

Surface Mount Frequency Mixer

Level 13 (LO Power +13dBm) 5 to 1000 MHz

LRMS-2MH+ LRMS-2MH



Generic photo used for illustration purposes only
CASE STYLE: QQQ130

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	200mW
IF Current	40mA
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

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

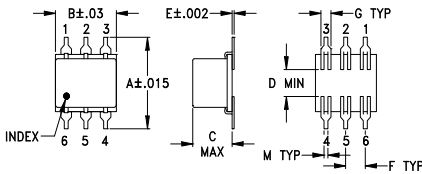
Features

- low conversion loss, 6.72 dB typ.
- good L-R isolation, 39 dB typ.

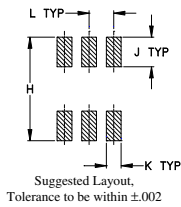
Applications

- HF/VHF/UHF
- instrumentation
- cellular

Outline Drawing



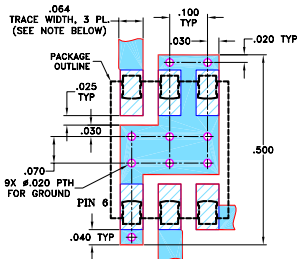
PCB Land Pattern



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	
.400	.31	.200	.10	.010	.100	.050	
10.16	7.87	5.08	2.54	0.25	2.54	1.27	
H	J	K	L	M			wt
.420	.120	.060	.100	.020			grams
10.67	3.05	1.52	2.54	0.51			0.55

Demo Board MCL P/N: TB-44+ Suggested PCB Layout (PL-083)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS $0.030" \pm 0.002"$; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Electrical Specifications

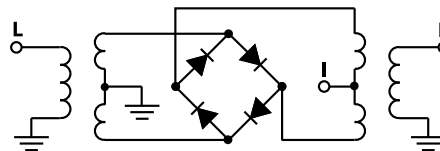
FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)					
LO/RF	IF	Mid-Band		Total Range Max.	Max.	L		M		U		L		M		U	
f_L-f_U		\bar{X}	σ			Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.
5-1000	DC-1000	6.72	.08	8.5	9.5	55	40	39	20	22	16	52	35	30	17	18	12

1 dB COMP.: +9 dBm typ. L = low range [f_L to $10 f_L$] M = mid range [$10 f_L$ to $f_U/2$] U = upper range [$f_U/2$ to f_U]

Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +13dBm	LO +13dBm	LO +13dBm	LO +13dBm	LO +13dBm
5.00	35.00	6.87	67.46	60.42	1.26	2.23
10.00	40.00	6.71	61.14	54.89	1.16	2.14
20.00	50.00	6.81	55.36	49.28	1.12	2.06
35.15	65.15	6.82	50.90	44.75	1.13	2.13
50.00	80.00	6.86	48.33	42.38	1.13	2.09
65.30	95.30	6.76	46.42	40.39	1.13	2.04
100.00	70.00	6.73	44.03	37.91	1.14	2.02
155.76	125.76	6.54	43.58	37.14	1.15	1.97
200.00	170.00	6.54	42.48	36.16	1.16	1.95
246.21	216.21	6.62	40.92	34.54	1.19	1.98
306.52	276.52	6.76	38.19	31.82	1.23	1.93
366.82	336.82	6.79	34.91	28.84	1.29	2.04
427.12	397.12	6.59	32.18	26.69	1.35	2.09
500.00	470.00	6.52	29.15	24.87	1.44	2.11
577.88	547.88	6.74	26.48	22.60	1.54	2.15
668.33	638.33	7.07	24.41	20.55	1.68	2.21
758.79	728.79	7.37	22.47	18.54	1.82	2.31
849.24	819.24	7.86	20.85	16.52	1.98	2.47
909.55	879.55	8.30	19.83	15.54	2.18	2.56
1030.00	970.00	8.73	19.01	14.41	2.43	2.61

Electrical Schematic

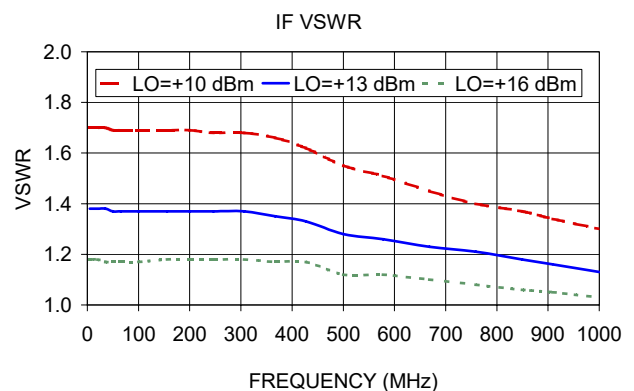
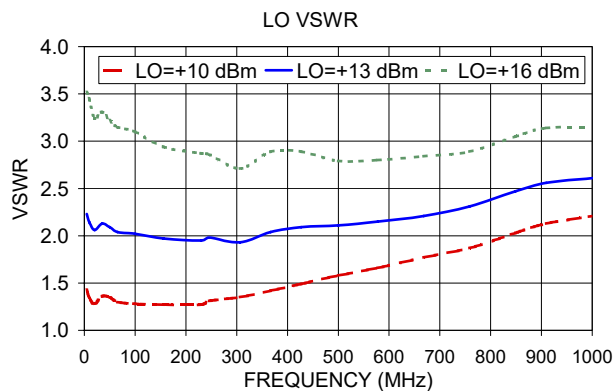
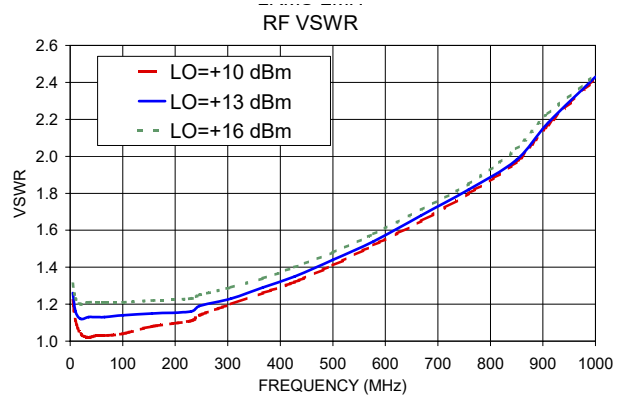
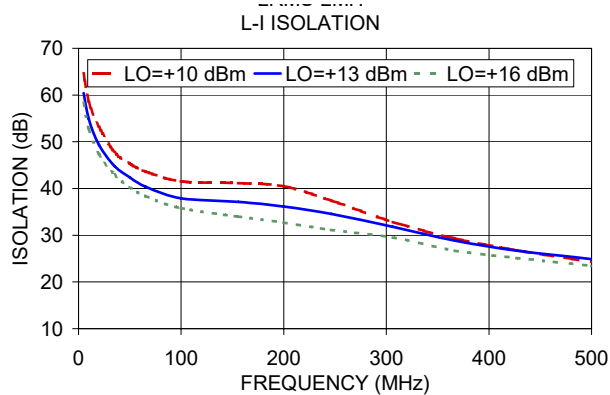
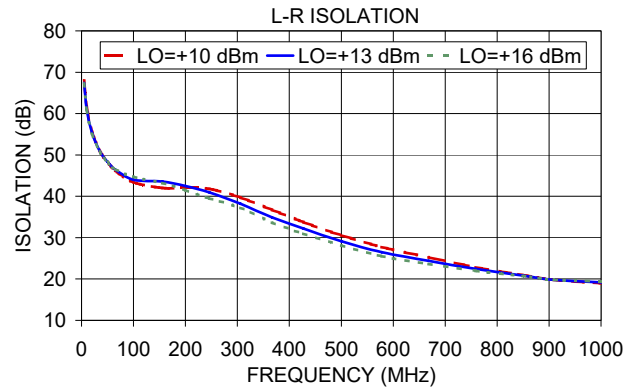
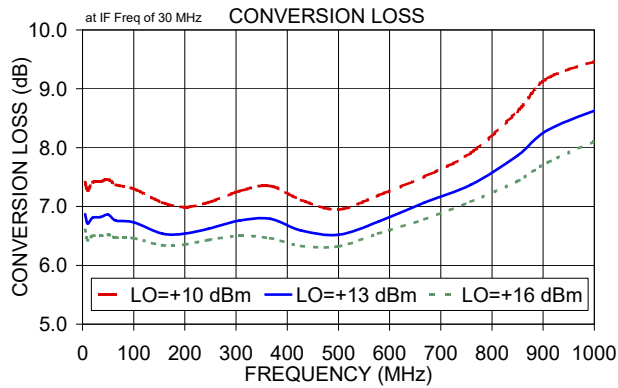


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Performance Charts



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Frequency Mixer

LRMS-2MH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (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
5.0	35.0	7.41	6.87	6.60	10.1	40.1	21.12	24.69	27.08	10.1	40.1	0.89	0.70	0.56
10.0	40.0	7.27	6.71	6.43	50.4	80.4	20.54	24.19	24.98	50.4	80.4	0.85	0.66	0.54
50.4	80.4	7.19	6.70	6.49	90.7	120.7	20.11	22.61	24.83	90.7	120.7	0.83	0.66	0.54
90.7	120.7	7.20	6.68	6.45	131.0	161.0	21.09	23.08	27.86	131.0	161.0	0.92	0.69	0.52
131.0	161.0	7.02	6.62	6.46	171.3	201.3	19.96	22.88	27.73	171.3	201.3	0.80	0.63	0.49
171.3	201.3	7.07	6.68	6.48	211.5	241.5	20.02	23.71	29.05	211.5	241.5	0.89	0.63	0.51
211.5	241.5	6.99	6.65	6.50	251.8	281.8	20.66	25.57	27.23	251.8	281.8	0.91	0.64	0.51
251.8	281.8	7.04	6.70	6.53	292.1	322.1	21.33	25.28	27.90	292.1	322.1	0.86	0.63	0.53
292.1	322.1	7.03	6.70	6.52	332.4	362.4	21.79	25.50	26.96	332.4	362.4	0.87	0.66	0.55
332.4	362.4	7.07	6.75	6.56	372.7	402.7	21.55	25.23	26.88	372.7	402.7	0.88	0.69	0.60
372.7	402.7	7.10	6.77	6.56	413.0	443.0	22.32	24.39	26.41	413.0	443.0	0.91	0.73	0.63
413.0	443.0	7.13	6.76	6.56	453.3	483.3	21.28	22.95	25.74	453.3	483.3	0.95	0.76	0.65
453.3	483.3	7.18	6.78	6.57	493.6	523.6	21.30	21.89	23.74	493.6	523.6	1.03	0.87	0.76
493.6	523.6	7.17	6.75	6.52	533.9	563.9	20.65	23.98	24.45	533.9	563.9	1.08	0.90	0.82
533.9	563.9	7.25	6.86	6.57	574.2	604.2	21.64	23.64	28.95	574.2	604.2	1.18	0.96	0.88
574.2	604.2	7.26	6.89	6.61	614.4	644.4	21.80	22.85	24.91	614.4	644.4	1.27	1.02	0.91
614.4	644.4	7.32	6.96	6.69	654.7	684.7	22.74	26.33	30.34	654.7	684.7	1.38	1.11	1.00
654.7	684.7	7.38	6.95	6.69	695.0	725.0	21.30	25.22	27.96	695.0	725.0	1.47	1.22	1.09
695.0	725.0	7.44	6.97	6.69	735.3	765.3	21.38	22.43	23.76	735.3	765.3	1.42	1.25	1.10
735.3	765.3	7.66	7.03	6.74	775.6	805.6	20.42	21.64	21.44	775.6	805.6	1.37	1.31	1.14
775.6	805.6	7.80	7.08	6.73	815.9	845.9	17.60	22.49	21.46	815.9	845.9	1.23	1.27	1.16
815.9	845.9	8.09	7.27	6.82	856.2	886.2	16.63	22.63	21.25	856.2	886.2	1.19	1.24	1.22
856.2	886.2	8.28	7.47	6.93	896.5	926.5	16.55	20.98	21.75	896.5	926.5	1.17	1.20	1.26
896.5	926.5	8.48	7.73	7.13	916.6	946.6	16.82	20.78	20.75	916.6	946.6	1.16	1.16	1.21
916.6	946.6	8.53	7.86	7.25	956.9	986.9	17.89	20.88	21.22	956.9	986.9	1.13	1.09	1.15
956.9	986.9	8.61	8.02	7.46	977.1	1007.1	18.15	21.23	22.15	977.1	1007.1	1.19	1.09	1.12
977.1	1007.1	8.61	8.08	7.57	1017.3	1047.3	19.87	25.39	24.88	1017.3	1047.3	1.21	1.05	1.02
1017.3	1047.3	8.69	8.24	7.83	1037.5	1067.5	21.39	26.56	25.73	1037.5	1067.5	1.24	1.05	0.98
1037.5	1067.5	8.72	8.31	8.04	1077.8	1107.8	24.05	21.86	22.15	1077.8	1107.8	1.32	1.15	1.01
1077.8	1107.8	8.74	8.35	8.11	1097.9	1127.9	20.67	20.47	21.44	1097.9	1127.9	1.37	1.12	0.96
1097.9	1127.9	8.79	8.44	8.27	1138.2	1168.2	18.18	19.54	21.39	1138.2	1168.2	1.37	1.08	0.92
1138.2	1168.2	8.88	8.54	8.35	1158.4	1188.4	17.80	19.73	21.86	1158.4	1188.4	1.39	1.06	0.89
1158.4	1188.4	9.03	8.72	8.58	1198.7	1228.7	17.33	19.96	21.56	1198.7	1228.7	1.40	1.02	0.90
1198.7	1228.7	9.09	8.83	8.66	1218.8	1248.8	17.35	19.85	21.39	1218.8	1248.8	1.35	0.98	0.87
1218.8	1248.8	9.29	9.05	8.88	1259.1	1289.1	17.50	20.11	21.46	1259.1	1289.1	1.38	0.93	0.87
1259.1	1289.1	9.39	9.15	9.03	1279.2	1309.2	17.28	20.00	20.84	1279.2	1309.2	1.38	0.91	0.87
1279.2	1309.2	9.62	9.41	9.31	1319.5	1349.5	17.53	20.44	20.47	1319.5	1349.5	1.30	0.84	0.84
1319.5	1349.5	9.76	9.55	9.49	1339.7	1369.7	17.24	20.05	20.77	1339.7	1369.7	1.31	0.81	0.81
1339.7	1369.7	10.25	9.97	9.90	1380.0	1410.0	16.87	19.29	19.35	1380.0	1410.0	1.43	0.83	0.79
1380.0	1410.0	10.47	10.11	10.07	1400.1	1430.1	16.66	19.09	19.34	1400.1	1430.1	1.39	0.81	0.77
1400.1	1430.1													



Frequency Mixer

LRMS-2MH+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+13			+13			+13
490.0	10.1	6.88	10.0	20.1	6.52	990.0	10.1	8.14
477.7	22.4	6.80	30.0	40.1	6.47	970.0	30.1	8.08
465.4	34.7	6.75	50.0	60.1	6.56	950.0	50.1	7.98
453.1	47.0	6.78	70.0	80.1	6.57	930.0	70.1	8.00
440.8	59.3	6.81	90.0	100.1	6.58	910.0	90.1	8.00
428.5	71.6	6.76	110.0	120.1	6.58	890.0	110.1	7.90
416.2	83.9	6.74	130.0	140.1	6.53	870.0	130.1	7.81
403.8	96.3	6.68	150.0	160.1	6.56	850.0	150.1	7.81
391.5	108.6	6.64	170.0	180.1	6.62	830.0	170.1	7.83
379.2	120.9	6.62	190.0	200.1	6.65	810.0	190.1	7.75
366.9	133.2	6.56	210.0	220.1	6.62	790.0	210.1	7.72
354.6	145.5	6.56	230.0	240.1	6.63	770.0	230.1	7.68
342.3	157.8	6.58	250.0	260.1	6.71	750.0	250.1	7.57
330.0	170.1	6.59	270.0	280.1	6.73	730.0	270.1	7.66
317.7	182.4	6.61	290.0	300.1	6.74	710.0	290.1	7.65
305.4	194.7	6.58	310.0	320.1	6.76	690.0	310.1	7.61
293.1	207.0	6.55	330.0	340.1	6.81	670.0	330.1	7.57
280.8	219.3	6.55	350.0	360.1	6.81	650.0	350.1	7.59
268.5	231.6	6.58	370.0	380.1	6.91	630.0	370.1	7.58
256.2	243.9	6.58	390.0	400.1	6.91	610.0	390.1	7.54
243.8	256.3	6.58	430.0	440.1	6.95	570.0	430.1	7.49
231.5	268.6	6.61	450.0	460.1	6.98	550.0	450.1	7.51
219.2	280.9	6.59	490.0	500.1	6.97	510.0	490.1	7.47
206.9	293.2	6.61	510.0	520.1	7.01	490.0	510.1	7.44
194.6	305.5	6.62	550.0	560.1	7.13	450.0	550.1	7.47
182.3	317.8	6.58	570.0	580.1	7.17	430.0	570.1	7.48
170.0	330.1	6.59	610.0	620.1	7.16	390.0	610.1	7.44
157.7	342.4	6.63	630.0	640.1	7.16	370.0	630.1	7.46
145.4	354.7	6.64	670.0	680.1	7.15	330.0	670.1	7.44
133.1	367.0	6.69	690.0	700.1	7.11	310.0	690.1	7.42
120.8	379.3	6.68	730.0	740.1	7.18	270.0	730.1	7.39
108.5	391.6	6.64	750.0	760.1	7.19	250.0	750.1	7.39
96.2	403.9	6.66	790.0	800.1	7.27	210.0	790.1	7.40
83.8	416.3	6.67	810.0	820.1	7.28	190.0	810.1	7.43
71.5	428.6	6.68	850.0	860.1	7.45	150.0	850.1	7.59
59.2	440.9	6.72	870.0	880.1	7.50	130.0	870.1	7.73
46.9	453.2	6.70	910.0	920.1	7.62	90.0	910.1	7.86
34.6	465.5	6.74	930.0	940.1	7.71	70.0	930.1	7.93
22.3	477.8	6.75	970.0	980.1	7.81	30.0	970.1	8.12
10.0	490.1	6.90	990.0	1000.1	7.79	10.0	990.1	8.39

Frequency Mixer

LRMS-2MH+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+10	+13	+16	+10	+13	+16
5.0	68.00	67.46	67.25	64.60	60.42	58.26
10.0	61.75	61.14	60.85	58.56	54.89	52.71
50.4	55.33	55.91	56.13	51.88	50.93	50.19
90.7	50.79	51.08	51.07	47.44	46.46	45.24
131.0	47.38	47.98	48.34	44.52	43.39	42.76
171.3	45.33	45.81	46.35	42.67	41.55	40.81
211.5	43.57	44.22	44.61	40.95	40.09	39.23
251.8	42.35	43.05	43.54	40.54	39.23	38.06
292.1	41.11	41.88	42.35	39.44	37.98	36.94
332.4	40.09	40.82	41.25	38.20	36.70	35.56
372.7	39.08	39.84	40.29	37.29	35.51	34.39
413.0	38.11	38.85	39.34	35.37	34.18	33.08
453.3	36.92	37.62	38.11	33.81	32.78	32.06
493.6	36.06	36.77	37.21	32.40	31.06	30.51
533.9	35.15	35.91	36.21	31.31	30.13	29.13
574.2	34.31	35.06	35.49	30.12	29.45	28.61
614.4	33.81	34.33	34.78	28.38	28.04	27.56
654.7	33.21	33.62	33.91	27.06	26.85	26.67
695.0	32.65	32.87	33.12	25.59	25.33	25.20
735.3	32.03	32.22	32.23	24.35	23.80	23.54
775.6	31.45	31.61	31.53	23.58	22.94	22.51
815.9	30.70	31.01	30.86	22.53	22.07	21.57
856.2	29.93	30.41	30.44	21.60	21.34	20.93
896.5	29.54	30.15	30.44	20.55	20.55	20.19
916.6	29.45	30.23	30.86	20.05	20.16	19.83
956.9	29.04	29.87	30.66	19.17	19.47	19.26
977.1	28.85	29.70	30.69	18.81	19.14	19.12
1017.3	28.70	29.75	30.97	17.78	18.27	18.35
1077.8	28.37	29.74	31.24	16.60	17.23	17.50
1097.9	28.63	30.50	32.66	16.15	16.80	17.06
1138.2	28.93	31.45	34.21	15.35	16.11	16.27
1158.4	29.31	32.14	35.10	15.07	15.78	15.98
1198.7	30.27	34.41	39.34	14.24	14.99	15.19
1218.8	30.37	34.80	40.16	13.88	14.72	14.86
1259.1	31.57	38.33	52.26	13.26	14.07	14.20
1279.2	31.66	39.93	52.66	12.97	13.75	13.99
1319.5	31.38	39.32	40.34	12.23	13.07	13.32
1339.7	31.67	38.84	37.55	12.03	12.89	13.12
1380.0	30.05	34.26	33.23	11.46	12.33	12.66
1400.1	29.46	33.14	32.30	11.19	12.09	12.47

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+10	+13	+16
10.1	40.1	54.33	51.69	49.04
50.4	80.4	37.17	37.26	37.19
90.7	120.7	32.63	32.62	32.85
131.0	161.0	29.96	30.07	30.21
171.3	201.3	28.32	28.44	28.38
211.5	241.5	27.12	27.19	27.30
251.8	281.8	26.33	26.48	26.54
292.1	322.1	25.92	26.15	26.21
332.4	362.4	25.55	25.82	26.01
372.7	402.7	25.37	25.74	25.93
413.0	443.0	25.24	25.66	26.02
453.3	483.3	25.22	25.70	26.03
493.6	523.6	25.04	25.54	25.82
533.9	563.9	24.08	24.49	24.67
574.2	604.2	22.37	22.70	22.83
614.4	644.4	20.48	20.50	20.54
654.7	684.7	18.71	18.59	18.59
695.0	725.0	17.42	17.24	17.20
735.3	765.3	16.42	16.22	16.17
775.6	805.6	15.70	15.57	15.51
815.9	845.9	15.08	15.04	15.05
856.2	886.2	14.48	14.56	14.64
896.5	926.5	13.99	14.18	14.38
916.6	946.6	13.83	14.07	14.31
956.9	986.9	13.56	13.89	14.25
977.1	1007.1	13.54	13.94	14.34
1017.3	1047.3	13.43	13.93	14.43
1037.5	1067.5	13.42	13.95	14.45
1077.8	1107.8	13.34	13.89	14.31
1097.9	1127.9	13.26	13.79	14.21
1138.2	1168.2	13.17	13.59	13.90
1158.4	1188.4	13.10	13.43	13.71
1198.7	1228.7	12.89	13.13	13.26
1218.8	1248.8	12.79	12.91	13.03
1259.1	1289.1	12.39	12.53	12.48
1279.2	1309.2	12.15	12.20	12.16
1319.5	1349.5	11.65	11.70	11.56
1339.7	1369.7	11.36	11.38	11.23
1380.0	1410.0	10.69	10.70	10.55
1400.1	1430.1	10.47	10.43	10.26



Frequency Mixer

LRMS-2MH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+10	+13	+16
5.0	35.0	1.43	2.23	3.52
10.0	40.0	1.34	2.14	3.44
50.4	80.4	1.15	1.24	1.32
90.7	120.7	1.15	1.26	1.34
131.0	161.0	1.18	1.28	1.34
171.3	201.3	1.17	1.28	1.34
211.5	241.5	1.20	1.29	1.35
251.8	281.8	1.20	1.29	1.34
292.1	322.1	1.21	1.29	1.35
332.4	362.4	1.22	1.30	1.36
372.7	402.7	1.24	1.31	1.37
413.0	443.0	1.26	1.33	1.39
453.3	483.3	1.29	1.36	1.42
493.6	523.6	1.34	1.42	1.48
533.9	563.9	1.37	1.44	1.51
574.2	604.2	1.42	1.48	1.55
614.4	644.4	1.48	1.54	1.59
654.7	684.7	1.53	1.59	1.66
695.0	725.0	1.60	1.66	1.73
735.3	765.3	1.67	1.74	1.81
775.6	805.6	1.77	1.84	1.91
815.9	845.9	1.92	1.96	2.03
856.2	886.2	2.08	2.11	2.16
896.5	926.5	2.27	2.28	2.31
916.6	946.6	2.37	2.38	2.41
956.9	986.9	2.59	2.61	2.63
977.1	1007.1	2.72	2.75	2.77
1017.3	1047.3	2.95	3.00	3.03
1037.5	1067.5	3.07	3.13	3.17
1077.8	1107.8	3.27	3.34	3.40
1097.9	1127.9	3.36	3.43	3.48
1138.2	1168.2	3.58	3.65	3.72
1158.4	1188.4	3.66	3.73	3.79
1198.7	1228.7	3.86	3.95	4.00
1218.8	1248.8	3.99	4.07	4.11
1259.1	1289.1	4.09	4.16	4.20
1279.2	1309.2	4.16	4.23	4.27
1319.5	1349.5	4.24	4.30	4.33
1339.7	1369.7	4.28	4.33	4.36
1380.0	1410.0	4.36	4.39	4.43
1400.1	1430.1	4.37	4.40	4.42

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+10	+13	+16
5.0	1.22	1.26	1.31
10.0	1.11	1.16	1.23
50.4	1.71	2.62	3.82
90.7	1.61	2.37	3.38
131.0	1.68	2.55	3.70
171.3	1.62	2.41	3.45
211.5	1.67	2.50	3.58
251.8	1.69	2.53	3.60
292.1	1.70	2.51	3.54
332.4	1.80	2.66	3.74
372.7	1.80	2.60	3.62
413.0	1.90	2.75	3.80
453.3	1.95	2.76	3.78
493.6	2.01	2.82	3.82
533.9	2.12	2.95	3.95
574.2	2.15	2.96	3.95
614.4	2.27	3.10	4.10
654.7	2.33	3.10	4.06
695.0	2.44	3.20	4.15
735.3	2.56	3.30	4.21
775.6	2.66	3.40	4.29
815.9	2.80	3.56	4.44
856.2	2.88	3.64	4.51
896.5	2.99	3.76	4.64
916.6	3.03	3.80	4.68
956.9	3.10	3.83	4.70
977.1	3.14	3.86	4.72
1017.3	3.21	3.90	4.75
1037.5	3.24	3.90	4.73
1077.8	3.29	3.90	4.69
1097.9	3.31	3.90	4.66
1138.2	3.38	3.93	4.64
1158.4	3.42	3.93	4.62
1198.7	3.48	3.92	4.55
1218.8	3.53	3.94	4.54
1259.1	3.63	3.97	4.53
1279.2	3.69	3.98	4.50
1319.5	3.79	4.01	4.48
1339.7	3.86	4.06	4.52
1380.0	3.95	4.10	4.48
1400.1	3.99	4.10	4.46

IF (OUT) (MHz)	IF VSWR @LO=1000.1MHz (:1)		
	@LO (dBm)		
	+10	+13	+16
5.0	1.70	1.38	1.18
10.0	1.70	1.38	1.18
30.2	2.50	2.04	1.67
50.4	2.39	1.97	1.59
70.6	2.35	1.95	1.59
90.8	2.39	1.98	1.61
111.0	2.45	2.02	1.64
131.2	2.44	2.01	1.64
151.4	2.37	1.96	1.61
171.6	2.33	1.93	1.58
191.8	2.36	1.97	1.62
212.0	2.40	2.00	1.65
232.2	2.39	1.99	1.64
252.4	2.38	1.99	1.64
272.7	2.40	2.01	1.66
292.9	2.38	2.00	1.66
313.1	2.34	1.96	1.64
333.3	2.32	1.95	1.64
353.5	2.34	1.98	1.68
373.7	2.33	1.98	1.68
393.9	2.30	1.95	1.65
434.3	2.21	1.91	1.65
454.5	2.22	1.92	1.68
494.9	2.26	1.96	1.71
515.1	2.18	1.90	1.68
555.5	2.17	1.91	1.71
575.7	2.19	1.95	1.75
616.1	2.14	1.90	1.71
636.3	2.10	1.87	1.70
676.7	2.09	1.88	1.73
696.9	2.11	1.90	1.75
737.3	2.00	1.81	1.67
757.6	1.95	1.78	1.66
798.0	1.93	1.78	1.68
818.2	1.92	1.78	1.68
858.6	1.84	1.70	1.62
878.8	1.79	1.66	1.59
919.2	1.78	1.68	1.63
939.4	1.78	1.67	1.62
979.8	1.69	1.60	1.56
1000.0	1.75	1.85	2.04

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	4	21	9	41	23	26	19	32	35	43
1	-	18	+0	32	13	32	28	37	40	37	65	43
2	>100	58	44	60	45	58	47	74	57	65	54	54
3	>100	69	78	69	64	67	60	69	71	72	63	85
4	>100	>87	87	>87	86	>87	81	85	>87	>87	85	>87
5	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>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: 500.1 MHz; -6.00 dBm.
 LO IN: 530.01 MHz; +13.00 dBm
 IF OUT: 29.91 MHz; -12.86 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	14	32	21	57	35	38	33	51	50	74
1	-	19	+0	30	13	36	29	43	41	42	57	51
2	>100	50	37	50	36	55	40	60	52	65	46	53
3	>100	50	48	65	48	53	45	52	58	54	51	54
4	>100	78	62	74	59	67	63	61	56	78	69	64
5	>100	91	75	77	57	63	54	62	53	63	62	72
6	>100	93	80	97	81	74	71	69	64	68	67	77
7	>100	78	83	86	81	78	75	82	75	93	95	86
8	>100	94	>97	>97	>97	>97	92	89	87	88	82	81
9	>100	>97	>97	>97	>97	95	91	86	83	88	83	92
10	>100	>97	>97	>97	>97	>97	>97	>97	94	>97	91	95
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; 4.00 dBm.
 LO IN: 530.01 MHz; +13.00 dBm
 IF OUT: 29.91 MHz; -2.79 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.

REV. X2
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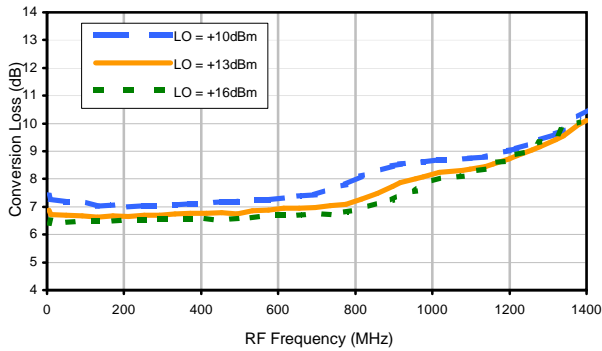


Frequency Mixer

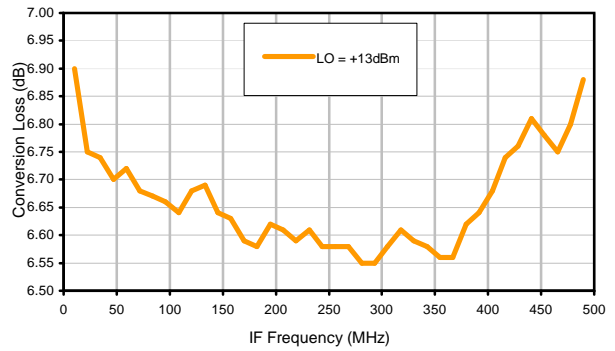
LRMS-2MH+

Typical Performance Curves

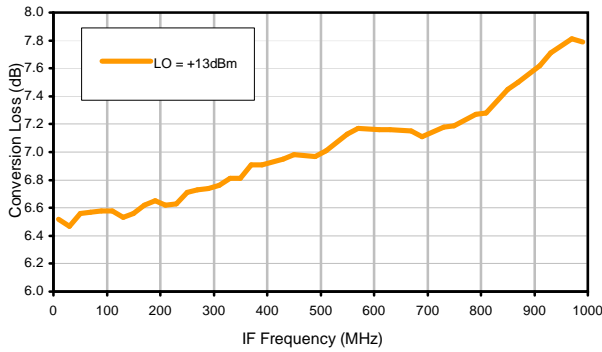
Conversion Loss @ IF=30MHz



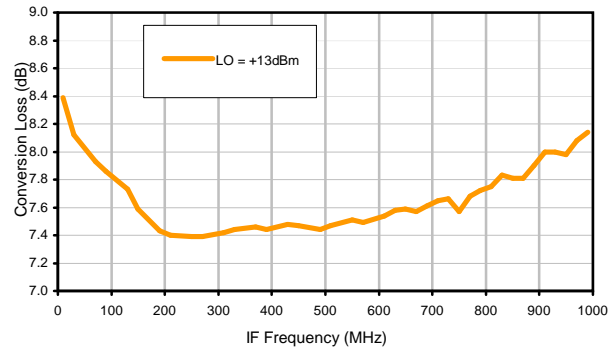
Conversion Loss vs. IF @ RF=500.1MHz



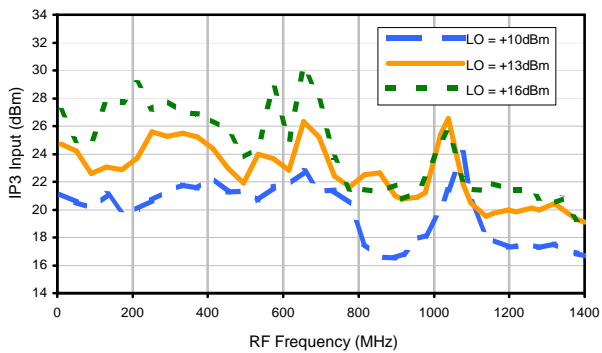
Conversion Loss vs. IF @ RF=10.1MHz



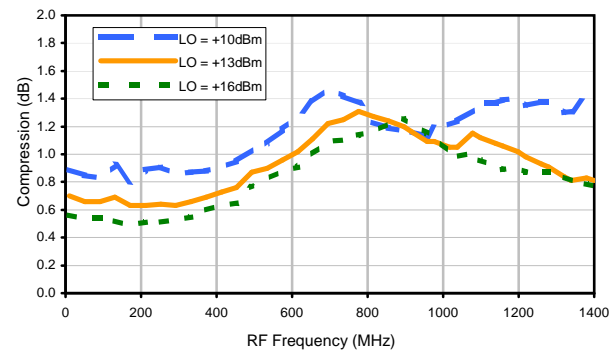
Conversion Loss vs. IF @ RF=1000.1MHz



IP3 Input

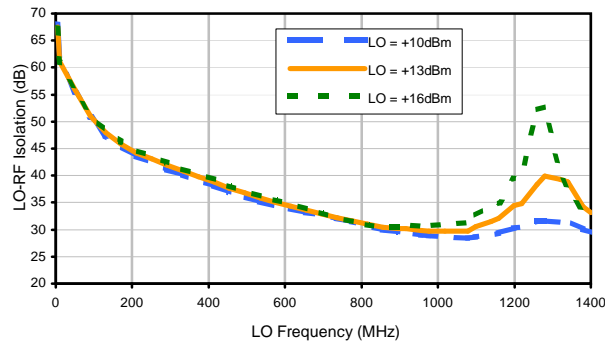


Compression @ RF IN=+9dBm

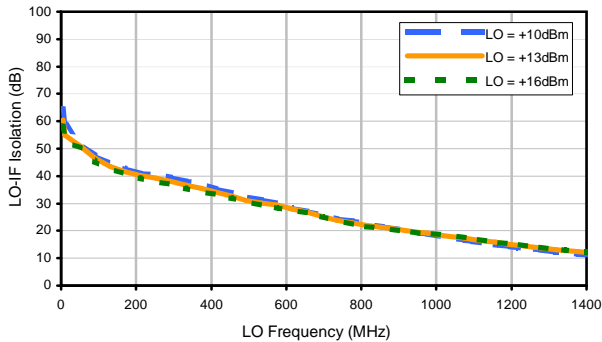


Typical Performance Curves

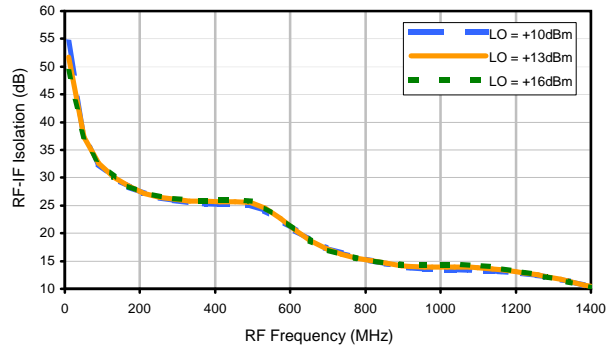
LO-RF Isolation



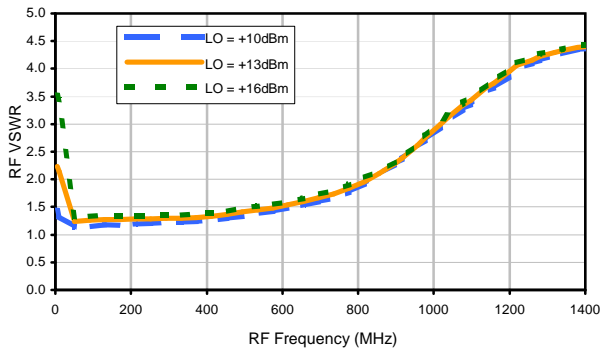
LO-IF Isolation



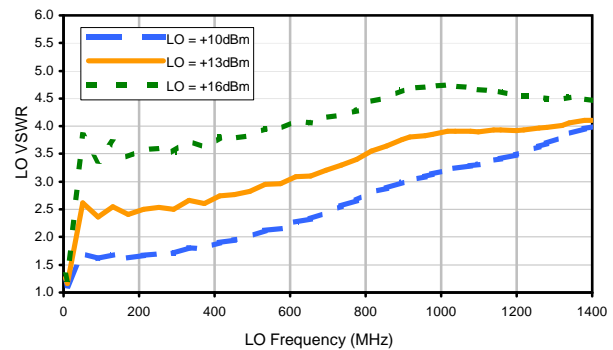
RF-IF Isolation



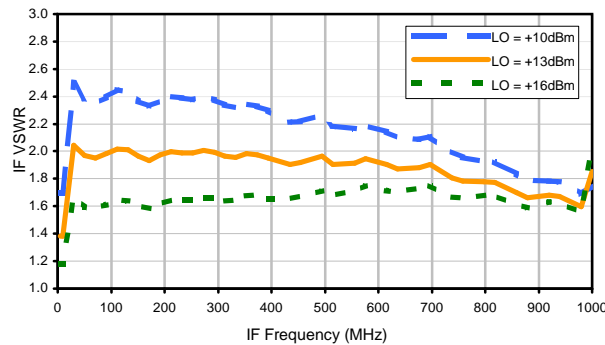
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	4	21	9	41	23	26	19	32	35	43
1	-	18	+0	32	13	32	28	37	40	37	65	43
2	>100	58	44	60	45	58	47	74	57	65	54	54
3	>100	69	78	69	64	67	60	69	71	72	63	85
4	>100	>87	87	>87	86	>87	81	85	>87	>87	85	>87
5	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>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: 500.1 MHz; -6.00 dBm.
 LO IN: 530.01 MHz; +13.00 dBm
 IF OUT: 29.91 MHz; -12.86 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	14	32	21	57	35	38	33	51	50	74
1	-	19	+0	30	13	36	29	43	41	42	57	51
2	>100	50	37	50	36	55	40	60	52	65	46	53
3	>100	50	48	65	48	53	45	52	58	54	51	54
4	>100	78	62	74	59	67	63	61	56	78	69	64
5	>100	91	75	77	57	63	54	62	53	63	62	72
6	>100	93	80	97	81	74	71	69	64	68	67	77
7	>100	78	83	86	81	78	75	82	75	93	95	86
8	>100	94	>97	>97	>97	>97	92	89	87	88	82	81
9	>100	>97	>97	>97	>97	95	91	86	83	88	83	92
10	>100	>97	>97	>97	>97	>97	>97	>97	94	>97	91	95
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; 4.00 dBm.
 LO IN: 530.01 MHz; +13.00 dBm
 IF OUT: 29.91 MHz; -2.79 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.

REV. X2
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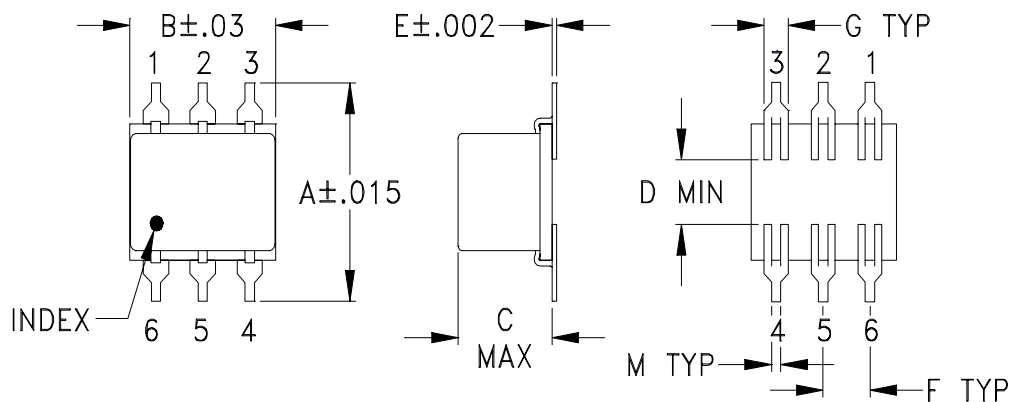
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see [minicircuits.com](http://www.minicircuits.com)

Case Style

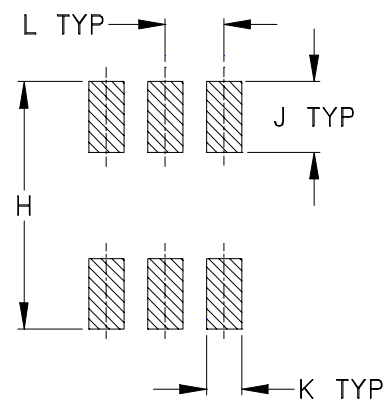
QQQ

QQQ130 (non-waterproof)
QQQ828 (washable)

Outline Dimensions



PCB Land Pattern



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

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT, GRAM
QQQ130	.400 (10.16)	.31 (7.87)	.200 (5.08)	.10 (2.54)	.010 (.25)	.100 (2.54)	.050 (1.27)	.420 (10.67)	.120 (3.05)	.060 (1.52)	.100 (2.54)	.020 (.51)	.55
QQQ828			.050 (1.27)										.20

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

Notes:

- Case material: Ceramic.
- Termination finish:
 - For RoHS Case Styles: Tin plate over Nickel plate.
 - For RoHS-5 Case Styles: Tin-Lead plate.



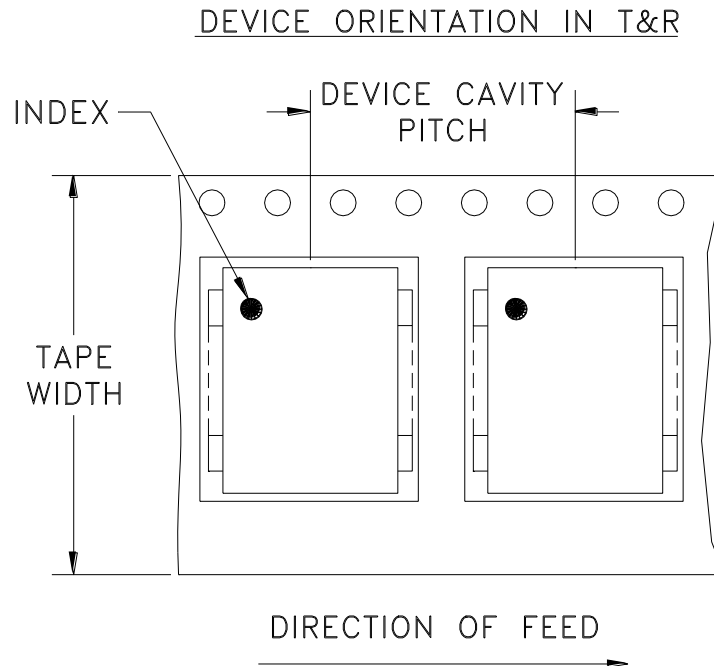
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		13	500

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.

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



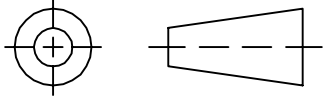
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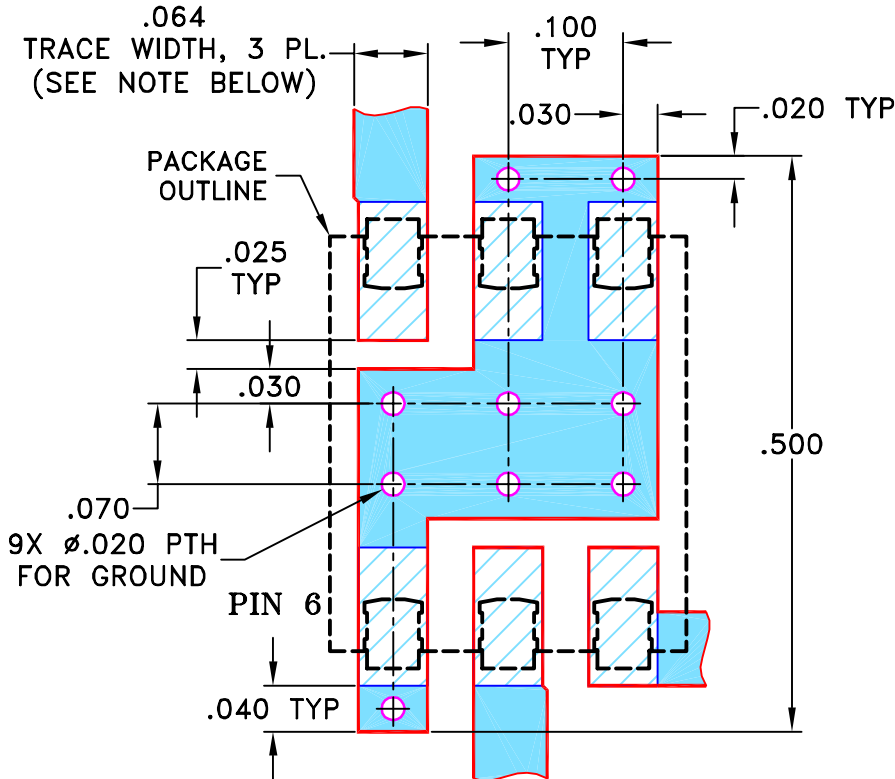
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/02/02	AV	DJ
A	M102713	UPDATED NOTES	01/14/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR QQQ569 CASE STYLE, "w" PIN CONNECTION



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

07/19/02

TOLERANCES ON:

CHECKED

WL

08/02/02

2 PL DECIMALS ± .005

APPROVED

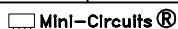
DJ

08/02/02

3 PL DECIMALS ±

ANGLES ±

FRACTIONS ±



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Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, w, QQQ569, LRMS-J, TB-44

SIZE

CODE IDENT

DRAWING NO:

REV:

A

15542

98-PL-083

A

FILE: 98PL083

SCALE:

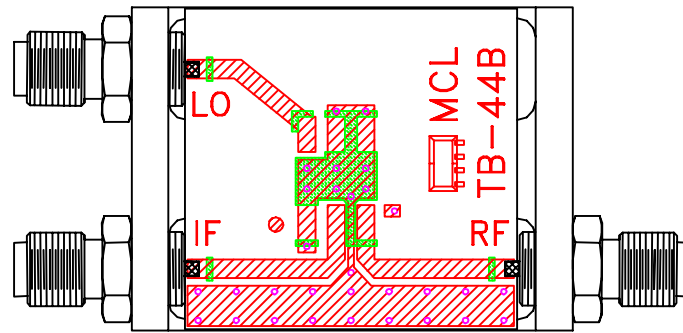
6:1

SHEET:

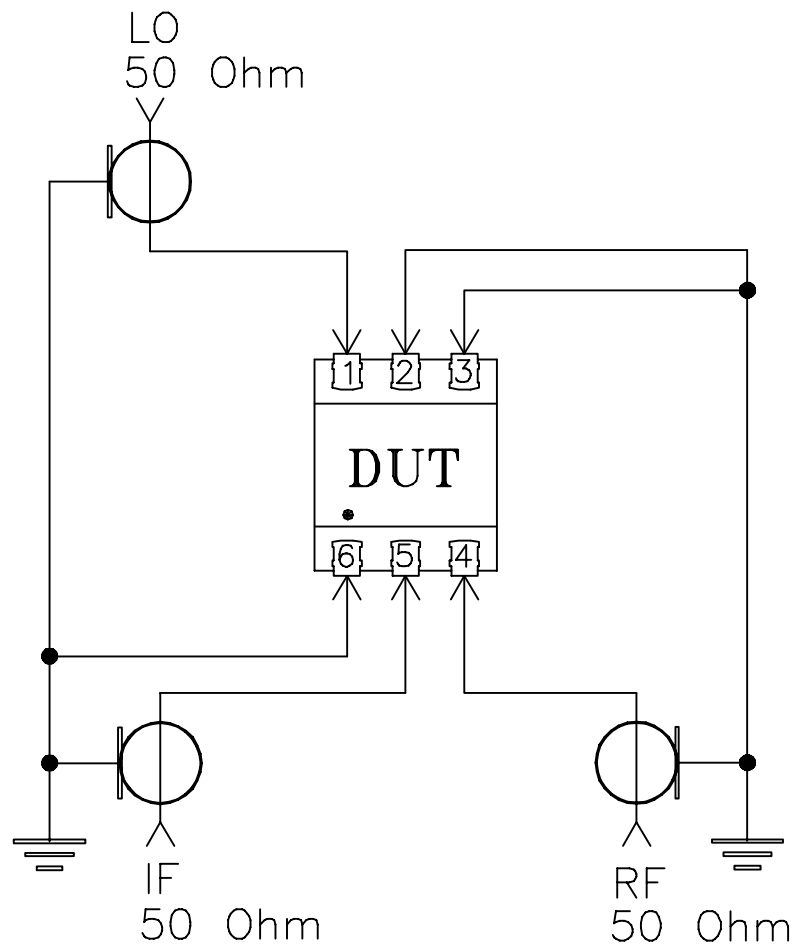
1 OF 1

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

Evaluation Board and Circuit




TB-44+



Schematic Diagram

Notes:

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

 Mini-Circuits®



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215