

Surface Mount Frequency Mixer

LRMS-1W+

Level 7 (LO Power +7dBm) 2 to 750 MHz

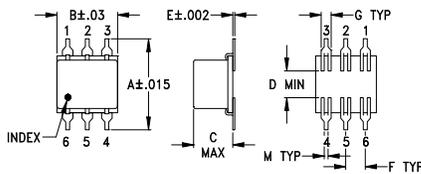
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	50mW
IF Current	40mA
Permanent damage may occur if any of these limits are exceeded.	

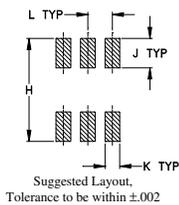
Pin Connections

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

Outline Drawing



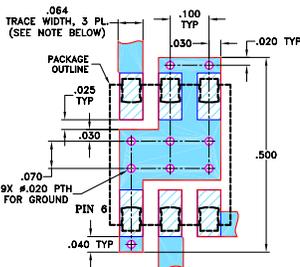
PCB Land Pattern



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" ± 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-Circuit's 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-Circuit's website at www.minicircuits.com/MCLStore/terms.jsp

Features

- low conversion loss, 5.83 dB typ.
- excellent L-R isolation, 45 dB typ.

Applications

- HF/VHF/UHF
- instrumentation
- cellular



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

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

Electrical Specifications

FREQUENCY (MHz)	CONVERSION LOSS (dB)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)							
		L	M	U	L	M	U					
2-750	DC-750	70	45	28	38	22	60	45	40	25	30	20

1 dB COMP.: +1 dBm typ.

L = low range [f_l to $10 f_l$]
m = mid band [$2 f_l$ to $f_l/2$]

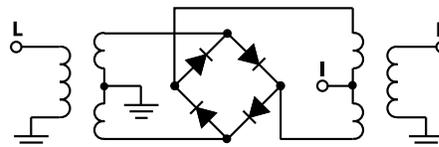
M = mid range [$10 f_l$ to $f_l/2$]

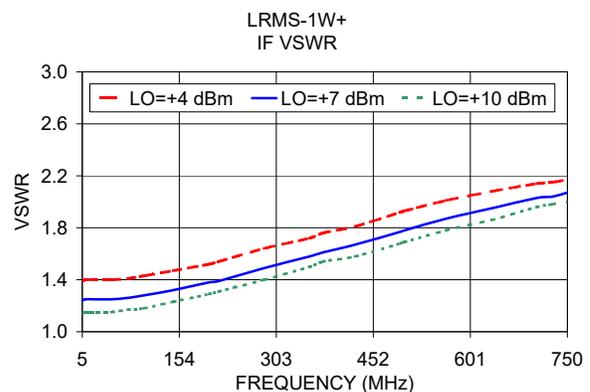
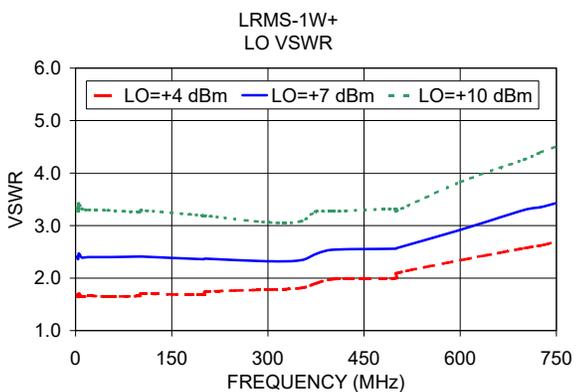
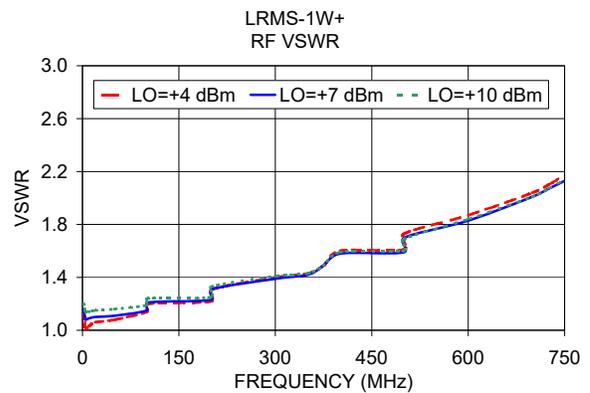
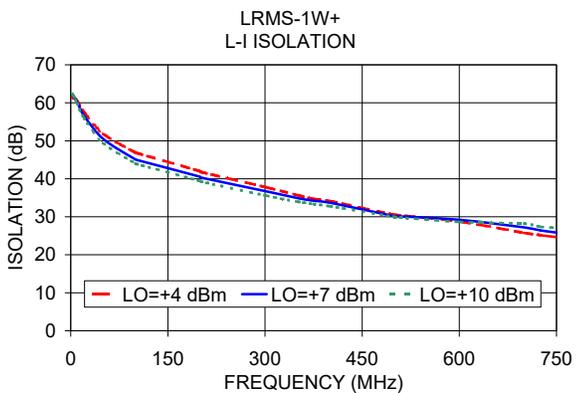
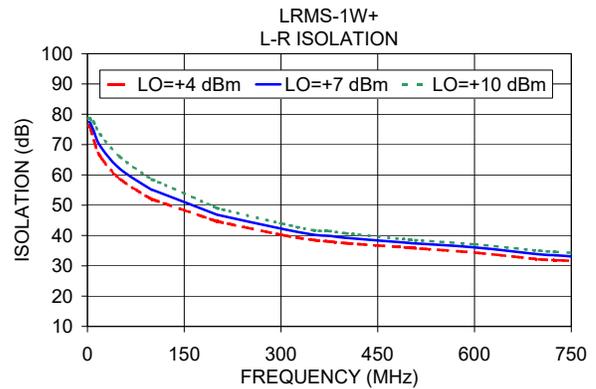
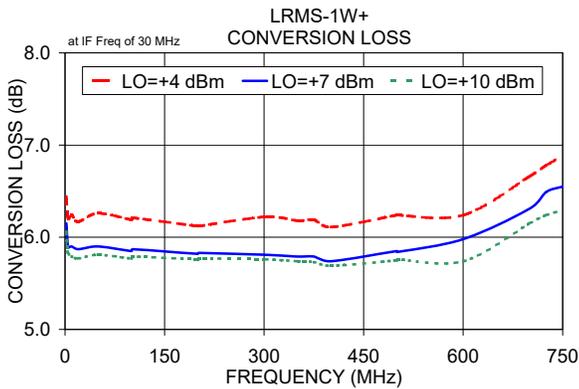
U = upper range [$f_l/2$ to f_l]

Typical Performance Data

Frequency (MHz)	Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
2.00	32.00	6.15	77.45	62.05	1.16
4.00	34.00	5.93	77.30	61.60	1.10
5.00	35.00	5.89	76.89	61.49	1.08
10.00	40.00	5.90	74.36	60.26	1.09
20.00	50.00	5.87	69.48	56.77	1.10
50.00	80.00	5.90	62.05	50.51	1.11
100.00	70.00	5.85	55.01	45.08	1.15
101.73	71.73	5.87	55.00	44.99	1.21
200.00	170.00	5.82	46.91	40.52	1.23
201.47	171.47	5.83	46.83	40.31	1.31
301.20	271.20	5.81	42.24	36.71	1.39
351.07	321.07	5.79	40.24	34.89	1.42
375.00	345.00	5.79	39.86	34.22	1.49
400.93	370.93	5.74	39.23	33.67	1.58
500.00	470.00	5.85	37.51	30.15	1.59
500.67	470.67	5.84	37.49	30.16	1.70
600.40	570.40	5.98	36.08	29.20	1.83
700.13	670.13	6.31	33.78	27.21	2.01
725.07	695.07	6.49	33.46	26.43	2.07
750.00	720.00	6.55	33.11	25.85	2.13

Electrical Schematic





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Frequency Mixer

LRMS-1W+

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=+1dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+4	+7	+10			+4	+7	+10			+4	+7	+10
2.0	32.0	6.44	6.15	6.06	10.1	40.1	18.99	21.08	21.36	10.1	40.1	1.31	1.16	0.78
4.0	34.0	6.24	5.93	5.84	30.1	60.1	17.10	17.52	17.80	30.1	60.1	1.32	1.08	0.89
5.0	35.0	6.20	5.89	5.82	50.1	80.1	18.40	17.17	17.79	50.1	80.1	1.45	1.04	0.80
10.0	40.0	6.24	5.90	5.79	70.1	100.1	19.15	18.28	18.28	70.1	100.1	1.37	1.13	0.77
30.1	60.1	5.99	5.66	5.50	110.1	140.1	16.26	16.71	23.72	110.1	140.1	1.33	1.04	0.76
50.1	80.1	6.01	5.69	5.57	130.1	160.1	16.22	16.80	29.19	130.1	160.1	1.33	1.06	0.73
70.1	100.1	6.00	5.73	5.58	170.1	200.1	15.92	19.23	25.28	170.1	200.1	1.26	1.01	0.66
110.1	140.1	6.11	5.78	5.68	190.1	220.1	17.24	19.70	24.84	190.1	220.1	1.30	0.93	0.70
170.1	200.1	6.13	5.83	5.72	230.1	260.1	17.17	19.18	18.74	230.1	260.1	1.35	0.93	0.77
190.1	220.1	6.11	5.84	5.72	250.1	280.1	18.49	20.29	19.40	250.1	280.1	1.23	0.95	0.72
230.1	260.1	6.07	5.84	5.74	290.1	320.1	17.01	23.23	24.68	290.1	320.1	1.25	0.84	0.71
250.1	280.1	6.09	5.82	5.72	310.1	340.1	24.46	20.51	21.56	310.1	340.1	1.27	1.02	0.72
290.1	320.1	6.10	5.84	5.72	350.1	380.1	15.36	16.34	18.49	350.1	380.1	1.34	0.90	0.74
310.1	340.1	6.09	5.84	5.75	370.1	400.1	13.41	15.40	16.38	370.1	400.1	1.27	0.90	0.65
350.1	380.1	6.03	5.76	5.77	410.1	440.1	16.27	14.87	18.05	410.1	440.1	1.20	0.76	0.71
370.1	400.1	6.12	5.90	5.80	430.1	460.1	18.83	18.71	22.25	430.1	460.1	1.03	0.82	0.67
410.1	440.1	6.25	6.01	5.87	470.1	500.1	16.22	21.29	19.12	470.1	500.1	1.18	0.90	0.73
430.1	460.1	6.23	5.96	5.79	490.1	520.1	16.13	19.67	19.17	490.1	520.1	1.25	0.96	0.76
470.1	500.1	6.33	6.07	5.95	530.1	560.1	17.83	21.11	18.53	530.1	560.1	1.15	0.81	0.57
490.1	520.1	6.33	6.08	5.96	550.1	580.1	13.87	16.63	19.08	550.1	580.1	1.23	0.90	0.63
550.1	580.1	6.40	6.13	6.02	590.1	620.1	12.50	14.05	16.44	590.1	620.1	1.16	0.98	0.63
590.1	620.1	6.52	6.30	6.20	610.1	640.1	11.02	13.11	16.57	610.1	640.1	1.33	0.82	0.61
610.1	640.1	6.60	6.39	6.26	650.1	680.1	9.26	11.29	13.80	650.1	680.1	1.63	1.17	0.98
650.1	680.1	6.80	6.56	6.44	670.1	700.1	8.39	10.64	14.74	670.1	700.1	1.61	1.19	0.93
670.1	700.1	6.86	6.63	6.52	710.1	740.1	7.36	9.46	12.54	710.1	740.1	1.63	1.29	1.05
710.1	740.1	6.97	6.76	6.60	730.1	760.1	6.98	9.16	11.98	730.1	760.1	1.72	1.49	1.15
730.1	760.1	7.09	6.84	6.67	770.1	800.1	6.92	9.57	13.01	770.1	800.1	1.86	1.42	1.20
770.1	800.1	7.22	6.93	6.75	790.1	820.1	7.19	10.04	14.21	790.1	820.1	1.80	1.53	1.27
790.1	820.1	7.25	6.97	6.77	830.1	860.1	8.20	12.22	16.11	830.1	860.1	1.94	1.62	1.43
830.1	860.1	7.42	7.09	6.89	850.1	880.1	9.03	12.84	20.16	850.1	880.1	2.03	1.69	1.43
850.1	880.1	7.48	7.12	6.96	890.1	920.1	10.59	16.29	27.84	890.1	920.1	1.97	1.77	1.47
890.1	920.1	7.63	7.20	7.01	910.1	940.1	11.48	15.51	18.06	910.1	940.1	2.11	1.73	1.62
910.1	940.1	7.83	7.37	7.14	950.1	980.1	13.81	20.68	19.28	950.1	980.1	1.90	1.71	1.39
950.1	980.1	8.19	7.66	7.38	970.1	1000.1	14.67	20.93	19.37	970.1	1000.1	1.80	1.64	1.28
970.1	1000.1	8.50	7.85	7.57	1010.1	1040.1	12.90	15.62	16.51	1010.1	1040.1	1.50	1.31	1.18
1010.1	1040.1	8.95	8.35	8.04	1030.1	1060.1	11.17	14.11	14.57	1030.1	1060.1	1.37	1.07	0.91
1070.1	1100.1	9.70	9.07	8.69	1070.1	1100.1	8.87	11.15	12.80	1070.1	1100.1	1.20	1.01	0.78
1090.1	1120.1	9.92	9.25	8.91	1090.1	1120.1	8.38	10.79	12.15	1090.1	1120.1	1.16	0.89	0.87
1130.1	1160.1	10.39	9.77	9.44	1130.1	1160.1	7.80	9.46	12.12	1130.1	1160.1	1.06	0.94	0.81
1150.1	1180.1	10.70	10.01	9.62	1150.1	1180.1	7.94	9.66	11.57	1150.1	1180.1	1.04	0.90	0.78

REV. X2
LRMS-1W+
100817
Page 1 of 5



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Frequency Mixer

LRMS-1W+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=375.1MHz (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)=750.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+7			+7			+7
365.0	10.1	6.03	10.0	20.1	5.78	740.0	10.1	7.31
356.1	19.0	6.02	28.7	38.8	5.64	721.3	28.8	7.30
347.3	27.9	5.99	47.4	57.5	5.62	702.6	47.5	7.22
338.4	36.7	5.97	66.2	76.3	5.68	683.8	66.3	7.15
329.5	45.6	5.94	84.9	95.0	5.69	665.1	85.0	7.09
320.6	54.5	5.90	103.6	113.7	5.75	646.4	103.7	7.05
311.8	63.4	5.89	122.3	132.4	5.71	627.7	122.4	7.04
302.9	72.2	5.87	141.0	151.1	5.75	609.0	141.1	6.99
294.0	81.1	5.84	159.7	169.8	5.78	590.3	159.8	6.94
285.1	90.0	5.84	178.5	188.6	5.79	571.5	178.6	6.91
276.3	98.9	5.83	197.2	207.3	5.81	552.8	197.3	6.94
267.4	107.7	5.82	215.9	226.0	5.85	534.1	216.0	6.90
258.5	116.6	5.80	234.6	244.7	5.85	515.4	234.7	6.90
249.6	125.5	5.82	253.3	263.4	5.89	496.7	253.4	6.86
240.8	134.4	5.78	272.1	282.2	5.89	477.9	272.2	6.84
231.9	143.2	5.77	290.8	300.9	5.92	459.2	290.9	6.86
223.0	152.1	5.77	309.5	319.6	5.93	440.5	309.6	6.96
214.1	161.0	5.77	328.2	338.3	5.94	421.8	328.3	6.94
205.3	169.9	5.77	346.9	357.0	5.91	403.1	347.0	6.91
196.4	178.7	5.75	365.6	375.7	5.94	384.4	365.7	6.91
187.5	187.6	5.32	384.4	394.5	5.96	365.6	384.5	6.98
178.6	196.5	5.75	403.1	413.2	5.92	346.9	403.2	6.99
169.8	205.4	5.74	421.8	431.9	5.98	328.2	421.9	6.99
160.9	214.2	5.73	440.5	450.6	6.01	309.5	440.6	6.99
152.0	223.1	5.78	459.2	469.3	6.00	290.8	459.3	6.95
143.1	232.0	5.77	477.9	488.0	6.06	272.1	478.0	6.94
134.3	240.9	5.77	496.7	506.8	6.12	253.3	496.8	6.93
125.4	249.7	5.78	515.4	525.5	6.14	234.6	515.5	6.90
116.5	258.6	5.80	534.1	544.2	6.17	215.9	534.2	6.88
107.6	267.5	5.79	552.8	562.9	6.21	197.2	552.9	6.88
98.8	276.4	5.79	571.5	581.6	6.24	178.5	571.6	6.90
89.9	285.2	5.77	590.3	600.4	6.20	159.7	590.4	6.93
81.0	294.1	5.66	609.0	619.1	6.24	141.0	609.1	6.94
72.1	303.0	5.64	627.7	637.8	6.20	122.3	627.8	6.92
63.3	311.9	5.77	646.4	656.5	6.16	103.6	646.5	6.90
54.4	320.7	5.80	665.1	675.2	6.15	84.9	665.2	6.91
45.5	329.6	5.76	683.8	693.9	6.19	66.2	683.9	6.91
36.6	338.5	5.80	702.6	712.7	6.20	47.4	702.7	6.86
18.9	356.2	5.85	721.3	731.4	6.14	28.7	721.4	6.88
10.0	365.1	5.72	740.0	750.1	6.08	10.0	740.1	6.78

REV. X2
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100817
Page 2 of 5



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Frequency Mixer

LRMS-1W+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+4	+7	+10	+4	+7	+10
2.0	76.36	77.45	78.57	61.46	62.05	62.37
4.0	76.01	77.30	78.72	61.31	61.60	61.92
5.0	75.18	76.89	78.20	61.28	61.49	61.60
10.0	71.36	74.36	77.17	60.46	60.26	59.90
30.1	61.83	62.72	62.90	56.35	52.56	52.15
50.1	57.32	58.63	58.28	52.53	49.13	47.92
70.1	54.12	54.62	54.97	49.58	46.69	45.41
110.1	49.78	50.12	50.71	45.90	43.60	42.25
170.1	45.44	45.97	46.55	42.64	40.71	39.21
190.1	44.34	44.95	45.35	41.99	40.01	38.56
230.1	42.59	43.13	43.53	40.23	38.45	36.94
250.1	41.72	42.10	42.35	39.41	37.82	36.44
290.1	40.51	41.02	41.27	37.64	36.35	35.13
310.1	39.79	40.31	40.60	36.78	35.67	34.54
350.1	38.21	38.52	38.76	35.13	34.39	33.44
370.1	37.69	37.92	38.19	34.14	33.63	32.76
410.1	37.07	37.25	37.46	32.32	32.29	31.89
430.1	37.05	37.27	37.37	31.18	31.20	30.98
470.1	36.77	36.98	36.94	29.84	29.85	29.71
490.1	36.50	36.66	36.56	29.28	29.30	29.19
550.1	35.15	35.11	34.93	28.08	28.12	28.01
590.1	34.07	34.26	34.29	27.60	27.83	27.55
610.1	33.41	33.69	33.81	27.18	27.58	27.25
650.1	32.57	33.04	33.36	26.26	27.10	26.87
670.1	32.19	32.73	33.12	25.67	26.84	26.91
710.1	31.67	32.31	32.84	24.57	25.97	26.53
730.1	31.65	32.37	32.97	23.99	25.47	26.18
770.1	31.60	32.41	33.07	23.09	24.52	25.41
790.1	31.59	32.42	33.04	22.57	23.91	24.78
830.1	31.40	32.12	32.51	21.64	22.83	23.64
850.1	31.12	31.69	31.96	21.17	22.25	23.05
890.1	30.02	30.33	30.44	20.56	21.49	22.26
910.1	29.51	29.73	29.79	20.11	20.98	21.75
950.1	28.43	28.40	28.35	19.86	20.63	21.38
970.1	27.88	27.75	27.65	19.71	20.45	21.18
1010.1	26.94	26.64	26.50	19.72	20.45	21.17
1070.1	26.04	25.57	25.34	19.86	20.80	21.59
1090.1	25.70	25.25	25.03	19.56	20.64	21.49
1130.1	25.05	24.66	24.43	19.24	20.60	21.64
1150.1	24.64	24.32	24.12	19.11	20.64	21.83

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+4	+7	+10
10.1	40.1	34.96	34.93	33.54
30.1	60.1	35.76	40.36	36.20
50.1	80.1	34.37	33.30	33.89
70.1	100.1	31.98	31.62	31.60
110.1	140.1	28.28	28.34	28.40
130.1	160.1	27.18	27.18	27.41
170.1	200.1	25.73	25.79	25.86
190.1	220.1	25.36	25.48	25.50
230.1	260.1	24.61	24.69	24.81
250.1	280.1	24.61	24.59	24.69
290.1	320.1	24.92	25.03	25.16
310.1	340.1	24.77	25.21	25.58
350.1	380.1	24.77	25.29	25.64
370.1	400.1	24.81	25.14	25.29
410.1	440.1	25.07	25.10	25.09
430.1	460.1	25.32	25.41	25.44
470.1	500.1	24.09	24.59	25.05
490.1	520.1	22.84	23.45	24.03
530.1	560.1	20.10	20.59	20.98
550.1	580.1	18.81	19.18	19.55
590.1	620.1	16.89	17.09	17.30
610.1	640.1	16.14	16.28	16.42
650.1	680.1	15.05	15.08	15.16
670.1	700.1	14.60	14.61	14.69
710.1	740.1	13.84	13.83	13.89
730.1	760.1	13.54	13.49	13.54
770.1	800.1	13.05	13.00	13.03
790.1	820.1	12.85	12.81	12.86
830.1	860.1	12.53	12.54	12.68
850.1	880.1	12.44	12.51	12.67
890.1	920.1	12.27	12.45	12.74
910.1	940.1	12.20	12.44	12.77
950.1	980.1	11.93	12.25	12.64
970.1	1000.1	11.73	12.04	12.41
1010.1	1040.1	11.42	11.63	11.84
1030.1	1060.1	11.28	11.47	11.65
1070.1	1100.1	11.07	11.31	11.49
1090.1	1120.1	10.94	11.20	11.38
1130.1	1160.1	10.54	10.83	11.00
1150.1	1180.1	10.30	10.58	10.74

Frequency Mixer

LRMS-1W+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+4	+7	+10
2.0	32.0	1.68	2.41	3.33
4.0	34.0	1.64	2.36	3.28
5.0	35.0	1.70	2.47	3.42
10.0	40.0	1.64	2.39	3.32
30.1	60.1	1.02	1.06	1.09
50.1	80.1	1.07	1.04	1.10
70.1	100.1	1.06	1.03	1.10
110.1	140.1	1.04	1.11	1.15
130.1	160.1	1.07	1.11	1.16
170.1	200.1	1.01	1.08	1.13
190.1	220.1	1.06	1.12	1.17
230.1	260.1	1.08	1.13	1.19
250.1	280.1	1.09	1.15	1.21
290.1	320.1	1.14	1.21	1.26
310.1	340.1	1.14	1.21	1.28
350.1	380.1	1.16	1.24	1.30
370.1	400.1	1.17	1.25	1.30
410.1	440.1	1.19	1.26	1.31
430.1	460.1	1.23	1.29	1.34
470.1	500.1	1.29	1.37	1.42
490.1	520.1	1.33	1.41	1.47
550.1	580.1	1.43	1.53	1.61
590.1	620.1	1.46	1.56	1.63
610.1	640.1	1.47	1.57	1.63
650.1	680.1	1.47	1.56	1.62
670.1	700.1	1.46	1.54	1.59
710.1	740.1	1.44	1.51	1.56
730.1	760.1	1.43	1.48	1.53
770.1	800.1	1.43	1.47	1.50
790.1	820.1	1.44	1.47	1.52
830.1	860.1	1.51	1.54	1.58
850.1	880.1	1.58	1.61	1.64
890.1	920.1	1.76	1.78	1.81
910.1	940.1	1.85	1.87	1.90
950.1	980.1	2.10	2.09	2.10
970.1	1000.1	2.22	2.21	2.21
1010.1	1040.1	2.44	2.42	2.42
1070.1	1100.1	2.79	2.75	2.73
1090.1	1120.1	2.86	2.82	2.80
1130.1	1160.1	3.07	3.03	2.99
1150.1	1180.1	3.08	3.05	3.02

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+4	+7	+10
2.0	1.14	1.16	1.20
4.0	1.06	1.10	1.15
5.0	1.01	1.08	1.14
10.0	1.03	1.09	1.14
30.1	1.86	2.71	3.73
50.1	1.86	2.70	3.76
70.1	1.81	2.59	3.60
110.1	1.82	2.59	3.54
130.1	1.84	2.64	3.62
170.1	1.81	2.59	3.56
190.1	1.83	2.61	3.57
230.1	1.87	2.65	3.61
250.1	1.84	2.60	3.53
290.1	1.87	2.61	3.53
310.1	1.89	2.63	3.55
350.1	1.90	2.66	3.57
370.1	1.94	2.71	3.63
410.1	1.96	2.71	3.60
430.1	1.97	2.70	3.58
470.1	2.01	2.73	3.61
490.1	1.98	2.68	3.52
550.1	2.04	2.74	3.60
590.1	2.04	2.72	3.53
610.1	2.07	2.75	3.55
650.1	2.12	2.80	3.60
670.1	2.09	2.73	3.50
710.1	2.11	2.74	3.50
730.1	2.13	2.78	3.56
770.1	2.12	2.73	3.47
790.1	2.12	2.73	3.47
830.1	2.14	2.75	3.48
850.1	2.12	2.69	3.40
890.1	2.16	2.72	3.40
910.1	2.18	2.74	3.43
950.1	2.22	2.76	3.42
970.1	2.26	2.80	3.45
1010.1	2.31	2.82	3.47
1070.1	2.35	2.82	3.43
1090.1	2.35	2.81	3.41
1130.1	2.39	2.83	3.42
1150.1	2.41	2.86	3.46

IF (OUT) (MHz)	IF VSWR @LO=750.1MHz (:1)		
	@LO (dBm)		
	+4	+7	+10
5.0	1.39	1.24	1.14
10.0	1.40	1.25	1.15
28.8	1.92	1.69	1.48
47.5	1.92	1.65	1.43
66.3	1.98	1.72	1.51
85.0	1.97	1.71	1.49
103.7	1.92	1.70	1.51
122.4	1.92	1.72	1.53
141.1	1.95	1.71	1.54
159.8	2.03	1.79	1.58
178.6	2.01	1.77	1.60
197.3	1.99	1.78	1.61
216.0	1.96	1.77	1.62
234.7	1.95	1.77	1.60
253.4	1.96	1.77	1.62
272.2	1.96	1.78	1.64
290.9	1.92	1.77	1.65
309.6	1.91	1.78	1.67
328.3	1.95	1.81	1.70
347.0	1.95	1.83	1.72
365.7	1.93	1.83	1.72
384.5	1.93	1.84	1.76
403.2	1.93	1.85	1.78
421.9	1.93	1.86	1.78
440.6	1.93	1.87	1.81
459.3	1.93	1.88	1.83
478.0	1.93	1.88	1.84
496.8	1.93	1.89	1.87
515.5	1.93	1.90	1.88
534.2	1.93	1.92	1.90
552.9	1.95	1.93	1.93
571.6	1.95	1.95	1.95
590.4	1.97	1.96	1.97
609.1	1.97	1.97	1.98
627.8	1.98	1.97	1.99
646.5	2.00	1.99	2.00
665.2	2.01	2.00	2.02
683.9	2.01	2.00	2.02
702.7	2.02	2.00	2.00
721.4	2.01	1.99	2.01
740.1	2.01	1.98	2.01

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	6	23	7	26	13	27	26	39	41	42
1	-	19	0	26	11	32	18	37	40	41	48	37
2	112	61	47	56	46	64	45	54	50	70	60	63
3	110	69	61	69	63	68	58	72	66	73	82	74
4	126	90	89	88	92	84	94	92	83	88	93	94
5	114	105	93	95	96	94	83	101	94	101	97	113
6	120	110	100	106	101	97	87	96	105	96	104	105
7	115	113	116	126	104	96	105	89	105	97	93	98
8	112	119	113	106	110	110	102	89	84	87	98	95
9	112	104	105	118	110	106	104	109	96	91	99	98
10	114	119	107	125	116	99	112	101	103	96	83	89
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 370.1 MHz; -14.00 dBm.
 LO IN: 400.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -20.05 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	15	32	19	43	25	40	39	52	60	63
1	-	19	0	28	12	32	19	41	41	47	52	45
2	112	53	39	52	39	56	40	50	45	55	52	66
3	121	56	44	54	46	51	40	67	44	54	61	57
4	114	62	69	63	58	63	56	77	50	62	60	77
5	113	83	64	66	59	71	56	79	56	67	62	76
6	123	95	73	81	77	81	77	83	72	85	90	81
7	119	81	90	85	72	76	73	79	75	78	70	85
8	113	98	109	97	91	90	93	93	98	89	82	94
9	109	99	101	96	100	93	84	86	84	86	84	90
10	113	99	103	108	112	116	96	94	94	98	97	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 370.1 MHz; -4.00 dBm.
 LO IN: 400.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -10.06 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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 Page 5 of 5



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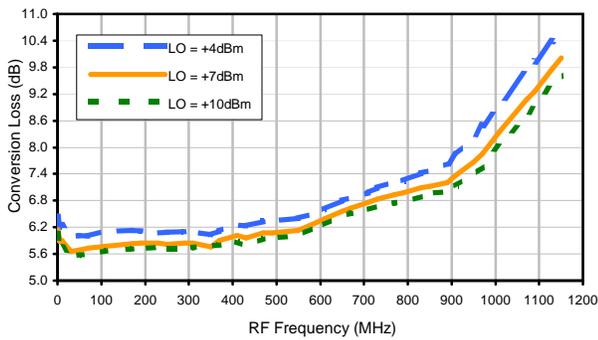
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Frequency Mixer

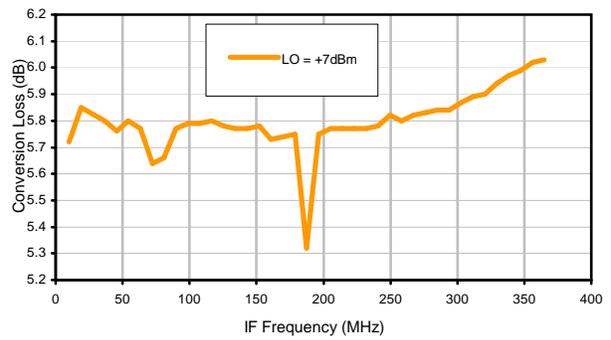
LRMS-1W+

Typical Performance Curves

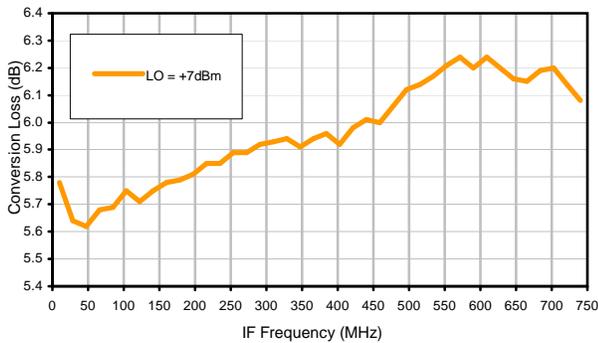
Conversion Loss @ IF=30MHz



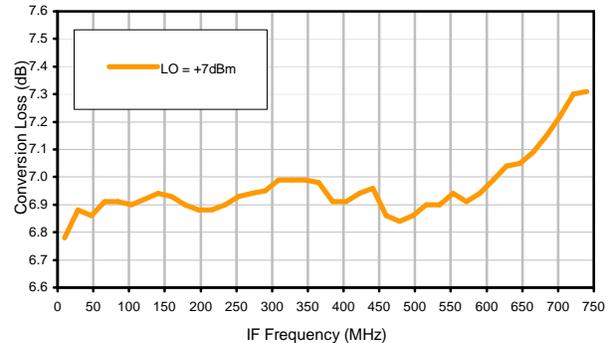
Conversion Loss vs. IF @ RF=375.1MHz



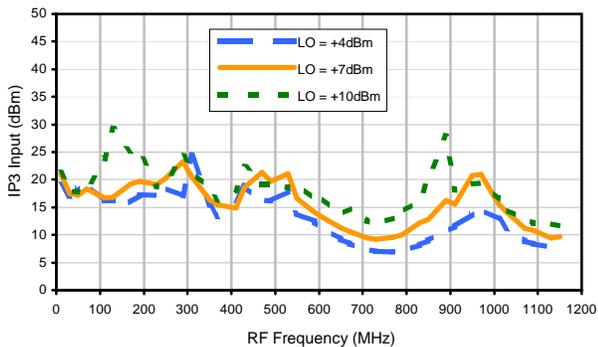
Conversion Loss vs. IF @ RF=10.1MHz



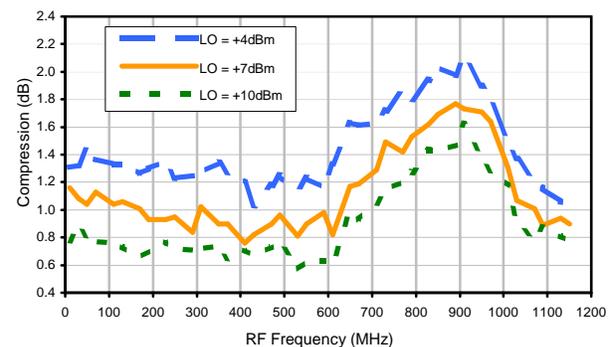
Conversion Loss vs. IF @ RF=750.1MHz



IP3 Input

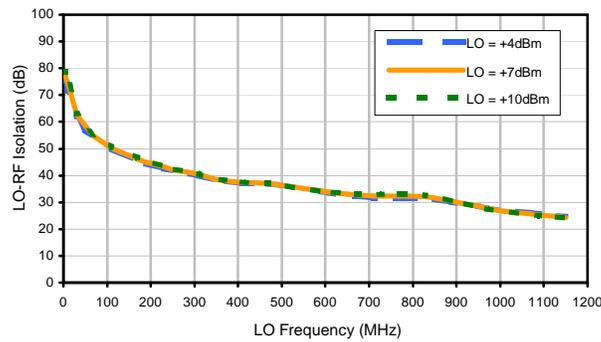


Compression @ RF IN=+1dBm

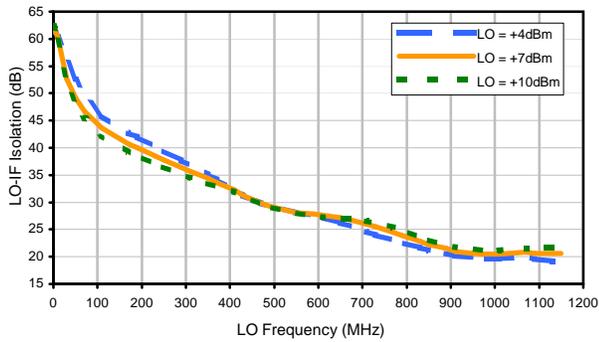


Typical Performance Curves

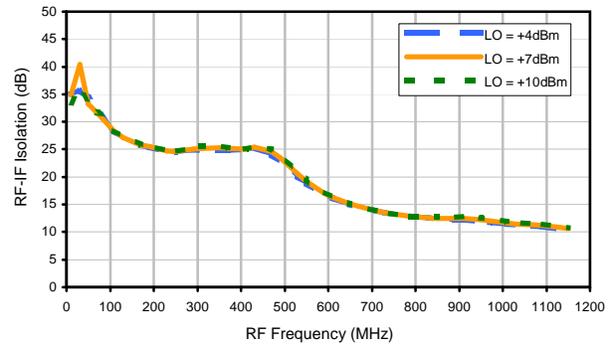
LO-RF Isolation



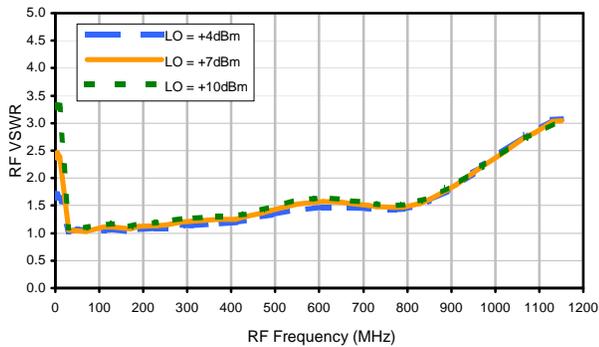
LO-IF Isolation



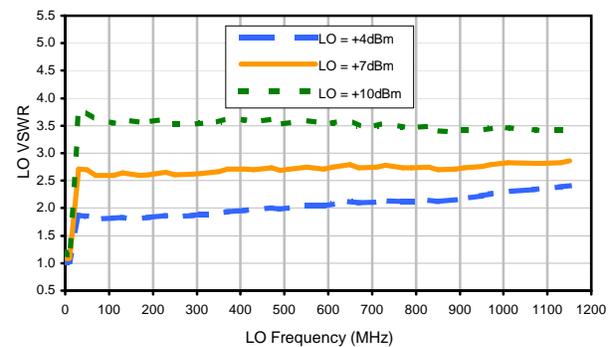
RF-IF Isolation



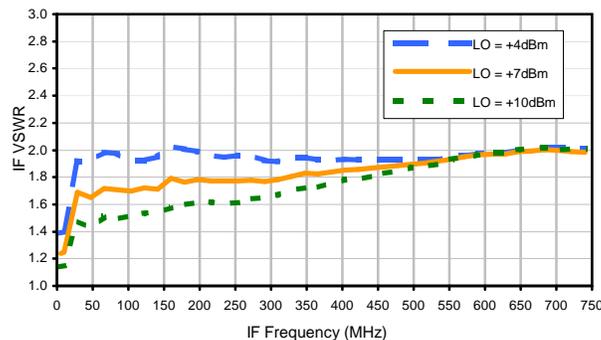
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	6	23	7	26	13	27	26	39	41	42
1	-	19	0	26	11	32	18	37	40	41	48	37
2	112	61	47	56	46	64	45	54	50	70	60	63
3	110	69	61	69	63	68	58	72	66	73	82	74
4	126	90	89	88	92	84	94	92	83	88	93	94
5	114	105	93	95	96	94	83	101	94	101	97	113
6	120	110	100	106	101	97	87	96	105	96	104	105
7	115	113	116	126	104	96	105	89	105	97	93	98
8	112	119	113	106	110	110	102	89	84	87	98	95
9	112	104	105	118	110	106	104	109	96	91	99	98
10	114	119	107	125	116	99	112	101	103	96	83	89
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 370.1 MHz; -14.00 dBm.
 LO IN: 400.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -20.05 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	15	32	19	43	25	40	39	52	60	63
1	-	19	0	28	12	32	19	41	41	47	52	45
2	112	53	39	52	39	56	40	50	45	55	52	66
3	121	56	44	54	46	51	40	67	44	54	61	57
4	114	62	69	63	58	63	56	77	50	62	60	77
5	113	83	64	66	59	71	56	79	56	67	62	76
6	123	95	73	81	77	81	77	83	72	85	90	81
7	119	81	90	85	72	76	73	79	75	78	70	85
8	113	98	109	97	91	90	93	93	98	89	82	94
9	109	99	101	96	100	93	84	86	84	86	84	90
10	113	99	103	108	112	116	96	94	94	98	97	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 370.1 MHz; -4.00 dBm.
 LO IN: 400.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -10.06 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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 Page 3 of 3



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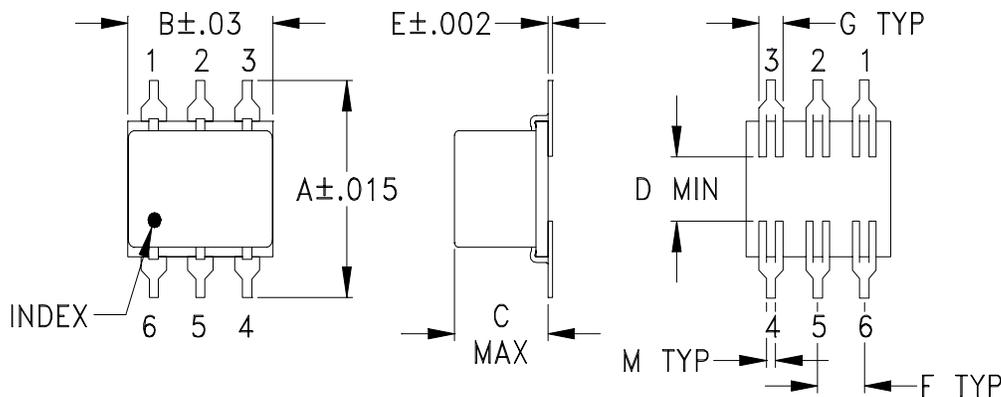
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Case Style

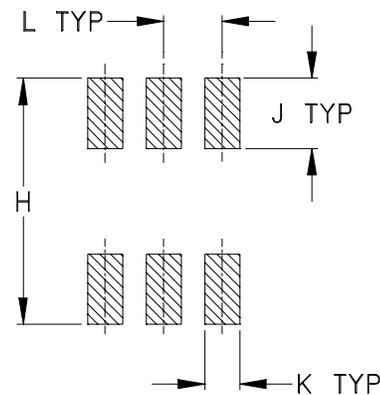
QQQ

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.



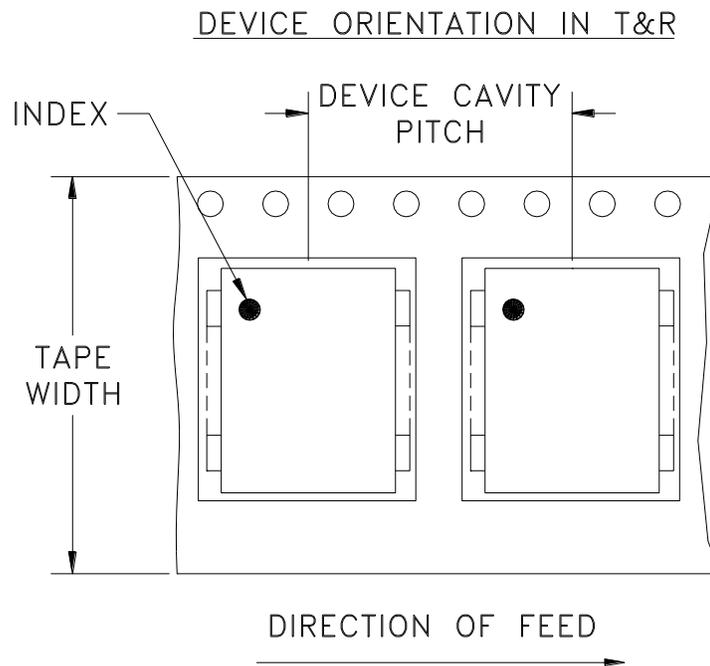
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24	16	7	10,20,50,100
		13	200,500

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.



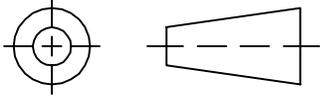
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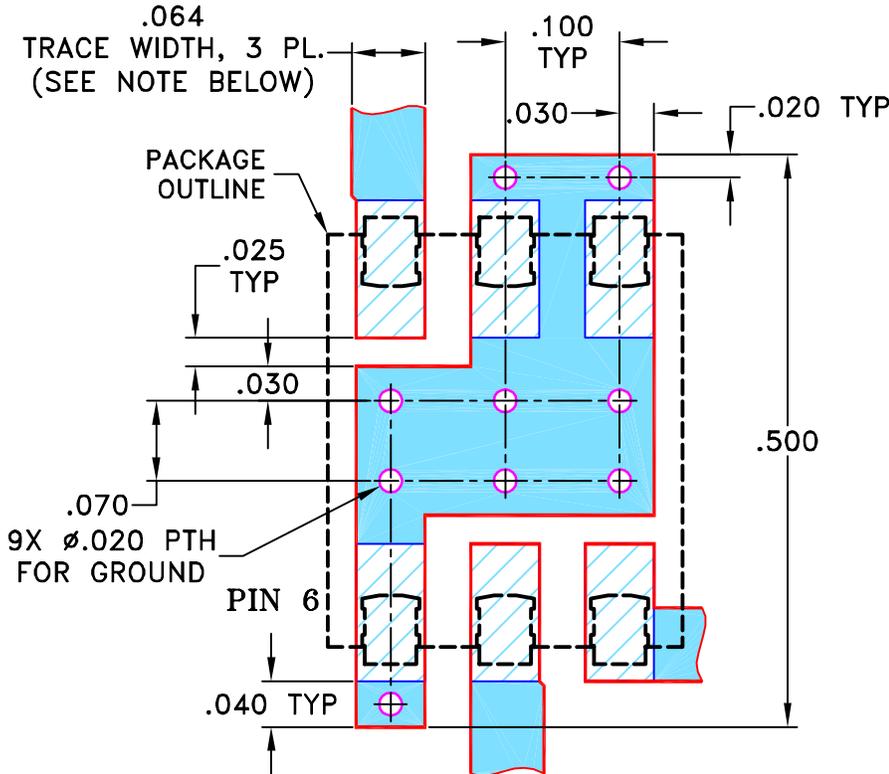
THIRD ANGLE PROJECTION



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 RO4350B 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

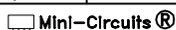
DRAWN AV 07/19/02

TOLERANCES ON:
2 PL DECIMALS ±
3 PL DECIMALS ± .005

CHECKED WL 08/02/02

ANGLES ±
FRACTIONS ±

APPROVED DJ 08/02/02



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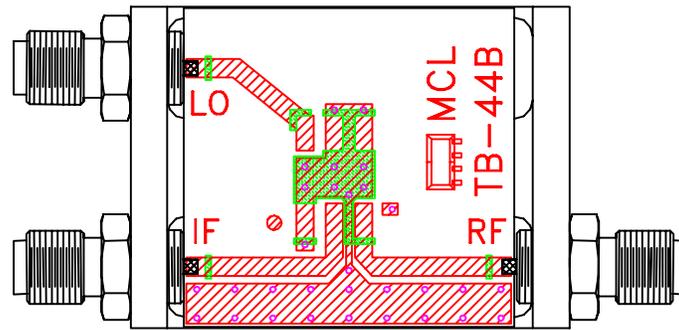
Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

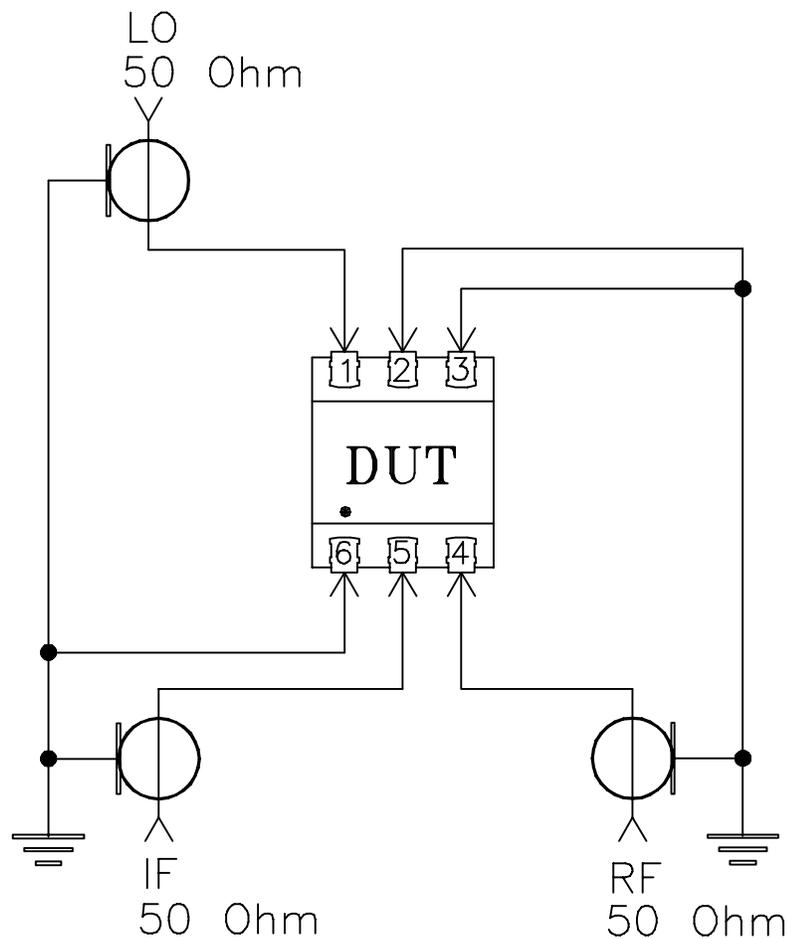
PL, w, QQQ569, LRMS-J, TB-44

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-083	REV: A
FILE: 98PL083	SCALE: 6:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



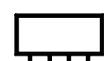
TB-44+



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