



电子元器件系列(中国.厦门) China.Xiamen
www.rf-china.com RF-Micom co.,Ltd

Email:sales@rf-china.com

Telephone:0086-592-5713956 Fax:5201617

PASSIVES

SPLITTERS/COMBINERS						
Part Number	Frequency (MHz)	Type	Insertion Loss (dB)	Isolation (dB)	Amplitude Balance (dB)	Package Style
DS-327	5 - 1000	2-Channel	0.3	35	0.1	FP-2
ELPD-20-1	5 - 1000	2- Channel	0.7	22	0.5	SM-93
ESSMJ-2-10-75	5 - 1000	2- Channel	0.4	29	0.3	SM-44
ESSMJ-2-12-75	5 - 1000	2- Channel	0.5	30	0.3	SM-44
DS-313	10 - 2000	2- Channel	1.8	18	0.6	SF-1
DS-409-4 SMA	10 - 2000	4-Channel	1.5	20	1	C-17 SMA
DS-109	10 - 500	2-Channel	0.9	25	0.2	FP-2
DS-319	10 - 500	2-Channel	0.9	25	0.2	TO-8-2
DSS-313	10 - 500	2-Channel	1.8	18	0.6	FP-2
DS-323	25 - 1000	3-Channel	0.4	35	0.4	FP-3
DS-324	25 - 1000	4-Channel	1	20	0.25	FP-5
DS52-0001	824 - 960	2- Channel	0.5	23	0.1	SOIC-8
DS53-0001	824 - 960	3-Channel	0.1	18	0.6	SOIC-8
DS54-0001	824 - 960	4-Channel	1	23	0.3	SOW-16
DS52-0004	1510 - 1660	2- Channel	0.4	20	0.1	SOIC-8
DS52-0005	1700 - 1900	2- Channel	0.3	20	0.1	SOIC-8
DS54-0002	1700 - 2000	4-Channel	1	23	0.3	SOW-16
DS52-0002	1850 - 1990	2- Channel	0.5	21	0.1	SOIC-8
DS52-0007	2200 - 2500	2- Channel	1	20	0	SOT-27

QUADRATURE HYBRIDS						
Part Number	Frequency (MHz)	Impedance Ω	Insertion Loss (dB)	Isolation (dB)	Amplitude Balance (dB)	Package Style
JH-139	250 - 500	50	0.5	30	1	FP-2
JH-140	500 - 1000	50	0.3	18	1	FP-2

COUPLERS							
Part Number	Frequency (MHz)	Imped. Ω	Coupling Nominal (dB)	Coupling Flatness (dB)	Typ. Mainline Loss (dB)	Isolation (dB)	Package Style
H-9 N	2 - 2000	50	—	—	—	30	C-21 w/ N connector
H-9 SMA	2 - 2000	50	—	—	—	30	C-21 w/ SMA connector
EMDC-10-1-75	5 - 1000	75	10	—	1.3	—	SM-22
H-183-4 SMA	30 - 3000	50	—	—	—	20	C-11 w/ SMA connector
CH20-0032-17G	824 - 960	50	17	1.2	0.3	32	SOIC-8
CH20-0033-17G	1700 - 2000	50	17	1.2	0.3	38	SOIC-8

PASSIVES (cont'd)

TRANSFORMERS						
Part Number	Frequency (MHz)	Impedance Ratio	Insert. Loss 3 dB Bandwidth	Insert. Loss 2dB Bandwidth	Insert. Loss 1dB Bandwidth	Package Style
ETC1-1T	0.3 - 200	1:1	—	—	0.3 - 200	SM-22
ETC4-1	1 - 350	4:1	1 - 350	2 - 300	5 - 100	SM-22
MABAES0031	1 - 650	4:01	450 - 650	1 - 450	10 - 200	SM-138
ETC4-1-2	2 - 800	4:1	2 - 800	5 - 600	10 - 100	SM-22
ETC1-1-13	4.5 - 3000	1:1	2000 - 3000	1000 - 2000	4.5 - 1000	SM-22
ETC1.5-4	5 - 1000	1.5:1	—	—	5 - 1000	SM-22
MABAES0029	50 - 1200	1:01	—	—	50 - 600	SM-138

RF PULSE TRANSFORMERS						
Part Number	Frequency (MHz)	Insertion Loss (dB)	Droop (nS, 10%)	Input Impedance Ω	Output Impedance Ω	Product Features
TP-103	0.05 - 1000	0.6	160	50	200	FP-1
TP-101	0.05 - 1500	0.5	300	50	50	FP-1

POWER DIVIDERS					
Part Number	Frequency (GHz)	Type	Insertion Loss (dB)	Typ. Isolation (dB)	Package Style
MAPDGM0001-DIE	1 - 5	3dB	3.8	15	DIE

DIPLEXERS					
Part Number	Frequency (MHz)	Impedance Ω	Passband Insertion Loss (dB)	Stopband Isolation (dB)	Package Style
EDF-2E	5 - 1000	75	0.5	45	SM-85
MAFLES0083	5 - 1000	75	0.5	50	SM-85

ISOLATORS						
Part Number	Frequency (MHz)	Isolation (dB)	Insertion Loss (dB)	Max. Forward Power (W)	Max. Reverse Power (W)	Package Style
MAFRIN0167	869 - 894	25	0.2	100	70	Drop-In
MAFRIN0160	925 - 960	25	0.2	100	70	Drop-In
MAFRIN0164	1805 - 1880	25	0.2	100	70	Drop-In
MAFRIN0203	1805 - 1880	25	0.25	20	10	Miniature SMT
MAFRIN0165	1930 - 1990	25	0.2	100	70	Drop-In
MAFRIN0204	1930 - 1990	25	0.25	20	10	Miniature SMT
MAFRIN0166	2090 - 2190	25	0.2	100	70	Drop-In
MAFRIN0205	2110 - 2170	25	0.25	20	10	Miniature SMT

PHASE SHIFTERS					
Part Number	Frequency (GHz)	Insertion Loss (dB)	Resolution (degrees)	RMS Phase Error (degrees)	Package Style
MAPCGM0001	1.0 - 1.9	6	6-bit - 5.625	5	FQFP-N 28L
MAPCGM0001-DIE	1.0 - 1.9	5.5	6-bit - 5.625	5	DIE
MAPCGM0003	2.3 - 4.1	6	6-bit - 5.625	6	FQFP-N 28L
MAPCGM0003-DIE	2.3 - 4.1	6	6-bit - 5.625	6	DIE
MAPCGM0002-DIE	3.5 - 6	6	6-bit - 5.625	6	DIE
MAPCGM0004-DIE	6 - 18	12	5-bit - 11.25	10	DIE

DIGITALLY-SWITCHED DELAY LINE						
Part Number	Frequency (GHz)	Control Step Range (pS)	Control Step Size (pS)	Insertion Loss (dB)	Output IP3 (dBm)	Package Style
MAMUSM0008	1.8 - 2.4	750	50	5	38	BGA

ATTENUATORS						
Part Number	Frequency (GHz)	Insertion Loss (dB)	Typical Attenuation Range (dB)	IP3 (dBm)	Product Features	Package Style
AT-107	DC - 2.0	3.2	0 - 31.5	48	Digital, 6 bit, TTL driver	CR-13
AT20-0106	DC - 2.0	4	0 - 50	46	Digital, 6 bit, TTL driver	CR-13
AT20-0107	DC - 2.0	3.2	0 - 31.5	48	Digital, 6 bit, TTL driver	CR-13
AT-210	DC - 2.0	1.5	0 - 15	50	Digital, 4 bit, high accuracy	SOIC-16
AT-220	DC - 2.0	1.6	0 - 30	50	Digital, 4 bit, high accuracy	SOIC-16
AT-230	DC - 2.0	1.6	0 - 28	50	Digital, 3 bit, high accuracy	SOIC-14
AT-250	DC - 2.0	3.2	0 - 15	18	0-5V Control	SO-8
AT-255	DC - 2.0	3.5	0 - 25	18	Single Bias	SO-8
AT-259	DC - 2.0	3.2	0 - 14	18	Single Bias	SO-8
AT-260	DC - 2.0	1.6	0 - 31	34	Digital, 5 bit, TTL driver	SSOP-20
AT-263	DC - 2.0	2.8	0 - 31	48	Digital, 5 bit, TTL driver	CR-12
AT-273	DC - 2.0	1.6	0 - 32	38	Digital, 2 bit, TTL driver	CR-11
AT-280	DC - 2.0	1.1	0 - 15.5	40	Digital, 5 bit, TTL driver	SO-16
AT65-0106	DC - 2.0	4.2	0 - 50	48	Digital, 6 bit, TTL driver	SOW-24
AT65-0107	DC - 2.0	3.4	0 - 31.5	48	Digital, 6 bit, TTL driver	SOW-24
AT65-0233	DC - 2.0	3	0 - 30	50	Digital, 4 bit, TTL driver	SO-16
AT65-0263	DC - 2.0	3	0 - 31	48	Digital, 5 bit, TTL driver	SOW-16
AT65-0283	DC - 2.0	2.2	0 - 15.5	48	Digital, 5 bit, TTL driver	SOW-16
AT65-0413	DC - 2.0	1.9	0 - 15	50	Digital, 4 bit, TTL driver	SO-16
AT90-0106	DC - 2.4	4.5	0 - 50	48	Digital, 6-Bit, TTL Driver	FQFP-N
AT90-1106	DC - 2.4	4.5	0 - 50	48	Digital, 6-Bit, TTL Driver, Single Supply	FQFP-N
AT-213	DC - 3.0	2	0 - 15	40	Digital, 4-Bit, TTL Driver	CR-11
AT90-1283	DC - 3.5	1.8	0 - 15.5	48	Digital, 5-Bit, TTL Driver, Single Supply	FQFP-N
AT90-0107	DC - 4.0	3	0 - 31.5	48	Digital, 6-Bit, TTL Driver	FQFP-N
AT90-0263	DC - 4.0	3.6	0 - 31	48	Digital, 5-Bit, TTL Driver	JEDEC
AT90-1107	DC - 4.0	3	0 - 31.5	48	Digital, 6-Bit, TTL Driver, Single Supply	FQFP-N
AT90-1263	DC - 4.0	2.8	0 - 31	48	Digital, 5-Bit, TTL Driver, Single Supply	FQFP-N
AT90-0001	DC - 6.0	2.1	0 - 31	48	Digital, 5-Bit, TTL Driver	FQFP-N
AT10-0019	0.05 - 1.0	2.4	0 - 42	37	PIN diode, Voltage Variable	SOW-16
AT-108	0.4 - 2.5	2.5	0 - 40	12	0-5V Single Bias	SO-8
AT-109	0.4 - 2.5	2.5	0 - 35	12	0-5V Control	SO-8
AT-110	0.4 - 2.5	3	0 - 30	12	0-5V Control	SO-8
AT-264	0.5 - 2.0	2	0 - 30	34	Digital, 4 bit, Single Control	TSSOP-16
AT-113	0.5 - 2.5	2.5	0 - 35	12	0-5V Control, linear	SO-8
MAATSS0001	0.5 - 2.5	1.9	0 - 15	46	Digital, 5 bit, Single Control	SSOP-16
MAATSS0002	0.8 - 2.5	1.8	0 - 31	46	Digital, 5 bit	SSOP-16
AT65-0008	0.9 - 2.5	1.2	0 - 25	40	Voltage Variable	SO-8
MAATGM0001-DIE	2.0 - 6.0	3	0 - 35.4	36	Wideband 6 bit attenuator chip	DIE
MAATGM0004-DIE	2.0 - 20.0	4	0 - 23.25	32	Digital, 5 bit	DIE

TRANSISTORS

AVIONICS RF						
Part Number	Frequency (MHz)	Pout (W)	Gain (dB)	Efficiency (%)	Vcc (V)	Package Style
MRF10005	960 - 1215	5	10.3	—	28	Ceramic
MRF1000MB	960 - 1215	0.7	10	—	18	Ceramic
MRF10031	960 - 1215	30	9	40	36	Ceramic
MRF1004MB	960 - 1215	4	10	40	35	Ceramic
MRF10120	960 - 1215	120	8	50	36	Ceramic
MRF1090MA	960 - 1215	90	8.4	35	50	Ceramic
MRF1090MB	960 - 1215	90	8.4	35	50	Ceramic
MRF1150MA	960 - 1215	150	7.8	35	50	Ceramic
MRF1150MB	960 - 1215	150	7.8	35	50	Ceramic
MRF10150	1025 - 1150	150	9.5	40	50	Ceramic
MRF10502	1025 - 1150	500	8.5	40	50	Ceramic
MRF16006	1600 - 1640	6	74	40	28	Ceramic
MRF16030	1600 - 1640	30	7.5	40	28	Ceramic
MRF3104	1600 - 1640	0.5	10.5	—	20	Ceramic

COMMUNICATIONS BIPOLAR						
Part Number	Frequency (MHz)	Pout (W)	Gain (dB)	Efficiency (%)	Vcc (V)	Package Style
MRF314	30 - 200	30	10	50	28	Ceramic
MRF316	30 - 200	80	10	55	28	Ceramic
MRF317	30 - 200	100	9	55	28	Ceramic
MRF171A	100 - 200	45	17	60	28	Ceramic
MRF313	100 - 400	1	15	45	28	Ceramic
MRF392	100 - 400	125	10	55	28	Ceramic
MRF393	100 - 500	100	9.5	55	28	Ceramic
MRF587	100 - 500	—	16.5	—	15	Ceramic
MRF321	150 - 400	10	12	50	28	Ceramic
MRF323	150 - 400	20	10	50	28	Ceramic
MRF327	225 - 400	80	7.3	50	28	Ceramic

TRANSISTORS (cont'd)

RF POWER MOSFET (BROADCAST)						
Part Number	Frequency (MHz)	Pout (W)	Gain (dB)	Efficiency (%)	Vcc (V)	Package Style
MRF141	5 - 175	150	18	40	28	Ceramic
MRF173	5 - 175	80	11	60	28	Ceramic
MRF173CQ	5 - 175	80	13	60	28	Ceramic
MRF174	5 - 200	125	9	50	28	Ceramic
MRF175GV	5 - 225	200	14	65	28	Ceramic
MRF176GV	5 - 225	200	17	55	50	Ceramic
MRF134	5 - 400	5	11	50	28	Ceramic
MRF136	5 - 400	15	16	60	28	Ceramic
MRF136Y	5 - 400	30	14	54	28	Ceramic
MRF137	5 - 400	30	13	60	28	Ceramic
MRF175GU	5 - 400	150	12	55	28	Ceramic
MRF175LU	5 - 400	100	10	55	28	Ceramic
MRF176GU	5 - 400	150	14	50	50	Ceramic
MRF177	5 - 400	100	12	60	28	Ceramic
MRF158	5 - 500	2	16	55	28	Ceramic
MRF160	5 - 500	4	16	55	28	Ceramic
MRF166C	5 - 500	20	13.5	50	28	Ceramic
MRF166W	5 - 500	40	14	50	28	Ceramic
MRF275G	5 - 500	150	10	50	28	Ceramic
MRF275L	5 - 500	100	8.8	55	28	Ceramic

RF POWER MOSFET (MEDICAL/INDUSTRIAL)						
Part Number	Frequency (MHz)	Pout (W)	Gain (dB)	Efficiency (%)	Vcc (V)	Package Style
MRF421	1 - 30	100	10	40	12.5	Ceramic
MRF422	1.5 - 30	150	10	40	28	Ceramic
MRF426	1.5 - 30	25	22	35	28	Ceramic
MRF428	2 - 30	150	15	45	50	Ceramic
MRF448	2 - 30	250	12	45	50	Ceramic
MRF454	2 - 30	80	12	50	12.5	Ceramic
MRF455	2 - 30	60	13	55	12.5	Ceramic
MRF429	2 - 60	150	13	45	50	Ceramic
MRF154	5 - 80	600	17	45	50	Ceramic
MRF157	5 - 80	600	21	45	50	Ceramic
MRF140	5 - 150	150	15	40	28	Ceramic
MRF150	5 - 150	150	17	45	28	Ceramic
MRF141G	5 - 175	300	12	50	28	Ceramic
MRF148A	5 - 175	30	18	40	28	Ceramic
MRF151	5 - 175	150	13	40	28	Ceramic
MRF151G	5 - 175	300	14	50	28	Ceramic

SWITCHES

SWITCHES							
Part Number	Frequency (GHz)	Type	Insertion Loss (dB)	Typ. Isol. (dB)	IP3 (dBm)	Product Features	Package Style
MASW20000	DC - 2	SPDT	1.7	50	43	0.083X0.035X0.004	CHIP
SW-395	DC - 2	SDPT	0.7	25	52	3V, low cost	SOT-26
SW-239	DC - 2.5	SPDT	0.6	25	46	General purpose	SOIC-8
SW-259	DC - 2.5	SPST	1	35	46	Terminated	SOIC-8
SW-277	DC - 2.5	SPDT	0.5	40	61	High power handling / power control	SOIC-8
SW-279	DC - 2.5	SPDT	0.5	38	61	High power handling	SOIC-8
SW-338	DC - 2.5	SPDT	0.5	33	46	Terminated	SOIC-338
SW-311	DC - 3	SPDT	1	40	40	TTL/CMOS driver	CR-9
SW-313	DC - 3	SPDT	0.9	50	30	Matched w/ TTL / CMOS control	CR-9
SW-314	DC - 3	SP4T	1.4	45	46	Absorptive	CR-14
SW-437	DC - 3	SPDT	0.3	15	55	Terminated, Low Power consumption	SOT-363
SW-438	DC - 3	SPDT	0.7	25	55	Low loss, High isolation	SOT-323
SW-439	DC - 3	SPDT	0.6	33	50	High isolation	MSOP-10
MASW6010G	DC - 6	SPDT	0.6	45	—	0.031X0.031X0.004	DIE
MA4SW110	DC - 26.5	SPST	0.5	47	—	Si PIN HMIC Switch	DIE
MA4SW210	DC - 26.5	SPDT	0.5	50	—	Si PIN HMIC Switch	DIE
MA4SW310	DC - 26.5	SP3T	0.5	57	—	Si PIN HMIC Switch	DIE
MA4SW410	.05 - 26	SP4T	0.9	34	—	Si PIN HMIC Switch	DIE
MASWS0024	0.5 - 3	SPDT	0.7	50	43	High isolation, terminated	MSOP-8-EP
MASWS0040	0.5 - 3	DP2T	0.7	19	52	Low insertion loss	FQFP-N
SW-475	0.5 - 3	SPDT	0.7	48	43	Positive supply voltage	FQFP-N
SW-485	0.5 - 3	SPDT	0.3	23	46	Low loss, small size	SOT-323
SW-335	0.8 - 2	SPDT	0.8	38	50	Integrated CMOS driver	SOIC-8
MASWGM0003-DIE	1 - 8	SPDT	1.8	45	35	TTL / CMOS control, non-reflective	DIE
MASWGM0001-DIE	2 - 14	DPDT	3	40	33	TTL / CMOS control, non-reflective	DIE
MASWGM0002-DIE	2 - 20	SPDT	4.3	35	29	On-chip TTL compatible driver	DIE
MASWS0039	4.5 - 6	DP2T	0.8	25	52	Low insertion loss	FQFP-N
MASWSM0002	5.15 - 5.35	SPDT	1	21	51	Fast switching speed	FQFP-N
MA4GC6772	77	Multi	4	24	—	2 ns switching speed	DIE
MA4GC6773	77	SPDT	1.2	24	—	2 ns switching speed	DIE
MA4GC6774	77	SP3T	1.4	24	—	2 ns switching speed	DIE

SWITCHES (cont'd)

DRIVERS			
Part Number	Type	Product Features	Package Style
SWD-119	Quad	Used to translate TTL control voltages for GaAs FET switches and attenuators	S0-16

FREQUENCY CONVERSION

MIXERS							
Part Number	Frequency (GHz)	Range IF (MHz)	Conv. Loss (dB)	Isolation LO-RF (dB)	Input 1 dB Comp. Point (dBm)	LO Drive Level (dBm)	Package Style
SM4T	0.001 - 3.4	1 - 2000	8	35	13	10	SurMount
SM4T17	0.001 - 3.4	1 - 2000	8	30	13	17	SurMount
MD-169	0.001 - 3.5	5 - 15000	10	25	24	24	FP-2
ELCM-1	0.005 - 0.5	DC - 500	6.2	27	1	7	SM-89
ELCM-25MH	0.005 - 2.5	5 - 1500	6.3	35	—	13	SM-87
MD-158	0.005 - 1.5	DC - 1000	6	35	1	8	FD-2
M8TC	0.01 - 3.4	0.01 - 2	7	35	7	10	TO-8 SMA
SM5T	0.05 - 5	50 - 3000	7.5	33	7	10	SurMount
MD57-0001	0.07 - 1	—	9.3	28	14	—	SOT-26
ESMD-C50H	0.08 - 2.5	DC - 1000	6.5	34	—	17	SM-2
ESMD-C50L	0.08 - 2.5	DC - 1000	7.5	32	—	3	SM-2
ESMD-C50M	0.08 - 2.5	DC - 1000	7	34	—	13	SM-2
MD-154	0.3 - 5	0.1 - 3000	10	11	7	10	FP-3
MA4EX900L-1226	0.7 - 1	DC - 300	8	25	1	5	MSOP-8
MD54-0004	0.8 - 1	DC - 100	7.5	38	21	13	S0-8
MD54-0005	0.8 - 1	DC - 150	8.5	25	15	5	SOT-25
EFM-900	0.81 - 1	10 - 100	8.5	—	22	13	SM-108
MA4EX240L-1225	1.7 - 2.5	DC - 400	7	17.5	1	5	SOT-25
MD54-0003	1.7 - 2	DC - 200	8.5	27	21	13	S0-8
EFM-1900	1.85 - 1.98	100 - 500	7.5	19	32	13	SM-106
CSM2-17	1.9 - 2.2	160 - 390	7.3	43	14	17	AK
MY82	2 - 18	0.03 - 5	8	25	—	—	VPAC
EFM-2100	2.11 - 2.17	100 - 500	8.5	16	22	13	SM-106
MA4EX370L-1225	3 - 4	DC - 1050	8.5	14	2	5	SOT-25
MA4EX600H-1225	4.2 - 6	DC - 2000	5.8	28	8	13 - 17	SOT-25
MA4EX580L-1225	4.7 - 6	DC - 1050	8.5	23	1.6	5	SOT-25
MY77C	8 - 12.5	DC - 2500	5.5	35	4	10	VPAC SMA
MA4EX2401	20 - 26	500 - 6000	8	30	10.5	13 - 17	DIE

FREQUENCY DOUBLERS

Part Number	Input Frequency (MHz)	Output Frequency (MHz)	Conversion Loss (dB)	Spurious	Package Style
SFD25	5 - 2400	10 - 4800	11.5	27	TO-8 SMA

AMPLIFIERS

GENERAL PURPOSE AMPLIFIERS					
Part Number	Frequency (GHz)	Gain (dB)	Noise Figure (dB)	1 dB Comp. (dBm)	Package Style
MAAMSS0014	0.05 - 0.45	18	4.4	22	SOT-89
MAAMSS0017	0.9 - 1.9	19	5	24	SOT-89
MAAMSS0007	1.7 - 2.5	13	5.5	23	FQFP-N

LOW NOISE AMPLIFIERS					
Part Number	Frequency (GHz)	Gain (dB)	Noise Figure (dB)	1 dB Comp. (dBm)	Package Style
A79	0.002 - 0.35	14	4	22	TO-8
AM-131	0.005 - 0.5	10	7.5	16	TO-8-1
AM-162	0.01 - 0.1	12.5	1.6	13	TO-8-1
AM-147	0.05 - 0.2	17	4.5	19	TO-8-1
MAALSS0012	0.2 - 3	12	1.5	21	SOT-363
AM50-0011	0.8 - 1	16	0.95	0.8	SOT-26
AM50-0003	0.8 - 1	15	1.5	16.5	SOIC-8
MAAM12021	1.5 - 1.6	21	1.6	6	SOIC-8
AM50-0002	1.575	27	1.2	1	SOIC-8
AM50-0004	1.7 - 2	14	1.5	16	SOIC-8
MAAM12031	1.7 - 2	20	1.65	7	SO-8
AM50-0012	1.8 - 2.2	19	1.4	20	FQFP-N
MAAM28000	2 - 8	17	5.5	14	DIE
MAAM28000-A1	2 - 8	17	5.5	14	CR-3
MAALSS0013	2.2 - 2.4	17	1.1	10	SOT-26
MAAM37000	3.5 - 7	17	2.2	14	DIE
MAAM37000-A1	3.5 - 7	17	5.5	14	CR-3
MAAM37000-A1G	3.5 - 7	17	5.5	14	CR-3
MAALGM0003-DIE	5 - 8	14	2.1	13	DIE
MAAM71200	7.5 - 12	15.5	2.7	11	DIE
MAAM71200-H1	7.5 - 12	15.5	2.7	14	CR-16

SIGNAL LIMITING AMPLIFIERS						
Part Number	Frequency (MHz)	Insertion Loss (dB)	Limiting Level (dB)	Input VSWR (In/Out)	Output VSWR (In/Out)	Package Style
SML1	5 - 3000	2 - 3	2.5 - 4.5	1.9 - 2.1	2 - 2.2	TO-8

AMPLIFIERS (cont'd)

POWER AMPLIFIERS						
Part Number	Frequency (GHz)	Gain (dB)	Output Psat (dBm)	1 dB Comp. (dBm)	Output IP3 (dBm)	Package Style
MAAPSM0015-DIE	DC - 20	11	21	--	--	DIE
MA02107AF	0.9 - 0.942	30.8	30.8	--	--	TSSOP
MAAPGM0026-DIE	1 - 3.3	20	28	27	36	DIE
MAAPGM0036-DIE	1.2 - 3.2	20	31	30	40	DIE
MA02206GJ	1.8 - 2	28.7	26.7	--	--	MSOP-8
MA02205AF	1.88 - 1.93	29.3	--	27.2	--	TSSOP
MAAPGM0027-DIE	2 - 4	22	30	29	37	DIE
MAAM26100	2 - 6	18	28	30	39	DIE
MAAM26100-B1	2 - 6	18	29	27	39	CR-2
MAAM26100-B1G	2 - 6	18	29	27	39	CR-2
MAAM26100-P1	2 - 6	18	30	--	40	CR-15
MAAPGM0028-DIE	2 - 8	14	28	26	--	DIE
MA02303GJ	2.2 - 2.6	26	26	--	43	MSOP-8
AM52-0024	2.4 - 2.5	31	27.5	--	40	MSOP-8
MAAPGM0035	2.5 - 5.5	17	32	31	42	Ceramic Flange Mount
MAAPGM0035-DIE	2.5 - 5.5	17	32	31	42	DIE
MAAPGM0022-DIE	3 - 6	17	31	31	43	DIE
MAAPGM0029-DIE	3.5 - 6.5	20	31	30	42	DIE
MAAPGM0021-DIE	4.5 - 9	17	33	31	41	DIE
MAAPSM0008	4.9 - 6	20.5	31.5	29.5	40	FQFP-N
MAAPGM0021	5 - 8.5	16	33	32	40	Ceramic Flange Mount
MAAPGM0030-DIE	5 - 9	17	30	29	38	DIE
MAAM71100	7 - 11	18	31	28	38	DIE
MAAPGM0033-DIE	9.5 - 11	14	30	29	35	DIE
MAAPGM0041	11 - 15	20	31	30	35	Ceramic Flange Mount
MAAPGM0041-DIE	11 - 15	20	31	30	35	DIE
MAAPGM0045-DIE	11.5 - 15	19	33	31	37	DIE
MAAPGM0042-DIE	11.5 - 16	20	31	28	35	DIE
MAAPGM0018-DIE	12 - 15.5	20	33	32	--	DIE
MAAPGM0043-DIE	13.5 - 15	17	32	31	37	DIE
MAAPSM0013	14 - 14.5	26	33	32.5	38	FQFP-N
AM42-0007-DIE	14 - 14.5	22	33	32	41	DIE
MAAPGM0046-DIE	15.5 - 18	15	26	25	32	DIE
MAAPGM0047-DIE	16 - 19.5	15	26	24	27	DIE

DIODES

PIN DIODES					
Part Number	Frequency (MHz)	Reverse Voltage (V)	Ct (pf)	Maximum Rs Ω	Product Features
MA4PK2000	0.5 - 400	2000	3.2 @ 100v, 1MHz	0.2 @ 0.5A, 4MHz	PILL
MA4PK2003	0.5 - 400	2000	3.2 @ 100v, 1MHz	0.2 @ 0.5A, 4MHz	Stud-Solder Lug
MA4P4001B-402	1 - 500	100	2.2 @ 100v, 1MHz	0.5 @ 100mA	AXIAL LEADED
MA4P4006F-1091	1 - 500	600	2.2 @ 100v, 1MHz	0.5 @ 100mA	AXIAL LEADED
MA4P7001F-1072	1 - 1000	100	0.7 @100v, 1MHz	0.8 @100mA, 100MHz	SMQ
MA4P7002F-1072	1 - 1000	200	0.7 @100v, 1MHz	0.8 @100mA, 100MHz	SMQ
MA4P7006F-1072	1 - 1000	600	0.7 @100v, 1MHz	0.8 @100mA, 100MHz	SMQ
MA4P7102F-1072	1 - 1000	200	1 @100v, 1MHz	0.5 @100mA, 100MHz	SMQ
MA4P1250-1072	5 - 500	50	0.7 @50v, 1MHz	0.75 @50mA	SMQ
MA4P274-1225	5 - 2500	100	0.5 @0V, 100MHz	3 @10mA	SOT-25
MA4P303-134	18 - 20000	200	0.15 @ 10V, 1MHz	1.5 @10mA	DIE

SCHOTTKY DIODES					
Part Number	Frequency (GHz)	Voltage Rating (V)	Max Ct (pF)	Vf @ 1mA	Package Style
MA4E2502H-1246	DC - 18	5	0.12	650	Surmount
MA4E2502M-1246	DC - 19	5	0.12	400	Surmount
MA4E2508L-1112	DC - 20	5	0.24	300	Surmount
MA4E2514M-1116	DC - 21	5	0.12	400	Surmount
MA4E2532L-1113	DC - 22	5	0.16	300	Surmount
MA4E1317	DC - 80	7	0.06	700	Flip Chip
MA4E1318	DC - 80	7	0.06	700	Flip Chip
MA4E2037	DC - 80	7	0.06	700	Beam Lead
MA4E2038	DC - 80	4.5	0.06	700	Beam Lead
MA4E2039	DC - 80	7	0.06	700	Beam Lead
MA4E2040	DC - 80	7	0.06	700	Beam Lead

DIODES (cont'd)

VARACTOR DIODES					
Part Number	Frequency (GHz)	Total Capacitance (pF)	Nominal Ct Ratio	Q (typical)	Package Style
MA4ST2600-1141	0.4 - 1.8	54 - 66	18	600	SOD 323
MA4ST2600CK-1146	0.4 - 1.8	54 - 66	18	600	SC-70 (3L)
MA4ST2500-1141	0.5 - 2	41 - 51	18	750	SOD 323
MA4ST2500CK-1146	0.5 - 2	41 - 51	18	750	SC-70 (3L)
MA4ST2400-1141	0.6 - 2.5	29 - 35	18	900	SOD 323
MA4ST2400CK-1146	0.6 - 2.5	29 - 35	18	900	SC-70 (3L)
MA4ST1320-1141	0.8 - 2	48 - 63	3.3	200	SOD 323
MA4ST1320CK-1146	0.8 - 2	48 - 63	3.3	200	SC-70 (3L)
MA4ST2300-1141	0.8 - 3.5	16 - 20	18	1250	SOD 323
MA4ST2300CK-1146	0.8 - 3.5	16 - 20	18	1250	SC-70 (3L)
MA4ST1330-1141	1 - 3	22 - 30	3.3	340	SOD 323
MA4ST1330CK-1146	1 - 3	22 - 30	3.3	340	SC-70 (3L)
MA4ST1230-1141	1.5 - 3.5	4.2 - 5.2	3.6	850	SOD 323
MA4ST1230CK-1146	1.5 - 3.5	4.2 - 5.2	3.6	850	SC-70 (3L)
MA4ST1340-1141	1.5 - 3.5	15 - 21	3.4	365	SOD 323
MA4ST1340CK-1146	1.5 - 3.5	15 - 21	3.4	365	SC-70 (3L)
MA4ST2200-1141	1.5 - 6.5	3.6 - 4.5	16	1200	SOD 323
MA4ST2200CK-1146	1.5 - 6.5	3.6 - 4.5	16	1200	SC-70 (3L)
MA4ST1240-1141	2 - 4.5	3 - 3.8	3.4	1200	SOD 323
MA4ST1240CK-1146	2 - 4.5	3 - 3.8	3.4	1200	SC-70 (3L)
MA4ST1350-1141	2 - 4.5	9.5 - 13.5	3.2	475	SOD 323
MA4ST1350CK-1146	2 - 4.5	9.5 - 13.5	3.2	475	SC-70 (3L)
MA46H203-1056	2 - 7	4.5 - 5.5	10	1500	Surface Mount Ceramic
MA46H202-1056	2.5 - 10	2.7 - 3.3	5.6	2000	Surface Mount Ceramic
MA46H201-1056	4.5 - 13	0.9 - 1.1	4.1	3000	Surface Mount Ceramic
MA46H146	18 - 40	0.063	2.1	15,600	Flip Chip

PART NUMBERS AND DESCRIPTIONS

Part Number	Family	Page No.	Part Number	Family	Page No.
A79	Amplifier, Low Noise	12	DS53-0001	Splitter / Combiner	4
AM-131	Amplifier, Low Noise	12	DS54-0001	Splitter / Combiner	4
AM-147	Amplifier, Low Noise	12	DS54-0002	Splitter / Combiner	4
AM-162	Amplifier, Low Noise	12	DSS-313	Splitter / Combiner	4
AM42-0007-DIE	Amplifier, Power	13	DSS-313 T1A	Splitter / Combiner	4
AM50-0002	Amplifier, Low Noise	12	EDF-2E	Diplexer	5
AM50-0003	Amplifier, Low Noise	12	EFM-1900	Mixer	11
AM50-0004	Amplifier, Low Noise	12	EFM-2100	Mixer	11
AM50-0011	Amplifier, Low Noise	12	EFM-900	Mixer	11
AM50-0012	Amplifier, Low Noise	12	ELCM-1	Mixer	11
AM52-0024	Amplifier, Power	13	ELCM-25MH	Mixer	11
AT10-0019	Attenuator, Digital	7	ELPD-20-1	Splitter / Combiner	4
AT-107	Attenuator, Digital	7	EMDC-10-1-75	Coupler, Directional	4
AT-108	Attenuator, Digital	7	ESMD-C50H	Mixer	11
AT-109	Attenuator, Digital	7	ESMD-C50L	Mixer	11
AT-110	Attenuator, Digital	7	ESMD-C50M	Mixer	11
AT-113	Attenuator, Digital	7	ESSMJ-2-10-75	Splitter / Combiner	4
AT20-0106	Attenuator, Digital	7	ESSMJ-2-12-75	Splitter / Combiner	4
AT20-0107	Attenuator, Digital	7	ETC1.5-4	Transformer	5
AT-210	Attenuator, Digital	7	ETC1-1-13	Transformer	5
AT-213	Attenuator, Digital	7	ETC1-1T	Transformer	5
AT-220	Attenuator, Digital	7	ETC4-1	Transformer	5
AT-230	Attenuator, Digital	7	ETC4-1-2	Transformer	5
AT-250	Attenuator, Digital	7	H-183-4 SMA	Coupler	4
AT-255	Attenuator, Digital	7	H-9 N	Coupler	4
AT-259	Attenuator, Digital	7	H-9 SMA	Coupler	4
AT-260	Attenuator, Digital	7	JH-139	Quadrature	4
AT-263	Attenuator, Digital	7	JH-140	Quadrature	4
AT-264	Attenuator, Digital	7	M8TC	Mixer	11
AT-273	Attenuator, Digital	7	MA02107AF	Amplifier, Power	13
AT-280	Attenuator, Digital	7	MA02205AF	Amplifier, Power	13
AT65-0008	Attenuator, Digital	7	MA02206GJ	Amplifier, Power	13
AT65-0106	Attenuator, Digital	7	MA02303GJ	Amplifier, Power	13
AT65-0107	Attenuator, Digital	7	MA46H146	Diode, Varactor	15
AT65-0233	Attenuator, Digital	7	MA46H201-1056	Diode, Varactor	15
AT65-0263	Attenuator, Digital	7	MA46H202-1056	Diode, Varactor	15
AT65-0283	Attenuator, Digital	7	MA46H203-1056	Diode, Varactor	15
AT65-0413	Attenuator, Digital	7	MA4E1317	Diode, Schottky	14
AT90-0001	Attenuator, Digital	7	MA4E1318	Diode, Schottky	14
AT90-0106	Attenuator, Digital	7	MA4E2037	Diode, Schottky	14
AT90-0107	Attenuator, Digital	7	MA4E2038	Diode, Schottky	14
AT90-0263	Attenuator, Digital	7	MA4E2039	Diode, Schottky	14
AT90-1106	Attenuator, Digital	7	MA4E2040	Diode, Schottky	14
AT90-1107	Attenuator, Digital	7	MA4E2502H-1246	Diode, Schottky	14
AT90-1263	Attenuator, Digital	7	MA4E2502M-1246	Diode, Schottky	14
AT90-1283	Attenuator, Digital	7	MA4E2508L-1112	Diode, Schottky	14
CH20-0032-17G	Coupler, Directional	4	MA4E2514M-1116	Diode, Schottky	14
CH20-0033-17G	Coupler, Directional	4	MA4E2532L-1113	Diode, Schottky	14
CSM2-17	Mixer	11	MA4EX2401	Mixer	11
DS-109	Splitter / Combiner	4	MA4EX240L-1225	Mixer	11
DS-313	Splitter / Combiner	4	MA4EX580L-1225	Mixer	11
DS-319	Splitter / Combiner	4	MA4EX600H-1225	Mixer	11
DS-323	Splitter / Combiner	4	MA4EX900L-1226T	Mixer	11
DS-324	Splitter / Combiner	4	MA4GC6772	Switch, PIN	10
DS-327	Splitter / Combiner	4	MA4GC6773	Switch, PIN	10
DS-409-4 SMA	Splitter / Combiner	4	MA4GC6774	Switch, PIN	10
DS52-0001	Splitter / Combiner	4	MA4P1250-1072	Diode, PIN	14
DS52-0002	Splitter / Combiner	4	MA4P274-1225	Diode, PIN	14
DS52-0004	Splitter / Combiner	4	MA4P303-134	Diode, PIN	14
DS52-0005	Splitter / Combiner	4	MA4P4001B-402	Diode, PIN	14
DS52-0007	Splitter / Combiner	4	MA4P4006F-1091	Diode, PIN	14

PART NUMBERS AND DESCRIPTIONS (cont'd)

Part Number	Family	Page No.	Part Number	Family	Page No.
MA4P7001F-1072	Diode, PIN	14	MAAPGM0033-DIE	Amplifier, Power	13
MA4P7002F-1072	Diode, PIN	14	MAAPGM0035	Amplifier, Power	13
MA4P7006F-1072	Diode, PIN	14	MAAPGM0035-DIE	Amplifier, Power	13
MA4P7102F-1072	Diode, PIN	14	MAAPGM0036-DIE	Amplifier, Power	13
MA4PK2000	Diode, PIN	14	MAAPGM0041	Amplifier, Power	13
MA4PK2003	Diode, PIN	14	MAAPGM0041-DIE	Amplifier, Power	13
MA4ST1230-1141	Diode, Varactor	15	MAAPGM0042-DIE	Amplifier, Power	13
MA4ST1230CK-1246	Diode, Varactor	15	MAAPGM0043-DIE	Amplifier, Power	13
MA4ST1240-1141	Diode, Varactor	15	MAAPGM0045-DIE	Amplifier, Power	13
MA4ST1240CK-1246	Diode, Varactor	15	MAAPGM0046-DIE	Amplifier, Power	13
MA4ST1320-1141	Diode, Varactor	15	MAAPGM0047-DIE	Amplifier, Power	13
MA4ST1320CK-1146	Diode, Varactor	15	MAAPSM0008	Amplifier, Power	13
MA4ST1330-1141	Diode, Varactor	15	MAAPSM0013	Amplifier, Power	13
MA4ST1330CK-1146	Diode, Varactor	15	MAAPSM0015-DIE	Amplifier, Power	13
MA4ST1340-1141	Diode, Varactor	15	MAATGM0001-DIE	Attenuator, Digital	7
MA4ST1340CK-1146	Diode, Varactor	15	MAATGM0004-DIE	Attenuator, Digital	7
MA4ST1350-1141	Diode, Varactor	15	MAATSS0001	Attenuator, Digital	7
MA4ST1350CK-1146	Diode, Varactor	15	MAATSS0002	Attenuator, Digital	7
MA4ST2200-1141	Diode, Varactor	15	MABAES0029	Transformer	5
MA4ST2200CK-1146	Diode, Varactor	15	MABAES0031	Transformer	5
MA4ST2300-1141	Diode, Varactor	15	MAFLES0083	Diplexer	5
MA4ST2300CK-1146	Diode, Varactor	15	MAFRINO160	Isolator	5
MA4ST2400-1141	Diode, Varactor	15	MAFRINO164	Isolator	5
MA4ST2400CK-1146	Diode, Varactor	15	MAFRINO165	Isolator	5
MA4ST2500-1141	Diode, Varactor	15	MAFRINO166	Isolator	5
MA4ST2500CK-1146	Diode, Varactor	15	MAFRINO167	Isolator	5
MA4ST2600-1141	Diode, Varactor	15	MAFRINO203	Isolator	5
MA4ST2600CK-1146	Diode, Varactor	15	MAFRINO204	Isolator	5
MA4SW110	Switch, PIN	10	MAFRINO205	Isolator	5
MA4SW210	Switch, PIN	10	MAMUSM0008	Delay Line	6
MA4SW310	Switch, PIN	10	MAPCGM0001	Phase Shifter	6
MA4SW410	Switch, PIN	10	MAPCGM0001-DIE	Phase Shifter	6
MAALGM0003-DIE	Amplifier, Low Noise	12	MAPCGM0002-DIE	Phase Shifter	6
MAALSS0012	Amplifier, Low Noise	12	MAPCGM0003	Phase Shifter	6
MAALSS0013	Amplifier, Low Noise	12	MAPCGM0003-DIE	Phase Shifter	6
MAAM12021	Amplifier, Low Noise	12	MAPCGM0004-DIE	Phase Shifter	6
MAAM12031	Amplifier, Low Noise	12	MAPDGM0001-DIE	Power Divider	5
MAAM26100	Amplifier, Power	13	MASW20000	Switch	10
MAAM26100-B1	Amplifier, Power	13	MASW6010G	Switch	10
MAAM26100-B1G	Amplifier, Power	13	MASWGM0001-DIE	Switch	10
MAAM26100-P1	Amplifier, Power	13	MASWGM0002-DIE	Switch	10
MAAM28000	Amplifier, Low Noise	12	MASWGM0003-DIE	Switch	10
MAAM28000-A1	Amplifier, Low Noise	12	MASWSM0002	Switch	10
MAAM37000	Amplifier, Low Noise	12	MASWSS0024	Switch	10
MAAM37000-A1	Amplifier, Low Noise	12	MASWSS0039	Switch	10
MAAM37000-A1G	Amplifier, Low Noise	12	MASWSS0040	Switch	10
MAAM71100	Amplifier, Power	13	MD-154	Mixer	11
MAAM71200	Amplifier, Low Noise	12	MD-158	Mixer	11
MAAM71200-H1	Amplifier, Low Noise	12	MD-169	Mixer	11
MAAMSS0007	Amplifier, General	12	MD54-0003	Mixer	11
MAAMSS0014	Amplifier, General	12	MD54-0004	Mixer	11
MAAMSS0017	Amplifier, General	12	MD54-0005	Mixer	11
MAAPGM0018-DIE	Amplifier, Power	13	MD57-0001	Mixer w/oscillator	11
MAAPGM0021	Amplifier, Power	13	MRF10005	Transistor, Avionic RF	8
MAAPGM0021-DIE	Amplifier, Power	13	MRF1000MB	Transistor, Avionic RF	8
MAAPGM0022-DIE	Amplifier, Power	13	MRF10031	Transistor, Avionic RF	8
MAAPGM0026-DIE	Amplifier, Power	13	MRF1004MB	Transistor, Avionic RF	8
MAAPGM0027-DIE	Amplifier, Power	13	MRF10120	Transistor, Avionic RF	8
MAAPGM0028-DIE	Amplifier, Power	13	MRF10150	Transistor, Avionic RF	8
MAAPGM0029-DIE	Amplifier, Power	13	MRF10502	Transistor, Avionic RF	8
MAAPGM0030-DIE	Amplifier, Power	13	MRF1090MA	Transistor, Avionic RF	8

PART NUMBERS AND DESCRIPTIONS (cont'd)

Part Number	Family	Page No.	Part Number	Family	Page No.
MRF1090MB	Transistor, Avionic RF	8	MRF3104	Transistor, Avionic RF	8
MRF1150MA	Transistor, Avionic RF	8	MRF313	Transistor, Comm Bipolar	8
MRF1150MB	Transistor, Avionic RF	8	MRF314	Transistor, Comm Bipolar	8
MRF134	Transistor, RF Power MOSFET (Broadcast)	9	MRF316	Transistor, Comm Bipolar	8
MRF136	Transistor, RF Power MOSFET (Broadcast)	9	MRF317	Transistor, Comm Bipolar	8
MRF136Y	Transistor, RF Power MOSFET (Broadcast)	9	MRF321	Transistor, Comm Bipolar	8
MRF137	Transistor, RF Power MOSFET (Broadcast)	9	MRF323	Transistor, Comm Bipolar	8
MRF140	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF327	Transistor, Comm Bipolar	8
MRF141	Transistor, RF Power MOSFET (Broadcast)	9	MRF392	Transistor, Comm Bipolar	8
MRF141G	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF393	Transistor, Comm Bipolar	8
MRF148A	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF421	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF150	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF422	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF151	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF426	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF151G	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF428	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF154	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF429	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF157	Transistor, RF Power MOSFET (Medical / Industrial)	9	MRF448	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF158	Transistor, RF Power MOSFET (Broadcast)	9	MRF454	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF160	Transistor, RF Power MOSFET (Broadcast)	9	MRF455	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF16006	Transistor, Avionic RF	8	MRF587	Transistor, RF Power MOSFET (Medical / Industrial)	9
MRF16030	Transistor, Avionic RF	8	MY77C	Mixer	11
MRF166C	Transistor, RF Power MOSFET (Broadcast)	9	MY82	Mixer	11
MRF166W	Transistor, RF Power MOSFET (Broadcast)	9	SFD25	Frequency Doubler	11
MRF171A	Transistor, Comm Bipolar	8	SM4T	Mixer	11
MRF173	Transistor, RF Power MOSFET (Broadcast)	9	SM4T17	Mixer	11
MRF173CQ	Transistor, RF Power MOSFET (Broadcast)	9	SM5T	Mixer	11
MRF174	Transistor, RF Power MOSFET (Broadcast)	9	SML1	Amplifier, Signal Limiting	12
MRF175GU	Transistor, RF Power MOSFET (Broadcast)	9	SW-239	Switch	10
MRF175GV	Transistor, RF Power MOSFET (Broadcast)	9	SW-259	Switch	10
MRF175LU	Transistor, RF Power MOSFET (Broadcast)	9	SW-277	Switch	10
MRF176GV	Transistor, RF Power MOSFET (Broadcast)	9	SW-279	Switch	10
MRF177	Transistor, RF Power MOSFET (Broadcast)	9	SW-311	Switch	10
MRF275G	Transistor, RF Power MOSFET (Broadcast)	9	SW-313	Switch	10
MRF275L	Transistor, RF Power MOSFET (Broadcast)	9	SW-314	Switch	10
			SW-335	Switch	10
			SW-338	Switch	10
			SW-395	Switch	10
			SW-437	Switch	10
			SW-438	Switch	10
			SW-439	Switch	10
			SW-475	Switch	10
			SW-485	Switch	10
			SWD-119	Driver	11
			TP-101	Transformer, RF pulse	5
			TP-103	Transformer, RF pulse	5

Headquartered in Lowell, Massachusetts with offices and manufacturing facilities worldwide, M/A-COM is a unit of Tyco Electronics, a business unit of Tyco International.