Surface Mount

Frequency Mixer

LRMS-1+
LRMS-1

Level 7 (LO Power +7dBm) 0.5 to 500 MHz

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	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

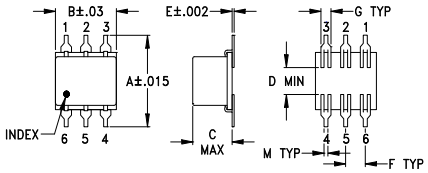
Features

- low conversion loss, 5.94 dB typ.

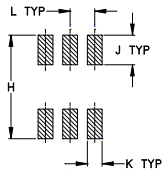
Applications

- HF/VHF/UHF
- instrumentation
- cellular

Outline Drawing



PCB Land Pattern



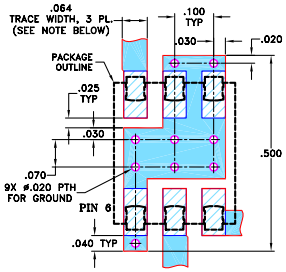
Suggested Layout,
Tolerance to be within ±.002

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

Electrical Specifications

FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)						IP3 at center band (dBm)
		Mid-Band m			Total Range	L		M		U		L		M		U		
LO/RF f_L-f_U	IF	$\overline{X}$	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
0.5-500	DC-500	5.94	.05	7.0	8.5	55	50	33	25	27	20	55	45	30	23	24	19	15

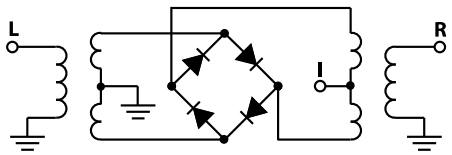
1 dB COMP.: +1 dBm typ.

L = low range [f_L to 10 f_L]
m= mid band [$2f_L$ to $f_U/2$]
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 +7dBm	LO +7dBm	LO +7dBm	LO +7dBm	LO +7dBm
0.50	30.50	7.45	89.00	64.40	1.11	2.27
1.00	31.00	6.68	82.65	64.35	1.05	2.27
2.00	32.00	6.15	76.59	63.49	1.02	2.43
5.00	35.00	5.84	68.78	59.68	1.01	2.52
10.00	40.00	5.78	63.45	55.38	1.01	2.50
20.00	50.00	5.84	56.92	48.99	1.02	2.50
50.00	80.00	5.84	48.06	40.83	1.03	2.48
67.10	97.10	5.78	47.33	39.62	1.04	2.43
100.00	70.00	5.74	45.42	36.85	1.04	2.40
117.05	87.05	5.71	45.23	36.32	1.07	2.38
150.35	120.35	5.73	44.09	34.84	1.09	2.29
200.00	170.00	5.78	41.97	32.90	1.11	2.29
216.95	186.95	5.84	40.74	32.23	1.13	2.25
250.00	220.00	5.91	38.62	30.58	1.17	2.28
283.55	253.55	5.81	36.99	29.19	1.19	2.30
333.50	303.50	5.81	34.17	26.96	1.22	2.23
383.45	353.45	6.03	31.17	25.64	1.28	2.29
433.40	403.40	6.34	29.18	23.85	1.31	2.24
466.70	436.70	6.56	27.71	22.78	1.37	2.34
500.00	470.00	6.82	27.09	22.32	1.43	2.31

Electrical Schematic



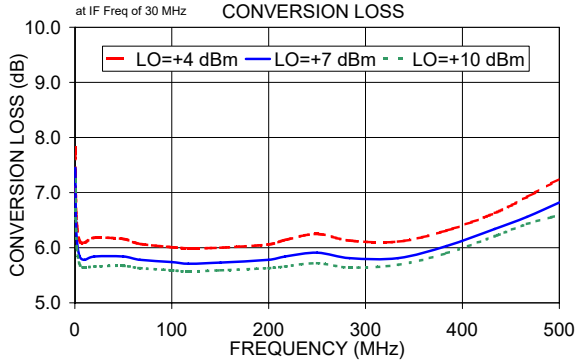
Notes

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

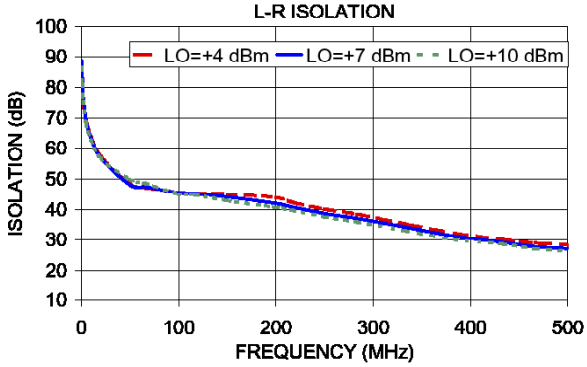
Mini-Circuits®
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Performance Charts

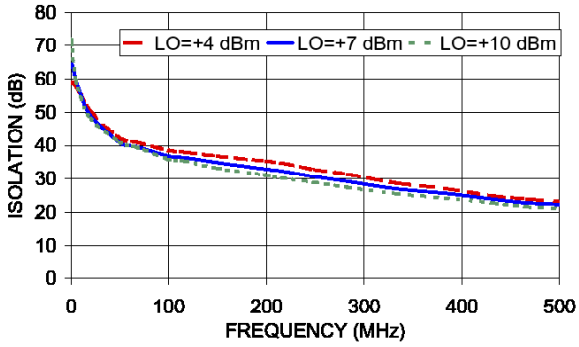
LRMS-1
at IF Freq of 30 MHz CONVERSION LOSS



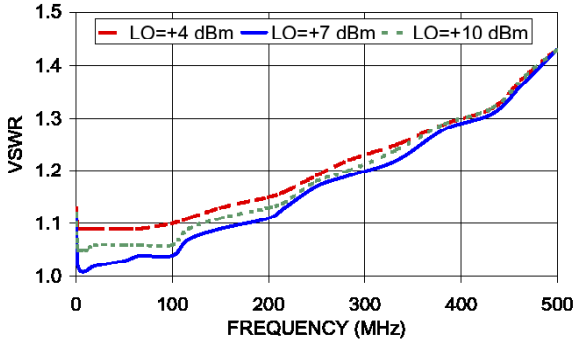
LRMS-1J
L-R ISOLATION



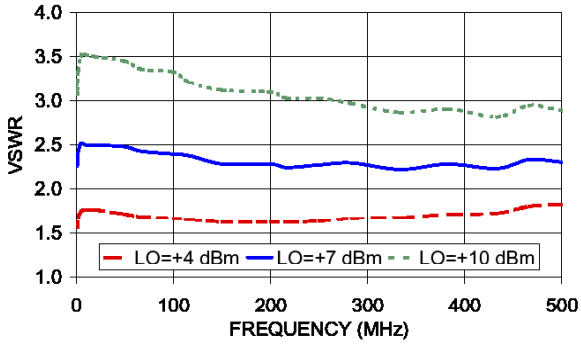
LRMS-1J
L-I ISOLATION



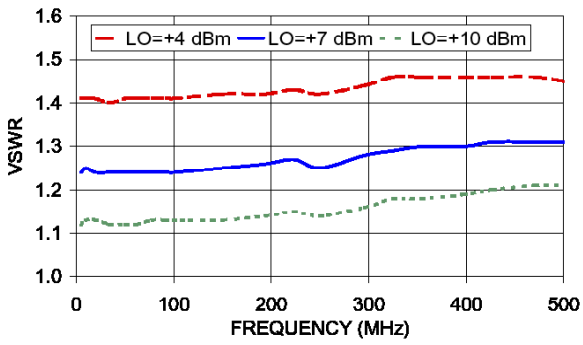
LRMS-1J
RF VSWR



LRMS-1J
LO VSWR



LRMS-1J
IF VSWR



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

Frequency Mixer LRMS-1

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+4	+7	+10
0.5	30.5	7.81	7.45	7.25
1.0	31.0	7.02	6.68	6.52
2.0	32.0	6.45	6.15	6.00
5.0	35.0	6.12	5.84	5.69
10.0	40.0	6.09	5.78	5.64
50.4	80.4	6.22	5.89	5.71
90.8	120.8	6.29	5.94	5.79
151.3	181.3	6.32	6.03	5.87
171.5	201.5	6.35	6.05	5.92
211.8	241.8	6.33	6.06	5.90
232.0	262.0	6.37	6.11	5.92
272.3	302.3	6.39	6.15	5.99
292.5	322.5	6.39	6.12	5.94
332.8	362.8	6.42	6.16	6.00
393.3	423.3	6.52	6.24	6.09
413.5	443.5	6.51	6.22	6.04
453.8	483.8	6.65	6.33	6.09
474.0	504.0	6.68	6.33	6.12
514.3	544.3	6.70	6.39	6.15
534.5	564.5	6.75	6.40	6.20
574.8	604.8	6.84	6.45	6.20
595.0	625.0	6.86	6.49	6.23
635.4	665.4	7.04	6.56	6.28
655.5	685.5	7.07	6.55	6.28
695.9	725.9	7.26	6.69	6.35
756.4	786.4	7.60	7.01	6.59
776.5	806.5	7.76	7.18	6.73
816.9	846.9	7.92	7.36	6.93
837.0	867.0	8.02	7.45	7.07
877.4	907.4	8.11	7.62	7.27
897.6	927.6	8.15	7.71	7.37
937.9	967.9	8.28	7.89	7.62
958.1	988.1	8.35	8.00	7.71
998.4	1028.4	8.47	8.10	7.94
1018.6	1048.6	8.53	8.18	8.02
1058.9	1088.9	8.79	8.44	8.32
1079.1	1109.1	8.85	8.59	8.46
1139.6	1169.6	9.43	9.16	9.09
1179.9	1209.9	9.88	9.63	9.55
1200.1	1230.1	10.15	9.85	9.84

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+4	+7	+10
10.1	40.1	22.04	23.14	23.11
50.4	80.4	22.89	24.56	24.10
90.8	120.8	17.68	19.77	25.87
110.9	140.9	17.81	21.22	21.69
151.3	181.3	19.85	18.88	21.86
171.5	201.5	18.30	25.30	22.58
211.8	241.8	18.91	18.88	18.47
232.0	262.0	25.10	20.55	22.92
272.3	302.3	19.00	18.35	17.77
292.5	322.5	20.22	19.05	19.20
332.8	362.8	17.06	17.04	18.99
353.0	383.0	18.30	18.35	21.00
393.3	423.3	19.16	18.53	18.84
413.5	443.5	19.80	17.26	18.98
453.8	483.8	15.44	19.13	21.84
474.0	504.0	14.25	15.93	21.41
514.3	544.3	14.10	13.74	17.39
534.5	564.5	13.04	13.58	14.78
574.8	604.8	12.10	13.07	15.31
595.0	625.0	12.97	13.89	15.61
635.4	665.4	13.45	15.50	24.30
655.5	685.5	13.11	17.86	26.02
695.9	725.9	12.50	20.81	19.39
716.0	746.0	12.37	19.69	20.98
756.4	786.4	12.13	16.16	17.68
776.5	806.5	11.21	15.68	19.99
816.9	846.9	13.01	18.47	15.99
837.0	867.0	12.90	18.62	16.95
877.4	907.4	17.42	21.78	15.60
897.6	927.6	15.70	22.81	16.92
937.9	967.9	18.27	15.66	15.89
958.1	988.1	14.85	14.77	15.58
998.4	1028.4	12.35	12.49	14.31
1018.6	1048.6	11.89	13.17	13.74
1058.9	1088.9	10.62	12.35	13.10
1079.1	1109.1	11.32	12.97	12.87
1119.4	1149.4	10.89	11.89	13.19
1139.6	1169.6	10.78	11.97	13.11
1179.9	1209.9	10.03	11.45	11.97
1200.1	1230.1	9.24	10.63	12.38

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+1dBm (dB) @LO (dBm)		
		+4	+7	+10
10.1	40.1	1.08	0.78	0.61
50.4	80.4	1.03	0.71	0.57
90.8	120.8	1.17	0.84	0.59
110.9	140.9	1.12	0.88	0.63
151.3	181.3	1.00	0.71	0.56
171.5	201.5	1.01	0.73	0.51
211.8	241.8	1.01	0.62	0.48
232.0	262.0	1.09	0.74	0.57
272.3	302.3	1.08	0.77	0.48
292.5	322.5	1.07	0.78	0.55
332.8	362.8	1.05	0.78	0.67
353.0	383.0	1.06	0.83	0.59
393.3	423.3	1.12	0.86	0.67
413.5	443.5	1.18	0.86	0.71
453.8	483.8	1.24	0.93	0.75
474.0	504.0	1.26	0.97	0.77
514.3	544.3	1.24	0.94	0.74
534.5	564.5	1.38	0.97	0.84
574.8	604.8	1.38	1.04	0.89
595.0	625.0	1.38	1.07	0.86
635.4	665.4	1.63	1.31	1.12
655.5	685.5	1.63	1.26	1.10
695.9	725.9	1.52	1.30	0.98
716.0	746.0	1.45	1.24	1.06
756.4	786.4	1.47	1.24	1.01
776.5	806.5	1.46	1.07	1.02
816.9	846.9	1.43	1.29	1.13
837.0	867.0	1.25	1.05	0.89
877.4	907.4	1.32	1.01	0.85
897.6	927.6	1.19	0.94	0.79
937.9	967.9	1.31	1.03	0.86
958.1	988.1	1.28	0.89	0.75
998.4	1028.4	1.27	0.94	0.77
1018.6	1048.6	1.48	1.01	0.84
1058.9	1088.9	1.21	0.82	0.76
1079.1	1109.1	1.16	0.79	0.68
1119.4	1149.4	1.20	0.84	0.75
1139.6	1169.6	1.12	0.77	0.72
1179.9	1209.9	1.16	0.70	0.65
1200.1	1230.1	1.10	0.73	0.75

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=250.1MHz (dB) @LO (dBm) +7
240.0	10.1	6.12
234.1	16.0	6.11
228.2	21.9	6.10
222.3	27.8	6.10
216.4	33.7	6.09
210.5	39.6	6.07
204.6	45.5	6.06
198.7	51.4	6.04
192.8	57.3	6.03
186.9	63.2	6.02
181.1	69.0	6.03
175.2	74.9	6.03
169.3	80.8	6.01
163.4	86.7	6.00
157.5	92.6	6.01
151.6	98.5	6.00
145.7	104.4	6.00
139.8	110.3	5.99
133.9	116.2	5.99
128.0	122.1	5.98
122.1	128.0	5.97
116.2	133.9	5.97
110.3	139.8	5.98
104.4	145.7	5.98
98.5	151.6	5.98
92.6	157.5	5.99
86.7	163.4	5.99
80.8	169.3	5.97
74.9	175.2	5.98
69.0	181.1	5.96
63.2	186.9	5.96
57.3	192.8	5.95
51.4	198.7	5.98
45.5	204.6	6.01
39.6	210.5	6.00
33.7	216.4	5.99
27.8	222.3	6.00
21.9	228.2	5.98
16.0	234.1	5.98
10.1	240.0	6.02

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB) @LO (dBm) +7
10.0	20.1	5.72
22.3	32.4	5.62
34.6	44.7	5.60
46.9	57.0	5.59
59.2	69.3	5.64
71.5	81.6	5.62
83.8	93.9	5.61
96.2	106.3	5.63
108.5	118.6	5.66
120.8	130.9	5.60
133.1	143.2	5.68
145.4	155.5	5.67
157.7	167.8	5.72
170.0	180.1	5.70
182.3	192.4	5.73
194.6	204.7	5.73
206.9	217.0	5.74
219.2	229.3	5.73
231.5	241.6	5.76
243.8	253.9	5.76
256.2	266.3	5.79
268.5	278.6	5.80
280.8	290.9	5.84
293.1	303.2	5.86
305.4	315.5	5.81
317.7	327.8	5.87
330.0	340.1	5.93
342.3	352.4	5.86
354.6	364.7	5.92
366.9	377.0	5.99
379.2	389.3	5.97
391.5	401.6	5.98
403.8	413.9	5.92
416.2	426.3	5.96
428.5	438.6	6.01
440.8	450.9	6.03
453.1	463.2	6.05
465.4	475.5	6.06
477.7	487.8	6.03
490.0	500.1	6.07

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB) @LO (dBm) +7
490.0	10.1	6.33
477.7	22.4	6.32
465.4	34.7	6.30
453.1	47.0	6.30
440.8	59.3	6.32
428.5	71.6	6.28
416.2	83.9	6.23
403.8	96.3	6.20
391.5	108.6	6.20
379.2	120.9	6.20
366.9	133.2	6.18
354.6	145.5	6.18
342.3	157.8	6.18
330.0	170.1	6.19
317.7	182.4	6.18
305.4	194.7	6.17
293.1	207.0	6.17
280.8	219.3	6.16
268.5	231.6	6.16
256.2	243.9	6.19
243.8	256.3	6.14
231.5	268.6	6.10
219.2	280.9	6.10
206.9	293.2	6.19
194.6	305.5	6.19
182.3	317.8	6.20
170.0	330.1	6.20
157.7	342.4	6.17
145.4	354.7	6.22
133.1	367.0	6.22
120.8	379.3	6.21
108.5	391.6	6.22
96.2	403.9	6.22
83.8	416.3	6.21
71.5	428.6	6.23
59.2	440.9	6.23
46.9	453.2	6.23
34.6	465.5	6.26
22.3	477.8	6.26
10.0	490.1	6.42

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+4	+7	+10	+4	+7	+10
0.5	77.47	89.00	86.40	58.57	64.40	71.90
1.0	76.77	82.65	81.16	59.07	64.35	70.66
2.0	74.40	76.59	75.41	58.90	63.49	66.01
5.0	68.98	68.78	67.98	57.58	59.68	59.61
10.0	63.87	63.45	62.82	55.47	55.38	54.46
50.4	58.65	57.67	57.75	52.36	53.08	52.92
90.8	52.25	52.72	52.84	48.55	48.57	48.65
151.3	48.16	48.51	48.76	44.55	44.86	44.87
171.5	47.09	47.46	47.78	43.86	44.05	43.90
211.8	45.36	45.81	46.05	42.53	42.44	42.05
232.0	44.64	45.13	45.40	41.93	41.56	41.00
272.3	43.32	43.78	44.09	40.47	39.87	39.21
292.5	42.90	43.35	43.64	39.98	39.24	38.56
332.8	42.21	42.79	43.10	38.31	37.56	36.89
393.3	40.08	40.73	41.12	35.62	34.94	34.45
413.5	39.41	40.12	40.61	34.54	33.85	33.40
453.8	38.33	39.03	39.53	32.91	32.10	31.60
474.0	37.88	38.57	39.11	32.43	31.55	30.96
514.3	37.72	38.32	38.79	31.28	30.41	29.73
534.5	37.55	37.97	38.21	30.70	29.87	29.21
574.8	37.61	37.74	37.65	29.49	28.78	28.16
595.0	37.72	37.77	37.62	28.73	28.04	27.42
635.4	37.32	37.01	36.51	27.08	26.51	25.94
655.5	37.02	36.68	36.11	26.41	25.90	25.35
695.9	36.13	35.79	35.17	24.89	24.49	24.02
756.4	34.70	34.53	33.98	22.81	22.56	22.16
776.5	34.24	34.19	33.80	22.17	21.95	21.54
816.9	33.42	33.43	33.21	20.92	20.79	20.43
837.0	33.13	33.13	32.98	20.36	20.28	19.94
877.4	32.80	32.88	32.90	19.47	19.50	19.22
897.6	32.69	32.78	32.84	18.80	18.88	18.64
937.9	32.75	32.99	33.21	17.89	18.06	17.82
958.1	33.18	33.52	33.76	17.38	17.57	17.32
998.4	34.33	34.84	34.88	16.46	16.69	16.42
1018.6	35.20	35.38	34.84	15.93	16.16	15.87
1058.9	37.64	37.32	35.41	15.17	15.42	15.14
1079.1	40.37	39.11	35.69	14.62	14.91	14.68
1139.6	50.65	36.45	32.12	13.48	13.74	13.50
1179.9	38.27	33.17	29.84	12.79	13.07	12.89
1200.1	34.78	31.01	28.35	12.48	12.73	12.53

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+4	+7	+10
10.1	40.1	48.96	47.99	40.63
50.4	80.4	34.53	34.30	34.31
90.8	120.8	29.75	29.89	29.95
110.9	140.9	28.42	28.67	28.74
151.3	181.3	26.30	26.51	26.73
171.5	201.5	25.60	25.91	26.03
211.8	241.8	24.56	24.85	25.03
232.0	262.0	24.13	24.46	24.66
272.3	302.3	23.82	24.20	24.47
292.5	322.5	23.75	24.13	24.48
332.8	362.8	23.56	24.02	24.42
353.0	383.0	23.60	24.07	24.46
393.3	423.3	24.02	24.58	25.05
413.5	443.5	24.18	24.93	25.48
453.8	483.8	24.49	25.38	26.00
474.0	504.0	24.21	24.99	25.58
514.3	544.3	22.70	23.09	23.35
534.5	564.5	21.62	21.82	21.91
574.8	604.8	19.53	19.47	19.35
595.0	625.0	18.64	18.49	18.35
635.4	665.4	17.17	16.94	16.78
655.5	685.5	16.55	16.33	16.17
695.9	725.9	15.61	15.42	15.29
716.0	746.0	15.24	15.07	14.96
756.4	786.4	14.60	14.46	14.38
776.5	806.5	14.35	14.23	14.17
816.9	846.9	13.82	13.76	13.77
837.0	867.0	13.61	13.57	13.60
877.4	907.4	13.20	13.23	13.33
897.6	927.6	13.01	13.06	13.17
937.9	967.9	12.65	12.74	12.83
958.1	988.1	12.42	12.49	12.56
998.4	1028.4	12.00	12.03	12.01
1018.6	1048.6	11.79	11.78	11.71
1058.9	1088.9	11.24	11.16	11.00
1079.1	1109.1	10.91	10.78	10.58
1119.4	1149.4	10.20	10.02	9.77
1139.6	1169.6	9.80	9.61	9.35
1179.9	1209.9	9.02	8.78	8.53
1200.1	1230.1	8.67	8.42	8.19

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+4	+7	+10
5.0	35.0	1.13	1.11	1.12
10.0	40.0	1.10	1.05	1.07
50.4	80.4	1.04	1.08	1.17
90.8	120.8	1.06	1.06	1.10
151.3	181.3	1.05	1.08	1.12
171.5	201.5	1.02	1.05	1.10
211.8	241.8	1.05	1.11	1.16
232.0	262.0	1.06	1.11	1.16
272.3	302.3	1.04	1.10	1.14
292.5	322.5	1.06	1.12	1.17
332.8	362.8	1.09	1.14	1.19
393.3	423.3	1.14	1.19	1.23
413.5	443.5	1.14	1.19	1.23
453.8	483.8	1.15	1.20	1.25
474.0	504.0	1.18	1.23	1.28
514.3	544.3	1.18	1.22	1.26
534.5	564.5	1.21	1.25	1.30
574.8	604.8	1.25	1.29	1.33
595.0	625.0	1.26	1.29	1.33
635.4	665.4	1.34	1.38	1.42
655.5	685.5	1.39	1.42	1.46
695.9	725.9	1.47	1.49	1.53
756.4	786.4	1.72	1.72	1.74
776.5	806.5	1.76	1.77	1.78
816.9	846.9	2.00	1.99	2.01
837.0	867.0	2.08	2.07	2.08
877.4	907.4	2.20	2.20	2.22
897.6	927.6	2.35	2.36	2.37
937.9	967.9	2.46	2.47	2.48
958.1	988.1	2.51	2.52	2.54
998.4	1028.4	2.78	2.78	2.80
1018.6	1048.6	2.82	2.82	2.82
1058.9	1088.9	2.99	2.99	2.99
1079.1	1109.1	3.14	3.13	3.12
1119.4	1149.4	3.21	3.20	3.18
1139.6	1169.6	3.48	3.44	3.41
1179.9	1209.9	3.42	3.37	3.34
1200.1	1230.1	3.37	3.32	3.29

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+4	+7	+10
5.0	1.58	2.27	3.21
10.0	1.57	2.27	3.08
50.4	1.75	2.50	3.48
90.8	1.73	2.47	3.40
151.3	1.73	2.48	3.40
171.5	1.74	2.49	3.40
211.8	1.74	2.46	3.35
232.0	1.79	2.54	3.46
272.3	1.83	2.57	3.48
292.5	1.81	2.53	3.40
332.8	1.87	2.62	3.51
393.3	1.91	2.64	3.50
413.5	1.98	2.72	3.62
453.8	2.08	2.84	3.76
474.0	2.08	2.81	3.69
514.3	2.12	2.86	3.75
534.5	2.15	2.90	3.79
574.8	2.19	2.91	3.76
595.0	2.26	3.00	3.88
635.4	2.36	3.11	3.99
655.5	2.40	3.12	3.97
695.9	2.50	3.22	4.08
756.4	2.62	3.35	4.19
776.5	2.68	3.43	4.27
816.9	2.79	3.54	4.39
837.0	2.84	3.58	4.42
877.4	2.89	3.61	4.42
897.6	2.89	3.60	4.41
937.9	3.00	3.70	4.48
958.1	3.04	3.73	4.51
998.4	3.10	3.76	4.50
1018.6	3.17	3.81	4.53
1058.9	3.20	3.79	4.47
1079.1	3.19	3.74	4.39
1119.4	3.31	3.83	4.44
1139.6	3.38	3.89	4.47
1179.9	3.37	3.81	4.34
1200.1	3.43	3.85	4.35

IF (OUT) (MHz)	IF VSWR @LO=500.1MHz (:1) @LO (dBm)		
	+4	+7	+10
5.0	1.41	1.24	1.12
10.0	1.41	1.25	1.13
22.1	1.72	1.53	1.36
34.1	1.62	1.45	1.29
46.1	1.54	1.37	1.26
58.1	1.52	1.36	1.21
70.1	1.51	1.35	1.21
82.1	1.56	1.39	1.25
94.1	1.59	1.40	1.26
106.1	1.60	1.42	1.27
130.1	1.63	1.44	1.29
142.1	1.60	1.41	1.27
154.1	1.56	1.38	1.25
166.1	1.54	1.36	1.23
178.1	1.55	1.37	1.24
190.1	1.58	1.41	1.27
202.1	1.63	1.44	1.31
214.1	1.65	1.47	1.32
226.1	1.66	1.47	1.32
238.1	1.64	1.45	1.30
250.1	1.59	1.42	1.28
274.1	1.56	1.39	1.26
286.1	1.59	1.41	1.28
298.1	1.61	1.43	1.30
310.1	1.63	1.45	1.32
322.1	1.63	1.45	1.31
334.1	1.61	1.43	1.30
346.1	1.58	1.41	1.28
358.1	1.55	1.39	1.27
370.1	1.55	1.39	1.27
382.1	1.57	1.41	1.30
394.1	1.61	1.45	1.34
418.1	1.66	1.50	1.37
430.1	1.64	1.47	1.35
442.1	1.60	1.44	1.32
454.1	1.57	1.41	1.30
478.1	1.60	1.45	1.35
490.1	1.65	1.50	1.40

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	13	24	19	34	15	33	21	40	24	48
1	-	18	0	28	12	34	19	37	32	47	41	45
2	114	69	51	69	52	70	52	76	52	68	57	71
3	108	71	74	74	68	74	59	94	63	80	67	79
4	110	95	83	89	83	97	89	100	86	100	89	95
5	115	105	107	108	91	89	87	89	89	111	89	98
6	115	104	100	104	99	103	81	92	92	99	98	104
7	120	106	105	101	100	92	98	77	85	91	99	108
8	110	104	108	114	107	106	95	85	87	94	86	91
9	119	107	98	103	112	102	96	101	105	43	92	94
10	108	104	115	100	98	107	103	99	99	87	68	99
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 250.1 MHz; -14.00 dBm.
LO IN: 280.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -20.64 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	22	34	31	45	27	45	32	53	37	58
1	-	18	0	28	12	35	19	39	32	50	41	50
2	102	67	46	70	47	66	47	74	46	59	50	65
3	123	52	53	55	64	64	48	58	51	66	57	67
4	108	75	64	74	63	78	64	76	62	87	63	77
5	120	74	73	66	61	66	58	64	55	73	56	72
6	125	86	81	89	80	97	83	94	86	99	84	96
7	109	91	77	89	74	87	78	88	79	84	81	84
8	111	102	90	102	93	107	96	100	83	104	99	101
9	108	97	97	98	92	97	88	103	106	53	100	95
10	115	118	107	108	105	103	121	102	106	100	83	96
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

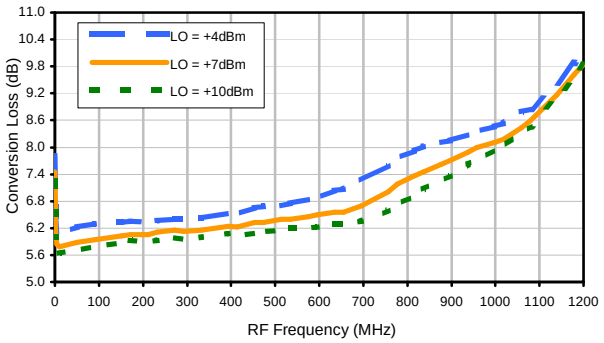
LO HARMONICS ORDER

Test conditions:
RF IN: 250.1 MHz; -4.00 dBm.
LO IN: 280.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -11.12 dBm

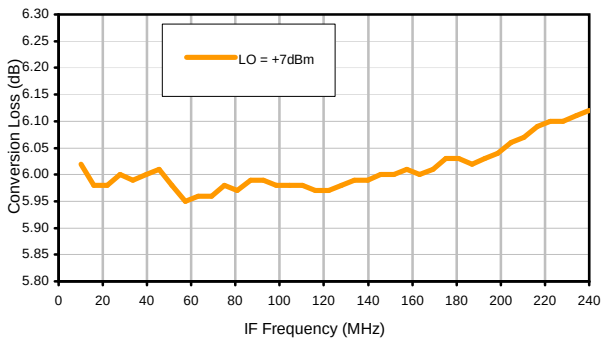
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Typical Performance Curves

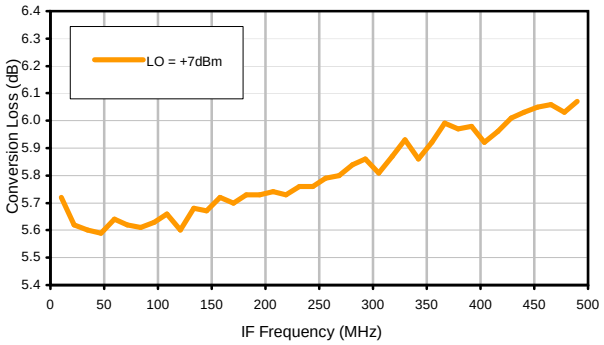
Conversion Loss @ IF=30MHz



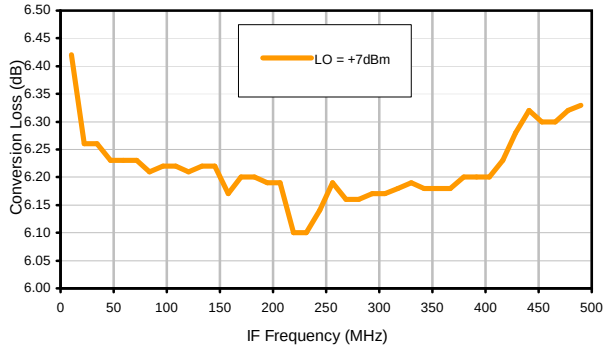
Conversion Loss vs. IF @ RF=250.1MHz



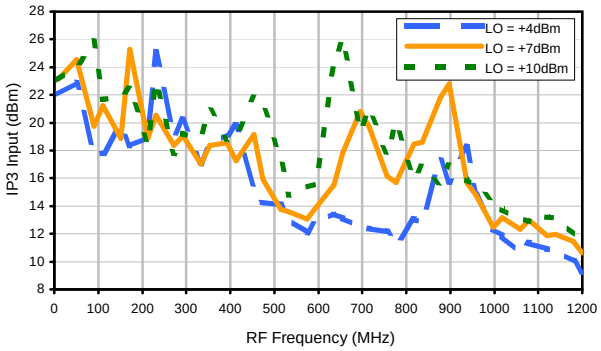
Conversion Loss vs. IF @ RF=10.1MHz



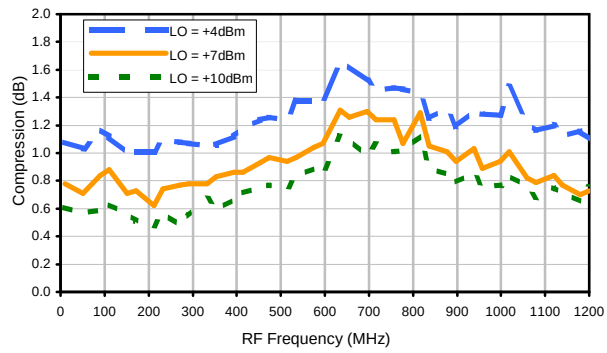
Conversion Lossvs. IF @ RF=500.1MHz



IP3 Input

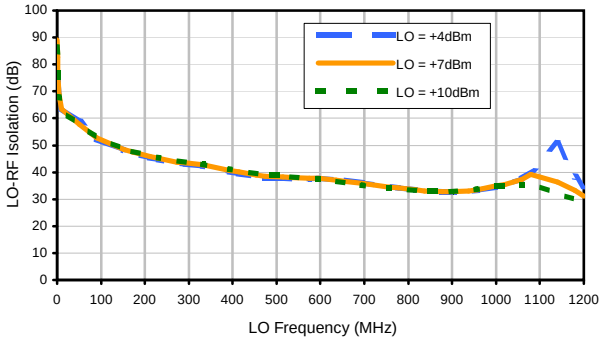


Compression @ RF IN=+1dBm

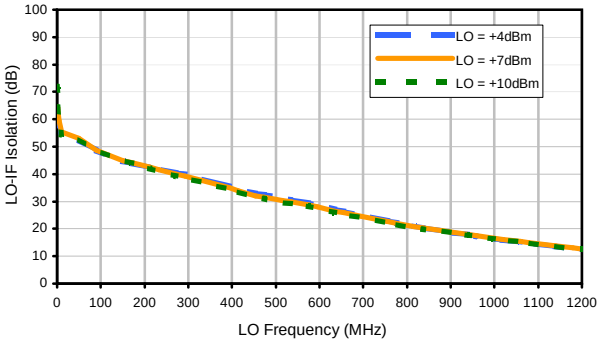


Typical Performance Curves

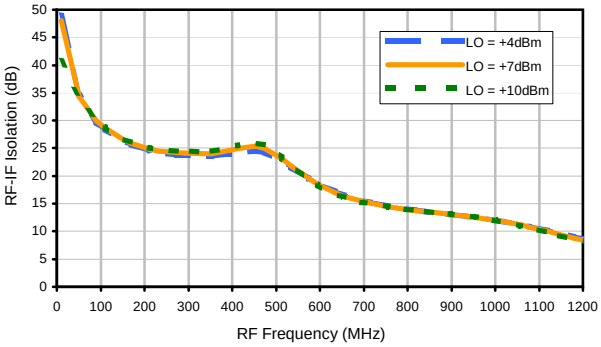
LO-RF Isolation



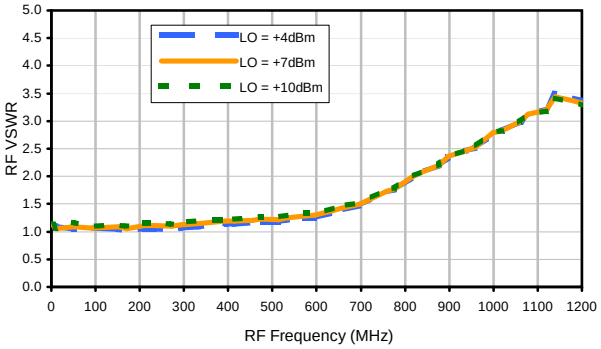
LO-IF Isolation



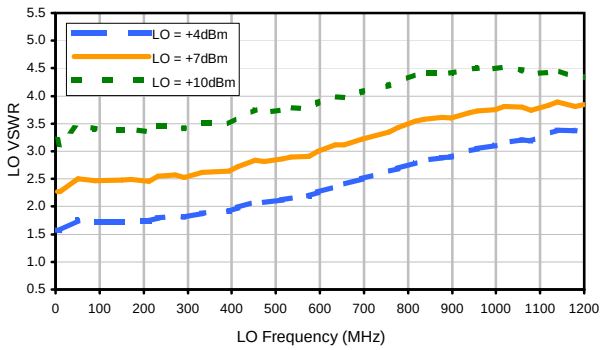
RF-IF Isolation



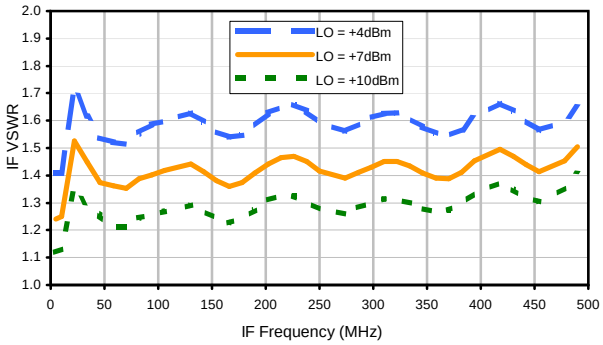
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	13	24	19	34	15	33	21	40	24	48
1	-	18	0	28	12	34	19	37	32	47	41	45
2	114	69	51	69	52	70	52	76	52	68	57	71
3	108	71	74	74	68	74	59	94	63	80	67	79
4	110	95	83	89	83	97	89	100	86	100	89	95
5	115	105	107	108	91	89	87	89	89	111	89	98
6	115	104	100	104	99	103	81	92	92	99	98	104
7	120	106	105	101	100	92	98	77	85	91	99	108
8	110	104	108	114	107	106	95	85	87	94	86	91
9	119	107	98	103	112	102	96	101	105	43	92	94
10	108	104	115	100	98	107	103	99	99	87	68	99
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 250.1 MHz; -14.00 dBm.
LO IN: 280.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -20.64 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	22	34	31	45	27	45	32	53	37	58
1	-	18	0	28	12	35	19	39	32	50	41	50
2	102	67	46	70	47	66	47	74	46	59	50	65
3	123	52	53	55	64	64	48	58	51	66	57	67
4	108	75	64	74	63	78	64	76	62	87	63	77
5	120	74	73	66	61	66	58	64	55	73	56	72
6	125	86	81	89	80	97	83	94	86	99	84	96
7	109	91	77	89	74	87	78	88	79	84	81	84
8	111	102	90	102	93	107	96	100	83	104	99	101
9	108	97	97	98	92	97	88	103	106	53	100	95
10	115	118	107	108	105	103	121	102	106	100	83	96
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

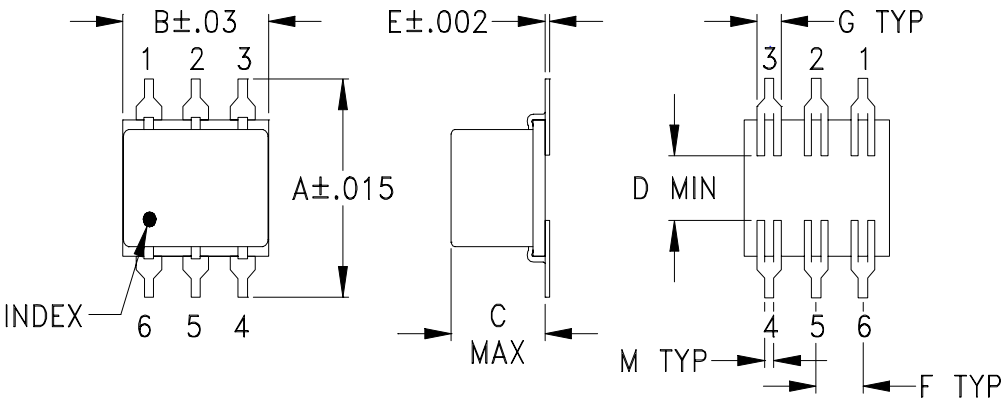
Test conditions:
RF IN: 250.1 MHz; -4.00 dBm.
LO IN: 280.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -11.12 dBm

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.

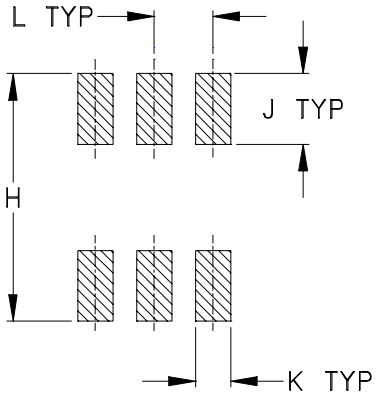
Case Style QQQ

QQQ130 (non-waterproof)
QQQ828 (washable)

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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

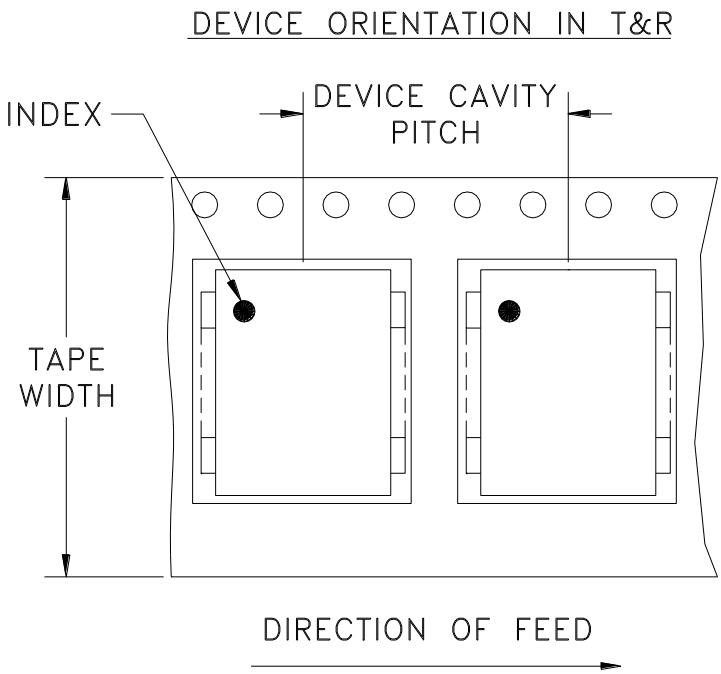
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

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

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F10



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
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.

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

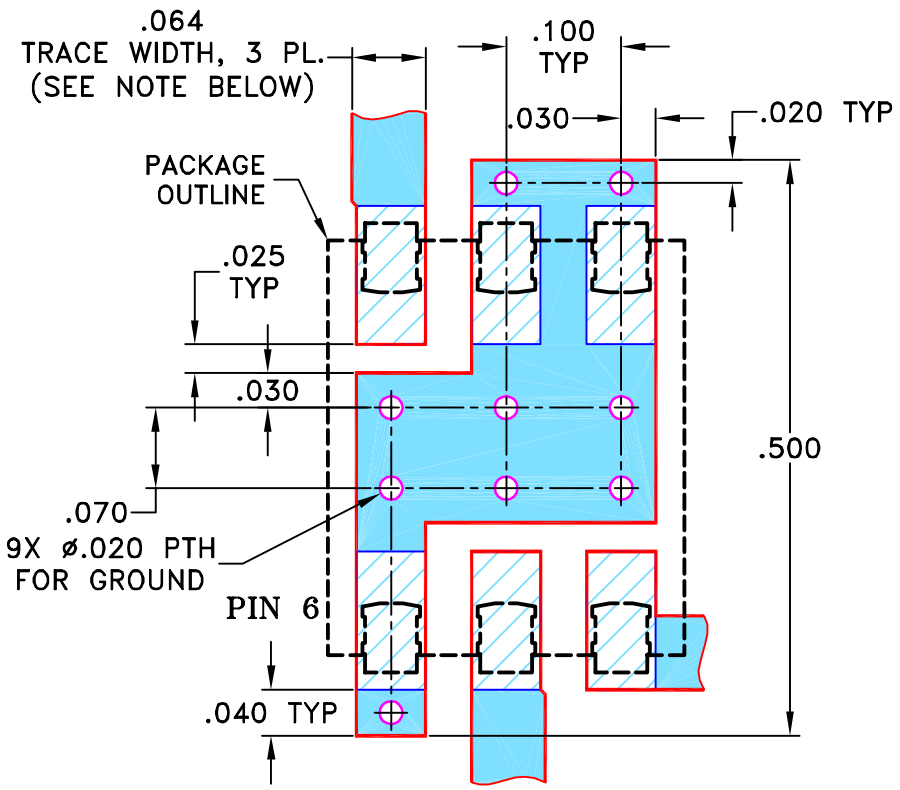
Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

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:	CHECKED	WL	08/02/02
2 PL DECIMALS ±	APPROVED	DJ	08/02/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

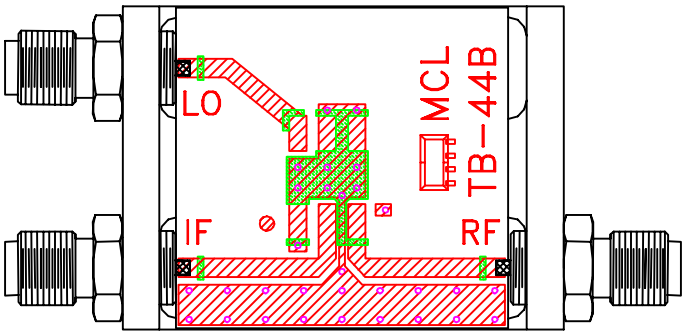
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

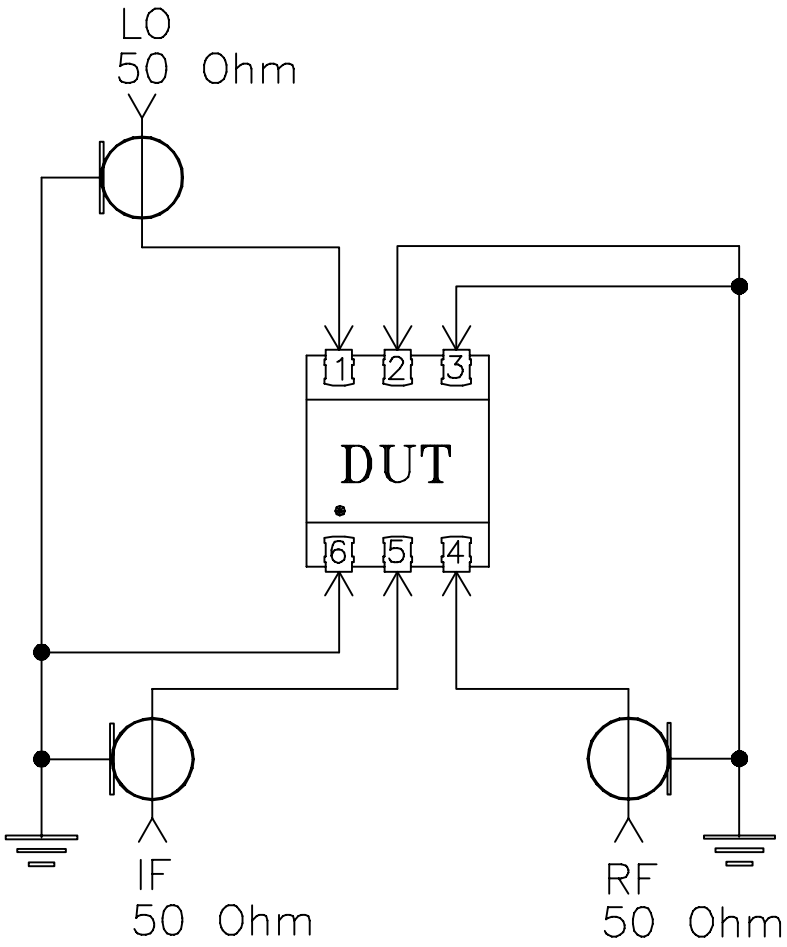
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-083	A

FILE:	SCALE:	SHEET:
98PL083	6:1	1 OF 1

Evaluation Board and Circuit



TB-44+



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV02T1

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