Surface Mount

Frequency Mixer

LRMS-2H+

Level 17 (LO Power +17dBm) 5 to 1000 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	200mW
IF Current	40mA

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

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

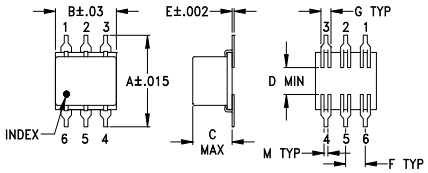
Features

- low conversion loss, 6.98 dB typ.
- excellent L-R isolation, 39 dB typ.; L-I isolation, 45 dB typ.

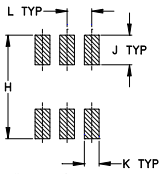
Applications

- VHF/UHF
- instrumentation
- cellular

Outline Drawing



PCB Land Pattern



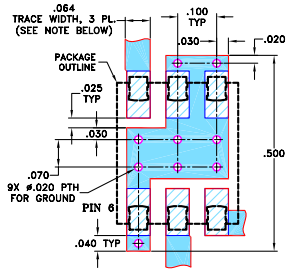
Suggested Layout,
Tolerance to be within ±.002

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)					
		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.
5-1000	DC-900	6.98	.054	8.5	9.3	55	40	39	22	33	20	52	30	45	22	30	17

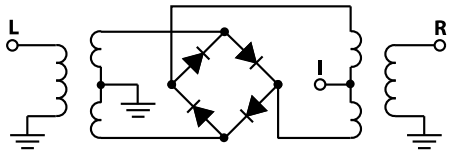
1 dB COMP.: +14 dBm typ.

L = low range [f_L to 10 f_L] M = mid range [10 f_L to f_U/2] U = upper range [f_U/2 to f_U]
m= mid band [2f_L to f_U/2]

Typical Performance Data

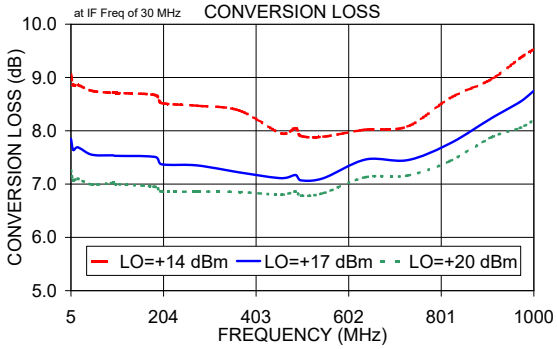
Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm
5.00	35.00	7.85	66.33	72.89	1.54	1.95
10.00	40.00	7.64	63.63	68.70	1.49	1.85
20.00	50.00	7.69	58.93	63.79	1.47	1.79
50.00	80.00	7.55	52.00	56.89	1.45	1.91
95.45	65.45	7.54	46.41	50.84	1.44	1.79
100.00	70.00	7.53	46.04	50.67	1.43	1.79
185.91	155.91	7.51	40.70	46.79	1.43	1.69
200.00	170.00	7.37	40.02	46.99	1.42	1.68
276.36	246.36	7.35	37.35	44.46	1.40	1.56
366.82	336.82	7.22	35.28	42.69	1.34	1.47
457.27	427.27	7.11	33.66	39.45	1.25	1.36
487.42	457.42	7.17	33.17	37.61	1.24	1.34
500.00	470.00	7.07	33.04	37.36	1.21	1.34
547.73	517.73	7.11	32.95	35.68	1.11	1.28
638.18	608.18	7.46	32.78	31.60	1.06	1.29
728.64	698.64	7.45	31.90	30.61	1.27	1.46
819.09	789.09	7.76	30.74	28.78	1.54	1.81
909.55	879.55	8.24	29.67	27.10	1.90	2.21
969.85	939.85	8.54	29.46	25.48	2.06	2.34
1000.00	970.00	8.75	29.31	24.84	2.10	2.40

Electrical Schematic

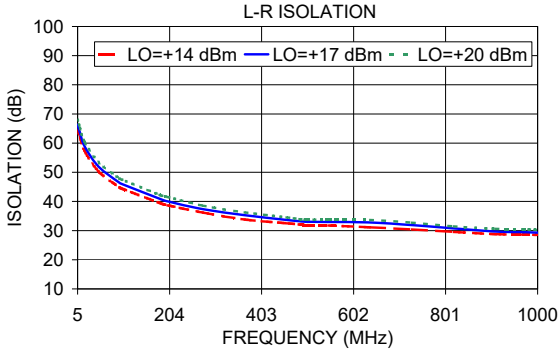


Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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

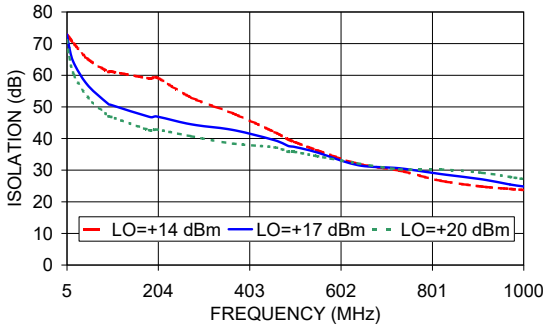
LRMS-2H+
at IF Freq of 30 MHz CONVERSION LOSS



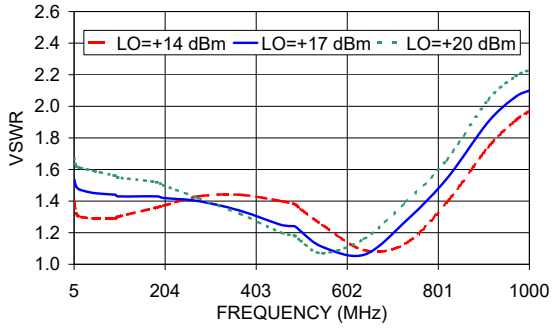
LRMS-2H+
L-R ISOLATION



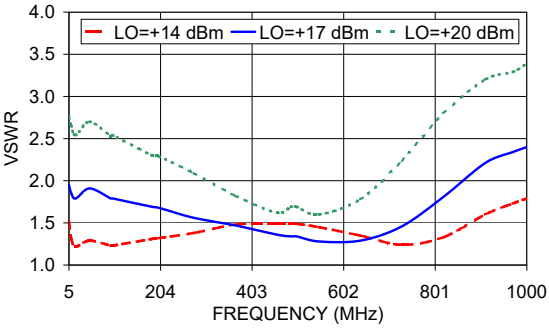
LRMS-2H+
L-I ISOLATION



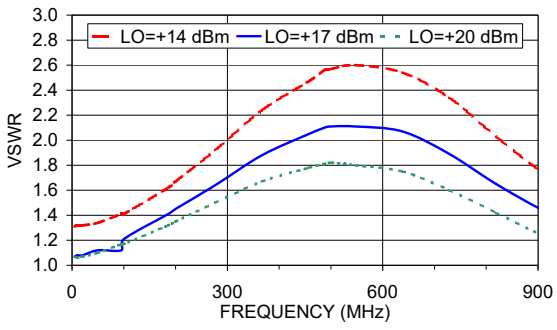
LRMS-2H+
RF VSWR



LRMS-2H+
LO VSWR



LRMS-2H+
IF VSWR



Frequency Mixer LRMS-2H+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+14	+17	+20
5.0	35.0	9.06	7.85	7.26
10.0	40.0	8.86	7.64	7.07
49.8	79.8	8.24	7.17	6.71
89.6	119.6	8.21	7.14	6.69
129.3	159.3	8.17	7.11	6.65
169.0	199.0	8.11	7.09	6.64
208.8	238.8	7.97	6.92	6.60
248.5	278.5	8.16	7.07	6.68
288.2	318.2	7.75	6.90	6.61
328.0	358.0	7.82	6.98	6.69
367.7	397.7	7.68	6.96	6.67
407.4	437.4	7.57	6.90	6.63
447.2	477.2	7.68	6.98	6.66
486.9	516.9	7.65	6.98	6.65
526.6	556.6	7.79	7.16	6.77
566.4	596.4	7.75	7.15	6.78
606.1	636.1	7.79	7.10	6.76
645.8	675.8	7.79	7.07	6.70
685.6	715.6	7.76	7.07	6.69
725.3	755.3	7.87	7.18	6.80
765.0	795.0	7.91	7.26	6.87
804.8	834.8	8.11	7.46	7.04
844.5	874.5	8.30	7.63	7.17
884.2	914.2	8.50	7.77	7.29
924.0	954.0	8.70	7.89	7.37
1003.4	1033.4	9.11	8.07	7.41
1043.2	1073.2	9.09	7.95	7.32
1082.9	1112.9	9.37	8.14	7.43
1122.6	1152.6	9.40	8.13	7.38
1162.4	1192.4	9.57	8.31	7.53
1202.1	1232.1	9.72	8.47	7.67
1241.8	1271.8	9.86	8.63	7.82
1281.6	1311.6	10.15	8.93	8.12
1321.3	1351.3	10.25	9.05	8.25
1361.0	1391.0	10.49	9.33	8.57
1380.9	1410.9	10.55	9.44	8.66
1420.6	1450.6	10.71	9.60	8.87
1440.5	1470.5	10.73	9.64	8.93
1480.2	1510.2	10.89	9.91	9.23
1500.1	1530.1	10.98	10.04	9.40

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+14	+17	+20
10.1	40.1	22.84	26.80	30.39
49.8	79.8	21.92	25.30	28.79
89.6	119.6	22.36	25.71	28.52
129.3	159.3	23.01	26.45	29.20
169.0	199.0	22.30	26.01	30.20
208.8	238.8	23.45	27.03	29.60
248.5	278.5	21.25	25.25	29.52
288.2	318.2	24.07	29.61	26.31
328.0	358.0	23.85	27.12	26.04
367.7	397.7	24.88	27.20	26.09
407.4	437.4	28.61	24.99	25.00
447.2	477.2	25.62	22.87	24.16
486.9	516.9	23.05	22.12	23.62
526.6	556.6	23.16	22.27	23.47
566.4	596.4	23.94	23.60	25.13
606.1	636.1	25.57	25.04	27.42
645.8	675.8	25.93	24.77	26.79
685.6	715.6	24.57	24.29	26.17
725.3	755.3	20.87	22.91	24.99
765.0	795.0	19.17	21.53	25.10
804.8	834.8	17.87	19.95	23.59
844.5	874.5	17.12	19.07	21.85
884.2	914.2	16.62	18.83	22.08
924.0	954.0	16.54	18.88	22.15
963.7	993.7	16.34	18.21	21.66
1003.4	1033.4	16.81	19.21	23.82
1043.2	1073.2	17.40	20.92	26.28
1082.9	1112.9	17.12	20.98	26.79
1122.6	1152.6	17.92	22.26	28.84
1162.4	1192.4	18.68	23.24	27.34
1202.1	1232.1	19.16	23.23	24.94
1241.8	1271.8	18.72	21.75	23.84
1281.6	1311.6	17.96	20.46	22.00
1321.3	1351.3	17.55	19.50	21.71
1361.0	1391.0	17.14	19.30	22.02
1380.9	1410.9	17.05	19.22	22.35
1420.6	1450.6	17.30	20.43	23.91
1440.5	1470.5	17.67	21.45	26.72
1480.2	1510.2	18.42	22.63	27.75
1500.1	1530.1	19.22	25.03	27.28

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+14dBm (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	0.31	0.12	0.07
49.8	79.8	0.37	0.12	0.07
89.6	119.6	0.18	0.05	0.04
129.3	159.3	0.29	0.08	0.07
169.0	199.0	0.20	0.10	0.08
208.8	238.8	0.34	0.16	0.09
248.5	278.5	0.21	0.14	0.08
288.2	318.2	0.47	0.21	0.10
328.0	358.0	0.50	0.15	0.08
367.7	397.7	0.56	0.15	0.09
407.4	437.4	0.61	0.20	0.12
447.2	477.2	0.52	0.20	0.14
486.9	516.9	0.56	0.19	0.17
526.6	556.6	0.57	0.15	0.14
566.4	596.4	0.58	0.18	0.18
606.1	636.1	0.67	0.26	0.23
645.8	675.8	0.68	0.35	0.29
685.6	715.6	0.72	0.39	0.32
725.3	755.3	0.79	0.45	0.37
765.0	795.0	0.79	0.51	0.41
804.8	834.8	0.84	0.48	0.40
844.5	874.5	0.85	0.56	0.44
884.2	914.2	0.78	0.55	0.46
924.0	954.0	0.72	0.55	0.50
963.7	993.7	0.53	0.54	0.54
1003.4	1033.4	0.57	0.61	0.64
1043.2	1073.2	0.64	0.71	0.71
1082.9	1112.9	0.56	0.69	0.73
1122.6	1152.6	0.55	0.75	0.79
1162.4	1192.4	0.49	0.69	0.75
1202.1	1232.1	0.45	0.65	0.73
1241.8	1271.8	0.44	0.63	0.72
1281.6	1311.6	0.39	0.57	0.68
1321.3	1351.3	0.47	0.62	0.72
1361.0	1391.0	0.53	0.66	0.73
1380.9	1410.9	0.56	0.67	0.73
1420.6	1450.6	0.65	0.71	0.74
1440.5	1470.5	0.72	0.79	0.81
1480.2	1510.2	0.83	0.84	0.86
1500.1	1530.1	0.84	0.85	0.88

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB) @LO (dBm) +17
490.0	10.1	7.14
477.7	22.4	7.08
465.4	34.7	7.05
453.1	47.0	7.13
440.8	59.3	7.18
428.5	71.6	7.01
416.2	83.9	7.07
403.8	96.3	7.04
391.5	108.6	7.02
379.2	120.9	6.99
366.9	133.2	6.82
354.6	145.5	6.78
342.3	157.8	6.85
330.0	170.1	6.89
317.7	182.4	6.83
305.4	194.7	6.74
293.1	207.0	6.65
280.8	219.3	6.61
268.5	231.6	6.69
256.2	243.9	6.63
243.8	256.3	6.59
231.5	268.6	6.64
219.2	280.9	6.62
206.9	293.2	6.65
194.6	305.5	6.67
182.3	317.8	6.62
170.0	330.1	6.65
157.7	342.4	6.70
145.4	354.7	6.70
133.1	367.0	6.76
120.8	379.3	6.75
108.5	391.6	6.72
96.2	403.9	6.77
83.8	416.3	6.77
71.5	428.6	6.78
59.2	440.9	6.84
46.9	453.2	6.83
34.6	465.5	6.90
22.3	477.8	6.95
10.0	490.1	6.97

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB) @LO (dBm) +17
10.0	20.1	6.99
29.8	39.9	6.87
49.6	59.7	7.02
69.3	79.4	7.08
89.1	99.2	7.01
108.9	119.0	7.02
128.7	138.8	7.04
148.4	158.5	7.08
168.2	178.3	7.08
188.0	198.1	7.15
207.8	217.9	7.11
227.6	237.7	7.07
247.3	257.4	7.16
267.1	277.2	7.31
286.9	297.0	7.21
306.7	316.8	7.14
326.4	336.5	7.26
346.2	356.3	7.23
366.0	376.1	7.27
385.8	395.9	7.29
405.6	415.7	7.27
425.3	435.4	7.30
445.1	455.2	7.28
464.9	475.0	7.38
484.7	494.8	7.32
504.4	514.5	7.29
524.2	534.3	7.31
544.0	554.1	7.35
583.6	593.7	7.29
603.3	613.4	7.36
642.9	653.0	7.36
662.7	672.8	7.44
702.2	712.3	7.48
722.0	732.1	7.51
761.6	771.7	7.60
781.3	791.4	7.56
820.9	831.0	7.56
840.7	850.8	7.58
880.2	890.3	7.50
900.0	910.1	7.49

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB) @LO (dBm) +17
900.0	100.1	7.49
880.2	119.9	7.42
860.4	139.7	7.39
840.7	159.4	7.31
820.9	179.2	7.27
801.1	199.0	7.22
781.3	218.8	7.13
761.6	238.5	7.12
741.8	258.3	7.11
722.0	278.1	7.13
702.2	297.9	7.03
682.4	317.7	7.05
662.7	337.4	7.09
642.9	357.2	7.12
623.1	377.0	7.18
603.3	396.8	7.15
583.6	416.5	7.19
563.8	436.3	7.20
544.0	456.1	7.24
524.2	475.9	7.26
504.4	495.7	7.22
484.7	515.4	7.29
464.9	535.2	7.28
445.1	555.0	7.35
425.3	574.8	7.31
405.6	594.5	7.31
385.8	614.3	7.36
366.0	634.1	7.35
326.4	673.7	7.39
306.7	693.4	7.42
267.1	733.0	7.54
247.3	752.8	7.64
207.8	792.3	7.79
188.0	812.1	7.86
148.4	851.7	8.00
128.7	871.4	8.08
89.1	911.0	8.02
69.3	930.8	8.10
29.8	970.3	8.12
10.0	990.1	8.02

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+14	+17	+20	+14	+17	+20
5.0	64.63	66.33	68.05	72.73	72.89	71.08
10.0	62.11	63.63	65.24	71.84	68.70	65.74
49.8	49.30	50.68	51.94	61.86	53.37	49.96
89.6	44.13	45.37	46.65	60.65	51.25	46.58
129.3	40.91	42.33	43.56	58.08	47.67	43.25
169.0	38.83	40.06	41.21	58.54	46.33	41.40
208.8	37.11	38.44	39.68	57.83	44.39	41.02
248.5	35.83	37.11	38.28	55.21	43.73	40.36
288.2	34.72	36.10	37.15	54.32	46.57	41.33
328.0	33.95	35.35	36.34	51.61	48.50	40.86
367.7	33.26	34.61	35.66	49.75	49.98	40.97
407.4	32.71	33.97	34.94	45.04	49.89	40.93
447.2	32.29	33.28	34.10	42.01	46.73	40.41
486.9	31.97	32.79	33.48	38.67	43.23	39.92
526.6	31.77	32.77	33.52	36.78	40.45	38.65
566.4	31.63	32.76	33.47	34.28	36.84	37.44
606.1	31.65	32.88	33.50	32.84	35.21	36.16
645.8	31.57	32.55	32.99	31.35	33.89	34.77
685.6	31.37	32.05	32.37	29.98	33.45	34.05
725.3	30.90	31.54	31.89	28.81	32.95	33.56
765.0	30.27	30.90	31.49	27.64	31.91	34.17
804.8	29.60	30.43	31.18	26.94	31.01	34.22
844.5	29.07	29.98	30.97	26.13	29.77	33.73
884.2	28.88	29.88	31.03	25.59	29.06	32.72
924.0	28.84	30.06	31.49	24.99	28.27	31.41
1003.4	29.59	31.23	32.85	24.23	27.04	29.42
1043.2	30.28	32.06	33.43	23.66	26.15	28.13
1082.9	30.92	32.32	33.09	23.33	25.48	27.24
1122.6	31.56	32.48	32.73	22.82	24.71	26.31
1162.4	31.69	31.91	31.73	22.52	24.32	25.81
1202.1	31.06	30.89	30.62	22.16	24.12	25.63
1241.8	30.36	29.90	29.49	21.96	24.41	26.05
1281.6	29.71	29.08	28.68	21.48	24.36	26.44
1321.3	29.00	28.19	27.81	20.92	24.15	26.71
1361.0	28.25	27.41	26.85	20.51	24.03	27.11
1380.9	27.86	27.08	26.80	20.23	23.75	27.18
1420.6	26.95	26.51	26.32	19.53	23.14	27.06
1440.5	26.43	26.02	25.82	19.32	23.06	27.32
1480.2	25.68	25.59	25.63	19.09	22.96	27.43
1500.1	25.08	25.19	25.31	18.74	22.62	27.23

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	56.55	47.57	49.50
49.8	79.8	38.58	38.61	38.91
89.6	119.6	34.36	34.54	34.57
129.3	159.3	31.81	32.12	32.55
169.0	199.0	30.08	30.67	30.98
208.8	238.8	29.08	29.73	30.07
248.5	278.5	28.39	28.99	29.51
288.2	318.2	28.34	28.89	29.37
328.0	358.0	28.13	29.28	29.81
367.7	397.7	27.83	29.41	30.46
407.4	437.4	27.58	29.45	31.21
447.2	477.2	27.42	29.24	30.84
486.9	516.9	27.77	29.10	29.45
526.6	556.6	27.12	27.94	28.28
566.4	596.4	25.54	26.01	26.64
606.1	636.1	23.51	23.90	24.52
645.8	675.8	21.45	21.57	21.90
685.6	715.6	19.68	19.51	19.53
725.3	755.3	18.19	17.74	17.52
765.0	795.0	16.93	16.39	16.06
804.8	834.8	15.90	15.35	15.03
844.5	874.5	15.07	14.44	14.10
884.2	914.2	14.34	13.65	13.30
924.0	954.0	13.60	13.02	12.68
963.7	993.7	13.04	12.52	12.30
1003.4	1033.4	12.46	12.03	11.79
1043.2	1073.2	11.98	11.72	11.51
1082.9	1112.9	11.71	11.53	11.45
1122.6	1152.6	11.35	11.30	11.33
1162.4	1192.4	11.11	11.13	11.20
1202.1	1232.1	10.91	10.97	11.05
1241.8	1271.8	10.78	10.87	10.88
1281.6	1311.6	10.66	10.78	10.76
1321.3	1351.3	10.48	10.62	10.59
1361.0	1391.0	10.25	10.45	10.42
1380.9	1410.9	10.11	10.34	10.32
1420.6	1450.6	9.87	10.03	9.92
1440.5	1470.5	9.76	9.85	9.77
1480.2	1510.2	9.44	9.43	9.29
1500.1	1530.1	9.26	9.19	9.02

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+14	+17	+20
5.0	35.0	1.40	1.54	1.67
10.0	40.0	1.32	1.49	1.62
49.8	79.8	1.03	1.12	1.22
89.6	119.6	1.04	1.14	1.24
129.3	159.3	1.06	1.15	1.25
169.0	199.0	1.07	1.16	1.26
208.8	238.8	1.09	1.20	1.30
248.5	278.5	1.09	1.17	1.29
288.2	318.2	1.10	1.22	1.33
328.0	358.0	1.10	1.23	1.33
367.7	397.7	1.11	1.24	1.34
407.4	437.4	1.13	1.28	1.38
447.2	477.2	1.12	1.27	1.38
486.9	516.9	1.15	1.28	1.38
526.6	556.6	1.14	1.27	1.36
566.4	596.4	1.16	1.28	1.37
606.1	636.1	1.18	1.32	1.41
645.8	675.8	1.19	1.35	1.45
685.6	715.6	1.24	1.40	1.50
725.3	755.3	1.25	1.41	1.51
765.0	795.0	1.26	1.41	1.51
804.8	834.8	1.26	1.40	1.49
844.5	874.5	1.24	1.36	1.45
884.2	914.2	1.22	1.33	1.41
924.0	954.0	1.21	1.30	1.38
963.7	993.7	1.19	1.27	1.36
1003.4	1033.4	1.24	1.31	1.40
1043.2	1073.2	1.31	1.38	1.47
1082.9	1112.9	1.40	1.46	1.53
1122.6	1152.6	1.54	1.58	1.64
1162.4	1192.4	1.68	1.71	1.75
1202.1	1232.1	1.84	1.86	1.89
1241.8	1271.8	2.02	2.01	2.03
1281.6	1311.6	2.21	2.19	2.18
1321.3	1351.3	2.42	2.38	2.35
1361.0	1391.0	2.62	2.58	2.53
1380.9	1410.9	2.71	2.66	2.60
1420.6	1450.6	2.88	2.82	2.73
1440.5	1470.5	2.93	2.87	2.78
1480.2	1510.2	3.04	2.97	2.87
1500.1	1530.1	3.08	3.00	2.90

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+14	+17	+20
5.0	1.52	1.95	2.77
10.0	1.31	1.85	2.65
49.7	1.09	1.74	2.66
89.5	1.08	1.62	2.39
129.2	1.10	1.70	2.57
168.9	1.09	1.64	2.43
208.7	1.10	1.65	2.47
248.4	1.12	1.68	2.51
288.2	1.10	1.64	2.43
327.9	1.12	1.70	2.54
367.6	1.10	1.67	2.47
407.4	1.11	1.71	2.53
447.1	1.12	1.73	2.54
486.8	1.12	1.72	2.53
526.6	1.14	1.77	2.60
566.3	1.16	1.77	2.57
606.0	1.18	1.81	2.63
645.8	1.21	1.83	2.63
685.5	1.24	1.85	2.65
725.2	1.27	1.89	2.70
765.0	1.32	1.92	2.71
804.7	1.35	1.97	2.78
844.5	1.38	1.99	2.78
884.2	1.42	2.03	2.81
923.9	1.45	2.04	2.82
963.7	1.49	2.07	2.85
1003.4	1.51	2.08	2.85
1043.1	1.52	2.07	2.83
1082.9	1.57	2.11	2.86
1122.6	1.60	2.11	2.84
1162.3	1.65	2.15	2.88
1202.1	1.73	2.20	2.89
1241.8	1.80	2.25	2.93
1281.6	1.87	2.29	2.96
1321.3	1.92	2.31	2.95
1361.0	1.99	2.37	3.01
1380.9	2.02	2.37	3.00
1420.6	2.07	2.37	2.96
1440.5	2.09	2.39	2.99
1480.2	2.17	2.42	3.00
1500.1	2.20	2.42	2.97

IF (OUT) (MHz)	IF VSWR @LO=1000.1MHz (:1) @LO (dBm)		
	+14	+17	+20
5.0	1.31	1.07	1.07
10.0	1.32	1.08	1.06
29.9	3.09	2.25	1.87
49.7	3.00	2.25	1.80
69.4	3.16	2.39	1.90
89.2	3.12	2.33	1.88
109.0	2.95	2.20	1.79
128.8	3.06	2.30	1.88
148.5	3.08	2.32	1.87
168.3	2.94	2.23	1.81
188.1	2.97	2.25	1.84
207.9	3.03	2.32	1.90
227.7	2.95	2.25	1.86
247.4	2.86	2.20	1.82
267.2	2.91	2.25	1.86
287.0	2.91	2.26	1.88
306.8	2.84	2.21	1.85
326.5	2.82	2.21	1.86
346.3	2.85	2.25	1.90
366.1	2.80	2.22	1.88
385.9	2.76	2.17	1.84
405.7	2.74	2.18	1.87
425.4	2.71	2.18	1.88
445.2	2.61	2.10	1.82
465.0	2.64	2.12	1.83
484.8	2.68	2.16	1.87
504.5	2.62	2.12	1.85
524.3	2.52	2.04	1.79
544.1	2.55	2.07	1.82
583.7	2.51	2.05	1.81
603.4	2.49	2.03	1.79
643.0	2.43	1.99	1.78
662.8	2.40	1.96	1.75
702.3	2.46	2.01	1.78
722.1	2.37	1.94	1.72
761.7	2.37	1.93	1.72
781.4	2.34	1.91	1.70
821.0	2.31	1.87	1.65
840.8	2.26	1.84	1.64
880.3	2.23	1.80	1.59
900.1	2.25	1.82	1.61

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	15	40	6	20	17	34	32	39	33	39
1	-	22	+0	28	14	30	27	36	40	42	35	48
2	96	47	43	47	43	49	41	48	54	60	63	60
3	>100	69	54	70	54	70	51	65	55	78	64	72
4	>100	78	80	81	>92	79	77	73	72	74	83	82
5	>100	>92	88	86	88	87	83	83	80	83	82	>92
6	>100	>92	>92	>92	>92	>92	>92	89	>92	91	90	>92
7	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
8	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
9	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
10	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; -1.00 dBm.
LO IN: 530.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; -8.25 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	25	40	19	38	32	46	48	56	44	57
1	-	22	+0	28	14	32	26	39	47	49	41	51
2	78	44	36	44	35	48	34	44	45	65	55	59
3	>100	54	40	56	41	55	36	50	45	56	52	59
4	>100	54	55	55	54	58	54	57	51	61	74	63
5	>100	76	57	67	52	74	52	64	50	69	54	73
6	>100	81	73	71	77	67	66	66	62	65	57	65
7	>100	82	93	87	74	76	73	78	68	73	64	84
8	>100	94	94	100	86	78	78	74	73	72	70	73
9	>100	>102	101	97	>102	89	80	77	77	79	76	76
10	>100	98	101	>102	98	99	90	82	82	81	79	81
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

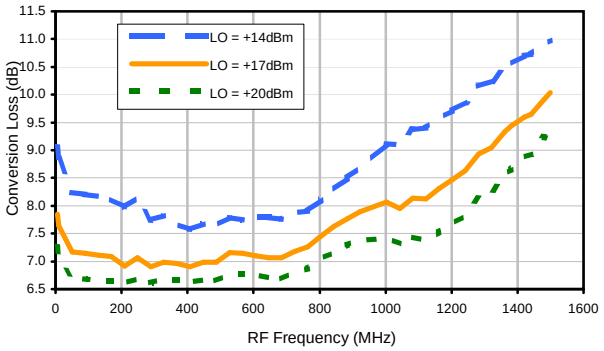
LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; 9.00 dBm.
LO IN: 530.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 1.7 dBm

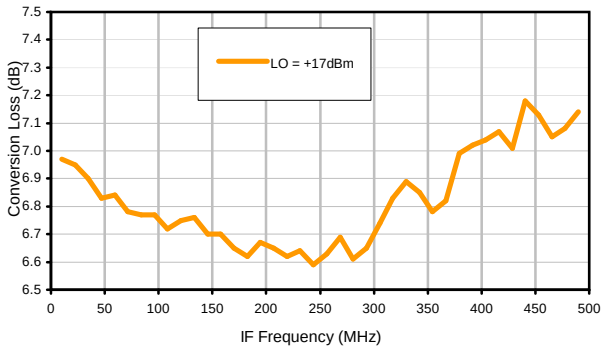
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Typical Performance Curves

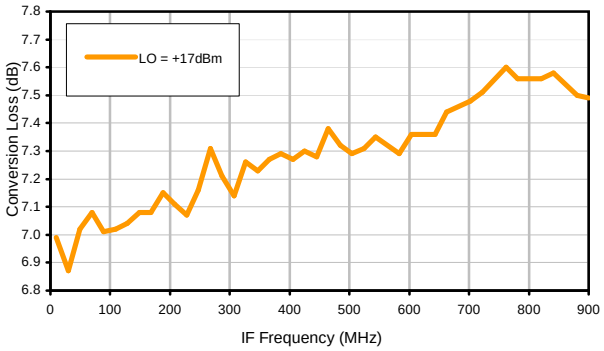
Conversion Loss @ IF=30MHz



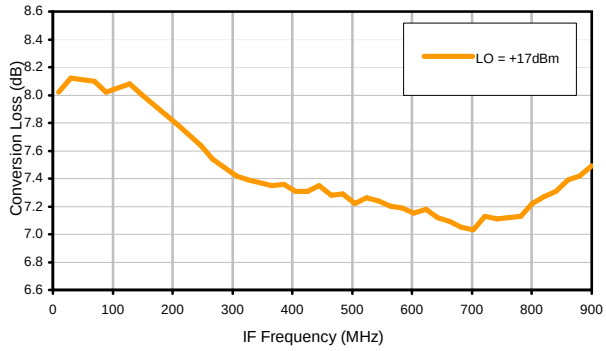
Conversion Loss vs. IF @ RF=500.1MHz



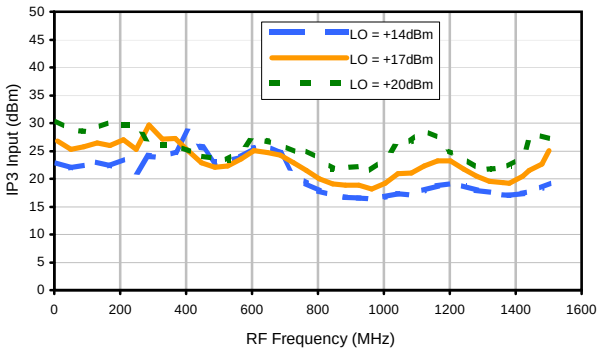
Conversion Loss vs. IF @ RF=10.1MHz



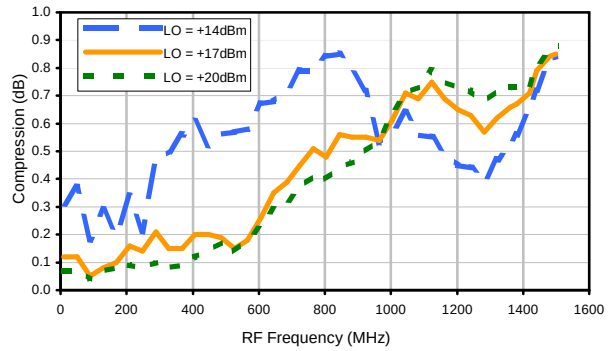
Conversion Loss vs. IF @ RF=1000.1MHz



IP3 Input

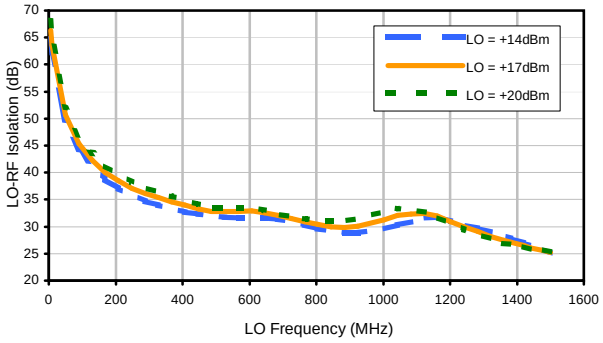


Compression @ RF IN=+14dBm

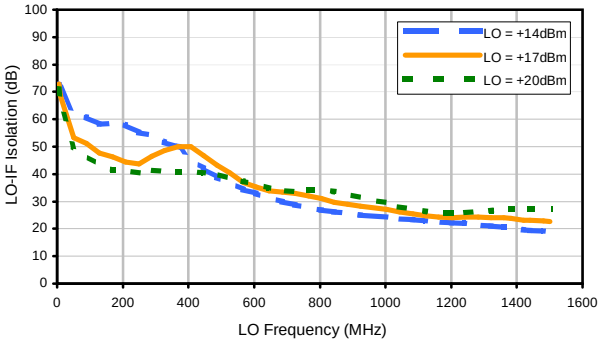


Typical Performance Curves

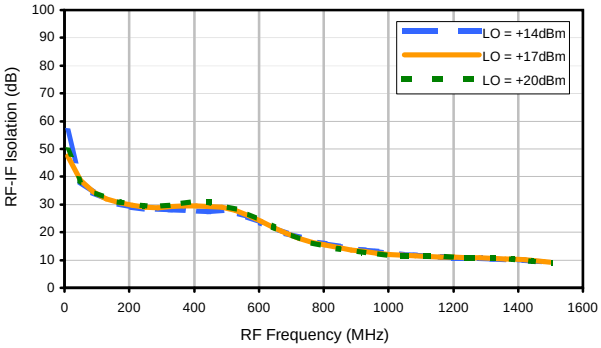
LO-RF Isolation



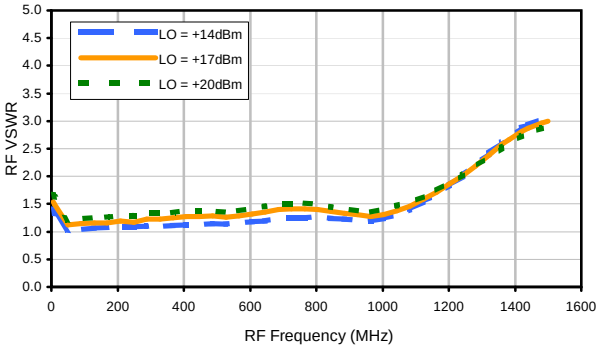
LO-IF Isolation



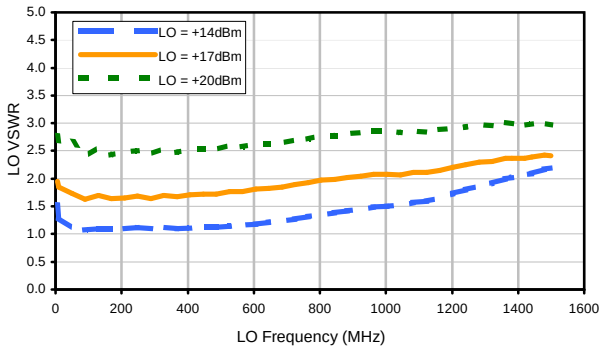
RF-IF Isolation



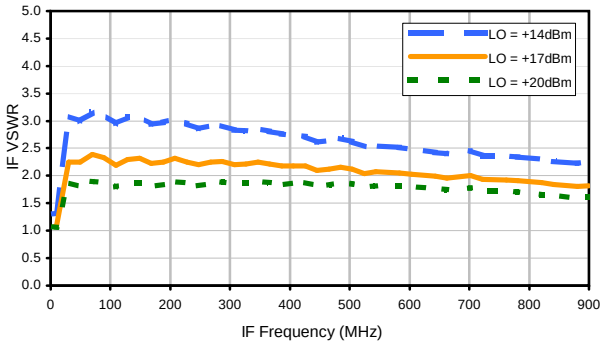
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	15	40	6	20	17	34	32	39	33	39
1	-	22	+0	28	14	30	27	36	40	42	35	48
2	96	47	43	47	43	49	41	48	54	60	63	60
3	>100	69	54	70	54	70	51	65	55	78	64	72
4	>100	78	80	81	>92	79	77	73	72	74	83	82
5	>100	>92	88	86	88	87	83	83	80	83	82	>92
6	>100	>92	>92	>92	>92	>92	>92	89	>92	91	90	>92
7	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
8	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
9	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
10	>100	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92	>92
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 500.1 MHz; -1.00 dBm.
LO IN: 530.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; -8.25 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	25	40	19	38	32	46	48	56	44	57
1	-	22	+0	28	14	32	26	39	47	49	41	51
2	78	44	36	44	35	48	34	44	45	65	55	59
3	>100	54	40	56	41	55	36	50	45	56	52	59
4	>100	54	55	55	54	58	54	57	51	61	74	63
5	>100	76	57	67	52	74	52	64	50	69	54	73
6	>100	81	73	71	77	67	66	66	62	65	57	65
7	>100	82	93	87	74	76	73	78	68	73	64	84
8	>100	94	94	100	86	78	78	74	73	72	70	73
9	>100	>102	101	97	>102	89	80	77	77	79	76	76
10	>100	98	101	>102	98	99	90	82	82	81	79	81
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

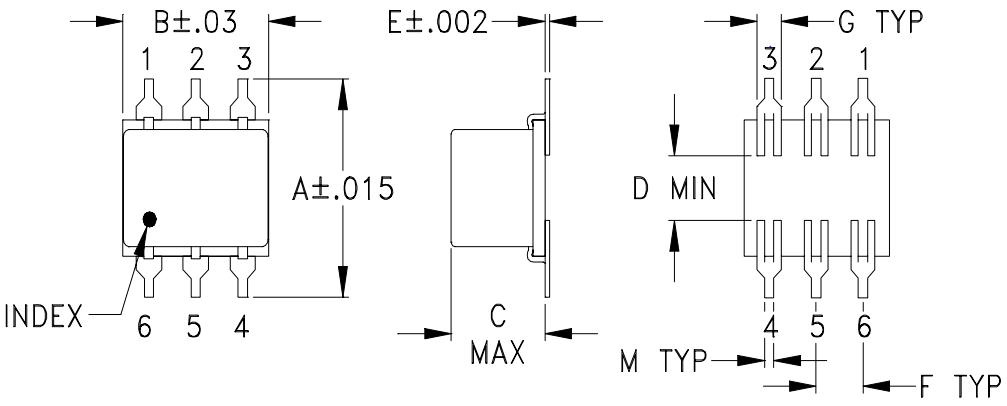
Test conditions:
RF IN: 500.1 MHz; 9.00 dBm.
LO IN: 530.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 1.7 dBm

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.

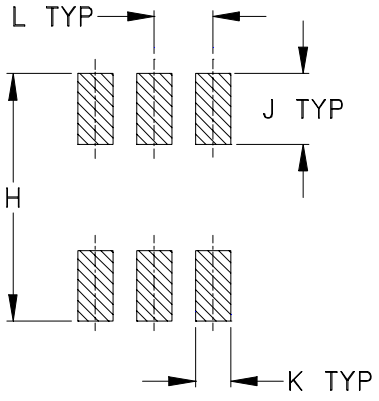
Case Style QQQ

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.

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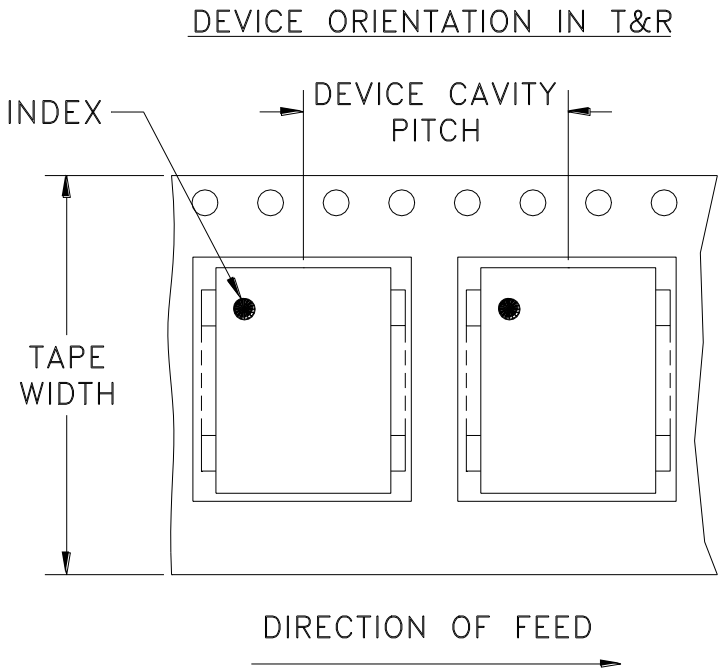
Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F10



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	16	7	10,20,50,100,200
		13	500

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

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

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

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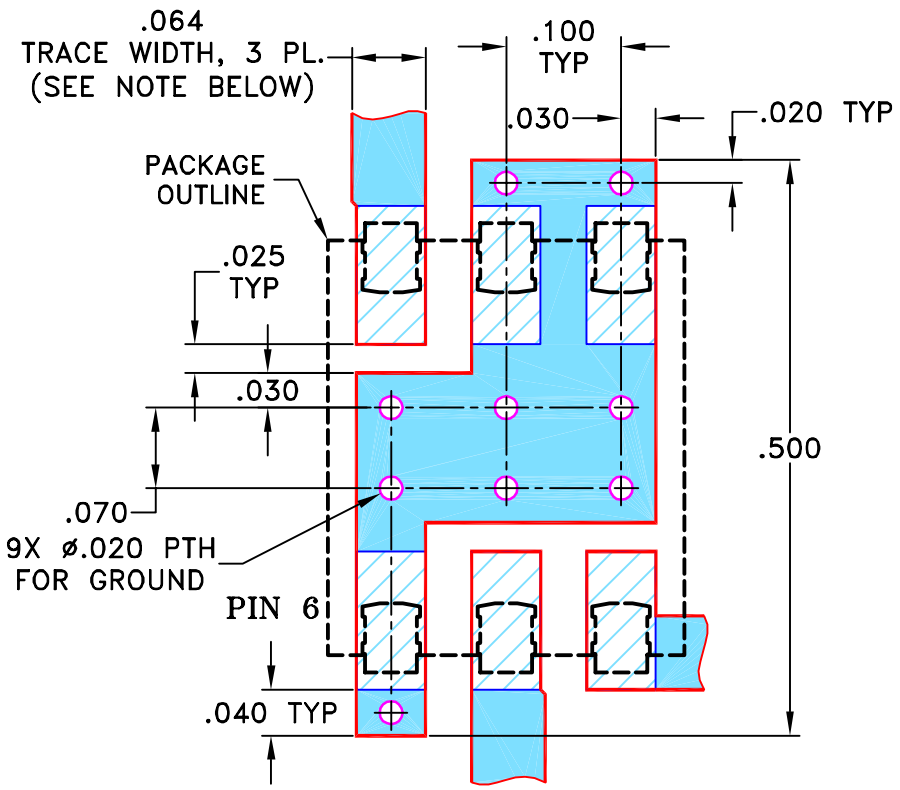
THIRD ANGLE PROJECTION

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:	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

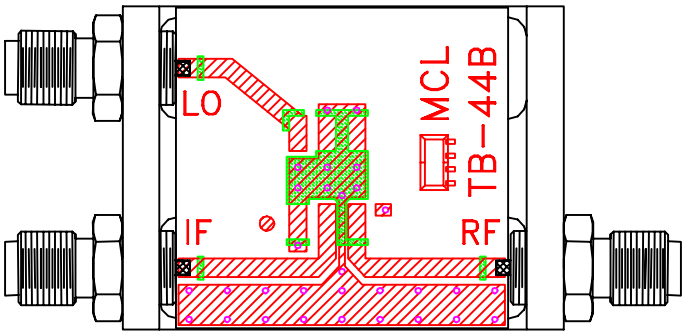
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

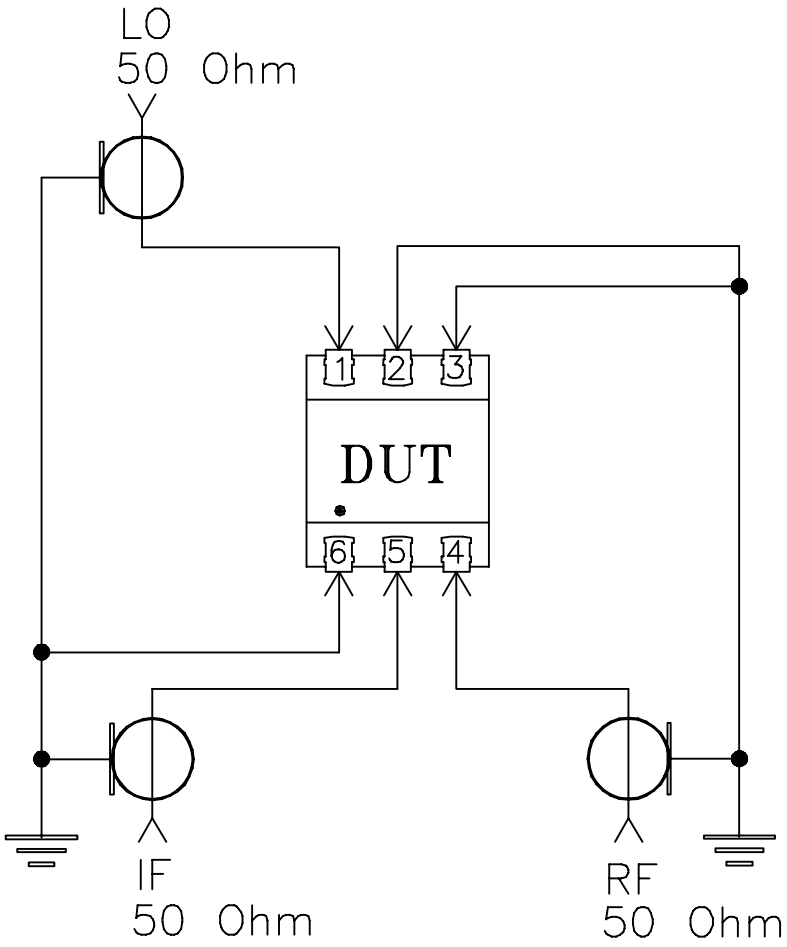
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-083	A

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.

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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