Surface Mount

Frequency Mixer

LRMS-1MH

Level 13 (LO Power +13dBm) 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

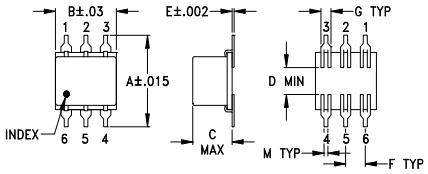
Features

- low conversion loss, 6.11 dB typ.
- excellent L-R isolation, 44 dB typ.

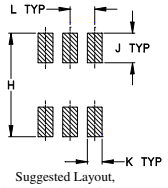
Applications

- VHF/UHF
- instrumentation

Outline Drawing



PCB Land Pattern



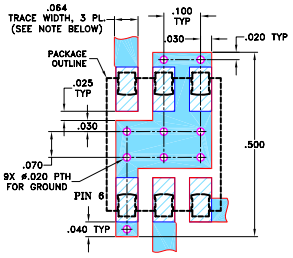
Suggested Layout,
Tolerance to be within ±.002

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.
2-500	DC-500	6.11	.08	7.0	8.0	58	45	44	25	30	20	55	40	36	25	28	17	23

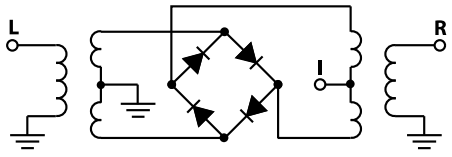
1 dB COMP.: +9 dBm typ.

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)	VSWR RF Port (:1)	Frequency (MHz)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR LO Port (:1)
RF	LO	LO +13dBm	LO +13dBm		LO +13dBm	LO +13dBm	LO +13dBm
2.10	32.10	7.17	1.70	10.50	64.73	57.65	1.83
4.10	34.10	6.62	1.39	14.50	62.18	54.96	1.83
6.10	36.10	6.34	1.27	20.50	59.26	52.09	1.82
10.10	40.10	6.20	1.17	24.50	57.87	50.57	1.82
14.10	44.10	6.16	1.13	30.50	56.09	48.83	1.82
18.10	48.10	6.12	1.10	35.00	54.94	47.64	1.83
20.10	50.10	6.13	1.09	40.10	53.90	46.55	1.83
25.10	55.10	6.11	1.08	50.10	52.15	44.74	1.83
50.10	80.10	6.17	1.05	80.10	48.24	40.84	1.82
100.10	130.10	6.14	1.05	105.10	46.64	38.62	1.81
125.10	155.10	6.11	1.06	155.10	45.00	36.74	1.83
150.10	180.10	6.13	1.07	205.10	43.30	35.62	1.81
175.10	205.10	6.11	1.07	255.10	41.88	34.89	1.87
200.10	230.10	6.20	1.08	305.10	39.81	33.72	1.90
250.10	280.10	6.21	1.09	330.10	39.28	33.35	1.93
300.10	330.10	6.19	1.10	355.10	38.68	32.69	1.91
350.10	380.10	6.28	1.12	405.10	36.85	30.94	1.95
400.10	430.10	6.32	1.12	430.10	35.87	30.29	1.96
425.10	455.10	6.43	1.12	455.10	34.64	29.24	1.93
500.00	470.00	6.45	1.18	470.00	33.91	28.41	1.94

Electrical Schematic



Notes

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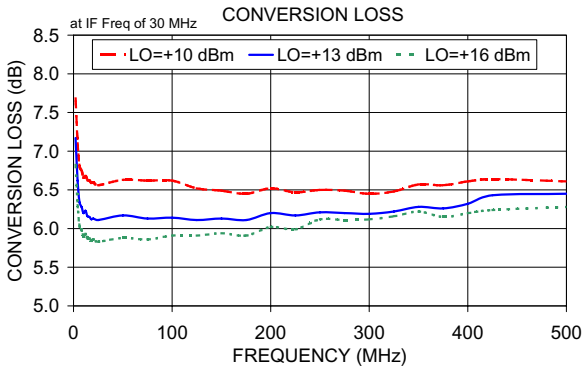
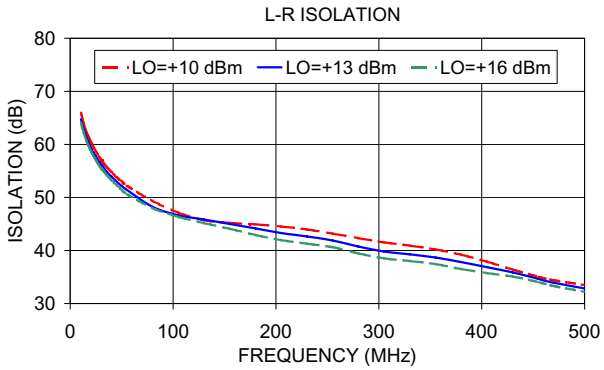
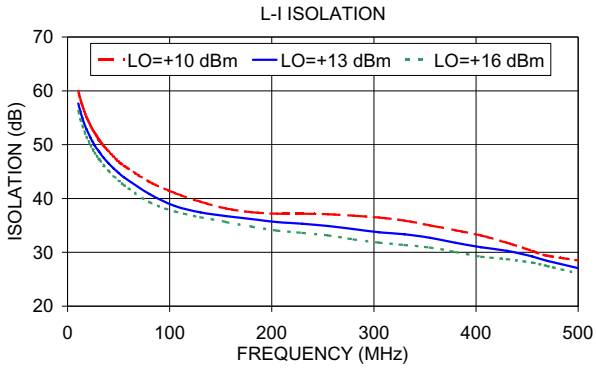
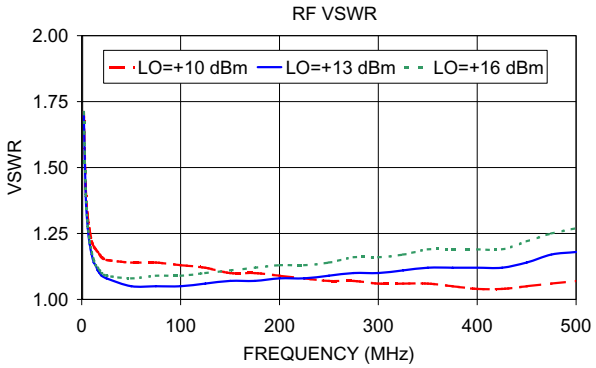
Performance Charts

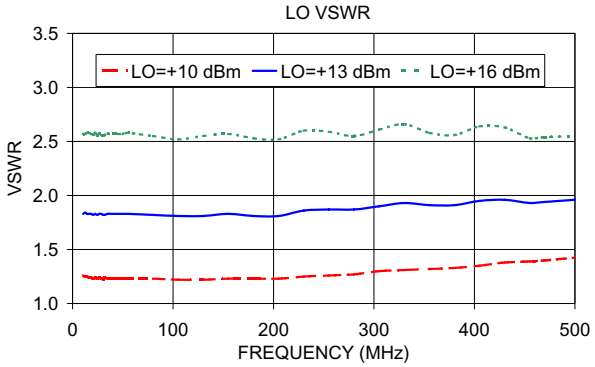
LRMS-1MH

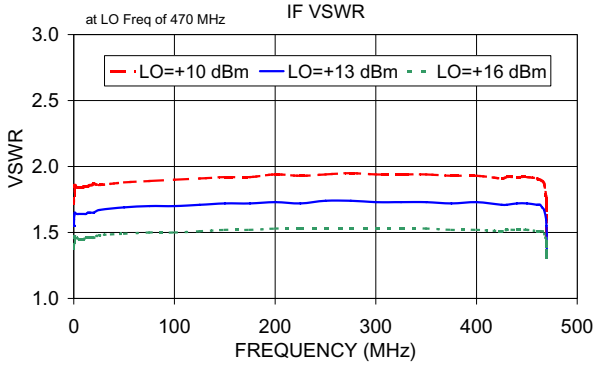












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Frequency Mixer LRMS-1MH

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+10	+13	+16
2.0	32.0	7.33	6.87	6.69
5.0	35.0	6.39	5.99	5.81
10.0	40.0	6.66	6.21	6.01
49.8	79.8	6.48	6.08	5.84
89.5	119.5	6.47	6.04	5.87
129.2	159.2	6.36	6.04	5.91
168.9	198.9	6.37	6.08	5.93
208.6	238.6	6.33	6.07	5.96
248.3	278.3	6.42	6.16	6.02
287.9	317.9	6.43	6.18	6.03
327.6	357.6	6.49	6.22	6.09
367.3	397.3	6.52	6.26	6.10
407.0	437.0	6.53	6.29	6.13
446.7	476.7	6.62	6.34	6.18
486.4	516.4	6.70	6.34	6.14
526.1	556.1	6.75	6.41	6.18
565.8	595.8	6.78	6.47	6.27
585.6	615.6	6.82	6.52	6.35
625.3	655.3	6.95	6.61	6.46
645.2	675.2	7.05	6.67	6.49
684.9	714.9	7.24	6.76	6.52
704.7	734.7	7.40	6.81	6.56
744.4	774.4	7.83	7.00	6.66
764.3	794.3	8.04	7.14	6.68
803.9	833.9	8.37	7.52	6.86
863.5	893.5	8.56	7.73	7.22
883.3	913.3	8.52	7.76	7.39
923.0	953.0	8.62	8.05	7.74
942.9	972.9	8.63	8.12	7.84
982.6	1012.6	8.72	8.27	8.02
1002.4	1032.4	8.71	8.31	8.08
1042.1	1072.1	8.73	8.37	8.14
1061.9	1091.9	8.74	8.38	8.14
1101.6	1131.6	8.75	8.41	8.20
1121.5	1151.5	8.77	8.44	8.26
1181.0	1211.0	9.01	8.78	8.65
1220.7	1250.7	9.35	9.09	8.99
1240.6	1270.6	9.62	9.34	9.21
1280.3	1310.3	10.19	9.87	9.77
1300.1	1330.1	10.48	10.19	10.09

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+10	+13	+16
10.1	40.1	22.50	25.50	28.36
49.8	79.8	23.07	26.62	27.23
89.5	119.5	23.13	27.55	23.68
129.2	159.2	23.35	23.67	21.85
168.9	198.9	28.48	20.58	22.20
208.6	238.6	22.03	20.04	23.39
248.3	278.3	19.98	21.37	27.02
287.9	317.9	18.30	21.28	34.84
327.6	357.6	18.62	22.68	26.05
367.3	397.3	20.02	26.42	24.07
407.0	437.0	20.33	24.64	20.29
446.7	476.7	18.43	24.52	19.15
486.4	516.4	20.26	25.88	22.48
526.1	556.1	23.77	24.68	22.37
565.8	595.8	25.23	19.32	19.06
585.6	615.6	22.69	17.72	18.16
625.3	655.3	19.47	15.78	17.32
645.2	675.2	18.33	15.36	17.08
684.9	714.9	17.09	15.67	17.44
704.7	734.7	16.42	16.00	18.29
744.4	774.4	14.71	17.04	20.54
764.3	794.3	13.70	17.31	23.08
803.9	833.9	12.88	15.70	20.96
823.8	853.8	13.43	16.20	18.90
863.5	893.5	16.24	17.76	17.83
883.3	913.3	20.17	18.10	19.67
923.0	953.0	28.36	18.26	21.03
942.9	972.9	20.82	19.30	22.00
982.6	1012.6	21.59	19.76	21.83
1002.4	1032.4	19.55	20.12	21.79
1042.1	1072.1	18.16	20.30	20.64
1061.9	1091.9	17.75	19.90	20.83
1101.6	1131.6	16.50	18.21	20.60
1121.5	1151.5	15.58	17.64	21.09
1161.2	1191.2	13.67	17.47	23.55
1181.0	1211.0	13.81	18.38	25.04
1220.7	1250.7	15.04	19.95	25.14
1240.6	1270.6	15.45	19.25	24.13
1280.3	1310.3	17.23	18.10	21.41
1300.1	1330.1	17.30	18.89	21.95

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+9dBm (dB) @LO (dBm)		
		+10	+13	+16
10.1	40.1	0.93	0.60	0.37
49.8	79.8	0.90	0.50	0.35
89.5	119.5	0.73	0.49	0.28
129.2	159.2	0.84	0.48	0.28
168.9	198.9	0.79	0.43	0.27
208.6	238.6	0.82	0.47	0.31
248.3	278.3	0.79	0.46	0.32
287.9	317.9	0.78	0.46	0.36
327.6	357.6	0.81	0.49	0.38
367.3	397.3	0.80	0.50	0.44
407.0	437.0	0.84	0.51	0.46
446.7	476.7	0.89	0.62	0.50
486.4	516.4	0.89	0.70	0.59
526.1	556.1	1.01	0.77	0.68
565.8	595.8	1.19	0.83	0.75
585.6	615.6	1.24	0.84	0.76
625.3	655.3	1.45	0.98	0.87
645.2	675.2	1.52	1.02	0.88
684.9	714.9	1.66	1.20	1.03
704.7	734.7	1.74	1.36	1.12
744.4	774.4	1.54	1.43	1.23
764.3	794.3	1.46	1.45	1.31
803.9	833.9	1.28	1.32	1.40
823.8	853.8	1.29	1.35	1.42
863.5	893.5	1.27	1.30	1.28
883.3	913.3	1.34	1.35	1.25
923.0	953.0	1.33	1.15	1.10
942.9	972.9	1.35	1.11	1.06
982.6	1012.6	1.36	1.04	0.98
1002.4	1032.4	1.42	1.05	1.00
1042.1	1072.1	1.43	0.97	0.98
1061.9	1091.9	1.47	1.03	1.01
1101.6	1131.6	1.58	1.03	1.03
1121.5	1151.5	1.59	1.03	1.02
1161.2	1191.2	1.71	1.00	0.91
1181.0	1211.0	1.76	0.97	0.84
1220.7	1250.7	1.81	0.90	0.72
1240.6	1270.6	1.92	0.93	0.72
1280.3	1310.3	2.19	0.93	0.66
1300.1	1330.1	2.36	0.99	0.71

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=250.1MHz (dB) @LO (dBm) +13
240.0	10.1	6.26
234.1	16.0	6.24
228.2	21.9	6.21
222.3	27.8	6.21
216.4	33.7	6.20
210.5	39.6	6.18
204.6	45.5	6.19
198.7	51.4	6.17
192.8	57.3	6.15
186.9	63.2	6.13
181.0	69.1	6.14
175.1	75.0	6.18
169.2	80.9	6.13
163.3	86.8	6.13
157.4	92.7	6.12
151.5	98.6	6.07
145.6	104.5	6.06
139.7	110.4	6.05
133.8	116.3	6.02
127.9	122.2	5.98
122.1	128.0	5.96
116.2	133.9	6.00
110.3	139.8	6.02
104.4	145.7	6.02
98.5	151.6	6.03
92.6	157.5	6.02
86.7	163.4	6.02
80.8	169.3	6.03
74.9	175.2	6.04
69.0	181.1	6.03
63.1	187.0	6.02
57.2	192.9	6.01
51.3	198.8	6.02
45.4	204.7	6.04
39.5	210.6	6.05
33.6	216.5	6.05
27.7	222.4	6.05
21.8	228.3	6.10
15.9	234.2	6.10
10.0	240.1	6.20

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB) @LO (dBm) +13
10.0	20.1	5.90
22.3	32.4	5.82
34.6	44.7	5.80
46.9	57.0	5.82
59.2	69.3	5.81
71.5	81.6	5.84
83.8	93.9	5.85
96.2	106.3	5.83
108.5	118.6	5.83
120.8	130.9	5.82
133.1	143.2	5.81
145.4	155.5	5.88
157.7	167.8	5.90
170.0	180.1	5.91
182.3	192.4	5.92
194.6	204.7	5.91
206.9	217.0	5.92
219.2	229.3	5.94
231.5	241.6	5.95
243.8	253.9	5.99
256.2	266.3	6.04
268.5	278.6	6.04
280.8	290.9	6.05
293.1	303.2	6.06
305.4	315.5	6.08
317.7	327.8	6.13
330.0	340.1	6.14
342.3	352.4	6.14
354.6	364.7	6.17
366.9	377.0	6.22
379.2	389.3	6.25
391.5	401.6	6.26
403.8	413.9	6.23
416.2	426.3	6.25
428.5	438.6	6.28
440.8	450.9	6.30
453.1	463.2	6.28
465.4	475.5	6.23
477.7	487.8	6.21
490.0	500.1	6.23

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB) @LO (dBm) +13
490.0	10.1	6.46
477.7	22.4	6.43
465.4	34.7	6.39
453.1	47.0	6.38
440.8	59.3	6.39
428.5	71.6	6.31
416.2	83.9	6.27
403.8	96.3	6.20
391.5	108.6	6.14
379.2	120.9	6.13
366.9	133.2	6.11
354.6	145.5	6.07
342.3	157.8	6.07
330.0	170.1	6.06
317.7	182.4	6.05
305.4	194.7	6.03
293.1	207.0	6.01
280.8	219.3	6.01
268.5	231.6	6.04
256.2	243.9	6.05
243.8	256.3	6.06
231.5	268.6	6.07
219.2	280.9	6.05
206.9	293.2	6.08
194.6	305.5	6.08
182.3	317.8	6.09
170.0	330.1	6.12
157.7	342.4	6.14
145.4	354.7	6.17
133.1	367.0	6.20
120.8	379.3	6.19
108.5	391.6	6.20
96.2	403.9	6.23
83.8	416.3	6.23
71.5	428.6	6.26
59.2	440.9	6.28
46.9	453.2	6.27
34.6	465.5	6.31
22.3	477.8	6.33
10.0	490.1	6.43

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+10	+13	+16	+10	+13	+16
2.0	76.01	74.51	74.01	68.31	65.71	64.46
5.0	69.66	68.76	68.46	63.66	61.00	59.73
10.0	64.01	63.07	62.89	58.52	55.80	54.50
49.8	52.79	51.28	50.15	45.48	43.68	42.37
89.5	48.36	47.07	46.51	40.95	38.97	38.00
129.2	46.36	45.67	43.99	38.63	36.92	35.88
168.9	46.21	44.61	42.57	37.07	35.85	34.53
208.6	45.25	42.74	40.74	36.63	34.90	33.59
248.3	44.55	41.76	39.90	36.51	34.26	32.78
287.9	42.35	39.97	38.07	35.78	33.63	31.96
327.6	41.01	38.41	36.65	34.60	32.50	30.88
367.3	39.53	37.35	35.66	33.10	31.10	29.70
407.0	37.26	35.72	34.34	31.93	30.35	28.87
446.7	34.49	33.72	32.72	29.43	28.71	27.83
486.4	32.70	31.76	30.79	27.93	27.02	26.32
526.1	31.29	30.07	29.28	27.51	25.76	24.68
565.8	30.65	29.31	28.21	26.91	25.62	24.09
585.6	30.31	28.90	27.75	26.35	25.36	23.93
625.3	29.69	27.85	26.66	24.50	23.97	23.04
645.2	29.48	27.62	26.48	23.69	23.35	22.49
684.9	28.55	26.84	25.63	22.01	22.00	21.21
704.7	28.09	26.37	25.05	21.12	21.14	20.51
744.4	27.16	25.61	24.34	19.69	19.64	19.13
764.3	26.63	25.12	23.81	19.29	19.14	18.65
803.9	25.61	24.26	22.91	18.68	18.09	17.50
863.5	24.72	23.53	22.64	18.18	17.43	16.47
883.3	24.48	23.25	22.34	18.05	17.33	16.23
923.0	24.13	22.98	22.41	17.23	16.66	15.46
942.9	23.92	22.90	22.40	16.97	16.46	15.18
982.6	23.61	22.88	22.59	16.06	15.82	14.54
1002.4	23.42	23.04	23.00	15.59	15.49	14.32
1042.1	23.11	23.00	23.17	14.57	14.60	13.43
1061.9	23.10	23.06	23.27	14.20	14.24	13.22
1101.6	23.04	23.04	23.34	13.07	13.15	12.18
1121.5	23.06	23.19	23.61	12.55	12.73	11.89
1181.0	23.51	23.70	24.10	11.14	11.54	10.94
1220.7	23.83	23.95	23.97	10.33	10.77	10.27
1240.6	24.36	24.27	23.92	10.06	10.45	10.03
1280.3	24.81	24.16	23.12	9.63	9.89	9.44
1300.1	25.03	24.06	22.82	9.52	9.71	9.33

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+10	+13	+16
10.1	40.1	45.50	44.46	44.01
49.8	79.8	31.98	31.67	31.46
89.5	119.5	27.21	27.04	27.07
129.2	159.2	24.60	24.58	24.59
168.9	198.9	23.01	23.03	23.04
208.6	238.6	21.88	21.94	22.02
248.3	278.3	21.26	21.32	21.37
287.9	317.9	20.95	21.06	21.12
327.6	357.6	20.75	20.99	21.15
367.3	397.3	20.77	21.02	21.22
407.0	437.0	21.02	21.24	21.30
446.7	476.7	21.19	21.33	21.58
486.4	516.4	21.23	21.50	21.94
526.1	556.1	20.59	20.52	20.98
565.8	595.8	19.27	19.05	19.29
585.6	615.6	18.23	18.08	18.34
625.3	655.3	16.28	16.33	16.52
645.2	675.2	15.33	15.45	15.60
684.9	714.9	13.83	14.08	14.30
704.7	734.7	13.14	13.38	13.61
744.4	774.4	11.97	12.17	12.44
764.3	794.3	11.57	11.73	12.04
803.9	833.9	10.87	11.00	11.39
823.8	853.8	10.59	10.76	11.32
863.5	893.5	10.08	10.35	11.08
883.3	913.3	9.86	10.20	10.85
923.0	953.0	9.47	9.83	10.41
942.9	972.9	9.27	9.69	10.29
982.6	1012.6	9.01	9.52	10.07
1002.4	1032.4	8.97	9.53	10.08
1042.1	1072.1	9.01	9.63	10.18
1061.9	1091.9	9.03	9.67	10.20
1101.6	1131.6	9.13	9.75	10.37
1121.5	1151.5	9.12	9.76	10.43
1161.2	1191.2	9.01	9.78	10.40
1181.0	1211.0	8.97	9.76	10.26
1220.7	1250.7	8.70	9.34	9.53
1240.6	1270.6	8.38	8.88	8.99
1280.3	1310.3	7.64	7.89	7.91
1300.1	1330.1	7.30	7.43	7.42

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+10	+13	+16
5.0	35.0	1.38	2.10	3.07
10.0	40.0	1.33	2.01	2.91
49.8	79.8	1.11	1.02	1.07
89.5	119.5	1.09	1.02	1.09
129.2	159.2	1.06	1.04	1.10
168.9	198.9	1.05	1.05	1.11
208.6	238.6	1.04	1.06	1.13
248.3	278.3	1.04	1.06	1.12
287.9	317.9	1.03	1.07	1.14
327.6	357.6	1.03	1.09	1.16
367.3	397.3	1.03	1.11	1.18
407.0	437.0	1.04	1.12	1.20
446.7	476.7	1.04	1.15	1.23
486.4	516.4	1.04	1.15	1.25
526.1	556.1	1.06	1.16	1.26
565.8	595.8	1.10	1.19	1.28
585.6	615.6	1.11	1.21	1.30
625.3	655.3	1.13	1.23	1.31
645.2	675.2	1.14	1.24	1.31
684.9	714.9	1.12	1.24	1.30
704.7	734.7	1.12	1.23	1.30
744.4	774.4	1.11	1.21	1.28
764.3	794.3	1.13	1.21	1.29
803.9	833.9	1.19	1.22	1.31
823.8	853.8	1.22	1.25	1.33
863.5	893.5	1.29	1.33	1.39
883.3	913.3	1.33	1.38	1.43
923.0	953.0	1.41	1.46	1.50
942.9	972.9	1.46	1.51	1.55
982.6	1012.6	1.54	1.59	1.64
1002.4	1032.4	1.57	1.62	1.66
1042.1	1072.1	1.64	1.70	1.74
1061.9	1091.9	1.67	1.73	1.78
1101.6	1131.6	1.77	1.83	1.89
1121.5	1151.5	1.81	1.88	1.96
1161.2	1191.2	1.91	2.01	2.10
1181.0	1211.0	1.98	2.09	2.18
1220.7	1250.7	2.10	2.22	2.30
1240.6	1270.6	2.14	2.26	2.33
1280.3	1310.3	2.18	2.29	2.36
1300.1	1330.1	2.17	2.27	2.35

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+10	+13	+16
5.0	1.16	1.13	1.15
10.0	1.12	1.06	1.09
49.8	1.30	1.96	2.79
89.5	1.28	1.88	2.65
129.2	1.29	1.92	2.71
168.9	1.28	1.89	2.65
208.6	1.29	1.92	2.68
248.3	1.32	1.96	2.72
287.9	1.33	1.95	2.69
327.6	1.37	2.01	2.76
367.3	1.40	2.02	2.74
407.0	1.44	2.07	2.79
446.7	1.48	2.11	2.82
486.4	1.53	2.13	2.83
526.1	1.58	2.20	2.89
565.8	1.61	2.22	2.90
585.6	1.64	2.25	2.93
625.3	1.69	2.30	2.96
645.2	1.71	2.31	2.96
684.9	1.77	2.34	2.97
704.7	1.81	2.38	3.00
744.4	1.87	2.42	3.02
764.3	1.89	2.45	3.03
803.9	1.95	2.51	3.09
823.8	1.97	2.53	3.10
863.5	2.00	2.55	3.10
883.3	2.02	2.57	3.12
923.0	2.06	2.61	3.15
942.9	2.08	2.61	3.14
982.6	2.12	2.63	3.13
1002.4	2.15	2.66	3.15
1042.1	2.18	2.66	3.12
1061.9	2.19	2.65	3.10
1101.6	2.21	2.65	3.05
1121.5	2.23	2.65	3.05
1161.2	2.23	2.62	2.98
1181.0	2.24	2.61	2.96
1220.7	2.25	2.60	2.94
1240.6	2.25	2.59	2.91
1280.3	2.25	2.54	2.82
1300.1	2.28	2.53	2.82

IF (OUT) (MHz)	IF VSWR @LO=500.5MHz (:1) @LO (dBm)		
	+10	+13	+16
5.0	1.41	1.24	1.14
10.0	1.42	1.25	1.14
22.3	1.77	1.51	1.29
34.5	1.75	1.50	1.30
46.8	1.87	1.61	1.38
59.0	1.80	1.54	1.32
71.3	1.81	1.54	1.33
83.5	1.79	1.52	1.32
95.8	1.86	1.59	1.37
108.0	1.80	1.53	1.33
120.3	1.87	1.60	1.39
132.5	1.89	1.61	1.39
144.8	1.86	1.58	1.37
157.0	1.83	1.56	1.35
169.3	1.82	1.55	1.34
181.5	1.83	1.56	1.36
193.8	1.88	1.60	1.39
206.0	1.89	1.61	1.40
218.3	1.92	1.63	1.42
230.5	1.92	1.62	1.41
242.8	1.89	1.60	1.39
255.0	1.89	1.60	1.39
267.3	1.88	1.59	1.38
279.5	1.89	1.60	1.39
291.8	1.92	1.62	1.41
304.0	1.89	1.60	1.40
316.3	1.93	1.63	1.42
328.5	1.92	1.62	1.41
340.8	1.93	1.63	1.42
353.0	1.95	1.64	1.43
365.3	1.91	1.62	1.41
377.5	1.92	1.62	1.42
389.8	1.93	1.63	1.42
402.0	1.97	1.66	1.45
414.3	2.01	1.69	1.48
426.5	1.99	1.68	1.46
438.8	1.97	1.66	1.45
451.0	1.96	1.65	1.44
463.3	1.94	1.64	1.43
487.8	1.99	1.69	1.49
500.0	1.88	1.63	1.49

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	17	25	22	31	25	45	35	57	41	62
1	-	15	+0	27	12	32	20	35	33	55	41	53
2	79	48	36	50	36	46	36	44	38	55	47	58
3	>100	44	45	49	53	53	46	48	46	52	51	56
4	>100	64	56	57	54	54	54	50	49	54	50	62
5	>100	57	55	57	57	60	52	57	49	60	50	68
6	>100	70	62	75	62	68	65	64	66	60	59	63
7	>100	83	77	73	74	68	72	68	65	67	63	76
8	>100	73	76	66	65	66	64	80	74	81	85	71
9	>100	85	82	89	78	81	74	72	91	72	78	74
10	>100	89	81	85	82	75	81	71	79	77	83	84
	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; +13.00 dBm
IF OUT: 29.91 MHz; -2.24 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	9	16	9	17	11	29	21	36	28	51
1	-	15	+0	26	13	30	20	34	34	46	34	47
2	99	65	40	49	41	47	39	52	42	57	53	60
3	>100	72	57	70	56	63	53	71	56	70	54	68
4	>100	75	65	72	69	67	71	67	65	72	87	77
5	>100	88	86	87	78	83	74	>88	72	86	74	81
6	>100	>88	>88	>88	>88	87	>88	85	83	85	84	85
7	>100	>88	>88	>88	>88	>88	>88	>88	84	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	85	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	66	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	78	>88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

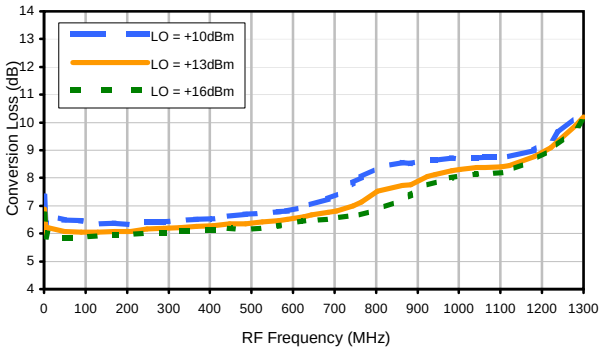
LO HARMONICS ORDER

Test conditions:
RF IN: 250.1 MHz; -6.00 dBm.
LO IN: 280.01 MHz; +13.00 dBm
IF OUT: 29.91 MHz; -12.18 dBm

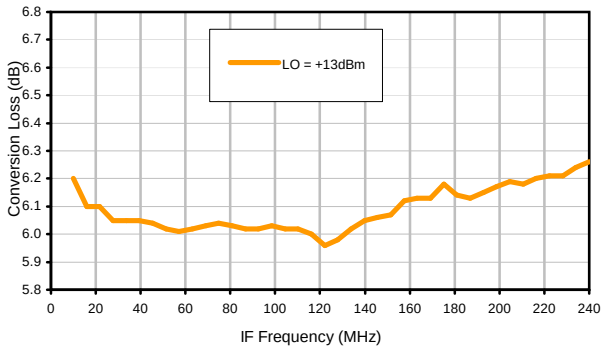
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Typical Performance Curves

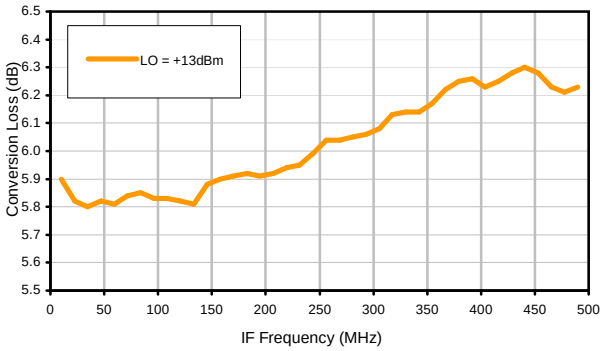
Conversion Loss @ IF=30MHz



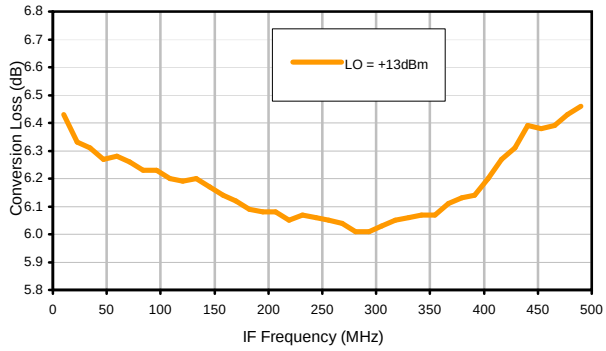
Conversion Loss vs. IF @ RF=250.1MHz



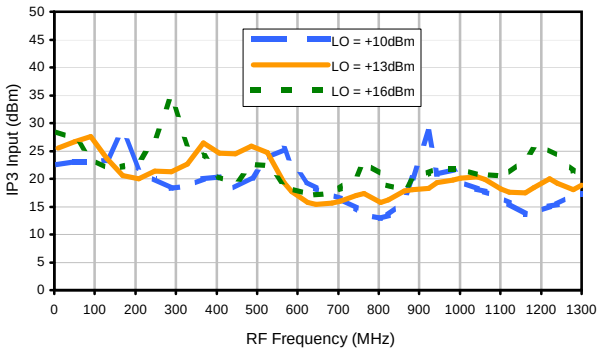
Conversion Loss vs. IF @ RF=10.1MHz



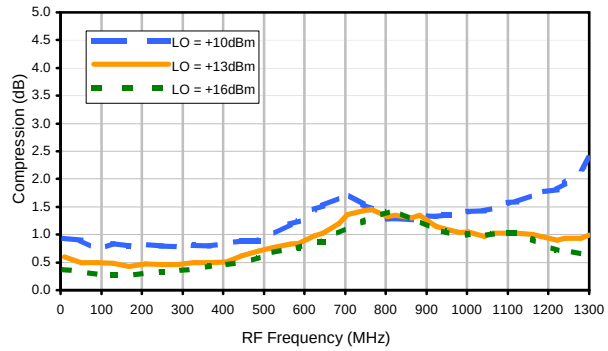
Conversion Loss vs. IF @ RF=500.1MHz



IP3 Input

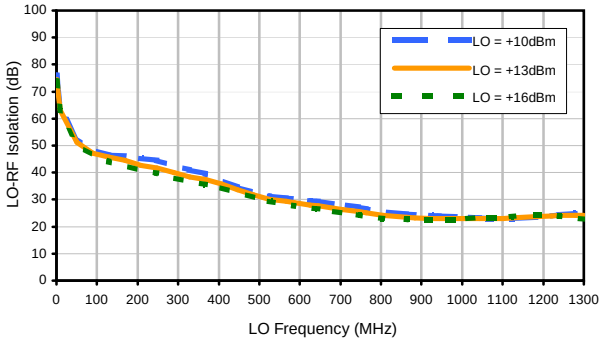


Compression @ RF IN=+9dBm

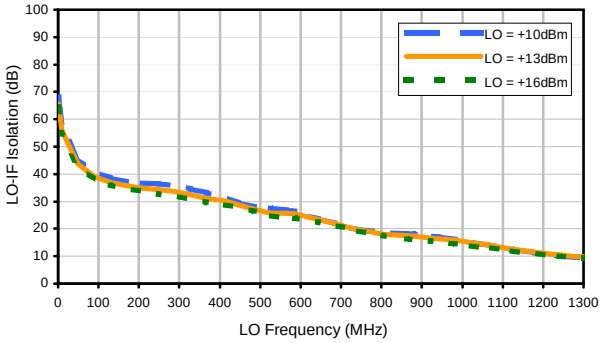


Typical Performance Curves

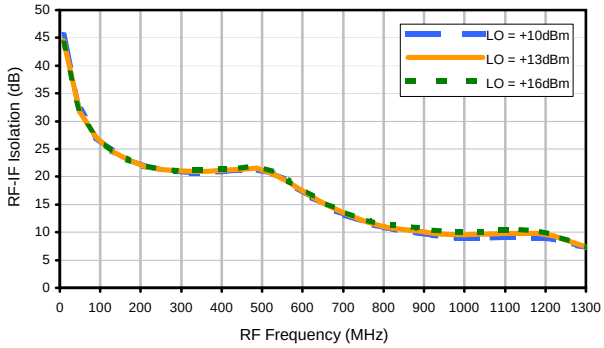
LO-RF Isolation



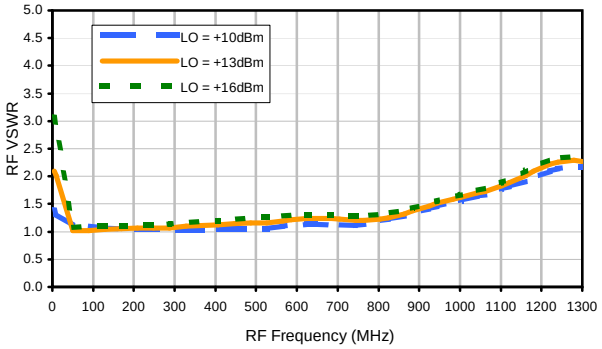
LO-IF Isolation



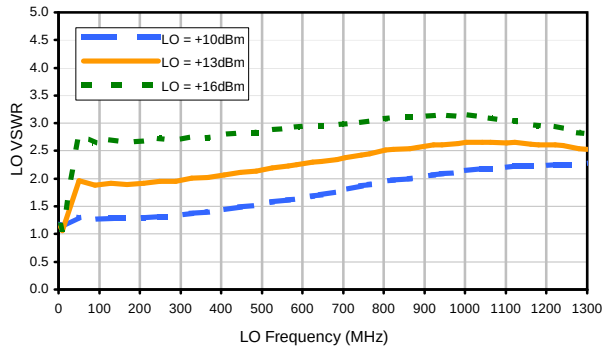
RF-IF Isolation



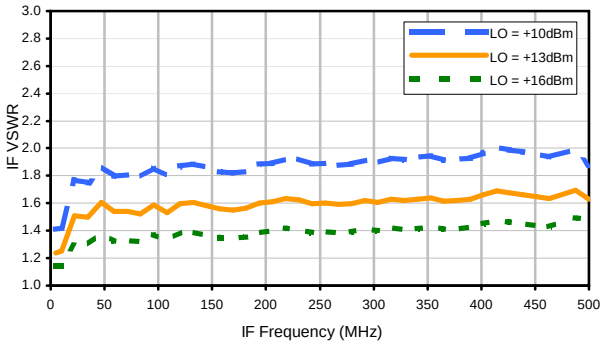
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	17	25	22	31	25	45	35	57	41	62
1	-	15	+0	27	12	32	20	35	33	55	41	53
2	79	48	36	50	36	46	36	44	38	55	47	58
3	>100	44	45	49	53	53	46	48	46	52	51	56
4	>100	64	56	57	54	54	54	50	49	54	50	62
5	>100	57	55	57	57	60	52	57	49	60	50	68
6	>100	70	62	75	62	68	65	64	66	60	59	63
7	>100	83	77	73	74	68	72	68	65	67	63	76
8	>100	73	76	66	65	66	64	80	74	81	85	71
9	>100	85	82	89	78	81	74	72	91	72	78	74
10	>100	89	81	85	82	75	81	71	79	77	83	84
	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; +13.00 dBm
IF OUT: 29.91 MHz; -2.24 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	9	16	9	17	11	29	21	36	28	51
1	-	15	+0	26	13	30	20	34	34	46	34	47
2	99	65	40	49	41	47	39	52	42	57	53	60
3	>100	72	57	70	56	63	53	71	56	70	54	68
4	>100	75	65	72	69	67	71	67	65	72	87	77
5	>100	88	86	87	78	83	74	>88	72	86	74	81
6	>100	>88	>88	>88	>88	87	>88	85	83	85	84	85
7	>100	>88	>88	>88	>88	>88	>88	>88	84	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	85	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	66	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	78	>88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

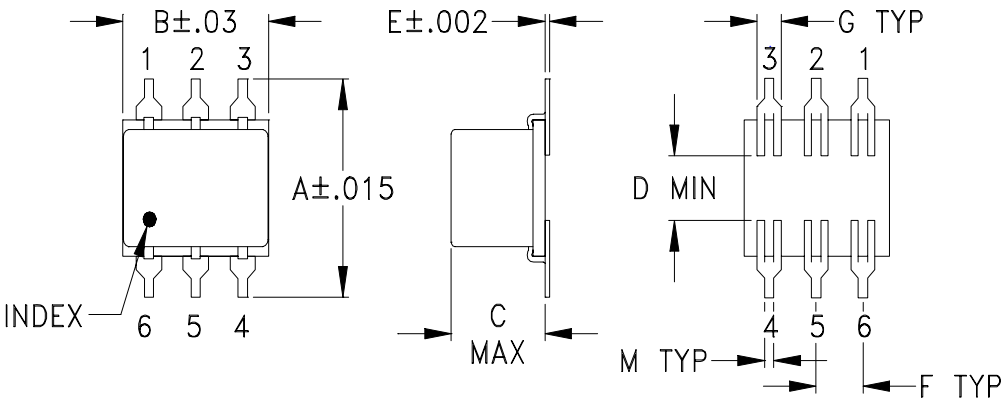
Test conditions:
RF IN: 250.1 MHz; -6.00 dBm.
LO IN: 280.01 MHz; +13.00 dBm
IF OUT: 29.91 MHz; -12.18 dBm

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.

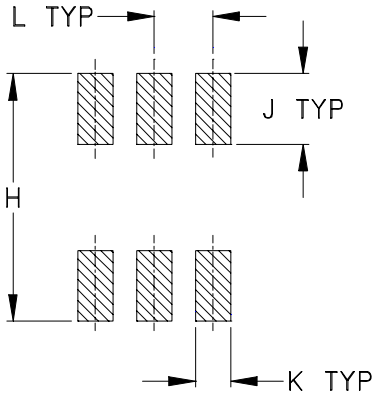
Case Style QQQ

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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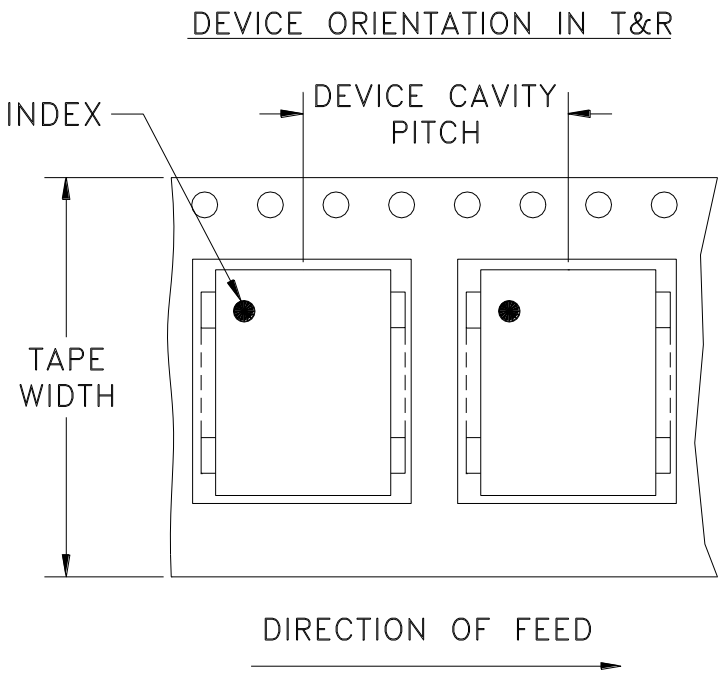
Tape & Reel Packaging TR-F10



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.

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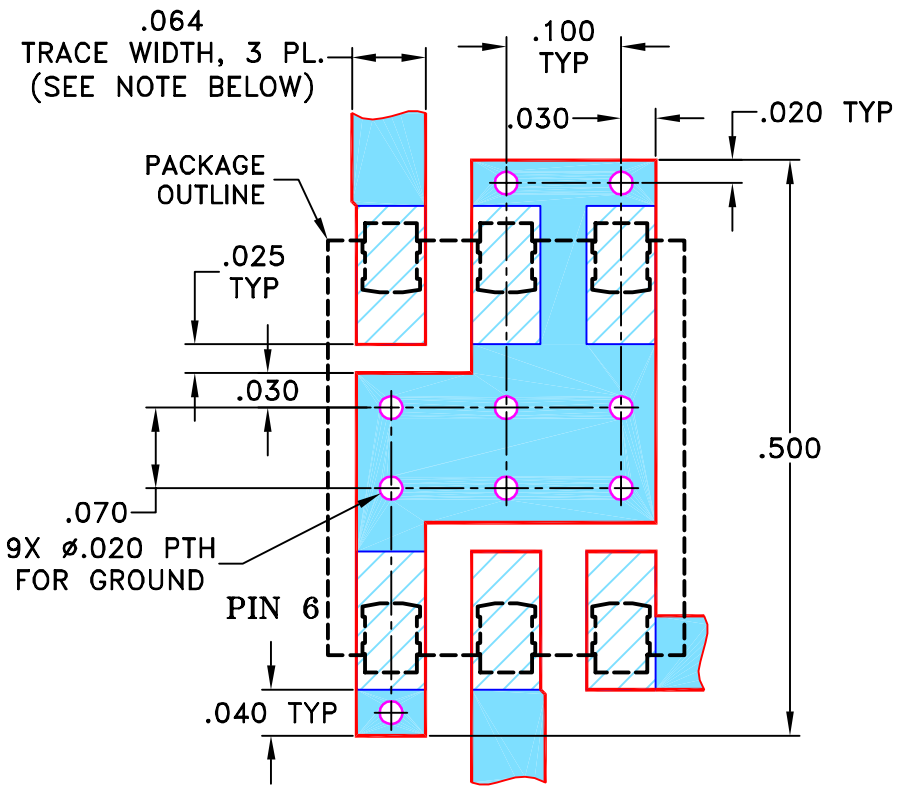
THIRD ANGLE PROJECTION

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

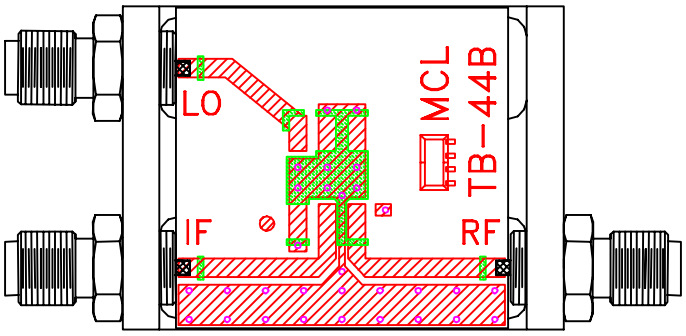
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

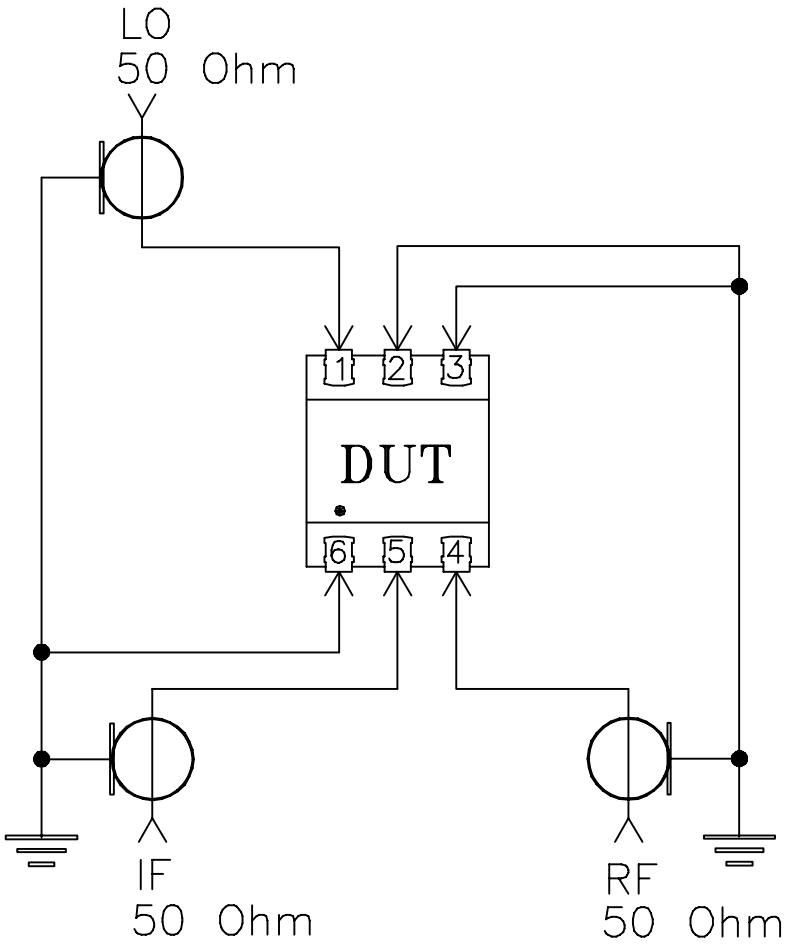
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-083	A

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