBm
2000 MHz:	+6.5 dBm	+8.0 dBm	+10.5 dBm
Typical VSWR:	Input / Output	Input / Output	Input / Output
100 MHz:	1.3:1 / 1.5:1	1.3:1 / 1.5:1	1.1:1 / 1.5:1
500 MHz:	1.3:1 / 1.5:1	1.3:1 / 1.5:1	1.2:1 / 1.5:1
1000 MHz:	1.3:1 / 1.5:1	1.3:1 / 1.5:1	1.2:1 / 1.5:1
2000 MHz:	1.3:1 / 1.5:1	1.3:1 / 1.5:1	1.3:1 / 1.5:1
Typical Noise Figure:			
100 MHz:	6.0 dB	5.5 dB	3.5 dB
500 MHz:	6.2 dB	6.0 dB	3.5 dB
1000 MHz:	6.5 dB	6.2 dB	4.0 dB
2000 MHz:	7.0 dB	7.0 dB	5.0 dB

TYPICAL PERFORMANCE CHARACTERISTICS







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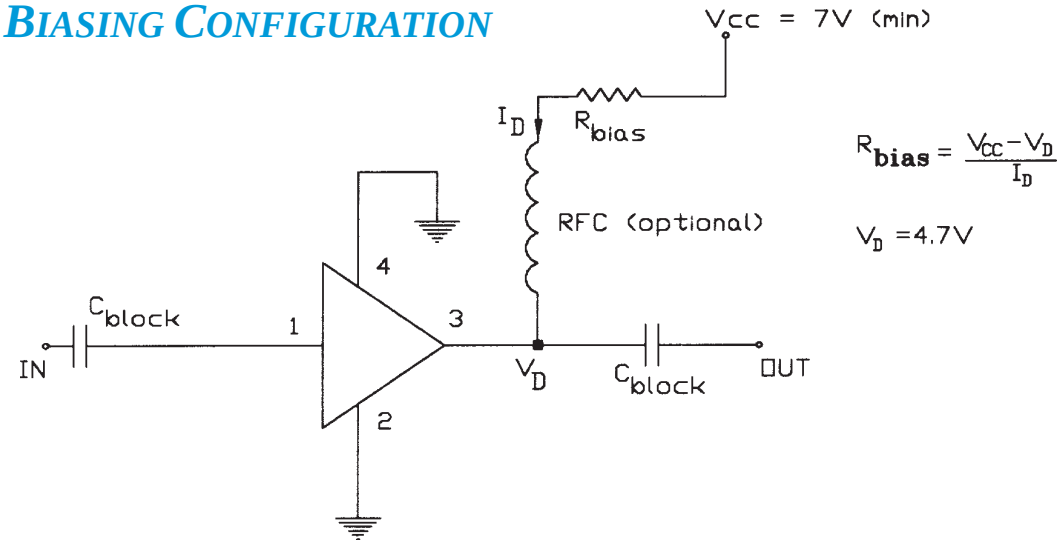
SYNERGY® MICROWAVE CORPORATION

SILICON BIPOLAR MONOLITHIC AMPLIFIERS

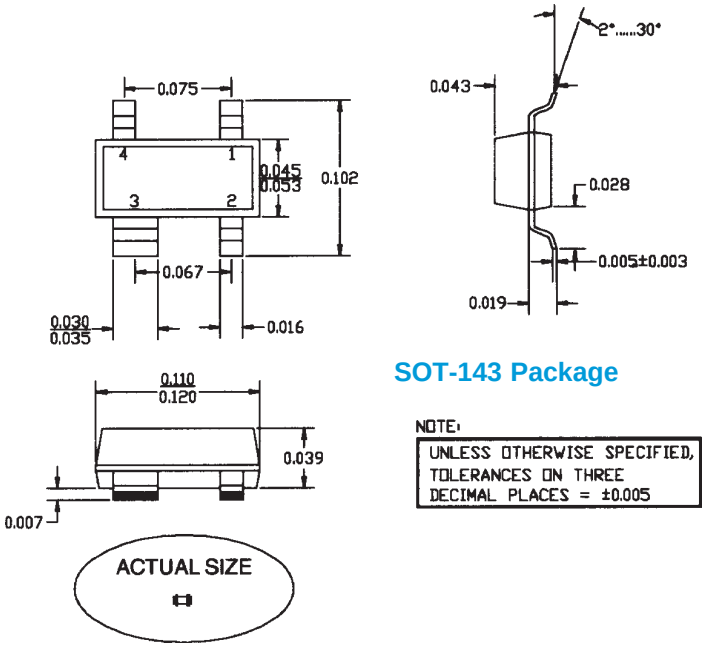
TYPICAL BIASING CONFIGURATION



$$R_{bias} = \frac{V_{CC} - V_D}{I_D}$$

V_D = 4.7V

MECHANICAL OUTLINE



SOT-143 Package

NOTE:
UNLESS OTHERWISE SPECIFIED, TOLERANCES ON THREE DECIMAL PLACES = ±0.005

MAXIMUM RATINGS

Parameter	Symbol	Unit
Device Current	I_D	60 mA
Total Power Dissipation, T_s < 99 °C	P_{tot}	250 mW
RF Input Power	P_{RFin}	10 dBm
T_s = Case Temperature		
Junction Temperature	T_j	150°C
Ambient Temperature	T_A	-45 to +85°C
Storage Temperature	T_{stg}	-65 to +150°C

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SYNERGY® MICROWAVE CORPORATION

ATTENUATORS / SWITCHES

Through-Hole
8-PIN RELAY HEADER

FREQUENCY RANGE (MHz) LF-HF	INSERTION (dB) LOSS XMB TYP/MAX	INSERTION (dB) LOSS FULL BAND TYP/MAX	ISOLATION (dB) LOSS LB TYP/MAX	ISOLATION (dB) LOSS MB TYP/MAX	ISOLATION (dB) LOSS UB TYP/MAX	SWITCH SPEED TYP	1dB COMP PT.(dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
1-200	1.4/2.0	1.6/2.5	65/50	50/40	50/35	2µsec	0	102	1	**AT-201**
5-400	5.5/6.5	6.0/7.5	75/70	--	65/55	10nsec	0	102	2	**AT-213**
5-450	2.5/3.5	3.5/4.7	65/50	45/35	35/25	2µsec	0	102	1	**AT-203**
5-700	6.0/7.5	8.0/10.0	90/75	80/70	60/45	2µsec	0	102	1	**AT-214**
10-1000	3.5/5.5	6.5/8.5	50/40	40/30	35/25	2µsec	0	102	1	**AT-204**

Coaxial Connector

FREQUENCY RANGE (MHz) LF-HF	INSERTION (dB) LOSS XMB TYP/MAX	INSERTION (dB) LOSS FULL BAND TYP/MAX	ISOLATION (dB) LOSS LB TYP/MAX	ISOLATION (dB) LOSS MB TYP/MAX	ISOLATION (dB) LOSS UB TYP/MAX	SWITCH SPEED TYP	1dB COMP PT.(dBm)	PACKAGE	PIN-OUT (See Below)	MODEL
5-400	5.5/6.5	6.0/7.5	75/70	--	65/55	10nsec	0	110	3	**AK-711***
5-450	2.5/3.5	3.5/4.7	65/50	45/35	35/25	2µsec	0	110	3	**AK-703***
5-700	6.0/7.5	8.0/10.0	90/75	80/70	60/45	2µsec	0	110	3	**AK-707***
10-1000	3.5/5.5	6.5/8.5	50/40	40/30	35/25	2µsec	0	110	3	**AK-706***

*Select Connector: "B" = BNC, "S" = SMA, "N" = TYPE N, "T" = TNC

LB = L F to 10 LF
MB = 10 LF to HF/2
UB = HF/2 to HF
XMB = 2 LF to HF/2
FULL BAND = LF to HF

PIN-OUT TABLE

	INPUT	OUTPUT	CONTROL	GROUND	CASE GND
# 1	1	8	*3,4	2,5,6,7	2
#2	1	8	*3,4	2,5,6,7	2,5,6,7
#3	1	8	2	--	--

* Connect together externally

For pin location and package outline drawings, see back pages.

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