

Non-Catalog Model

Frequency Mixer

SYM-11MH

Level 13 (LO Power +13 dBm)

Important Note

This is a non-catalog model and can be manufactured on specific request.
Pricing and delivery information can be supplied upon request.



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CASE STYLE : TTT167

ELECTRICAL SPECIFICATIONS 50Ω @ +25°C					
Parameter		Min.	Typ.	Max.	Units
Frequency	LO (fL to fU)	50		2000	MHz
	RF (fL to fU)	50		2000	MHz
	IF	50		1000	MHz
Conversion Loss	mid band		6.6	8.0	dB
	Total Range			9.9	dB
LO-RF Isolation	Low Range	35	55		dB
	Mid Range	25	44		dB
	Upper Range	20	30		dB
LO-IF Isolation	Low Range	25	40		dB
	Mid Range	20	36		dB
	Upper Range	20	29		dB
1 dB Comp. Input Power			+9		dBm

Notes: Low Range = [fL to 10fL]
mid band = [2fL to fU/2]

Mid Range = [10fL to fU/2]

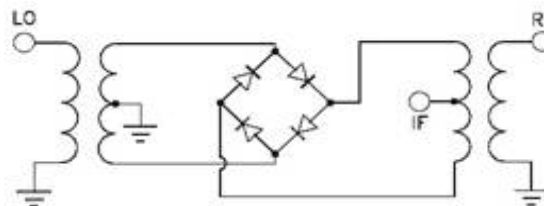
Upper Range = [fU/2 to fU]

Units are non-hermetic.

MAXIMUM RATINGS	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	200mW
IF Current	40mA

PIN CONNECTIONS	
LO	2
RF	1
IF	3
GROUND	4, 5, 6

Electrical Schematics



Frequency Mixer

SYM-11MH

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=50MHz (dB)			RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)			RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+9dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
+10	+13	+16	+10	+13	+16	+10	+13	+16	+10	+13	+16			
10.1	60.1	6.50	6.19	6.01	10.1	60.1	23.55	25.13	27.46	10.1	60.1	1.44	0.96	0.68
90.4	140.4	6.38	6.12	5.97	90.4	140.4	36.23	31.67	32.12	90.4	140.4	1.61	1.19	0.86
170.7	220.7	6.43	6.19	6.03	170.7	220.7	26.08	25.65	25.95	170.7	220.7	1.61	1.20	0.89
251.0	301.0	6.55	6.27	6.09	251.0	301.0	23.96	25.73	25.37	251.0	301.0	1.63	1.25	0.95
331.3	381.3	6.70	6.39	6.18	331.3	381.3	21.45	22.73	25.07	331.3	381.3	1.64	1.28	0.98
411.5	461.5	6.76	6.41	6.23	411.5	461.5	22.23	23.35	27.23	411.5	461.5	1.71	1.33	1.01
491.8	541.8	6.89	6.50	6.29	491.8	541.8	21.90	24.66	25.49	491.8	541.8	1.76	1.37	1.05
552.0	602.0	6.98	6.58	6.36	552.0	602.0	20.60	22.48	22.72	552.0	602.0	1.73	1.38	1.07
632.3	682.3	7.02	6.63	6.41	632.3	682.3	22.21	24.50	23.87	632.3	682.3	1.83	1.45	1.13
692.5	742.5	6.98	6.64	6.44	692.5	742.5	21.29	25.82	30.28	692.5	742.5	1.84	1.44	1.12
772.8	822.8	6.90	6.61	6.43	772.8	822.8	23.66	22.38	26.29	772.8	822.8	1.85	1.43	1.14
833.0	883.0	6.88	6.62	6.48	833.0	883.0	22.40	23.66	35.29	833.0	883.0	1.91	1.50	1.21
913.3	963.3	6.86	6.62	6.49	913.3	963.3	21.12	22.30	23.58	913.3	963.3	1.94	1.56	1.29
973.6	1023.6	6.93	6.65	6.50	973.6	1023.6	21.09	20.40	20.83	973.6	1023.6	1.91	1.59	1.35
1053.8	1103.8	7.03	6.73	6.57	1053.8	1103.8	32.58	22.70	19.80	1053.8	1103.8	1.79	1.50	1.29
1114.1	1164.1	7.15	6.83	6.66	1114.1	1164.1	20.25	23.25	21.61	1114.1	1164.1	1.73	1.45	1.27
1194.3	1244.3	7.54	7.13	6.89	1194.3	1244.3	24.07	20.20	18.62	1194.3	1244.3	1.38	1.17	1.05
1254.6	1304.6	7.72	7.32	7.07	1254.6	1304.6	20.59	22.67	18.85	1254.6	1304.6	1.45	1.15	1.00
1334.8	1384.8	7.75	7.44	7.26	1334.8	1384.8	19.15	21.81	22.99	1334.8	1384.8	1.34	0.96	0.80
1395.1	1445.1	7.83	7.51	7.36	1395.1	1445.1	17.75	20.86	24.94	1395.1	1445.1	1.36	0.94	0.74
1475.4	1525.4	7.91	7.53	7.36	1475.4	1525.4	17.07	21.24	23.74	1475.4	1525.4	1.33	0.93	0.73
1535.6	1585.6	7.98	7.58	7.42	1535.6	1585.6	16.44	21.94	22.30	1535.6	1585.6	1.31	0.93	0.72
1615.9	1665.9	8.08	7.67	7.50	1615.9	1665.9	16.65	21.10	21.11	1615.9	1665.9	1.32	0.89	0.67
1676.1	1726.1	8.23	7.76	7.60	1676.1	1726.1	17.61	19.59	27.37	1676.1	1726.1	1.31	0.88	0.61
1756.4	1806.4	8.48	7.95	7.78	1756.4	1806.4	18.30	21.79	22.49	1756.4	1806.4	1.19	0.80	0.54
1816.6	1866.6	8.67	8.16	7.91	1816.6	1866.6	18.23	20.60	24.10	1816.6	1866.6	1.13	0.72	0.49
1896.9	1946.9	8.95	8.39	8.13	1896.9	1946.9	16.88	19.12	21.12	1896.9	1946.9	1.05	0.69	0.44
1957.1	2007.1	9.27	8.65	8.30	1957.1	2007.1	15.28	17.82	20.25	1957.1	2007.1	1.00	0.68	0.47
2037.4	2087.4	9.60	8.98	8.53	2037.4	2087.4	14.60	16.28	18.31	2037.4	2087.4	0.98	0.64	0.51
2097.6	2147.6	9.86	9.14	8.63	2097.6	2147.6	14.18	16.35	19.24	2097.6	2147.6	0.97	0.72	0.59
2177.9	2227.9	10.05	9.19	8.66	2177.9	2227.9	14.34	16.98	19.64	2177.9	2227.9	1.02	0.91	0.82
2238.1	2288.1	9.98	9.14	8.70	2238.1	2288.1	14.83	16.39	16.89	2238.1	2288.1	1.20	1.09	0.99
2318.4	2368.4	9.70	8.90	8.43	2318.4	2368.4	14.81	14.94	15.01	2318.4	2368.4	1.58	1.48	1.39
2378.6	2428.6	9.53	8.85	8.47	2378.6	2428.6	13.73	13.67	13.69	2378.6	2428.6	1.83	1.67	1.52
2458.9	2508.9	9.52	8.84	8.47	2458.9	2508.9	11.54	12.31	12.46	2458.9	2508.9	2.12	1.90	1.69
2519.1	2569.1	9.56	9.00	8.68	2519.1	2569.1	10.33	11.09	11.77	2519.1	2569.1	2.15	1.85	1.60
2599.4	2649.4	9.81	9.29	9.00	2599.4	2649.4	9.80	10.85	11.77	2599.4	2649.4	2.19	1.86	1.60
2659.6	2709.6	9.95	9.43	9.14	2659.6	2709.6	10.15	11.21	11.92	2659.6	2709.6	2.17	1.81	1.56
2739.9	2789.9	10.23	9.73	9.45	2739.9	2789.9	11.00	12.45	13.60	2739.9	2789.9	2.02	1.64	1.40
2800.1	2850.1	10.46	9.95	9.72	2800.1	2850.1	12.31	13.78	14.66	2800.1	2850.1	1.96	1.54	1.26

Frequency Mixer

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Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=50.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=2000.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+13			+13			+13
950.0	50.1	6.48	50.0	100.1	6.12	1000.0	1000.1	8.14
930.0	70.1	6.54	70.2	120.3	6.14	979.8	1020.3	8.16
910.0	90.1	6.55	90.4	140.5	6.13	959.6	1040.5	8.17
890.0	110.1	6.58	110.6	160.7	6.12	939.4	1060.7	8.16
870.0	130.1	6.57	130.9	181.0	6.16	919.1	1081.0	8.18
850.0	150.1	6.62	151.1	201.2	6.15	898.9	1101.2	8.16
830.0	170.1	6.63	171.3	221.4	6.16	878.7	1121.4	8.15
810.0	190.1	6.62	191.5	241.6	6.20	858.5	1141.6	8.10
790.0	210.1	6.66	211.7	261.8	6.19	838.3	1161.8	8.10
770.0	230.1	6.63	231.9	282.0	6.21	818.1	1182.0	8.08
750.0	250.1	6.47	252.1	302.2	6.23	797.9	1202.2	8.06
730.0	270.1	6.63	272.3	322.4	6.23	777.7	1222.4	8.03
710.0	290.1	6.63	292.6	342.7	6.25	757.4	1242.7	7.98
690.0	310.1	6.66	312.8	362.9	6.25	737.2	1262.9	8.02
670.0	330.1	6.63	333.0	383.1	6.28	717.0	1283.1	8.04
650.0	350.1	6.65	353.2	403.3	6.24	696.8	1303.3	8.05
630.0	370.1	6.62	373.4	423.5	6.26	676.6	1323.5	8.06
610.0	390.1	6.63	393.6	443.7	6.27	656.4	1343.7	8.04
590.0	410.1	6.62	413.8	463.9	6.24	636.2	1363.9	8.06
570.0	430.1	6.59	434.0	484.1	6.28	616.0	1384.1	8.04
550.0	450.1	6.56	454.3	504.4	6.23	595.7	1404.4	8.04
530.0	470.1	6.52	474.5	524.6	6.26	575.5	1424.6	8.05
510.0	490.1	6.53	494.7	544.8	6.26	555.3	1444.8	8.05
490.0	510.1	6.47	514.9	565.0	6.28	535.1	1465.0	8.10
470.0	530.1	6.52	535.3	605.4	6.28	494.7	1505.4	8.13
450.0	550.1	6.56	575.5	625.6	6.32	474.5	1525.6	8.12
430.0	570.1	6.57	616.0	666.1	6.32	434.0	1566.1	8.17
410.0	590.1	6.56	636.2	686.3	6.28	413.8	1586.3	8.19
370.0	630.1	6.58	676.6	726.7	6.23	373.4	1626.7	8.15
350.0	650.1	6.58	696.8	746.9	6.17	353.2	1646.9	8.11
310.0	690.1	6.61	737.2	787.3	6.20	312.8	1687.3	8.07
290.0	710.1	6.61	757.4	807.5	6.17	292.6	1707.5	8.04
250.0	750.1	6.61	797.9	848.0	6.19	252.1	1748.0	8.03
230.0	770.1	6.59	818.1	868.2	6.19	231.9	1768.2	8.06
190.0	810.1	6.54	858.5	908.6	6.18	191.5	1808.6	8.12
170.0	830.1	6.54	878.7	928.8	6.18	171.3	1828.8	8.13
130.0	870.1	6.53	919.1	969.2	6.15	130.9	1869.2	8.11
110.0	890.1	6.54	939.4	989.5	6.16	110.6	1889.5	8.12
70.0	930.1	6.54	979.8	1029.9	6.19	70.2	1929.9	8.11
50.0	950.1	6.54	1000.0	1050.1	6.18	50.0	1950.1	8.08

REV. X2
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Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+10	+13	+16	+10	+13	+16
10.1	36.53	41.03	45.55	27.48	29.50	31.39
90.4	56.83	60.28	61.38	37.34	40.32	42.82
170.7	62.39	65.06	62.61	38.04	39.64	39.91
251.0	58.80	68.62	62.16	37.65	37.86	37.13
331.3	55.74	70.41	60.46	37.13	36.36	35.21
411.5	53.95	74.20	57.51	36.58	35.23	33.90
491.8	53.05	74.23	55.39	35.83	34.10	32.66
552.0	52.75	73.98	53.45	35.58	33.62	32.16
632.3	52.04	66.39	52.56	35.45	33.16	31.60
692.5	51.56	62.51	50.24	35.23	32.91	31.38
772.8	51.87	59.45	48.25	34.37	32.28	30.94
833.0	53.09	54.41	46.18	33.88	32.13	30.94
913.3	55.44	48.79	43.11	32.87	31.38	30.36
973.6	52.21	45.59	41.73	32.40	30.95	29.86
1053.8	47.56	43.53	39.74	31.71	30.51	29.53
1114.1	45.06	43.21	39.38	31.24	29.97	29.05
1194.3	42.26	42.26	38.92	31.18	29.75	28.72
1254.6	40.95	40.52	37.45	31.09	29.76	28.77
1334.8	39.20	39.11	36.31	31.80	30.49	29.40
1395.1	37.50	38.01	35.88	32.27	31.11	29.93
1475.4	36.24	36.45	34.96	32.24	31.29	30.00
1535.6	35.72	36.21	34.70	31.86	30.98	29.53
1615.9	34.95	37.43	35.55	31.83	31.30	30.15
1676.1	34.46	38.04	36.04	32.19	32.44	31.71
1756.4	33.69	38.18	37.34	33.40	35.32	36.21
1816.6	33.19	37.60	37.55	33.34	35.92	37.74
1896.9	32.77	37.64	40.08	31.71	33.37	35.06
1957.1	32.19	36.36	41.80	30.66	31.93	32.81
2037.4	31.37	34.28	39.20	29.34	30.11	30.36
2097.6	31.16	33.48	37.08	28.71	29.56	30.08
2177.9	30.77	32.53	35.44	27.96	28.14	28.15
2238.1	30.43	32.07	35.02	27.55	27.64	27.72
2318.4	29.46	30.57	32.76	27.15	27.06	26.95
2378.6	28.55	29.58	31.50	26.79	26.56	26.39
2458.9	27.54	28.87	31.05	26.32	25.90	25.74
2519.1	26.91	28.62	30.88	26.09	25.69	25.38
2599.4	25.90	27.87	30.39	25.54	25.32	25.08
2659.6	25.79	27.87	30.44	25.02	24.76	24.62
2739.9	26.05	28.40	31.00	24.95	24.60	24.32
2800.1	26.34	28.79	31.37	24.75	24.37	24.16

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+10	+13	+16
10.1	60.1	18.97	19.23	19.19
90.4	140.4	23.97	24.24	24.49
170.7	220.7	24.50	24.74	25.08
251.0	301.0	25.10	25.41	25.79
331.3	381.3	25.77	26.17	26.71
411.5	461.5	26.81	27.33	27.99
491.8	541.8	28.22	28.99	30.03
552.0	602.0	29.58	30.45	31.47
632.3	682.3	32.21	33.48	34.85
692.5	742.5	35.84	37.11	38.03
772.8	822.8	42.18	39.27	36.25
833.0	883.0	37.81	35.12	33.00
913.3	963.3	36.05	34.09	31.90
973.6	1023.6	34.11	32.15	30.31
1053.8	1103.8	32.79	30.49	28.33
1114.1	1164.1	31.93	29.44	26.54
1194.3	1244.3	30.22	28.21	25.34
1254.6	1304.6	28.04	26.60	24.38
1334.8	1384.8	26.22	25.01	23.05
1395.1	1445.1	25.15	24.31	22.95
1475.4	1525.4	24.30	23.61	22.67
1535.6	1585.6	23.85	23.69	23.49
1615.9	1665.9	23.54	23.39	23.27
1676.1	1726.1	23.64	23.42	23.25
1756.4	1806.4	24.78	24.34	23.96
1816.6	1866.6	26.32	26.14	25.25
1896.9	1946.9	30.53	32.43	34.49
1957.1	2007.1	35.00	36.40	38.16
2037.4	2087.4	41.43	39.39	40.70
2097.6	2147.6	35.55	32.12	30.60
2177.9	2227.9	30.26	28.74	27.85
2238.1	2288.1	28.26	27.33	26.85
2318.4	2368.4	26.37	25.73	25.42
2378.6	2428.6	25.46	24.92	24.66
2458.9	2508.9	24.50	23.53	22.95
2519.1	2569.1	23.78	22.66	21.64
2599.4	2649.4	23.16	21.60	20.42
2659.6	2709.6	22.86	21.30	19.97
2739.9	2789.9	22.17	20.70	19.56
2800.1	2850.1	21.61	20.31	19.37

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Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=2000.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+10	+13	+16		+10	+13	+16		+10	+13	+16
10.1	60.1	1.44	1.43	1.43	10.1	1.81	2.37	3.12	50.1	1.30	1.17	1.20
90.4	140.4	1.16	1.09	1.07	90.4	1.53	2.16	2.94	69.9	1.28	1.12	1.16
170.7	220.7	1.17	1.10	1.06	170.7	1.51	2.10	2.84	89.7	1.29	1.12	1.15
251.0	301.0	1.19	1.11	1.04	251.0	1.52	2.09	2.79	109.5	1.28	1.11	1.15
331.3	381.3	1.21	1.12	1.05	331.3	1.54	2.08	2.76	129.3	1.29	1.11	1.15
411.5	461.5	1.19	1.10	1.03	411.5	1.54	2.06	2.72	149.1	1.27	1.11	1.16
491.8	541.8	1.20	1.10	1.03	491.8	1.53	2.02	2.63	168.9	1.27	1.11	1.17
552.0	602.0	1.22	1.12	1.05	552.0	1.54	2.02	2.63	188.6	1.29	1.12	1.17
632.3	682.3	1.23	1.13	1.07	632.3	1.51	1.96	2.54	208.4	1.29	1.12	1.17
692.5	742.5	1.21	1.13	1.09	692.5	1.49	1.92	2.48	228.2	1.29	1.14	1.18
772.8	822.8	1.22	1.16	1.14	772.8	1.44	1.86	2.38	248.0	1.30	1.16	1.20
833.0	883.0	1.24	1.20	1.18	833.0	1.45	1.84	2.36	267.8	1.31	1.16	1.20
913.3	963.3	1.28	1.23	1.22	913.3	1.47	1.81	2.29	287.6	1.30	1.17	1.21
973.6	1023.6	1.31	1.25	1.24	973.6	1.51	1.78	2.22	307.4	1.31	1.18	1.22
1053.8	1103.8	1.35	1.27	1.25	1053.8	1.57	1.77	2.16	327.2	1.32	1.19	1.22
1114.1	1164.1	1.40	1.30	1.25	1114.1	1.59	1.74	2.11	347.0	1.32	1.19	1.23
1194.3	1244.3	1.54	1.41	1.34	1194.3	1.63	1.69	2.01	366.8	1.32	1.20	1.23
1254.6	1304.6	1.59	1.46	1.39	1254.6	1.64	1.68	1.97	386.6	1.34	1.21	1.24
1334.8	1384.8	1.60	1.47	1.41	1334.8	1.69	1.62	1.86	406.4	1.34	1.21	1.24
1395.1	1445.1	1.61	1.48	1.42	1395.1	1.74	1.61	1.79	426.1	1.34	1.21	1.24
1475.4	1525.4	1.61	1.45	1.39	1475.4	1.77	1.57	1.71	445.9	1.34	1.23	1.26
1535.6	1585.6	1.60	1.44	1.37	1535.6	1.80	1.53	1.62	465.7	1.34	1.23	1.25
1615.9	1665.9	1.57	1.39	1.32	1615.9	1.80	1.47	1.52	505.3	1.35	1.24	1.26
1676.1	1726.1	1.57	1.37	1.29	1676.1	1.82	1.44	1.43	525.1	1.36	1.25	1.27
1756.4	1806.4	1.55	1.33	1.25	1756.4	1.82	1.39	1.33	564.7	1.35	1.25	1.28
1816.6	1866.6	1.55	1.33	1.25	1816.6	1.84	1.37	1.24	584.5	1.36	1.26	1.29
1896.9	1946.9	1.57	1.35	1.27	1896.9	1.84	1.34	1.12	624.1	1.37	1.26	1.27
1957.1	2007.1	1.62	1.42	1.34	1957.1	1.86	1.34	1.04	643.9	1.38	1.28	1.29
2037.4	2087.4	1.69	1.52	1.45	2037.4	1.89	1.36	1.07	683.4	1.38	1.27	1.27
2097.6	2147.6	1.76	1.59	1.52	2097.6	1.92	1.41	1.17	703.2	1.38	1.27	1.27
2177.9	2227.9	1.87	1.68	1.61	2177.9	1.95	1.49	1.32	742.8	1.41	1.28	1.26
2238.1	2288.1	1.92	1.74	1.66	2238.1	1.98	1.55	1.41	762.6	1.40	1.27	1.25
2318.4	2368.4	1.95	1.77	1.68	2318.4	1.98	1.60	1.50	802.2	1.42	1.29	1.26
2378.6	2428.6	1.92	1.76	1.67	2378.6	1.94	1.62	1.58	822.0	1.41	1.27	1.24
2458.9	2508.9	1.87	1.71	1.60	2458.9	1.89	1.67	1.69	861.6	1.42	1.28	1.24
2519.1	2569.1	1.77	1.65	1.55	2519.1	1.92	1.73	1.76	881.4	1.42	1.27	1.22
2599.4	2649.4	1.63	1.52	1.43	2599.4	1.92	1.81	1.88	920.9	1.42	1.27	1.22
2659.6	2709.6	1.51	1.42	1.33	2659.6	1.92	1.87	1.97	940.7	1.43	1.27	1.21
2739.9	2789.9	1.37	1.30	1.22	2739.9	1.94	1.95	2.07	980.3	1.42	1.26	1.19
2800.1	2850.1	1.28	1.23	1.18	2800.1	1.97	2.01	2.14	1000.1	1.43	1.27	1.19

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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	4	11	20	23	30	27	28	29	37	54
1	-	27	+0	26	12	26	19	39	45	35	37	45
2	92	54	50	72	51	57	48	49	56	56	52	55
3	>100	63	61	68	61	74	57	63	65	62	68	63
4	>100	84	82	83	82	80	78	75	75	75	78	82
5	>100	>87	>87	>87	>87	>87	86	>87	85	84	>87	>87
6	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
7	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
8	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
9	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
10	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 1000.1 MHz; -6.00 dBm.
LO IN: 1050.01 MHz; +13.00 dBm
IF OUT: 49.91 MHz; -12.74 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	15	22	37	44	38	40	46	49	61	78
1	-	25	+0	25	13	30	22	56	42	47	44	57
2	73	48	38	40	38	42	42	48	56	57	50	56
3	>100	43	41	45	39	56	45	41	43	50	60	49
4	>100	52	50	48	49	55	55	57	50	50	58	69
5	>100	65	51	72	51	61	54	67	58	61	59	59
6	92	77	69	83	62	60	61	59	61	72	62	58
7	>100	74	84	72	64	70	63	64	68	65	65	61
8	>100	94	81	76	74	74	80	67	77	66	72	70
9	>100	87	83	91	86	80	79	70	77	72	75	71
10	>100	>97	88	89	>97	85	81	82	78	77	85	82
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 1000.1 MHz; 4.00 dBm.
LO IN: 1050.01 MHz; +13.00 dBm
IF OUT: 49.91 MHz; -2.97 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.



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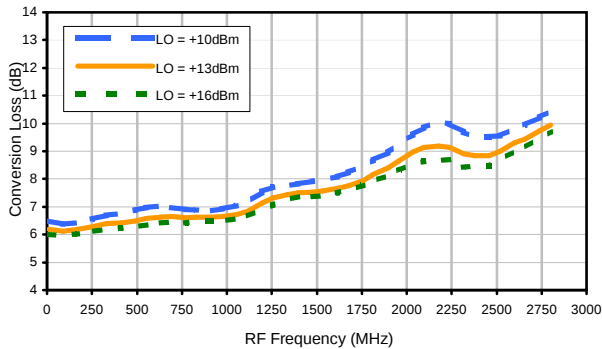
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Frequency Mixer

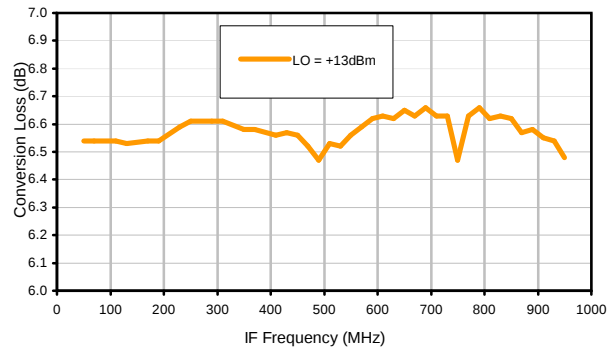
SYM-11MH

Typical Performance Curves

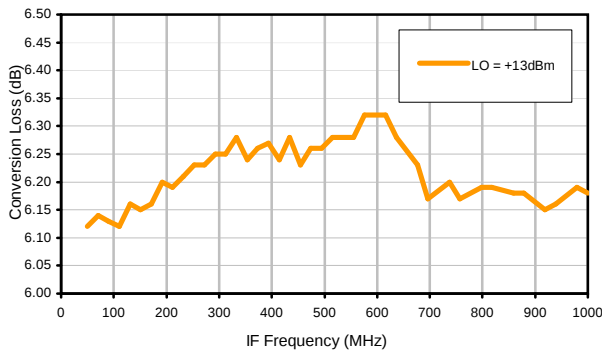
Conversion Loss @ IF=50MHz



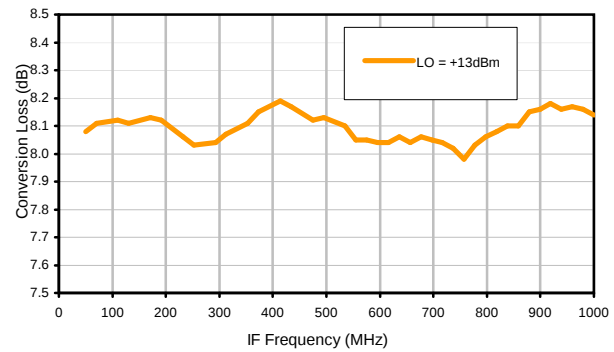
Conversion Loss vs. IF @ RF=1000.1MHz



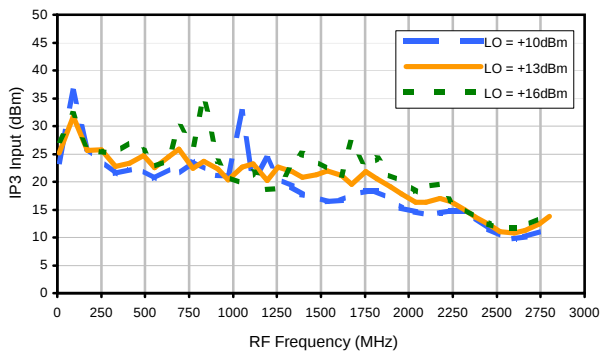
Conversion Loss vs. IF @ RF=50.1MHz



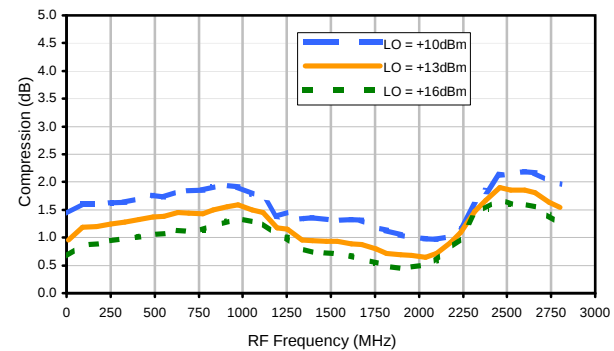
Conversion Loss vs. IF @ RF=2000.1MHz



IP3 Input



Compression @ RF IN=+9dBm



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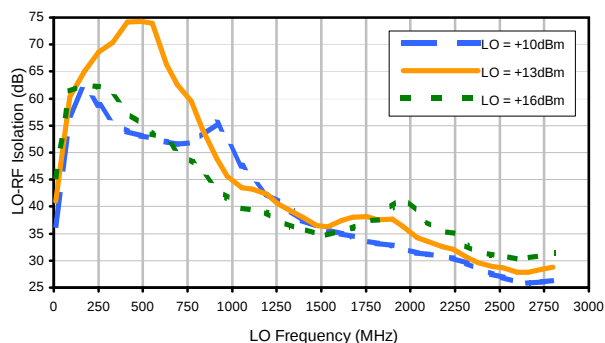
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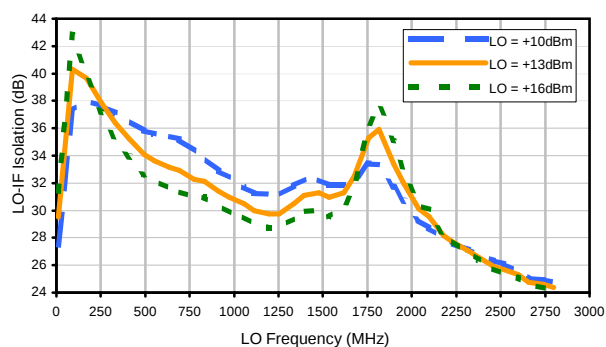
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Typical Performance Curves

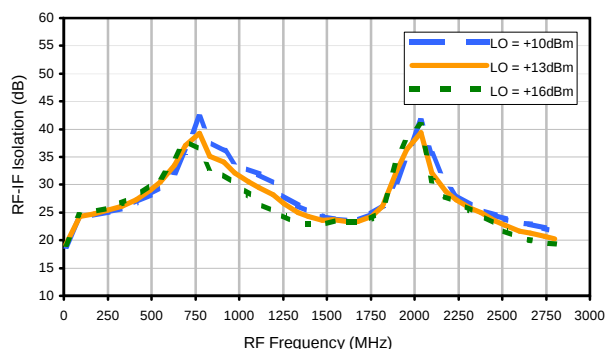
LO-RF Isolation



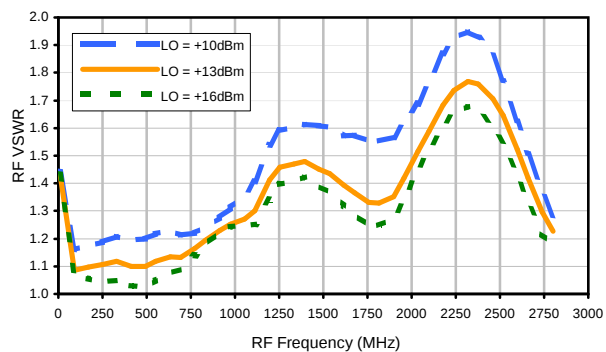
LO-IF Isolation



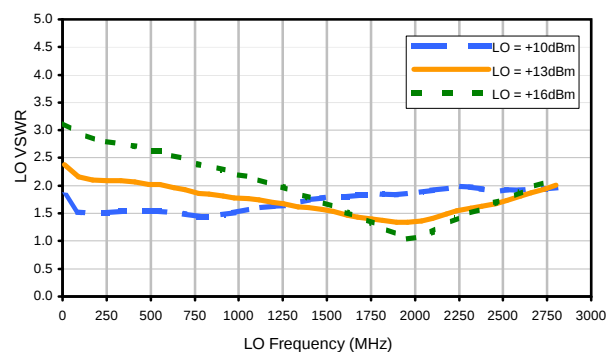
RF-IF Isolation



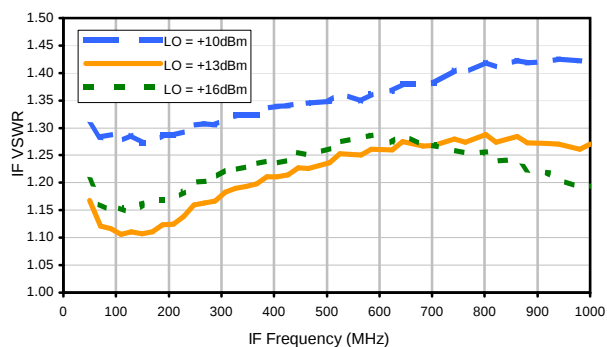
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	4	11	20	23	30	27	28	29	37	54
1	-	27	+0	26	12	26	19	39	45	35	37	45
2	92	54	50	72	51	57	48	49	56	56	52	55
3	>100	63	61	68	61	74	57	63	65	62	68	63
4	>100	84	82	83	82	80	78	75	75	75	78	82
5	>100	>87	>87	>87	>87	>87	86	>87	85	84	>87	>87
6	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
7	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
8	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
9	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
10	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 1000.1 MHz; -6.00 dBm.
LO IN: 1050.01 MHz; +13.00 dBm
IF OUT: 49.91 MHz; -12.74 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	15	22	37	44	38	40	46	49	61	78
1	-	25	+0	25	13	30	22	56	42	47	44	57
2	73	48	38	40	38	42	42	48	56	57	50	56
3	>100	43	41	45	39	56	45	41	43	50	60	49
4	>100	52	50	48	49	55	55	57	50	50	58	69
5	>100	65	51	72	51	61	54	67	58	61	59	59
6	92	77	69	83	62	60	61	59	61	72	62	58
7	>100	74	84	72	64	70	63	64	68	65	65	61
8	>100	94	81	76	74	74	80	67	77	66	72	70
9	>100	87	83	91	86	80	79	70	77	72	75	71
10	>100	>97	88	89	>97	85	81	82	78	77	85	82
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 1000.1 MHz; 4.00 dBm.
LO IN: 1050.01 MHz; +13.00 dBm
IF OUT: 49.91 MHz; -2.97 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.



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Outline Dimensions

TTT166
TTT167



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
TTT166	.38 (9.65)	.50 (12.70)	.15 (3.81)	.020 (0.51)	.075 (1.91)	.250 (6.35)	.425 (10.80)	.187 (4.75)	.050 (1.27)	.050 (1.27)	.070 (1.78)	.270 (6.86)	.540 (13.72)
TTT167			.23 (5.84)										

CASE #	P	Q	R	S	T	WT. GRAM
TTT166	.060 (1.52)	.095 (2.41)	.445 (11.30)	.208 (5.28)	.415 (10.54)	.8
TTT167						.8

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$

Note:

- Case material: Plastic.
- Base material: Printed wiring laminate.
- Termination finish:
 - For RoHS Case Styles: 3-5 μ inch (.08-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
 - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Tape & Reel Packaging TR-F12



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	12	7	Small quantity standards (see note)	10
				20
				50
				100
				200
		13	Standard	500

Note: Please Consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf



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THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
A	M86762	ADDED CONNECTIONS "lp & lq"	05/23/03	MMG	WL
B	M94598	ADDED CONNECTION "hk"	10/08/04	MMG	HY
C	M102713	UPDATED NOTES & DESCRIPTION	01/14/06	GF	IL
D	M132989	UPDATED NOTE 2	08/24/11	GF	DJ

**SUGGESTED MOUNTING CONFIGURATION FOR
TTT166/167 CASE STYLE, "hk"/"lp"/"lq"
"x"/"ck"/"ec" PIN CONNECTIONS**

**NOTE:**

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" $\pm$.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. THE USE OF SOLDER MASK OVER THE GROUND AREA UNDER THE UNIT AS SHOWN IS RECOMMENDED TO PREVENT POTENTIAL SHORTING. IF USER CHOOSES TO EXPOSE METAL UNDER THE ENTIRE UNIT GROUND PAD FOR IMPROVED GROUNDING, IT IS RECOMMENDED A SOLDER MASK DAM BE APPLIED AROUND EACH GROUND PAD TO ENSURE FILLET AND CONNECTION AT GROUND PADS.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), SEE NOTE 2.



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03

**Mini-Circuits®**13 Neptune Avenue
Brooklyn NY 11235

PL, hk/lp/lq/x/ck/ec, TTT166/167,
SYM/HJK/SYAS/SYPD, TB-12

SIZE
ACODE IDENT
15542DRAWING NO:
98-PL-079REV:
D

FILE: 98PL079

SCALE: 5:1

SHEET: 1 OF 1

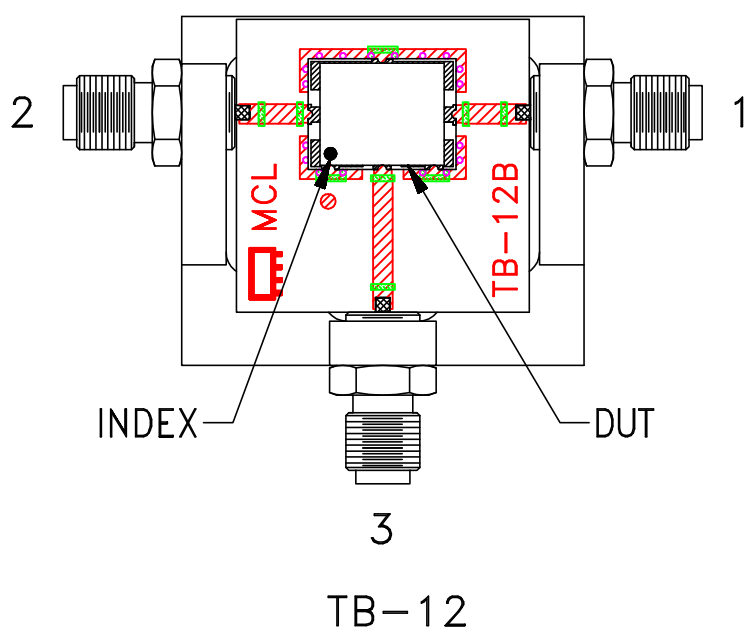
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ASHEETA1.DWG REV:A DATE:01/12/95

Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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