Surface Mount

Frequency Mixer

LRMS-1H

Level 17 (LO Power +17dBm) 2 to 500 MHz

Generic photo used for illustration purposes only

CASE STYLE: QQQ130

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

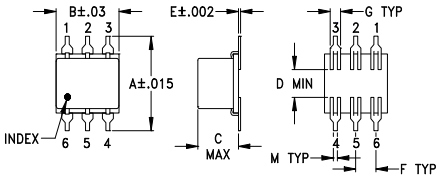
Features

- low conversion loss, 6.25 dB typ.
- excellent L-R isolation, 44 dB typ.

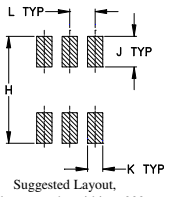
Applications

- HF/VHF/UHF
- instrumentation

Outline Drawing



PCB Land Pattern

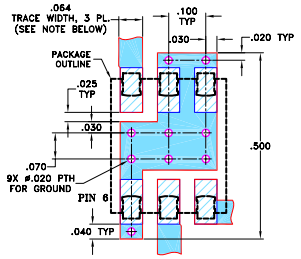


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.400	.31	.200	.10	.010	.100	.050
10.16	7.87	5.08	2.54	0.25	2.54	1.27

H	J	K	L	M	wt
.420	.120	.060	.100	.020	grams
10.67	3.05	1.52	2.54	0.51	0.55

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



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

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.
2-500	DC-500	6.25	.034	7.0	8.5	55	44	44	25	33	20	50	34	45	25	37	22	25

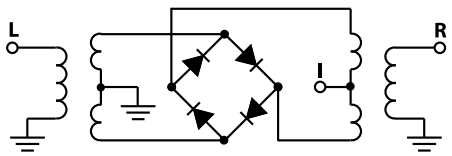
1 dB COMP.: +14 dBm typ.

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 +17dBm	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm
2.00	32.00	6.78	79.29	69.19	1.33	1.77
4.00	34.00	6.60	72.35	63.39	1.20	1.75
5.00	35.00	6.57	71.51	62.98	1.15	1.82
10.00	40.00	6.55	65.84	61.30	1.14	1.82
20.00	50.00	6.48	59.50	58.68	1.13	1.75
35.20	65.20	6.36	51.64	53.67	1.14	1.75
50.00	80.00	6.53	51.61	53.63	1.14	1.76
85.00	55.00	6.47	45.13	48.67	1.15	1.74
100.00	70.00	6.48	44.98	48.52	1.17	1.71
134.80	104.80	6.32	41.19	46.50	1.19	1.69
184.60	154.60	6.35	38.78	44.90	1.22	1.65
200.00	170.00	6.40	38.62	44.42	1.23	1.62
234.40	204.40	6.30	36.44	41.20	1.24	1.63
250.00	220.00	6.22	36.14	41.01	1.26	1.62
284.20	254.20	6.22	35.11	38.57	1.30	1.58
334.00	304.00	6.18	33.38	37.07	1.34	1.54
383.80	353.80	6.11	32.33	33.77	1.39	1.51
433.60	403.60	6.16	32.22	31.10	1.44	1.45
483.40	453.40	6.45	31.29	29.09	1.47	1.41
500.00	470.00	6.45	30.80	28.30	1.49	1.39

Electrical Schematic



Notes

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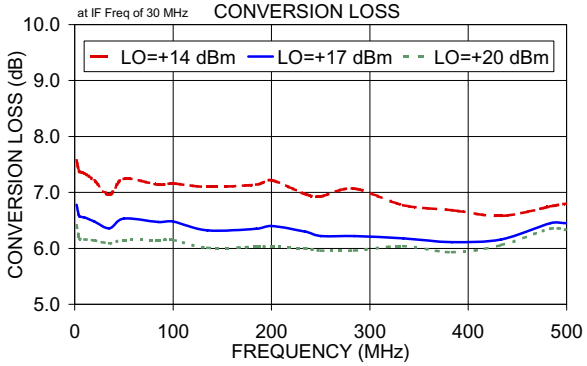
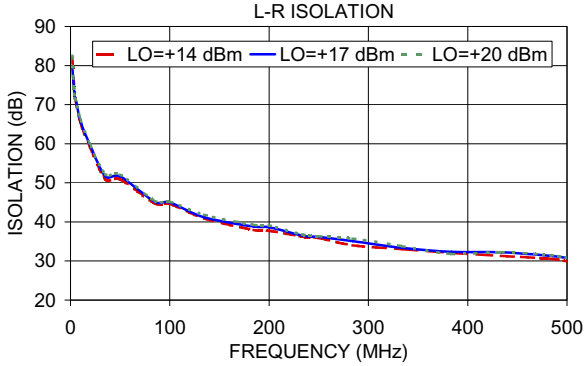
Performance Charts

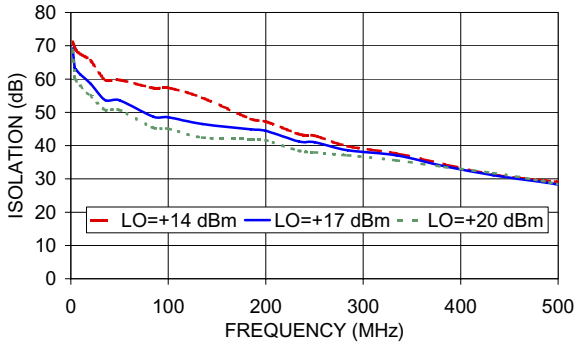
LRMS-1HJ
at IF Freq of 30 MHz CONVERSION LOSS



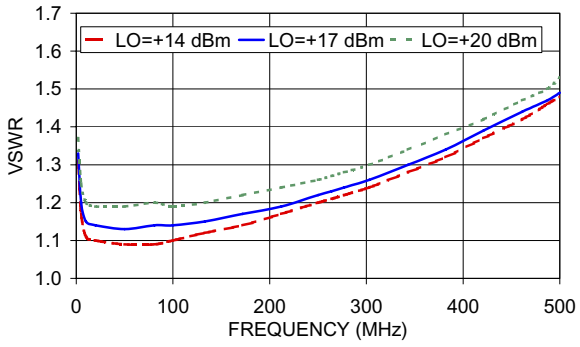
LRMS-1HJ
L-R ISOLATION



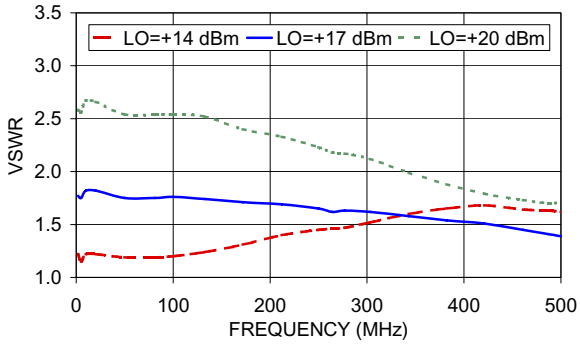
LRMS-1HJ
L-I ISOLATION



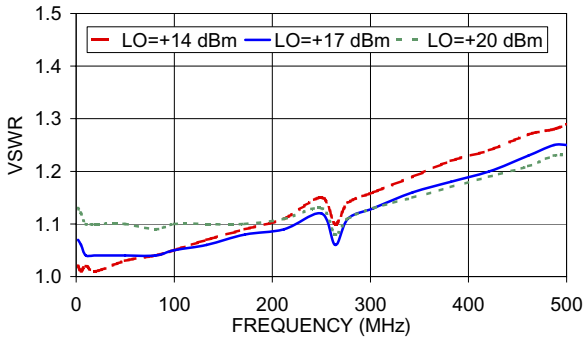
LRMS-1HJ
RF VSWR



LRMS-1HJ
LO VSWR



LRMS-1HJ
IF VSWR



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Frequency Mixer LRMS-1H+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+14	+17	+20
2.0	32.0	7.57	6.78	6.41
5.0	35.0	7.37	6.57	6.17
10.0	40.0	7.34	6.55	6.16
49.8	79.8	6.85	6.30	6.01
89.5	119.5	6.86	6.25	5.98
129.2	159.2	6.76	6.20	5.97
168.9	198.9	6.75	6.20	5.99
208.6	238.6	6.61	6.14	5.97
248.3	278.3	6.76	6.26	6.05
287.9	317.9	6.60	6.20	6.05
327.6	357.6	6.66	6.26	6.11
367.3	397.3	6.63	6.23	6.07
446.7	476.7	6.85	6.45	6.20
486.4	516.4	6.82	6.44	6.19
526.1	556.1	6.88	6.51	6.26
565.8	595.8	6.83	6.44	6.23
585.6	615.6	6.87	6.46	6.24
625.3	655.3	6.87	6.48	6.29
645.2	675.2	6.95	6.56	6.34
684.9	714.9	7.05	6.64	6.44
744.4	774.4	7.43	6.96	6.66
764.3	794.3	7.54	7.03	6.71
803.9	833.9	7.86	7.32	6.88
823.8	853.8	8.03	7.44	6.97
863.5	893.5	8.42	7.74	7.21
883.3	913.3	8.55	7.88	7.29
923.0	953.0	9.03	8.24	7.58
942.9	972.9	9.19	8.31	7.62
982.6	1012.6	9.49	8.39	7.64
1002.4	1032.4	9.63	8.46	7.69
1042.1	1072.1	9.79	8.51	7.75
1061.9	1091.9	9.93	8.63	7.85
1101.6	1131.6	10.12	8.83	8.04
1121.5	1151.5	10.22	8.93	8.11
1181.0	1211.0	10.36	9.26	8.51
1220.7	1250.7	10.54	9.59	8.91
1240.6	1270.6	10.58	9.70	9.05
1280.3	1310.3	10.90	10.19	9.63
1300.1	1330.1	11.03	10.35	9.85

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+14	+17	+20
10.1	40.1	26.27	29.17	33.94
49.8	79.8	25.90	28.15	32.43
89.5	119.5	25.53	28.19	28.59
129.2	159.2	27.42	28.63	33.48
168.9	198.9	26.79	27.37	34.62
208.6	238.6	28.95	30.44	29.13
248.3	278.3	24.27	30.03	26.53
287.9	317.9	26.48	29.77	27.63
327.6	357.6	29.58	27.50	26.55
367.3	397.3	29.37	25.02	24.49
407.0	437.0	24.87	22.68	22.92
446.7	476.7	24.92	22.70	22.95
486.4	516.4	25.89	24.36	25.96
526.1	556.1	27.08	25.40	26.28
565.8	595.8	28.45	26.38	26.86
585.6	615.6	25.20	24.68	25.57
625.3	655.3	21.39	22.60	24.13
645.2	675.2	21.11	21.64	22.92
684.9	714.9	18.44	19.80	22.05
704.7	734.7	17.14	18.51	20.72
764.3	794.3	15.05	16.32	19.15
803.9	833.9	14.40	15.39	18.51
823.8	853.8	14.53	15.20	17.92
863.5	893.5	14.26	14.91	16.76
883.3	913.3	14.51	15.06	16.60
923.0	953.0	15.07	16.35	18.12
942.9	972.9	15.67	17.68	20.05
982.6	1012.6	16.97	20.40	24.05
1002.4	1032.4	17.57	21.37	24.41
1042.1	1072.1	17.99	21.33	23.43
1061.9	1091.9	18.01	20.99	22.67
1101.6	1131.6	17.84	19.68	20.74
1121.5	1151.5	17.58	19.18	20.24
1161.2	1191.2	17.91	18.81	20.25
1181.0	1211.0	17.66	18.80	20.55
1220.7	1250.7	18.49	19.55	21.48
1240.6	1270.6	18.99	20.04	22.35
1280.3	1310.3	20.27	22.10	24.51
1300.1	1330.1	21.24	22.92	25.88

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+14dBm (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	1.05	0.63	0.42
49.8	79.8	0.88	0.51	0.32
89.5	119.5	0.79	0.46	0.29
129.2	159.2	0.82	0.50	0.29
168.9	198.9	0.78	0.46	0.26
208.6	238.6	0.90	0.48	0.26
248.3	278.3	0.86	0.47	0.29
287.9	317.9	0.98	0.44	0.26
327.6	357.6	0.95	0.44	0.27
367.3	397.3	0.98	0.48	0.32
407.0	437.0	0.86	0.44	0.30
446.7	476.7	0.87	0.41	0.30
486.4	516.4	0.97	0.47	0.34
526.1	556.1	1.08	0.56	0.38
565.8	595.8	1.22	0.68	0.47
585.6	615.6	1.17	0.66	0.47
625.3	655.3	1.37	0.79	0.50
645.2	675.2	1.32	0.80	0.51
684.9	714.9	1.36	0.85	0.54
704.7	734.7	1.47	0.99	0.63
764.3	794.3	1.41	1.07	0.77
803.9	833.9	1.37	1.02	0.76
823.8	853.8	1.36	1.02	0.82
863.5	893.5	1.15	0.88	0.73
883.3	913.3	1.15	0.88	0.74
923.0	953.0	0.84	0.68	0.62
942.9	972.9	0.71	0.66	0.63
982.6	1012.6	0.59	0.68	0.72
1002.4	1032.4	0.53	0.70	0.75
1042.1	1072.1	0.52	0.80	0.83
1061.9	1091.9	0.43	0.75	0.84
1101.6	1131.6	0.44	0.77	0.85
1121.5	1151.5	0.47	0.77	0.86
1161.2	1191.2	0.59	0.76	0.88
1181.0	1211.0	0.61	0.76	0.87
1220.7	1250.7	0.71	0.80	0.89
1240.6	1270.6	0.76	0.77	0.89
1280.3	1310.3	0.75	0.68	0.78
1300.1	1330.1	0.82	0.65	0.72

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=250.1MHz (dB) @LO (dBm) +17
240.0	10.1	6.30
234.1	16.0	6.32
228.2	21.9	6.20
222.3	27.8	6.25
216.4	33.7	6.23
210.5	39.6	6.19
204.6	45.5	6.26
198.7	51.4	6.19
192.8	57.3	6.17
186.9	63.2	6.22
181.0	69.1	6.17
175.1	75.0	6.29
169.2	80.9	6.20
163.3	86.8	6.18
157.4	92.7	6.26
151.5	98.6	6.14
145.6	104.5	6.19
139.7	110.4	6.20
133.8	116.3	6.11
127.9	122.2	6.12
122.1	128.0	6.05
116.2	133.9	6.04
110.3	139.8	6.14
104.4	145.7	6.08
98.5	151.6	6.11
92.6	157.5	6.08
86.7	163.4	6.04
80.8	169.3	6.10
74.9	175.2	6.09
69.0	181.1	6.09
63.1	187.0	6.08
57.2	192.9	6.04
51.3	198.8	6.06
45.4	204.7	6.10
39.5	210.6	6.12
33.6	216.5	6.15
27.7	222.4	6.12
21.8	228.3	6.16
15.9	234.2	6.20
10.0	240.1	6.22

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB) @LO (dBm) +17
10.0	20.1	6.02
22.3	32.4	5.97
34.6	44.7	5.96
46.9	57.0	5.94
59.2	69.3	5.89
71.5	81.6	5.94
83.8	93.9	6.02
96.2	106.3	5.94
108.5	118.6	5.92
120.8	130.9	5.88
133.1	143.2	5.85
145.4	155.5	5.97
157.7	167.8	6.00
170.0	180.1	5.95
182.3	192.4	5.96
194.6	204.7	5.99
206.9	217.0	6.00
219.2	229.3	6.03
231.5	241.6	5.98
243.8	253.9	5.98
256.2	266.3	6.07
268.5	278.6	6.11
280.8	290.9	6.08
293.1	303.2	6.10
305.4	315.5	6.05
317.7	327.8	6.10
330.0	340.1	6.17
342.3	352.4	6.12
354.6	364.7	6.15
366.9	377.0	6.18
379.2	389.3	6.17
391.5	401.6	6.22
403.8	413.9	6.14
416.2	426.3	6.10
428.5	438.6	6.18
440.8	450.9	6.20
453.1	463.2	6.25
465.4	475.5	6.27
477.7	487.8	6.17
490.0	500.1	6.22

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB) @LO (dBm) +17
490.0	10.1	6.45
477.7	22.4	6.40
465.4	34.7	6.36
453.1	47.0	6.41
440.8	59.3	6.44
428.5	71.6	6.33
416.2	83.9	6.32
403.8	96.3	6.26
391.5	108.6	6.22
379.2	120.9	6.23
366.9	133.2	6.10
354.6	145.5	6.05
342.3	157.8	6.08
330.0	170.1	6.08
317.7	182.4	6.03
305.4	194.7	6.00
293.1	207.0	5.95
280.8	219.3	5.93
268.5	231.6	6.00
256.2	243.9	5.99
243.8	256.3	6.02
231.5	268.6	6.06
219.2	280.9	6.02
206.9	293.2	6.04
194.6	305.5	6.04
182.3	317.8	5.99
170.0	330.1	6.02
157.7	342.4	6.05
145.4	354.7	6.06
133.1	367.0	6.14
120.8	379.3	6.13
108.5	391.6	6.13
96.2	403.9	6.21
83.8	416.3	6.21
71.5	428.6	6.25
59.2	440.9	6.33
46.9	453.2	6.31
34.6	465.5	6.40
22.3	477.8	6.48
10.0	490.1	6.53

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+14	+17	+20	+14	+17	+20
2.0	81.98	79.29	82.48	71.18	69.19	68.76
5.0	71.15	71.51	71.45	68.75	62.98	59.64
10.0	65.40	65.84	66.21	67.50	61.30	57.95
49.8	60.38	60.94	61.46	67.09	66.93	57.90
89.5	54.87	55.52	55.80	58.82	65.15	55.51
129.2	51.17	51.37	52.09	54.48	61.28	52.19
168.9	48.46	48.80	49.64	50.53	58.09	51.23
208.6	46.08	46.99	47.65	47.86	52.67	49.54
248.3	44.39	45.18	45.58	45.86	50.05	48.42
287.9	43.16	44.13	44.31	42.06	45.32	46.27
327.6	41.83	42.64	43.05	39.69	43.01	44.91
367.3	41.00	40.93	41.07	37.59	40.74	42.83
446.7	40.39	40.19	39.98	34.26	37.09	39.84
486.4	39.55	40.22	40.40	33.40	35.40	37.41
526.1	38.11	38.81	39.17	32.67	35.56	36.89
565.8	37.18	37.62	37.67	30.77	34.35	36.79
585.6	36.25	36.75	36.92	30.08	34.02	37.61
625.3	34.93	35.65	35.91	28.64	32.27	37.06
645.2	33.86	34.69	35.27	28.10	31.21	36.07
684.9	32.61	33.32	34.14	27.61	30.35	34.33
744.4	31.71	32.17	33.08	27.12	29.73	32.92
764.3	31.46	31.78	32.48	27.06	29.50	32.76
803.9	31.85	32.25	33.04	27.41	28.88	31.57
823.8	31.77	32.14	32.94	27.60	28.75	30.92
863.5	32.45	33.20	34.15	28.27	28.57	29.38
883.3	32.82	33.93	35.22	28.64	28.79	28.99
923.0	33.45	35.06	36.48	29.17	29.72	29.28
942.9	33.83	35.23	36.04	29.51	30.60	30.07
982.6	34.10	35.28	35.90	29.27	32.29	32.56
1002.4	33.84	34.96	35.59	28.96	32.75	34.36
1042.1	34.09	34.53	34.61	27.44	31.16	35.37
1061.9	34.66	34.93	35.16	26.73	29.92	33.91
1101.6	35.11	34.90	34.90	25.35	27.67	30.90
1121.5	35.13	34.31	33.87	24.77	26.84	29.96
1181.0	34.12	33.58	33.75	23.61	25.21	27.75
1220.7	32.24	32.15	32.56	23.27	24.92	27.58
1240.6	31.47	31.59	32.36	23.04	24.65	27.25
1280.3	29.98	30.57	31.69	23.17	24.98	27.45
1300.1	29.07	29.85	30.91	23.32	25.26	27.84

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	43.46	49.31	40.13
49.8	79.8	32.39	32.52	32.43
89.5	119.5	27.87	28.12	28.16
129.2	159.2	25.26	25.49	25.63
168.9	198.9	23.47	23.73	23.96
208.6	238.6	22.24	22.70	22.98
248.3	278.3	21.63	21.79	21.95
287.9	317.9	21.41	21.88	22.05
327.6	357.6	20.93	21.57	22.10
367.3	397.3	20.74	21.43	22.06
407.0	437.0	21.29	21.82	22.36
446.7	476.7	22.13	22.43	22.55
486.4	516.4	22.76	23.21	23.44
526.1	556.1	21.98	22.59	23.44
565.8	595.8	20.00	20.59	21.57
585.6	615.6	18.89	19.28	20.01
625.3	655.3	17.16	17.19	17.43
645.2	675.2	16.43	16.32	16.37
684.9	714.9	15.29	14.95	14.73
704.7	734.7	14.83	14.52	14.22
744.4	774.4	14.08	13.61	13.30
764.3	794.3	13.65	13.15	12.84
823.8	853.8	12.76	12.36	12.05
863.5	893.5	12.32	12.01	11.74
883.3	913.3	12.07	11.82	11.60
923.0	953.0	11.72	11.52	11.39
942.9	972.9	11.57	11.41	11.27
982.6	1012.6	11.36	11.23	11.15
1002.4	1032.4	11.22	11.11	11.02
1042.1	1072.1	10.93	10.87	10.81
1061.9	1091.9	10.74	10.72	10.74
1101.6	1131.6	10.16	10.18	10.24
1121.5	1151.5	9.88	9.99	10.07
1161.2	1191.2	9.39	9.54	9.70
1181.0	1211.0	9.12	9.29	9.45
1220.7	1250.7	8.71	8.93	9.08
1240.6	1270.6	8.49	8.70	8.83
1280.3	1310.3	8.10	8.24	8.29
1300.1	1330.1	7.90	8.00	8.03

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+14	+17	+20
2.0	32.0	1.22	1.77	2.58
5.0	35.0	1.15	1.75	2.56
10.0	40.0	1.22	1.82	2.67
49.8	79.8	1.25	1.11	1.02
89.5	119.5	1.25	1.10	1.02
129.2	159.2	1.21	1.08	1.03
168.9	198.9	1.21	1.08	1.05
208.6	238.6	1.18	1.07	1.08
248.3	278.3	1.22	1.10	1.08
287.9	317.9	1.18	1.09	1.11
327.6	357.6	1.18	1.10	1.13
367.3	397.3	1.17	1.10	1.14
407.0	437.0	1.16	1.10	1.15
446.7	476.7	1.18	1.12	1.15
486.4	516.4	1.18	1.16	1.20
526.1	556.1	1.20	1.21	1.25
565.8	595.8	1.22	1.25	1.31
585.6	615.6	1.24	1.27	1.34
625.3	655.3	1.24	1.29	1.37
645.2	675.2	1.24	1.29	1.37
684.9	714.9	1.21	1.26	1.33
704.7	734.7	1.21	1.24	1.30
744.4	774.4	1.19	1.18	1.24
764.3	794.3	1.21	1.18	1.22
803.9	833.9	1.25	1.19	1.22
823.8	853.8	1.29	1.23	1.24
863.5	893.5	1.39	1.33	1.32
883.3	913.3	1.46	1.40	1.39
923.0	953.0	1.64	1.58	1.56
942.9	972.9	1.75	1.68	1.65
982.6	1012.6	1.99	1.90	1.86
1002.4	1032.4	2.13	2.02	1.97
1042.1	1072.1	2.40	2.26	2.19
1061.9	1091.9	2.54	2.39	2.31
1101.6	1131.6	2.78	2.61	2.50
1121.5	1151.5	2.88	2.72	2.60
1181.0	1211.0	3.08	2.95	2.83
1220.7	1250.7	3.20	3.09	2.97
1240.6	1270.6	3.21	3.11	2.99
1280.3	1310.3	3.28	3.20	3.09
1300.1	1330.1	3.28	3.19	3.09

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+14	+17	+20
2.0	1.31	1.33	1.37
5.0	1.17	1.20	1.25
10.0	1.11	1.15	1.20
49.8	1.03	1.65	2.46
89.5	1.04	1.55	2.24
129.2	1.01	1.61	2.39
168.9	1.05	1.58	2.30
208.6	1.07	1.59	2.31
248.3	1.08	1.63	2.37
287.9	1.14	1.61	2.31
327.6	1.15	1.66	2.40
367.3	1.22	1.68	2.36
407.0	1.23	1.69	2.39
446.7	1.27	1.74	2.43
486.4	1.32	1.74	2.41
526.1	1.34	1.79	2.47
565.8	1.41	1.81	2.46
585.6	1.42	1.82	2.47
625.3	1.49	1.88	2.53
645.2	1.51	1.89	2.52
684.9	1.56	1.93	2.54
704.7	1.58	1.96	2.59
744.4	1.62	2.01	2.61
764.3	1.63	2.02	2.62
803.9	1.65	2.05	2.67
823.8	1.66	2.07	2.68
863.5	1.68	2.06	2.67
883.3	1.69	2.07	2.68
923.0	1.72	2.09	2.70
942.9	1.73	2.09	2.68
982.6	1.76	2.08	2.67
1002.4	1.78	2.09	2.67
1042.1	1.85	2.12	2.69
1061.9	1.88	2.12	2.69
1101.6	1.95	2.16	2.70
1121.5	1.99	2.17	2.71
1181.0	2.12	2.24	2.74
1220.7	2.23	2.29	2.77
1240.6	2.29	2.33	2.80
1280.3	2.42	2.40	2.84
1300.1	2.49	2.43	2.84

IF (OUT) (MHz)	IF VSWR @LO=500.5MHz (:1) @LO (dBm)		
	+14	+17	+20
2.0	1.02	1.07	1.13
5.0	1.01	1.06	1.12
10.0	1.02	1.04	1.10
22.3	1.98	1.74	1.50
34.5	1.88	1.64	1.41
46.8	1.86	1.63	1.42
59.0	1.85	1.62	1.40
71.3	1.83	1.58	1.38
83.5	1.88	1.63	1.42
95.8	1.92	1.67	1.46
108.0	1.98	1.73	1.50
120.3	1.91	1.68	1.45
132.5	1.91	1.68	1.45
144.8	1.87	1.64	1.42
157.0	1.88	1.64	1.42
169.3	1.89	1.65	1.43
181.5	1.94	1.70	1.48
193.8	2.00	1.75	1.52
206.0	1.97	1.73	1.51
218.3	1.98	1.73	1.51
230.5	1.94	1.69	1.48
242.8	1.92	1.68	1.46
255.0	1.91	1.68	1.47
267.3	1.93	1.70	1.49
279.5	1.99	1.75	1.53
291.8	2.01	1.76	1.54
316.3	2.04	1.79	1.56
328.5	1.98	1.74	1.52
340.8	1.97	1.74	1.52
353.0	1.98	1.74	1.53
365.3	2.01	1.77	1.56
377.5	2.03	1.78	1.57
389.8	2.04	1.80	1.58
402.0	2.09	1.84	1.62
414.3	2.11	1.86	1.63
426.5	2.10	1.84	1.62
438.8	2.10	1.85	1.63
451.0	2.05	1.81	1.60
463.3	2.07	1.83	1.63
487.8	2.18	1.94	1.72
500.0	2.07	1.87	1.69

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	22	26	15	28	21	33	52	48	36	40
1	-	16	+0	26	14	31	22	37	36	46	34	48
2	88	71	49	64	48	62	48	63	50	63	65	66
3	>100	59	61	65	57	67	50	68	50	63	47	64
4	>100	79	73	79	72	79	77	85	83	88	79	79
5	>100	79	77	82	73	80	70	78	69	79	69	87
6	>100	89	92	>93	91	>93	87	90	88	>93	87	>93
7	>100	>93	>93	>93	92	>93	91	90	88	92	92	>93
8	>100	>93	>93	>93	>93	>93	>93	>93	>93	>93	>93	>93
9	>100	>93	>93	>93	>93	>93	>93	>93	>93	78	>93	>93
10	>100	>93	>93	>93	>93	>93	>93	>93	>93	>93	83	>93
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: **RF IN: 250.1 MHz; -1.00 dBm.**
LO IN: 280.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; -7.28 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	33	37	27	42	36	53	54	63	68	66
1	-	16	+0	27	13	34	22	35	34	53	46	60
2	76	60	47	65	44	56	42	54	44	56	64	67
3	>100	44	44	47	49	50	46	47	58	60	42	56
4	>100	70	62	68	59	65	59	63	57	67	58	70
5	>100	61	63	73	59	66	52	59	48	59	48	61
6	>100	73	70	78	68	79	68	75	70	75	68	76
7	>100	74	72	76	67	71	69	71	62	68	60	68
8	>100	87	78	77	77	82	76	84	76	84	78	89
9	>100	88	80	77	77	79	72	81	69	75	68	73
10	>100	>103	101	87	87	84	90	84	85	90	91	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

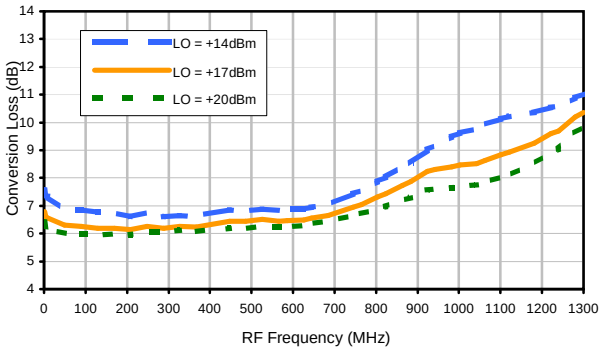
LO HARMONICS ORDER

Test conditions: **RF IN: 250.1 MHz; 9.00 dBm.**
LO IN: 280.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 2.7 dBm

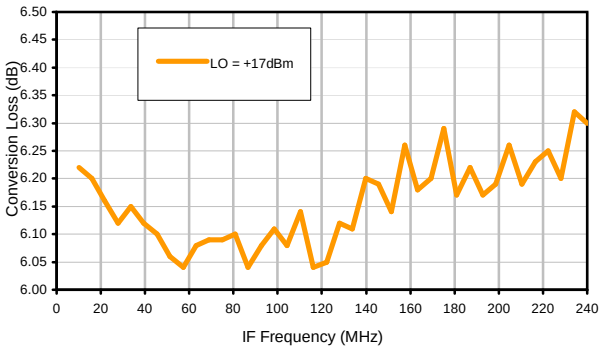
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Typical Performance Curves

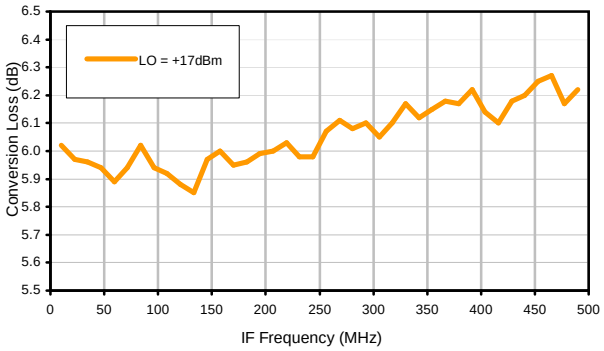
Conversion Loss @ IF=30MHz



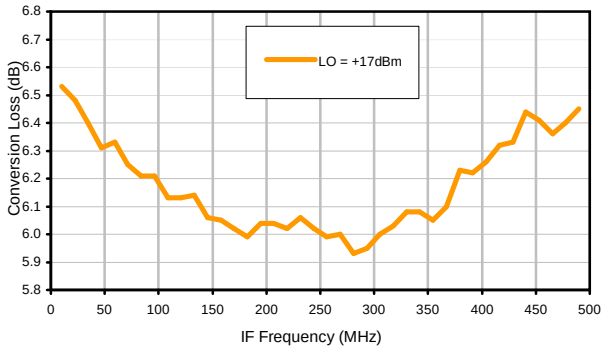
Conversion Loss vs. IF @ RF=250.1MHz



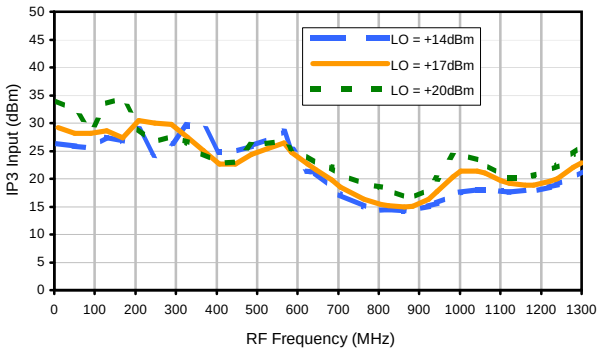
Conversion Loss vs. IF @ RF=10.1MHz



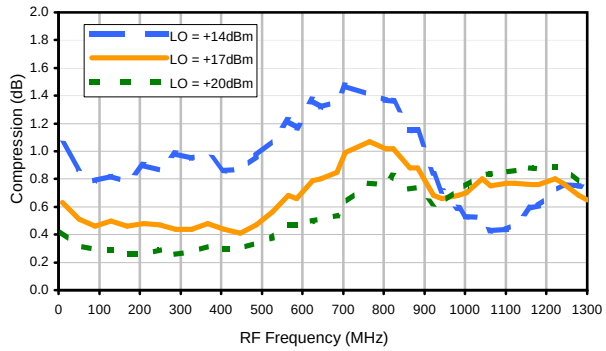
Conversion Loss vs. IF @ RF=500.1MHz



IP3 Input

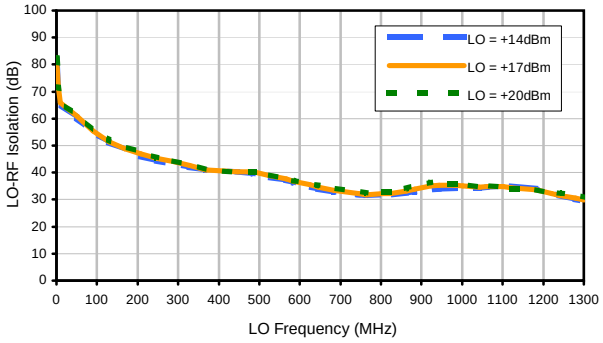


Compression @ RF IN=+14dBm

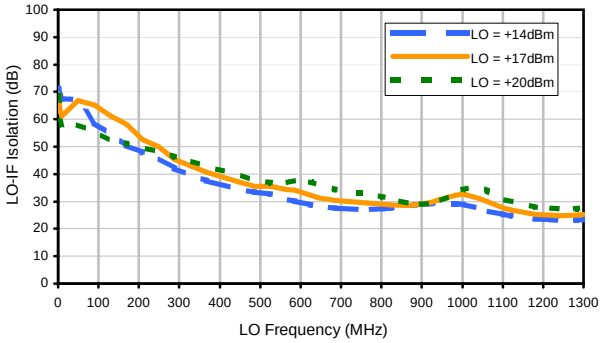


Typical Performance Curves

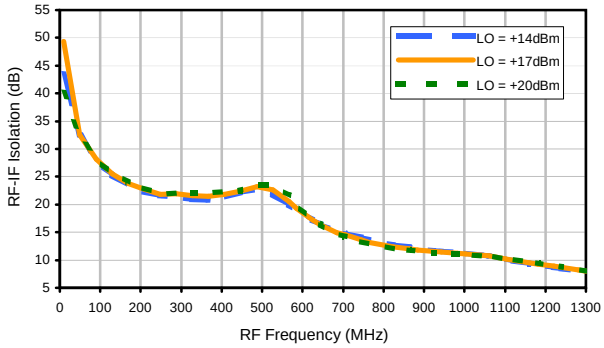
LO-RF Isolation



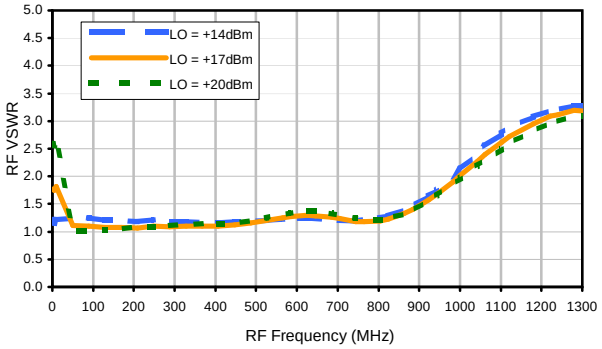
LO-IF Isolation



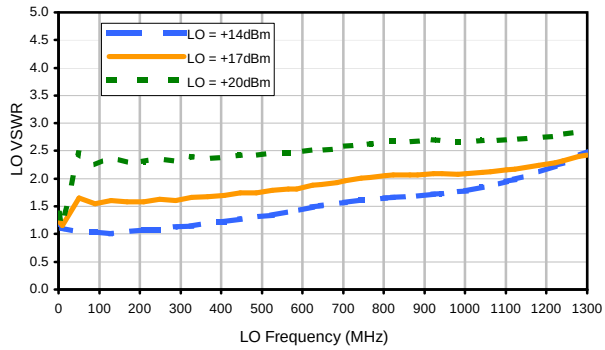
RF-IF Isolation



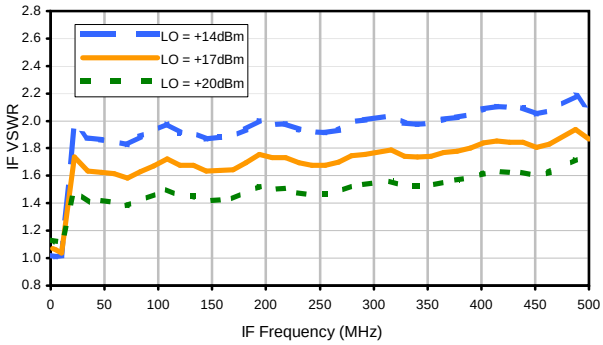
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	22	26	15	28	21	33	52	48	36	40
1	-	16	+0	26	14	31	22	37	36	46	34	48
2	88	71	49	64	48	62	48	63	50	63	65	66
3	>100	59	61	65	57	67	50	68	50	63	47	64
4	>100	79	73	79	72	79	77	85	83	88	79	79
5	>100	79	77	82	73	80	70	78	69	79	69	87
6	>100	89	92	>93	91	>93	87	90	88	>93	87	>93
7	>100	>93	>93	>93	92	>93	91	90	88	92	92	>93
8	>100	>93	>93	>93	>93	>93	>93	>93	>93	>93	>93	>93
9	>100	>93	>93	>93	>93	>93	>93	>93	>93	78	>93	>93
10	>100	>93	>93	>93	>93	>93	>93	>93	>93	>93	83	>93
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 250.1 MHz; -1.00 dBm.
LO IN: 280.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; -7.28 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	33	37	27	42	36	53	54	63	68	66
1	-	16	+0	27	13	34	22	35	34	53	46	60
2	76	60	47	65	44	56	42	54	44	56	64	67
3	>100	44	44	47	49	50	46	47	58	60	42	56
4	>100	70	62	68	59	65	59	63	57	67	58	70
5	>100	61	63	73	59	66	52	59	48	59	48	61
6	>100	73	70	78	68	79	68	75	70	75	68	76
7	>100	74	72	76	67	71	69	71	62	68	60	68
8	>100	87	78	77	77	82	76	84	76	84	78	89
9	>100	88	80	77	77	79	72	81	69	75	68	73
10	>100	>103	101	87	87	84	90	84	85	90	91	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

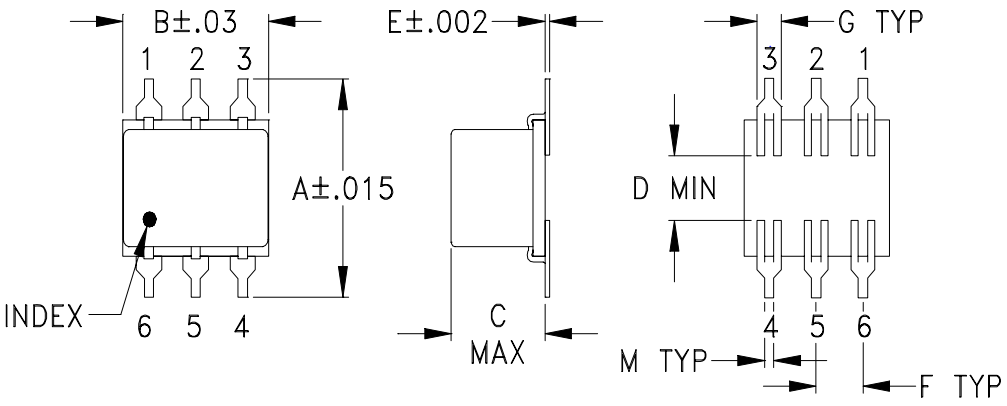
Test conditions:
RF IN: 250.1 MHz; 9.00 dBm.
LO IN: 280.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 2.7 dBm

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.

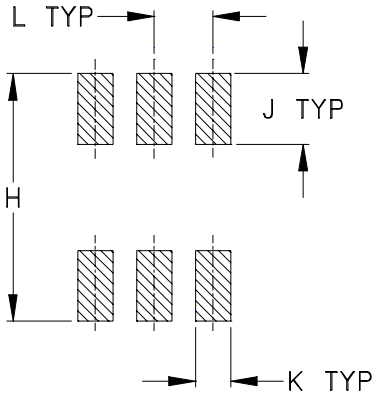
Case Style QQQ

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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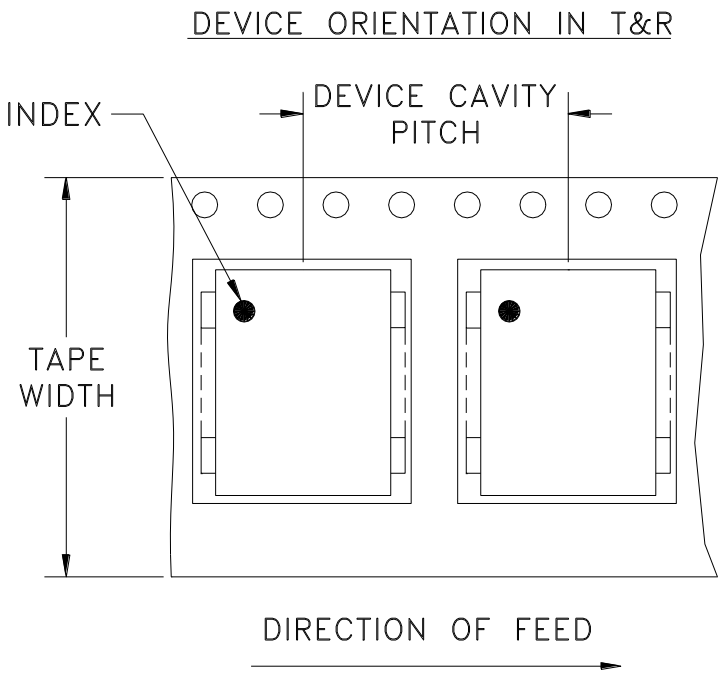
Tape & Reel Packaging TR-F10



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
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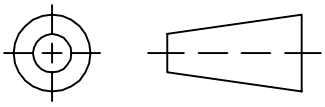
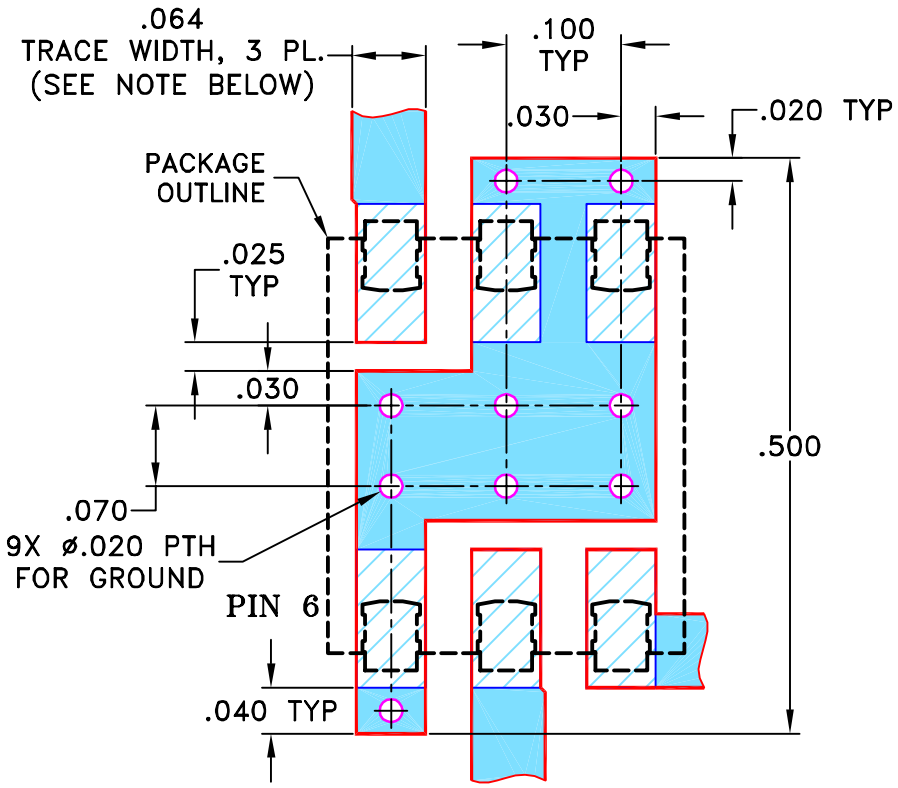
THIRD ANGLE PROJECTION



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

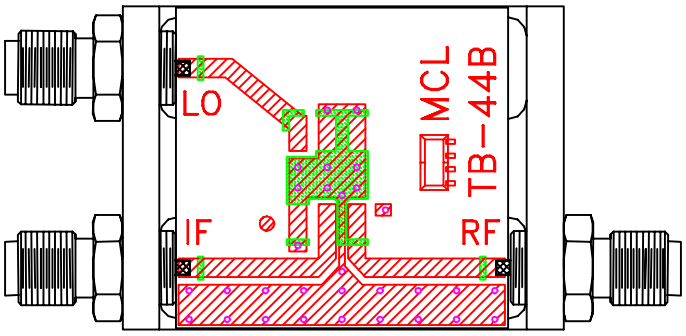
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

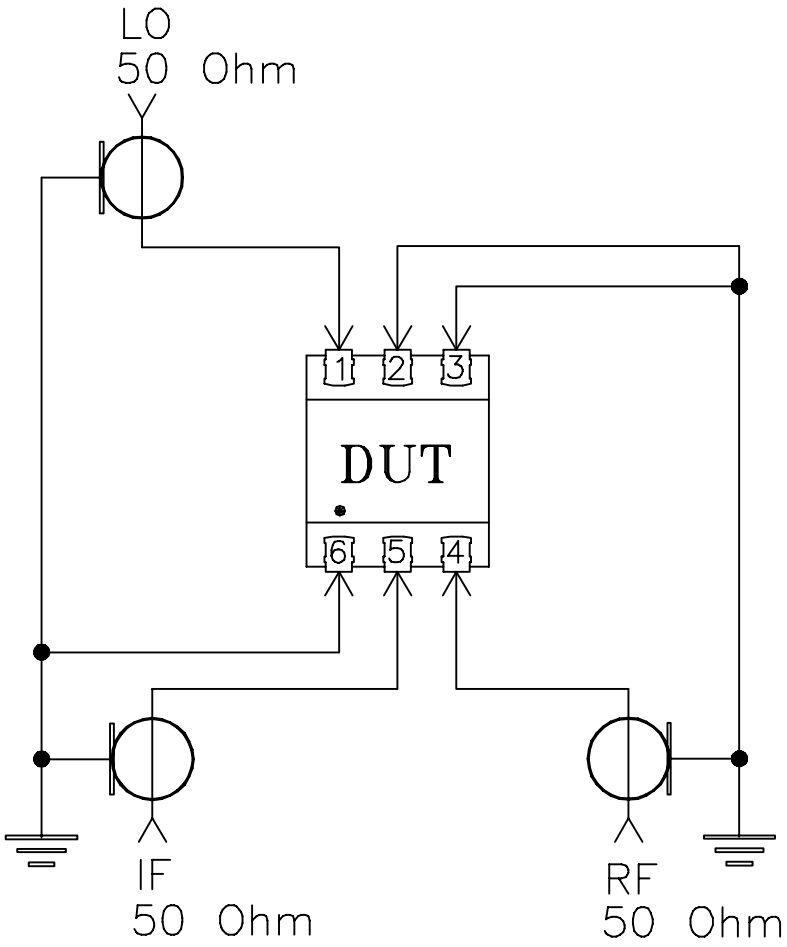
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-083	A

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.

Mini-Circuits®

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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