Surface Mount

Frequency Mixer

LRMS-5+

Level 7 (LO Power +7dBm) 5 to 1500 MHz

CASE STYLE: QQQ130

+RoHS Compliant

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

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

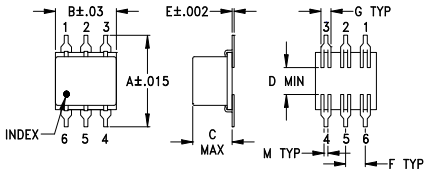
Features

- low conversion loss, 5.92 dB typ.
- excellent L-R isolation, 40 dB typ.

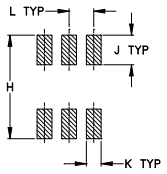
Applications

- VHF/UHF
- satellite distribution
- cellular

Outline Drawing



PCB Land Pattern



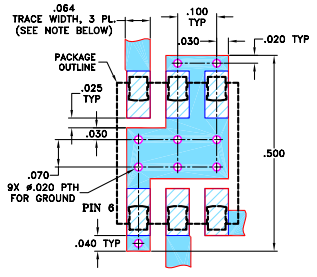
Suggested Layout,
Tolerance to be within ±.002

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)
LO/RF	IF	Mid-Band m			Total Range	L		M		U		L		M		U		
f_L-f_U		$\overline{X}$	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
5-1500	DC-1000	5.92	.34	7.5	9.5	60	40	40	20	30	18	55	30	30	18	15	8	12

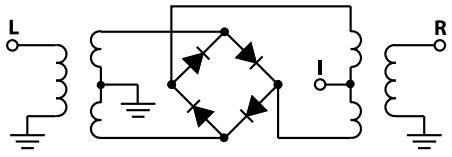
1 dB COMP.: +1 dBm typ.

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
5.00	35.00	6.17	78.28	82.08	2.64	2.43
10.00	40.00	6.03	73.09	75.39	1.62	2.43
20.00	50.00	5.86	67.43	67.33	1.37	2.37
50.00	80.00	5.46	60.16	61.16	1.27	2.46
100.00	70.00	5.31	53.66	53.86	1.29	2.38
149.68	119.68	5.33	50.07	50.77	1.34	2.33
200.00	170.00	5.37	47.54	48.24	1.40	2.28
246.13	216.13	5.54	45.92	48.66	1.48	2.29
342.58	312.58	5.71	43.07	48.72	1.68	2.29
439.03	409.03	5.77	40.76	43.78	1.93	2.33
500.00	470.00	5.97	39.74	38.41	2.10	2.41
583.71	553.71	6.25	39.21	33.19	2.36	2.48
680.16	650.16	6.55	38.34	29.32	2.71	2.69
750.00	720.00	6.89	37.60	26.77	2.92	2.80
873.07	843.07	7.45	36.91	21.63	3.32	3.09
1000.00	970.00	7.70	35.50	18.14	3.56	3.20
1114.19	1084.19	7.76	33.72	16.32	3.69	3.18
1210.65	1180.65	8.02	32.50	14.96	3.73	3.19
1355.32	1325.32	8.41	30.92	13.25	3.75	3.12
1500.00	1470.00	8.83	28.64	12.28	3.83	2.98

Electrical Schematic

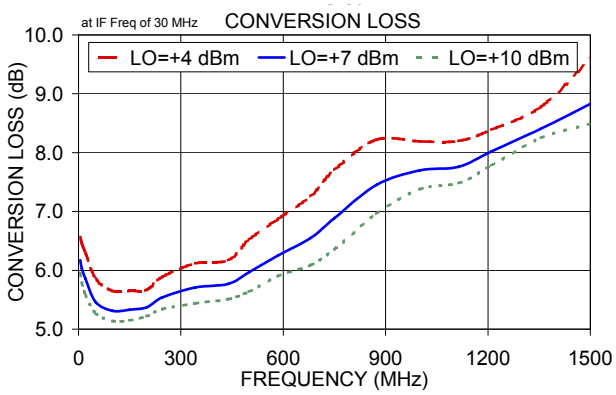


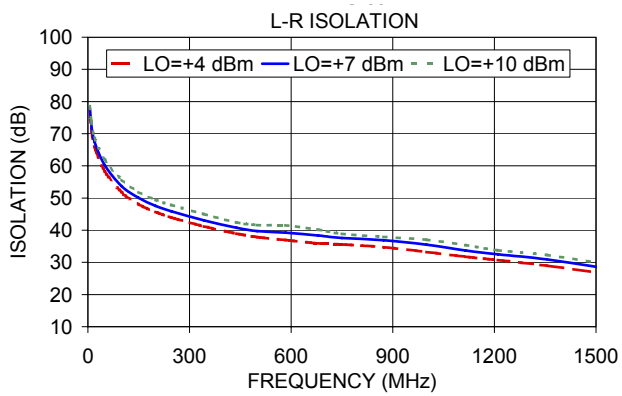
Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

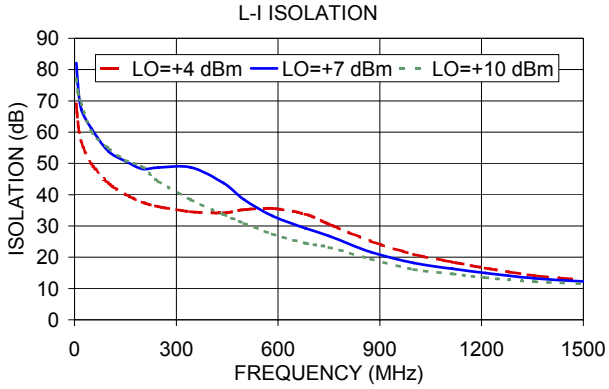
Mini-Circuits®
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

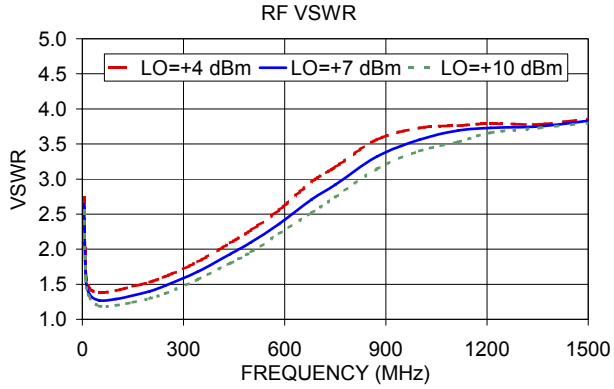
Performance Charts

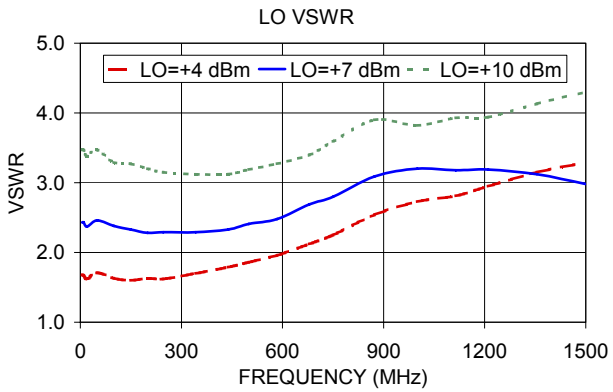
LRMS-5+

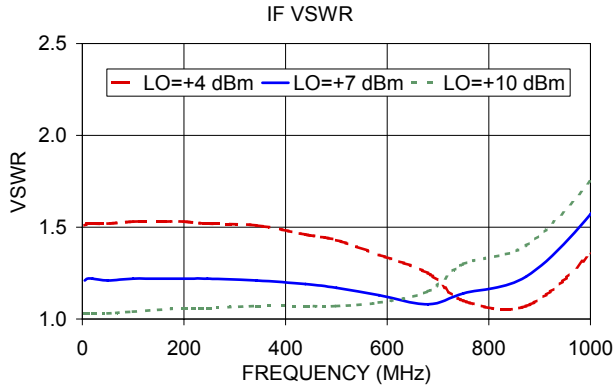












Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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-5+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+4	+7	+10
5.0	35.0	6.56	6.17	5.95
10.0	40.0	6.45	6.03	5.79
70.4	100.4	6.36	5.99	5.79
130.7	160.7	6.15	5.81	5.64
190.9	220.9	6.11	5.79	5.62
251.2	281.2	6.13	5.81	5.64
311.5	341.5	6.15	5.84	5.67
371.8	401.8	6.24	5.90	5.70
432.0	462.0	6.27	5.96	5.74
492.3	522.3	6.36	6.00	5.76
552.6	582.6	6.46	6.09	5.86
612.9	642.9	6.54	6.14	5.88
673.1	703.1	6.66	6.22	5.92
733.4	763.4	6.81	6.36	6.01
793.7	823.7	6.93	6.43	6.08
854.0	884.0	7.06	6.46	6.12
914.2	944.2	7.30	6.60	6.21
974.5	1004.5	7.65	6.86	6.40
1034.8	1064.8	8.00	7.26	6.74
1095.1	1125.1	8.25	7.65	7.14
1155.3	1185.3	8.36	7.90	7.49
1215.6	1245.6	8.41	8.03	7.70
1275.9	1305.9	8.50	8.16	7.89
1336.2	1366.2	8.58	8.29	8.07
1396.4	1426.4	8.68	8.41	8.24
1436.6	1466.6	8.71	8.46	8.29
1496.9	1526.9	8.76	8.48	8.33
1597.3	1627.3	8.90	8.57	8.46
1637.5	1667.5	8.93	8.58	8.48
1697.8	1727.8	9.02	8.63	8.54
1738.0	1768.0	9.12	8.64	8.55
1798.3	1828.3	9.30	8.71	8.55
1838.4	1868.4	9.46	8.74	8.54
1898.7	1928.7	9.75	8.80	8.51
1938.9	1968.9	10.09	8.91	8.53
1999.2	2029.2	10.52	9.12	8.63
2039.4	2069.4	11.00	9.34	8.74
2099.6	2129.6	11.46	9.60	8.89
2139.8	2169.8	12.24	9.86	9.01
2200.1	2230.1	12.90	10.06	9.09

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+4	+7	+10
10.1	40.1	14.42	17.18	19.19
70.4	100.4	18.34	20.22	16.43
130.7	160.7	14.53	13.46	18.76
190.9	220.9	13.23	15.76	26.19
251.2	281.2	12.74	16.96	26.18
311.5	341.5	13.68	19.29	21.81
371.8	401.8	14.55	20.94	18.48
432.0	462.0	17.00	18.67	17.73
492.3	522.3	18.02	21.33	18.91
552.6	582.6	18.36	18.60	17.78
612.9	642.9	23.86	15.60	16.85
673.1	703.1	17.70	17.67	14.51
733.4	763.4	16.57	14.88	12.24
793.7	823.7	14.17	13.27	10.45
854.0	884.0	13.20	15.01	13.87
914.2	944.2	12.79	14.31	15.76
974.5	1004.5	11.14	13.73	15.50
1034.8	1064.8	9.20	13.27	15.32
1095.1	1125.1	7.65	10.23	12.45
1155.3	1185.3	7.49	8.89	11.20
1215.6	1245.6	7.75	7.96	10.10
1275.9	1305.9	8.28	7.98	8.65
1336.2	1366.2	9.11	8.45	8.55
1396.4	1426.4	9.94	9.50	10.04
1436.6	1466.6	10.97	10.91	11.21
1496.9	1526.9	10.82	12.84	12.02
1537.1	1567.1	11.55	12.80	12.97
1597.3	1627.3	11.76	13.62	14.81
1637.5	1667.5	11.34	15.02	14.17
1697.8	1727.8	11.42	13.01	14.43
1738.0	1768.0	11.50	11.61	14.43
1798.3	1828.3	10.63	11.66	13.06
1838.4	1868.4	9.81	12.58	14.25
1898.7	1928.7	9.44	13.14	13.55
1938.9	1968.9	9.53	11.89	14.34
1999.2	2029.2	10.36	10.65	12.84
2039.4	2069.4	10.82	11.03	12.83
2099.6	2129.6	12.28	13.12	13.13
2139.8	2169.8	12.85	14.85	13.11
2200.1	2230.1	9.11	14.78	19.64

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+1dBm (dB) @LO (dBm)		
		+4	+7	+10
10.1	40.1	0.32	0.22	0.13
70.4	100.4	0.76	0.49	0.33
130.7	160.7	0.87	0.59	0.38
190.9	220.9	0.87	0.63	0.41
251.2	281.2	0.92	0.63	0.46
311.5	341.5	0.91	0.65	0.48
371.8	401.8	0.92	0.68	0.53
432.0	462.0	0.99	0.77	0.61
492.3	522.3	1.08	0.84	0.70
552.6	582.6	1.24	1.00	0.77
612.9	642.9	1.35	1.10	0.89
673.1	703.1	1.39	1.14	0.96
733.4	763.4	1.45	1.17	1.01
793.7	823.7	1.47	1.23	1.05
854.0	884.0	1.53	1.30	1.11
914.2	944.2	1.53	1.38	1.14
974.5	1004.5	1.40	1.33	1.14
1034.8	1064.8	1.08	1.07	1.02
1095.1	1125.1	0.90	0.83	0.80
1155.3	1185.3	0.80	0.72	0.65
1215.6	1245.6	0.68	0.55	0.58
1275.9	1305.9	0.64	0.49	0.54
1336.2	1366.2	0.65	0.51	0.48
1396.4	1426.4	0.66	0.50	0.46
1436.6	1466.6	0.74	0.53	0.48
1496.9	1526.9	0.80	0.50	0.41
1537.1	1567.1	0.78	0.52	0.42
1597.3	1627.3	0.76	0.47	0.42
1637.5	1667.5	0.78	0.42	0.43
1697.8	1727.8	0.80	0.42	0.39
1738.0	1768.0	0.81	0.45	0.35
1798.3	1828.3	0.87	0.44	0.35
1838.4	1868.4	0.94	0.48	0.35
1898.7	1928.7	0.88	0.45	0.35
1938.9	1968.9	0.88	0.52	0.35
1999.2	2029.2	0.77	0.45	0.33
2039.4	2069.4	0.62	0.51	0.30
2099.6	2129.6	0.39	0.45	0.27
2139.8	2169.8	0.20	0.40	0.28
2200.1	2230.1	-0.27	0.35	0.20

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)
		@LO (dBm)
		+7
490.0	10.1	6.07
477.7	22.4	6.02
465.4	34.7	6.00
453.1	47.0	6.01
440.8	59.3	6.01
428.5	71.6	6.00
416.2	83.9	5.99
403.8	96.3	5.97
391.5	108.6	5.97
379.2	120.9	5.95
366.9	133.2	5.95
354.6	145.5	5.97
342.3	157.8	5.97
330.0	170.1	5.97
317.7	182.4	5.98
305.4	194.7	5.98
293.1	207.0	5.95
280.8	219.3	5.93
268.5	231.6	5.91
256.2	243.9	5.86
243.8	256.3	5.87
231.5	268.6	5.93
219.2	280.9	5.95
206.9	293.2	5.97
194.6	305.5	5.96
182.3	317.8	5.95
170.0	330.1	5.96
157.7	342.4	5.97
145.4	354.7	5.98
133.1	367.0	6.00
120.8	379.3	5.98
108.5	391.6	5.96
96.2	403.9	5.97
83.8	416.3	5.96
71.5	428.6	5.97
59.2	440.9	5.98
46.9	453.2	5.96
34.6	465.5	5.99
22.3	477.8	5.99
10.0	490.1	6.11

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB)
		@LO (dBm)
		+7
10.0	20.1	6.96
30.0	40.1	6.84
50.0	60.1	6.86
70.0	80.1	6.88
90.0	100.1	6.91
110.0	120.1	6.88
130.0	140.1	6.85
150.0	160.1	6.88
170.0	180.1	6.92
190.0	200.1	6.91
210.0	220.1	6.89
230.0	240.1	6.91
250.0	260.1	6.95
270.0	280.1	6.96
290.0	300.1	6.96
310.0	320.1	6.98
330.0	340.1	6.99
350.0	360.1	7.00
370.0	380.1	7.04
390.0	400.1	7.05
430.0	440.1	7.10
450.0	460.1	7.12
490.0	500.1	7.15
510.0	520.1	7.16
550.0	560.1	7.22
570.0	580.1	7.22
610.0	620.1	7.21
630.0	640.1	7.23
670.0	680.1	7.27
690.0	700.1	7.29
730.0	740.1	7.40
750.0	760.1	7.42
790.0	800.1	7.48
810.0	820.1	7.50
850.0	860.1	7.57
870.0	880.1	7.60
910.0	920.1	7.70
930.0	940.1	7.76
970.0	980.1	7.91
990.0	1000.1	7.97

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB)
		@LO (dBm)
		+7
990.0	10.1	7.12
970.0	30.1	7.15
950.0	50.1	7.14
930.0	70.1	7.20
910.0	90.1	7.23
890.0	110.1	7.23
870.0	130.1	7.18
850.0	150.1	7.20
830.0	170.1	7.21
810.0	190.1	7.19
790.0	210.1	7.17
770.0	230.1	7.13
750.0	250.1	6.96
730.0	270.1	7.11
710.0	290.1	7.11
690.0	310.1	7.03
670.0	330.1	7.00
650.0	350.1	7.00
630.0	370.1	6.98
610.0	390.1	6.95
570.0	430.1	6.90
550.0	450.1	6.90
510.0	490.1	6.77
490.0	510.1	6.72
450.0	550.1	6.83
430.0	570.1	6.83
390.0	610.1	6.74
370.0	630.1	6.74
330.0	670.1	6.78
310.0	690.1	6.82
270.0	730.1	6.88
250.0	750.1	6.91
210.0	790.1	6.92
190.0	810.1	6.92
150.0	850.1	6.94
130.0	870.1	6.92
90.0	910.1	6.88
70.0	930.1	6.88
30.0	970.1	6.93
10.0	990.1	7.11

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+4	+7	+10	+4	+7	+10
5.0	77.61	78.28	78.52	69.01	82.08	77.02
10.0	71.70	73.09	73.85	63.30	75.39	72.75
70.4	65.98	70.75	75.15	55.71	54.44	48.39
130.7	58.67	62.99	67.62	52.15	49.84	43.44
190.9	54.28	58.40	63.13	47.90	47.91	40.71
251.2	52.27	56.50	61.37	46.03	45.17	38.03
311.5	51.38	56.44	61.50	45.55	43.27	36.00
371.8	51.25	56.99	61.67	45.61	41.13	34.26
432.0	52.36	60.32	60.73	48.35	38.17	32.34
492.3	54.14	64.18	55.72	53.97	36.34	30.65
552.6	61.77	57.50	50.77	57.32	34.08	29.19
612.9	75.15	51.09	46.59	43.57	31.25	27.20
673.1	57.74	46.55	42.98	39.77	29.23	25.46
733.4	51.82	44.16	40.83	35.90	27.79	24.00
793.7	47.74	42.23	39.60	32.70	26.52	23.22
854.0	44.79	40.97	38.92	29.04	24.86	22.04
914.2	43.52	39.97	38.40	25.93	22.33	20.25
974.5	43.31	39.67	38.00	24.04	20.70	18.84
1034.8	44.01	39.76	38.00	22.69	19.38	17.59
1095.1	46.32	41.37	39.13	21.48	18.49	16.78
1155.3	48.99	43.52	40.77	20.43	17.77	16.13
1215.6	53.53	47.47	43.45	19.40	17.13	15.36
1275.9	54.65	53.78	47.58	18.59	16.56	14.90
1336.2	46.97	55.22	54.17	17.90	15.91	14.46
1396.4	43.12	47.13	50.60	17.22	15.36	14.09
1436.6	41.71	45.06	48.03	16.71	15.10	13.78
1496.9	39.54	42.01	43.87	16.01	14.58	13.24
1597.3	37.06	38.80	40.26	14.94	13.85	12.71
1637.5	35.39	36.90	37.83	14.52	13.38	12.41
1697.8	33.62	34.99	35.83	13.99	13.13	12.28
1738.0	32.66	33.89	34.81	13.65	12.93	12.21
1798.3	30.90	32.08	33.05	13.04	12.68	12.09
1838.4	30.13	31.29	32.24	12.73	12.43	11.95
1898.7	28.79	29.90	30.83	12.27	12.18	11.73
1938.9	28.02	29.09	30.00	12.06	11.97	11.63
1999.2	27.02	27.95	28.86	11.75	11.73	11.42
2039.4	26.67	27.54	28.36	11.70	11.68	11.36
2099.6	25.91	26.69	27.53	11.65	11.58	11.43
2139.8	25.47	26.37	27.16	11.60	11.68	11.52
2200.1	24.84	25.62	26.45	11.70	11.76	11.68

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+4	+7	+10
10.1	40.1	44.47	46.28	48.71
70.4	100.4	40.94	39.29	39.31
130.7	160.7	36.23	35.94	35.48
190.9	220.9	34.48	33.93	33.45
251.2	281.2	33.51	33.07	32.66
311.5	341.5	32.83	32.31	32.11
371.8	401.8	31.67	31.31	31.10
432.0	462.0	29.66	29.57	29.46
492.3	522.3	27.26	27.27	27.17
552.6	582.6	24.83	24.82	24.88
612.9	642.9	22.76	22.63	22.54
673.1	703.1	21.19	21.03	20.94
733.4	763.4	20.02	19.97	19.96
793.7	823.7	19.12	19.25	19.51
854.0	884.0	18.67	18.94	19.38
914.2	944.2	18.50	18.77	19.18
974.5	1004.5	18.44	18.77	19.02
1034.8	1064.8	18.45	18.78	19.16
1095.1	1125.1	18.32	18.76	19.12
1155.3	1185.3	18.14	18.53	18.90
1215.6	1245.6	17.77	18.18	18.46
1275.9	1305.9	17.22	17.59	17.82
1336.2	1366.2	16.74	17.02	17.26
1396.4	1426.4	16.20	16.44	16.71
1436.6	1466.6	15.91	16.18	16.37
1496.9	1526.9	15.59	15.77	16.01
1537.1	1567.1	15.36	15.56	15.78
1597.3	1627.3	15.09	15.37	15.56
1637.5	1667.5	14.96	15.22	15.42
1697.8	1727.8	14.67	15.06	15.26
1738.0	1768.0	14.42	14.82	15.11
1798.3	1828.3	14.12	14.60	14.98
1838.4	1868.4	13.93	14.43	14.87
1898.7	1928.7	13.69	14.25	14.75
1938.9	1968.9	13.54	14.08	14.63
1999.2	2029.2	13.52	14.07	14.64
2039.4	2069.4	13.52	14.02	14.52
2099.6	2129.6	13.62	14.10	14.54
2139.8	2169.8	13.70	14.25	14.63
2200.1	2230.1	13.92	14.51	14.90

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+4	+7	+10
5.0	35.0	1.68	2.43	3.47
10.0	40.0	1.67	2.43	3.47
70.4	100.4	1.20	1.19	1.21
130.7	160.7	1.10	1.08	1.11
190.9	220.9	1.07	1.01	1.06
251.2	281.2	1.09	1.04	1.05
311.5	341.5	1.12	1.07	1.07
371.8	401.8	1.16	1.11	1.10
432.0	462.0	1.19	1.16	1.15
492.3	522.3	1.23	1.20	1.19
552.6	582.6	1.30	1.27	1.25
612.9	642.9	1.39	1.35	1.32
673.1	703.1	1.50	1.44	1.41
733.4	763.4	1.61	1.55	1.50
793.7	823.7	1.77	1.70	1.63
854.0	884.0	1.95	1.86	1.79
914.2	944.2	2.19	2.07	2.00
974.5	1004.5	2.44	2.29	2.19
1034.8	1064.8	2.61	2.49	2.37
1095.1	1125.1	2.68	2.60	2.52
1155.3	1185.3	2.72	2.68	2.64
1215.6	1245.6	2.78	2.76	2.73
1275.9	1305.9	2.84	2.82	2.78
1336.2	1366.2	2.89	2.86	2.82
1396.4	1426.4	2.89	2.84	2.82
1436.6	1466.6	2.88	2.85	2.80
1496.9	1526.9	2.87	2.84	2.83
1537.1	1567.1	2.91	2.87	2.85
1597.3	1627.3	2.96	2.93	2.90
1637.5	1667.5	2.99	2.96	2.92
1697.8	1727.8	3.01	2.93	2.90
1738.0	1768.0	3.03	2.93	2.89
1798.3	1828.3	3.02	2.88	2.83
1838.4	1868.4	3.08	2.89	2.82
1898.7	1928.7	3.20	2.96	2.85
1938.9	1968.9	3.35	3.07	2.94
1999.2	2029.2	3.53	3.23	3.05
2039.4	2069.4	3.63	3.31	3.09
2099.6	2129.6	3.70	3.33	3.11
2139.8	2169.8	3.83	3.39	3.16
2200.1	2230.1	3.90	3.39	3.14

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+4	+7	+10
5.0	2.73	2.64	2.55
10.0	1.68	1.62	1.58
70.4	1.81	2.57	3.52
130.7	1.81	2.56	3.50
190.9	1.77	2.49	3.38
251.2	1.82	2.55	3.45
311.5	1.84	2.55	3.42
371.8	1.87	2.57	3.41
432.0	1.94	2.64	3.48
492.3	1.96	2.64	3.43
552.6	2.03	2.70	3.48
612.9	2.08	2.73	3.47
673.1	2.14	2.76	3.45
733.4	2.21	2.82	3.50
793.7	2.25	2.83	3.48
854.0	2.32	2.86	3.48
914.2	2.40	2.91	3.49
974.5	2.47	2.96	3.50
1034.8	2.57	3.06	3.58
1095.1	2.59	3.05	3.54
1155.3	2.67	3.11	3.58
1215.6	2.69	3.11	3.56
1275.9	2.72	3.10	3.52
1336.2	2.80	3.15	3.55
1396.4	2.80	3.11	3.48
1436.6	2.88	3.16	3.52
1496.9	2.91	3.14	3.47
1537.1	3.00	3.21	3.52
1597.3	3.05	3.20	3.47
1637.5	3.16	3.30	3.56
1697.8	3.30	3.36	3.58
1738.0	3.46	3.47	3.67
1798.3	3.65	3.59	3.75
1838.4	3.86	3.74	3.86
1898.7	4.09	3.87	3.92
1938.9	4.30	4.02	4.06
1999.2	4.52	4.15	4.10
2039.4	4.72	4.33	4.24
2099.6	4.96	4.47	4.31
2139.8	5.20	4.64	4.46
2200.1	5.36	4.79	4.50

IF (OUT) (MHz)	IF VSWR @LO=1010.1MHz (:1) @LO (dBm)		
	+4	+7	+10
5.0	1.51	1.21	1.03
10.0	1.52	1.22	1.03
30.3	1.61	1.30	1.11
50.5	1.59	1.26	1.06
70.7	1.53	1.21	1.03
90.9	1.58	1.27	1.07
111.1	1.61	1.28	1.09
131.3	1.57	1.25	1.05
151.5	1.55	1.23	1.04
171.7	1.53	1.23	1.06
191.9	1.54	1.24	1.07
212.1	1.55	1.24	1.07
232.3	1.53	1.23	1.06
252.5	1.51	1.22	1.07
272.8	1.51	1.23	1.08
293.0	1.52	1.24	1.09
313.2	1.52	1.24	1.09
333.4	1.50	1.23	1.09
353.6	1.50	1.23	1.10
373.8	1.49	1.23	1.11
394.0	1.48	1.23	1.12
434.4	1.45	1.21	1.13
454.6	1.44	1.22	1.14
495.0	1.43	1.21	1.14
515.2	1.41	1.20	1.16
555.6	1.40	1.22	1.18
575.8	1.40	1.21	1.18
616.2	1.35	1.19	1.19
636.4	1.36	1.20	1.20
676.8	1.34	1.19	1.19
697.0	1.30	1.16	1.18
737.4	1.28	1.18	1.23
757.7	1.28	1.18	1.23
798.1	1.23	1.13	1.21
818.3	1.20	1.13	1.23
858.7	1.21	1.15	1.25
878.9	1.19	1.13	1.22
919.3	1.12	1.12	1.26
939.5	1.12	1.15	1.30
979.9	1.10	1.16	1.31
1000.1	1.11	1.24	1.41

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	+1	23	11	18	8	40	25	44	36	41
1	-	13	+0	37	16	39	39	46	36	51	41	58
2	111	55	36	61	35	73	49	58	45	57	56	61
3	119	70	64	66	72	68	70	74	73	72	63	74
4	112	97	96	86	85	86	86	82	89	81	88	83
5	118	122	107	97	94	106	90	94	101	104	98	95
6	119	108	107	108	102	111	105	90	104	109	101	119
7	110	100	107	102	126	115	105	96	88	105	103	104
8	138	106	102	100	107	99	108	99	100	96	108	105
9	119	101	110	98	105	107	105	115	109	95	99	109
10	105	104	101	104	99	100	106	103	119	135	105	101
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: **RF IN: 750.1 MHz; -14.00 dBm.**
LO IN: 780.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -20.3 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	7	33	22	31	21	54	39	58	44	59
1	-	13	+0	38	17	44	42	49	48	57	50	65
2	90	47	27	50	27	57	43	57	38	56	55	62
3	112	45	43	47	47	51	47	59	74	66	54	69
4	107	62	65	61	55	55	44	62	57	58	58	63
5	109	64	66	65	57	67	56	62	64	79	68	68
6	116	79	80	70	82	68	57	66	59	68	71	71
7	117	85	76	83	77	90	72	75	68	72	73	81
8	117	99	95	88	84	85	97	85	76	79	69	92
9	122	96	105	95	88	99	87	100	84	78	76	77
10	112	105	102	115	101	93	91	88	96	88	80	88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

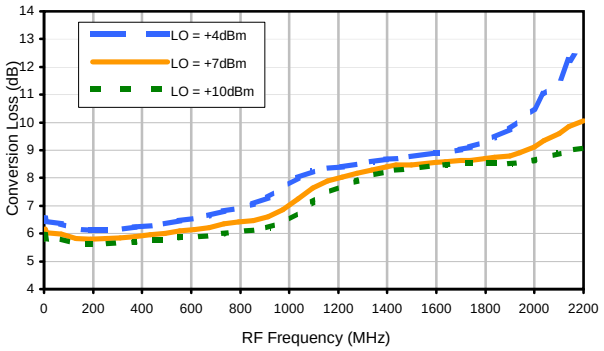
Test conditions: **RF IN: 750.1 MHz; -4.00 dBm.**
LO IN: 780.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -10.41 dBm

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.

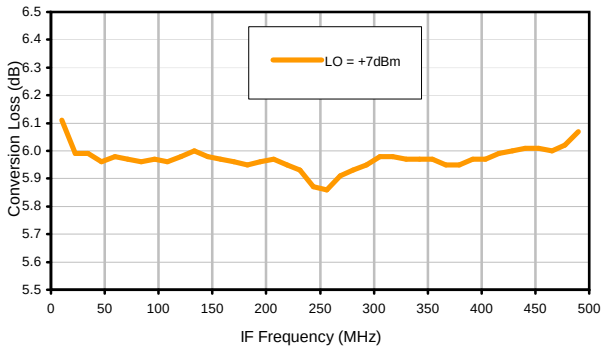
Frequency Mixer LRMS-5+

Typical Performance Curves

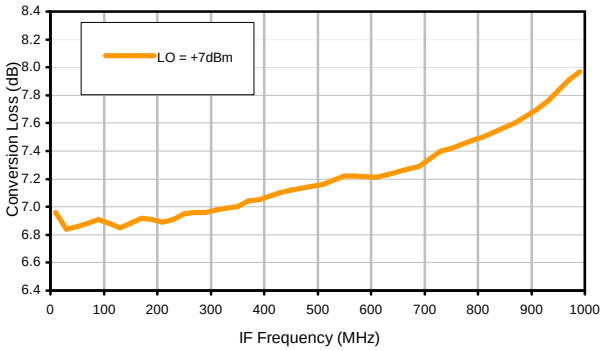
Conversion Loss @ IF=30MHz



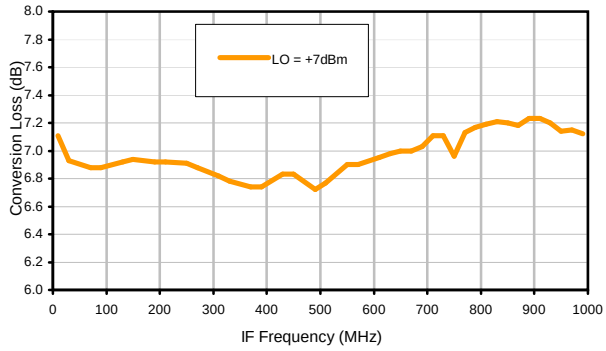
Conversion Loss vs. IF @ RF=500.1MHz



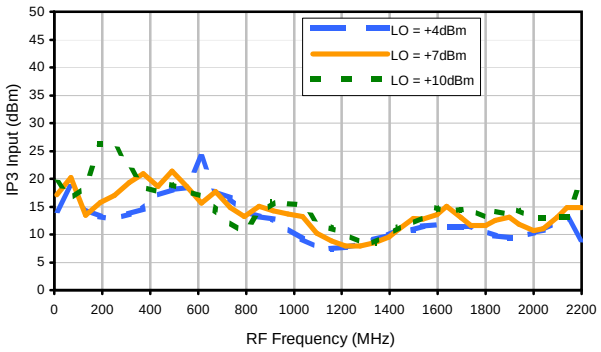
Conversion Loss vs. IF @ RF=10.1MHz



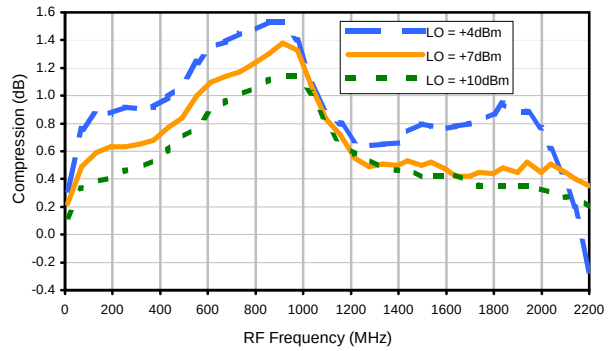
Conversion Loss vs. IF @ RF=1000.1MHz



IP3 Input

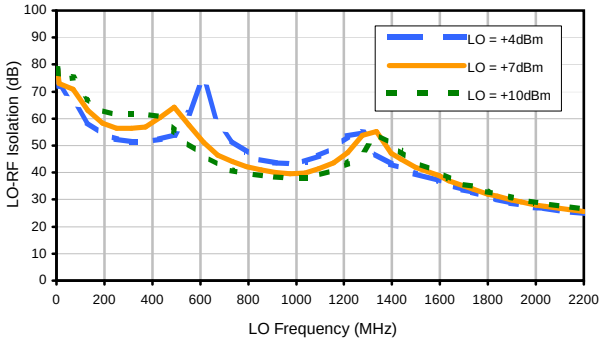


Compression @ RF IN=+1dBm

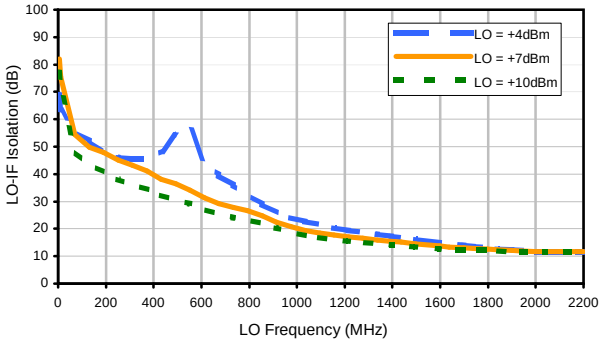


Typical Performance Curves

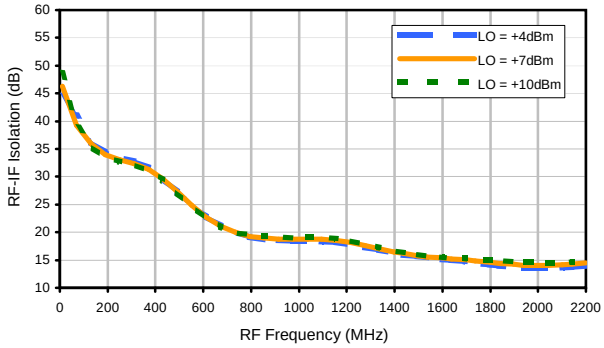
LO-RF Isolation



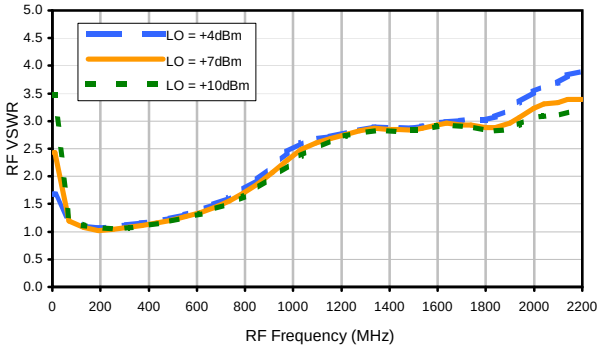
LO-IF Isolation



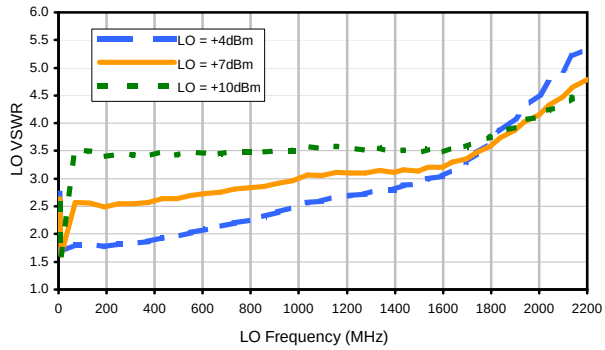
RF-IF Isolation



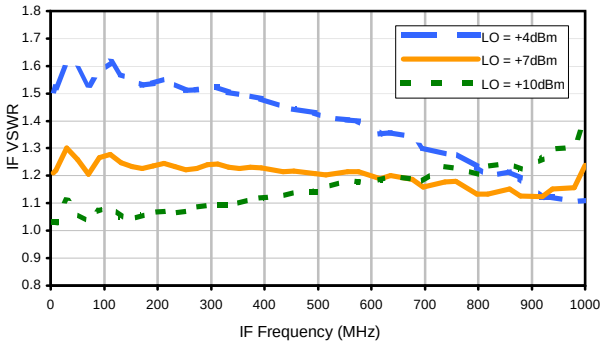
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	+1	23	11	18	8	40	25	44	36	41
1	-	13	+0	37	16	39	39	46	36	51	41	58
2	111	55	36	61	35	73	49	58	45	57	56	61
3	119	70	64	66	72	68	70	74	73	72	63	74
4	112	97	96	86	85	86	86	82	89	81	88	83
5	118	122	107	97	94	106	90	94	101	104	98	95
6	119	108	107	108	102	111	105	90	104	109	101	119
7	110	100	107	102	126	115	105	96	88	105	103	104
8	138	106	102	100	107	99	108	99	100	96	108	105
9	119	101	110	98	105	107	105	115	109	95	99	109
10	105	104	101	104	99	100	106	103	119	135	105	101
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: **RF IN: 750.1 MHz; -14.00 dBm.**
LO IN: 780.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -20.3 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	7	33	22	31	21	54	39	58	44	59
1	-	13	+0	38	17	44	42	49	48	57	50	65
2	90	47	27	50	27	57	43	57	38	56	55	62
3	112	45	43	47	47	51	47	59	74	66	54	69
4	107	62	65	61	55	55	44	62	57	58	58	63
5	109	64	66	65	57	67	56	62	64	79	68	68
6	116	79	80	70	82	68	57	66	59	68	71	71
7	117	85	76	83	77	90	72	75	68	72	73	81
8	117	99	95	88	84	85	97	85	76	79	69	92
9	122	96	105	95	88	99	87	100	84	78	76	77
10	112	105	102	115	101	93	91	88	96	88	80	88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

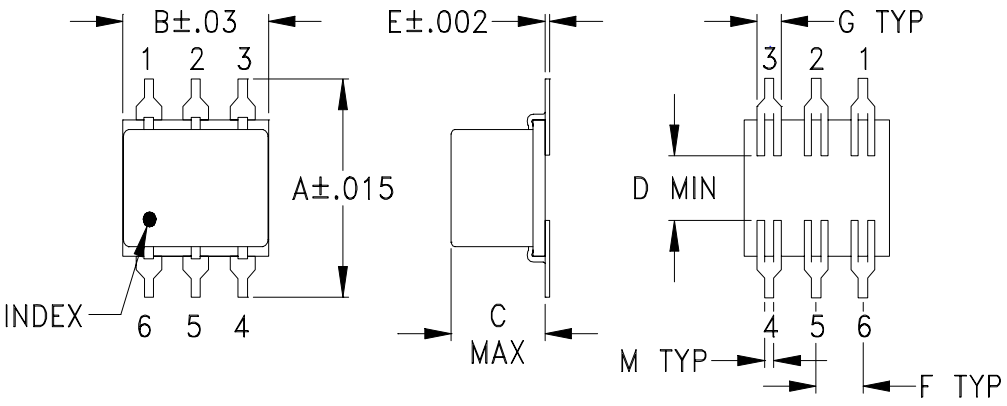
Test conditions: **RF IN: 750.1 MHz; -4.00 dBm.**
LO IN: 780.01 MHz; +7.00 dBm
IF OUT: 29.91 MHz; -10.41 dBm

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.

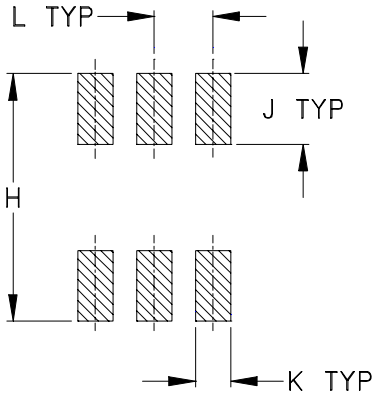
Case Style QQQ

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

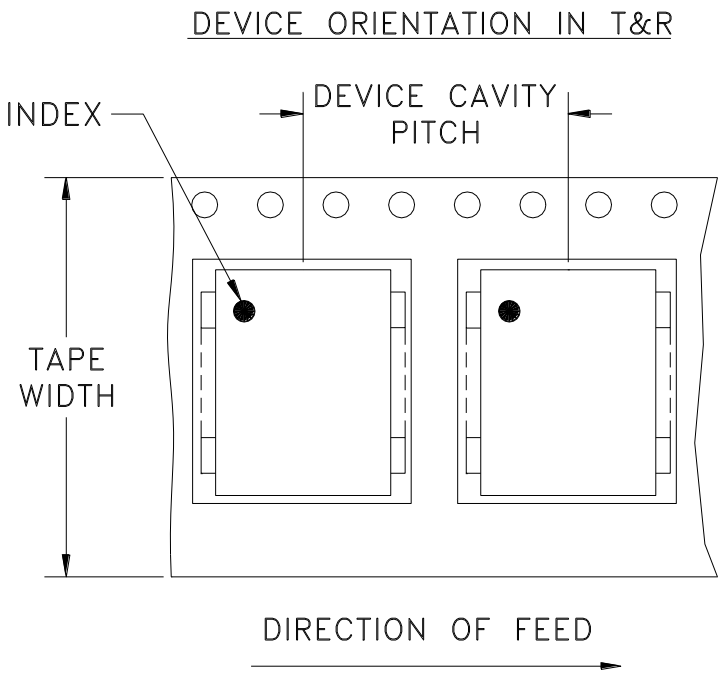
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

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

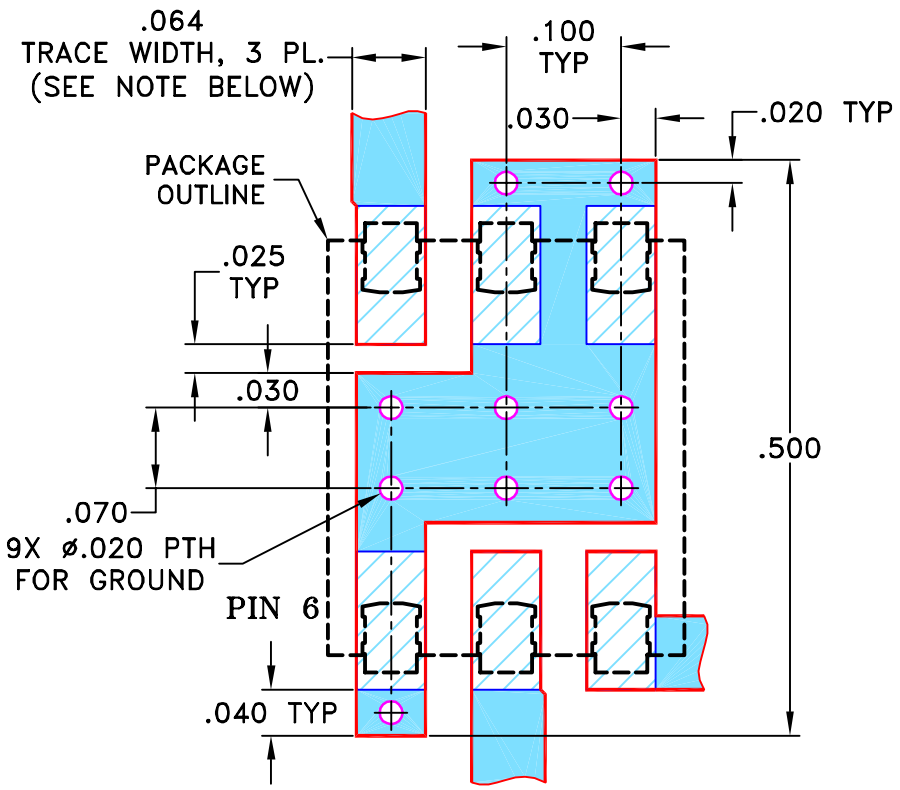
Note: Please consult individual model data sheet to determine device per reel availability.

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

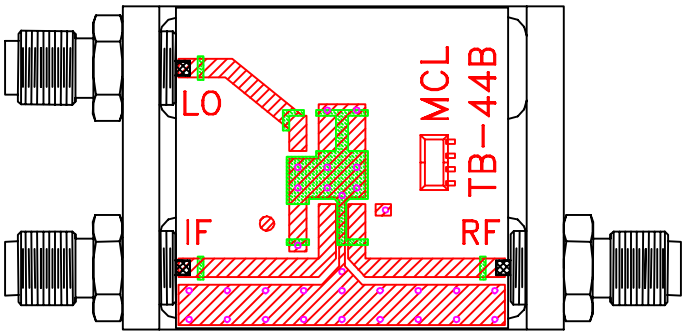
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

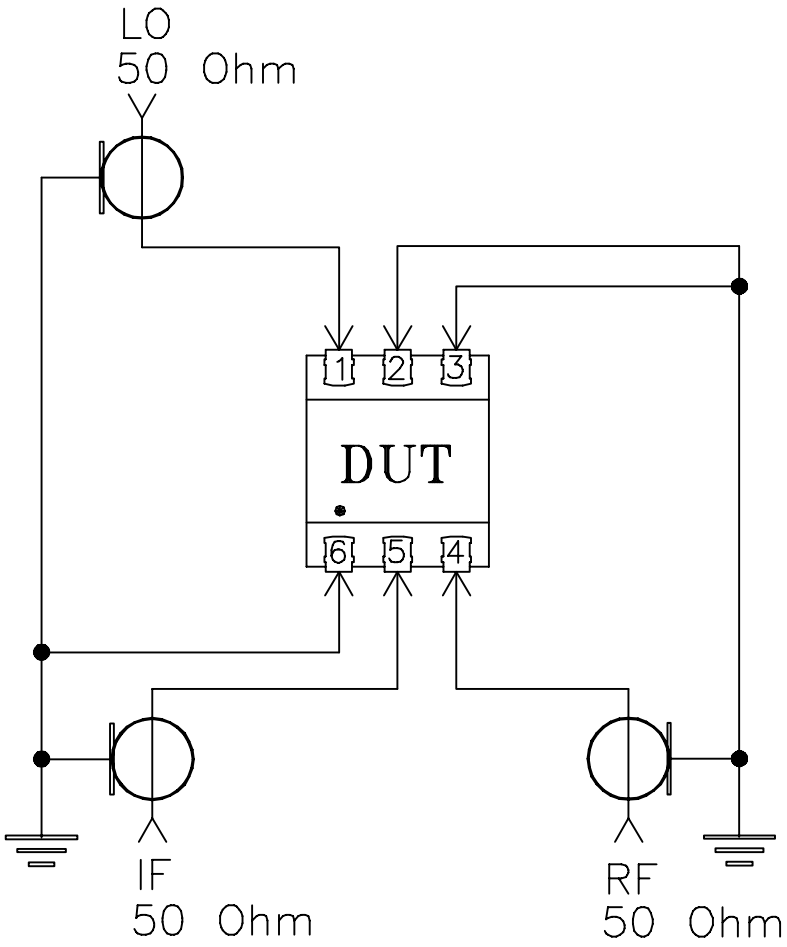
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-083	A

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