

Level 13 (LO Power +13dBm) 2 to 500 MHz

Maximum Ratings

Operating Temperature -40°C to 85°C

Storage Temperature -55°C to 100°C

RF Power 200mW

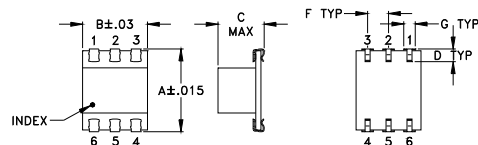
IF Current 40mA

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

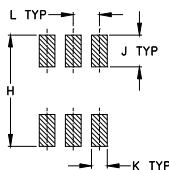
Pin Connections

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

Outline Drawing

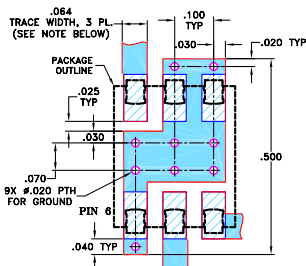


PCB Land Pattern

Suggested Layout,
Tolerance to be within ±0.02

Outline Dimensions (inch/mm)

A	B	C	D	E	F	G
.390	.31	.225	.060	--	.100	.045
9.91	7.87	5.72	1.52	--	2.54	1.14
H	J	K	L	M	wt	
.420	.120	.060	.100	--	grams	
10.67	3.05	1.52	2.54	--	0.50	

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

NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B 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

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

Features

- low conversion loss, 6.13 dB typ.
- excellent L-R isolation, 44 dB typ.
- aqueous washable
- J-leads for strain relief

Applications

- VHF/UHF
- instrumentation



Generic photo used for illustration purposes only

CASE STYLE: QQQ569

Electrical Specifications

FREQUENCY (MHz)	CONVERSION LOSS (dB)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			IP3 at center band (dBm)
		L	M	U	L	M	U	
LO/RF f_L - f_U	Mid-Band m Total Range Max.	Typ. Min.	Typ. Min.	Typ. Min.	Typ. Min.	Typ. Min.	Typ. Min.	Typ.
2-500 DC-500	6.13 .08 7.0 8.0	58 45 44 25 30 20	55 40 36 25 28 17	23				

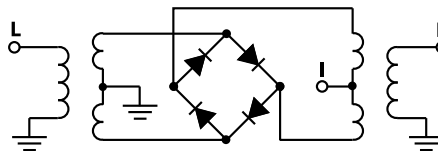
1 dB COMP.: +9 dBm typ.

L = low range [f_L to $10 f_L$] M = mid 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

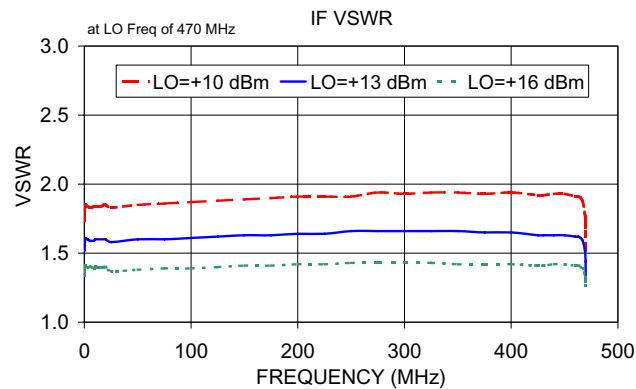
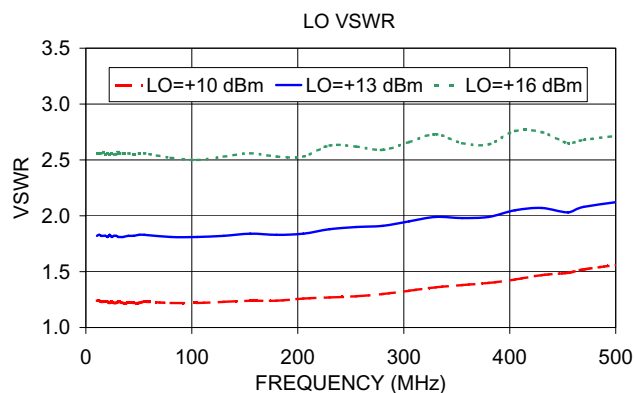
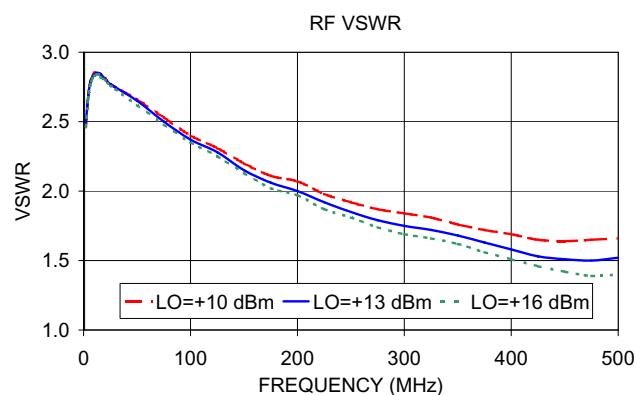
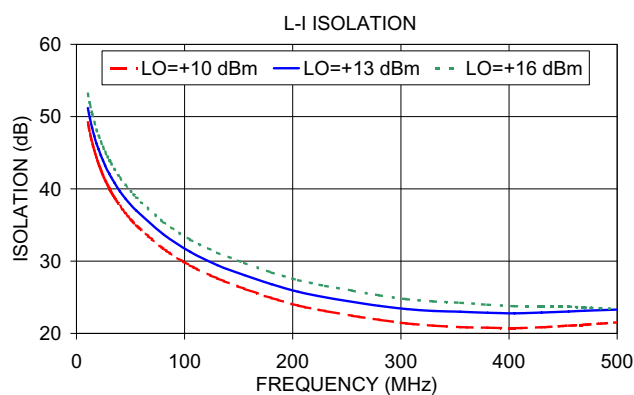
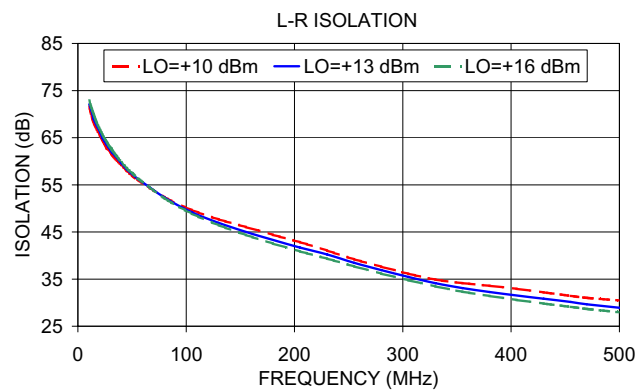
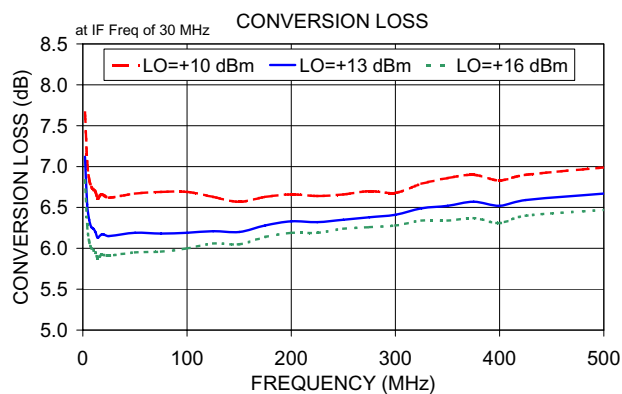
Frequency (MHz)		Conversion Loss (dB)	VSWR RF Port (:1)	Frequency (MHz)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR LO Port (:1)
RF	LO						
		LO +13dBm	LO +13dBm		LO +13dBm	LO +13dBm	LO +13dBm
2.10	32.10	7.12	2.48	10.50	72.10	51.18	1.82
4.10	34.10	6.54	2.67	14.50	69.04	48.42	1.82
6.10	36.10	6.35	2.78	20.50	66.13	45.46	1.81
10.10	40.10	6.24	2.84	24.50	64.29	43.96	1.81
14.10	44.10	6.13	2.85	30.50	62.15	42.08	1.81
18.10	48.10	6.17	2.82	35.00	61.00	40.87	1.81
20.10	50.10	6.17	2.81	40.10	59.59	39.68	1.82
25.10	55.10	6.15	2.77	50.10	57.26	37.80	1.83
50.10	80.10	6.19	2.65	80.10	52.29	33.74	1.81
100.10	130.10	6.19	2.37	105.10	49.20	31.29	1.81
125.10	155.10	6.21	2.28	155.10	45.02	28.06	1.84
150.10	180.10	6.20	2.15	205.10	41.68	25.76	1.84
175.10	205.10	6.28	2.06	255.10	38.45	24.37	1.90
200.10	230.10	6.33	2.00	305.10	35.47	23.37	1.95
250.10	280.10	6.35	1.85	330.10	34.14	23.10	1.99
300.10	330.10	6.41	1.75	355.10	33.10	23.00	1.98
350.10	380.10	6.52	1.68	405.10	31.53	22.77	2.05
400.10	430.10	6.52	1.58	430.10	30.84	22.89	2.07
425.10	455.10	6.59	1.53	455.10	30.16	23.02	2.03
500.00	470.00	6.67	1.52	470.00	29.64	23.13	2.08

Electrical Schematic



Performance Charts

LRMS-1MHJ



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Frequency Mixer

LRMS-1MHJ

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

Frequency Mixer

LRMS-1MHJ

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=250.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+13			+13			+13
240.0	10.1	6.26	10.0	20.1	5.90	490.0	10.1	6.46
234.1	16.0	6.24	22.3	32.4	5.82	477.7	22.4	6.43
228.2	21.9	6.21	34.6	44.7	5.80	465.4	34.7	6.39
222.3	27.8	6.21	46.9	57.0	5.82	453.1	47.0	6.38
216.4	33.7	6.20	59.2	69.3	5.81	440.8	59.3	6.39
210.5	39.6	6.18	71.5	81.6	5.84	428.5	71.6	6.31
204.6	45.5	6.19	83.8	93.9	5.85	416.2	83.9	6.27
198.7	51.4	6.17	96.2	106.3	5.83	403.8	96.3	6.20
192.8	57.3	6.15	108.5	118.6	5.83	391.5	108.6	6.14
186.9	63.2	6.13	120.8	130.9	5.82	379.2	120.9	6.13
181.0	69.1	6.14	133.1	143.2	5.81	366.9	133.2	6.11
175.1	75.0	6.18	145.4	155.5	5.88	354.6	145.5	6.07
169.2	80.9	6.13	157.7	167.8	5.90	342.3	157.8	6.07
163.3	86.8	6.13	170.0	180.1	5.91	330.0	170.1	6.06
157.4	92.7	6.12	182.3	192.4	5.92	317.7	182.4	6.05
151.5	98.6	6.07	194.6	204.7	5.91	305.4	194.7	6.03
145.6	104.5	6.06	206.9	217.0	5.92	293.1	207.0	6.01
139.7	110.4	6.05	219.2	229.3	5.94	280.8	219.3	6.01
133.8	116.3	6.02	231.5	241.6	5.95	268.5	231.6	6.04
127.9	122.2	5.98	243.8	253.9	5.99	256.2	243.9	6.05
122.1	128.0	5.96	256.2	266.3	6.04	243.8	256.3	6.06
116.2	133.9	6.00	268.5	278.6	6.04	231.5	268.6	6.07
110.3	139.8	6.02	280.8	290.9	6.05	219.2	280.9	6.05
104.4	145.7	6.02	293.1	303.2	6.06	206.9	293.2	6.08
98.5	151.6	6.03	305.4	315.5	6.08	194.6	305.5	6.08
92.6	157.5	6.02	317.7	327.8	6.13	182.3	317.8	6.09
86.7	163.4	6.02	330.0	340.1	6.14	170.0	330.1	6.12
80.8	169.3	6.03	342.3	352.4	6.14	157.7	342.4	6.14
74.9	175.2	6.04	354.6	364.7	6.17	145.4	354.7	6.17
69.0	181.1	6.03	366.9	377.0	6.22	133.1	367.0	6.20
63.1	187.0	6.02	379.2	389.3	6.25	120.8	379.3	6.19
57.2	192.9	6.01	391.5	401.6	6.26	108.5	391.6	6.20
51.3	198.8	6.02	403.8	413.9	6.23	96.2	403.9	6.23
45.4	204.7	6.04	416.2	426.3	6.25	83.8	416.3	6.23
39.5	210.6	6.05	428.5	438.6	6.28	71.5	428.6	6.26
33.6	216.5	6.05	440.8	450.9	6.30	59.2	440.9	6.28
27.7	222.4	6.05	453.1	463.2	6.28	46.9	453.2	6.27
21.8	228.3	6.10	465.4	475.5	6.23	34.6	465.5	6.31
15.9	234.2	6.10	477.7	487.8	6.21	22.3	477.8	6.33
10.0	240.1	6.20	490.0	500.1	6.23	10.0	490.1	6.43

Frequency Mixer

LRMS-1MHJ

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@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

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Frequency Mixer

LRMS-1MHJ

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.

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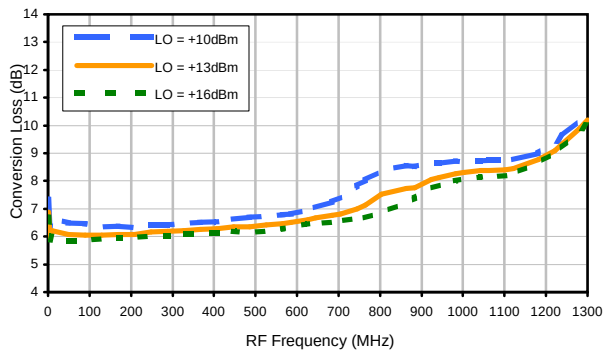


Frequency Mixer

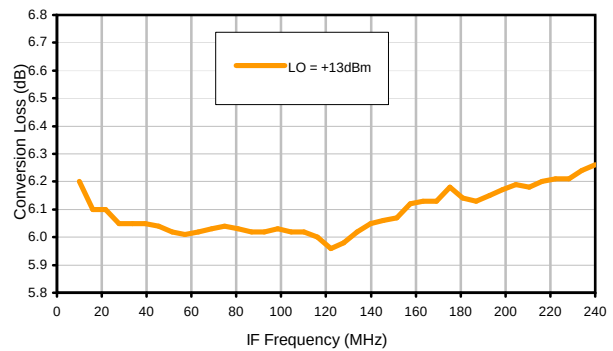
LRMS-1MHJ

Typical Performance Curves

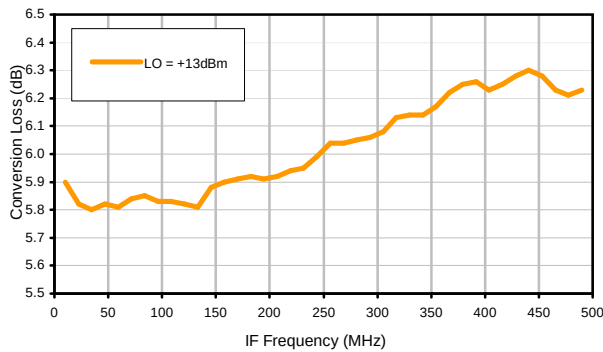
Conversion Loss @ IF=30MHz



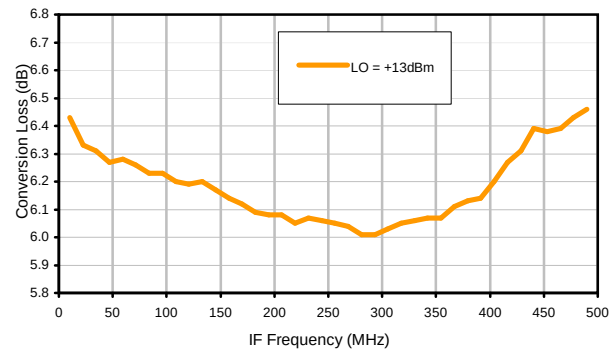
Conversion Loss vs. IF @ RF=250.1MHz



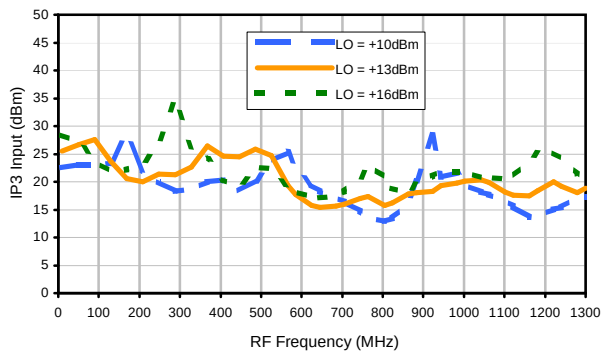
Conversion Loss vs. IF @ RF=10.1MHz



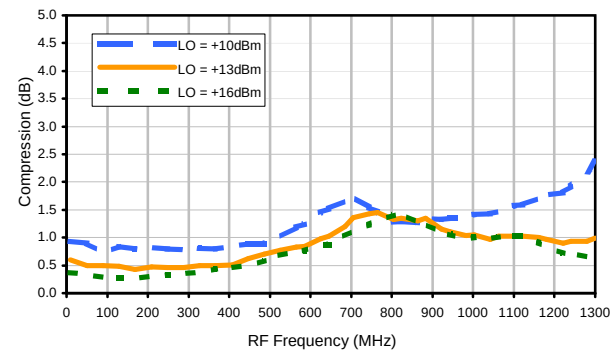
Conversion Loss vs. IF @ RF=500.1MHz



IP3 Input



Compression @ RF IN=+9dBm



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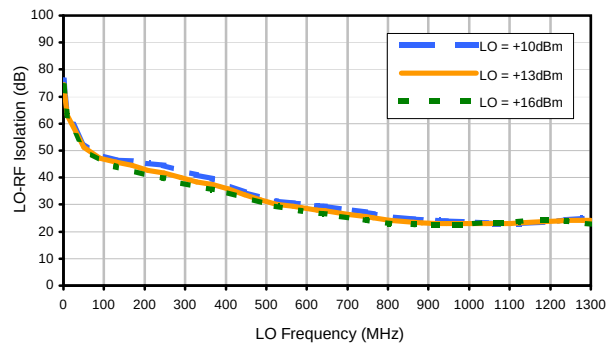


Frequency Mixer

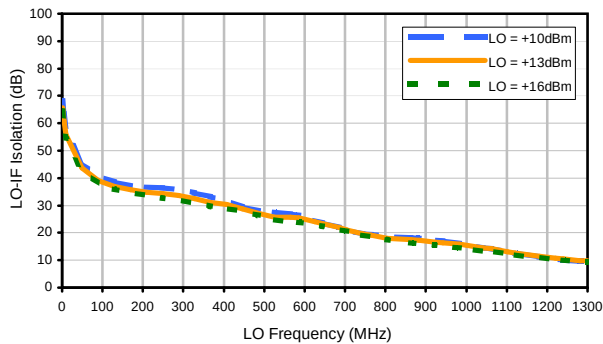
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Typical Performance Curves

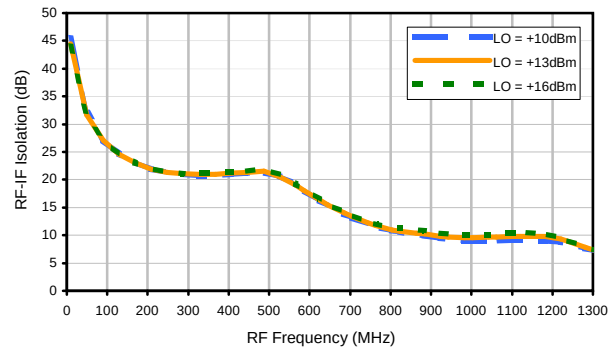
LO-RF Isolation



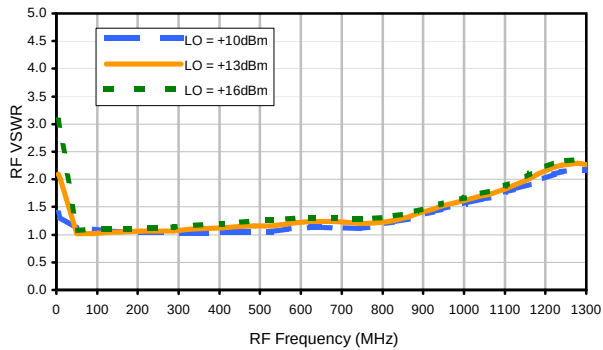
LO-IF Isolation



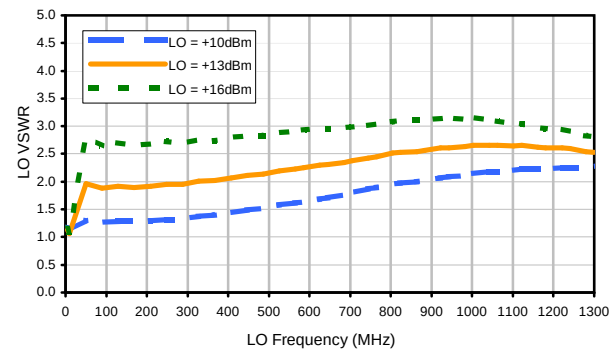
RF-IF Isolation



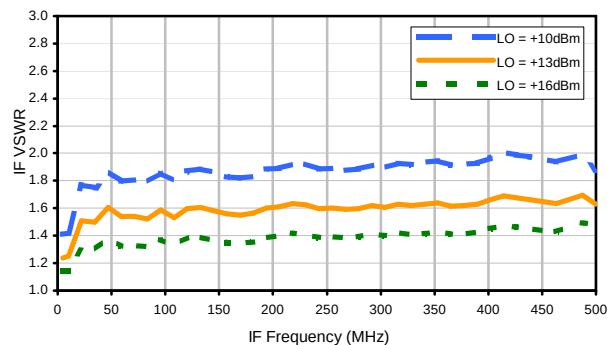
RF VSWR



LO VSWR



IF VSWR



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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.

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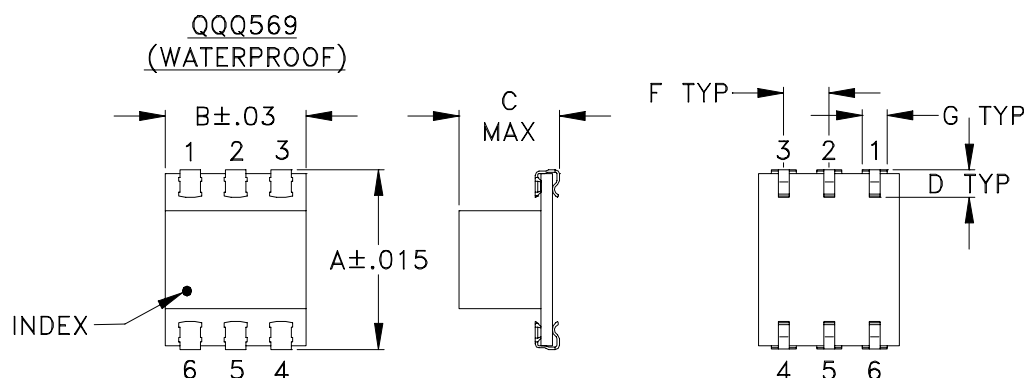


Case Style

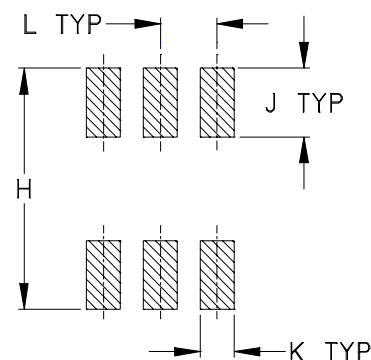
QQQ

QQQ569 (waterproof)

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT, GRAM
QQQ569	.390 (9.90)	.31 (7.87)	.225 (5.72)	.060 (1.52)	-	.100 (2.54)	.045 (1.14)	.420 (10.67)	.120 (3.05)	.060 (1.52)	.100 (2.54)	-	.50

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

Notes:

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



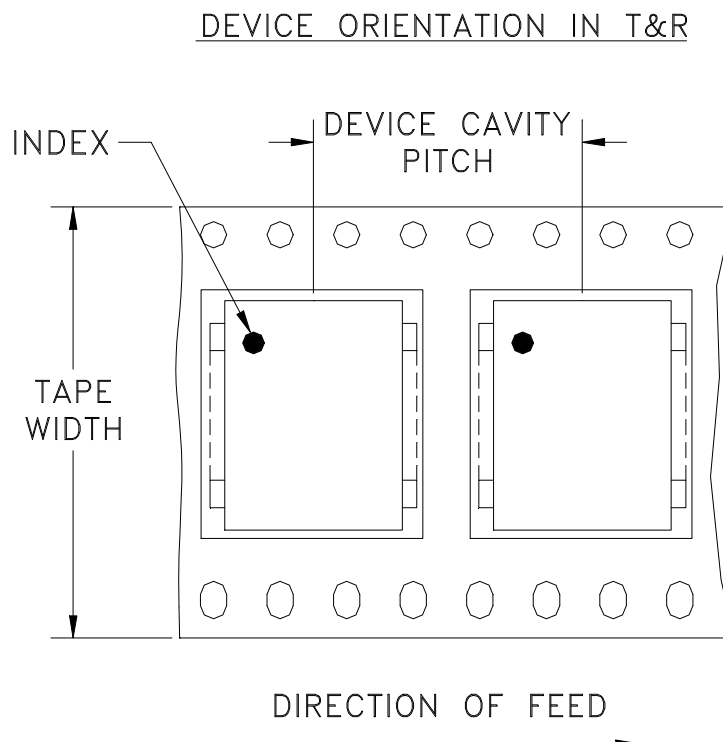
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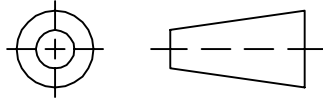
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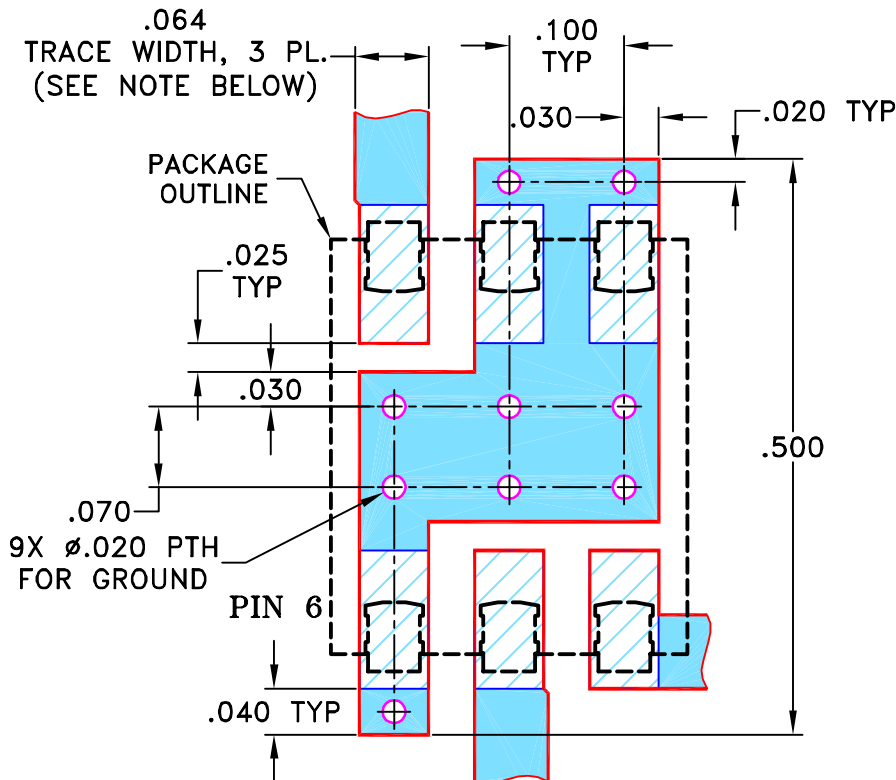
THIRD ANGLE PROJECTION



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" $\pm$ 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 $\pm$.005

APPROVED

DJ

08/02/02

ANGLES $\pm$

FRACTIONS $\pm$

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



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

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

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-083

REV:

A

FILE:

98PL083

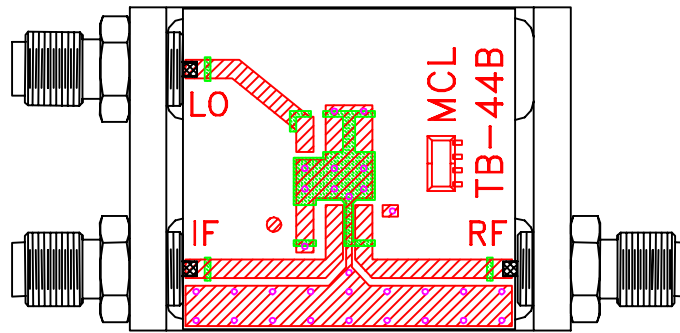
SCALE:

6:1

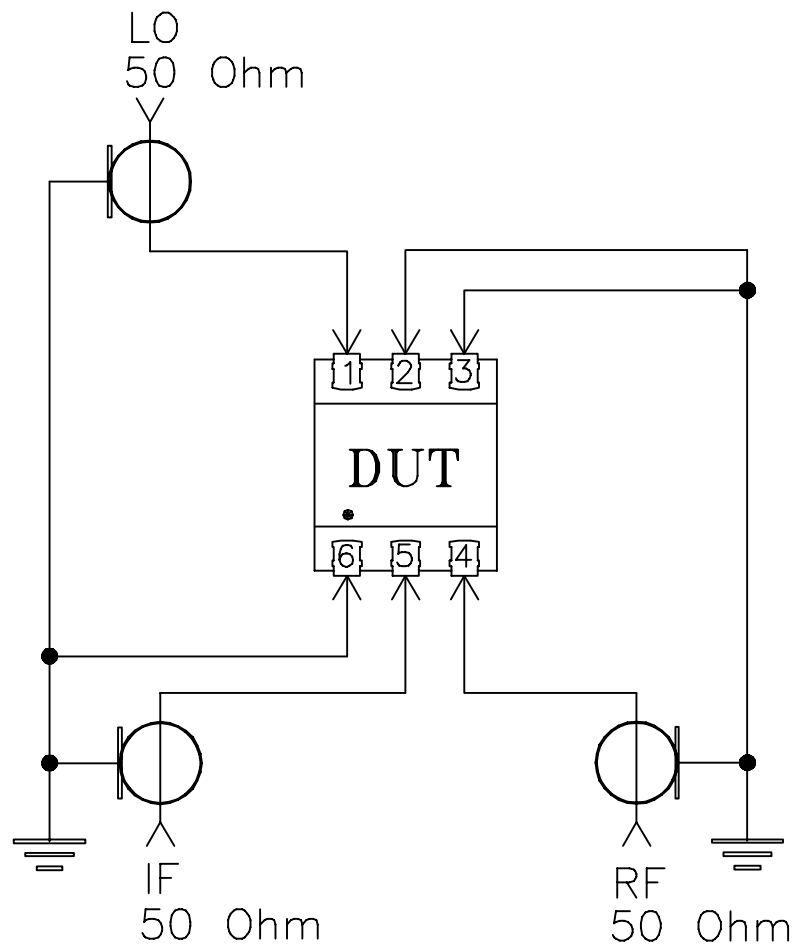
SHEET:

1 OF 1

Evaluation Board and Circuit



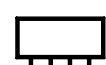
TB-44+



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 inch.

 Mini-Circuits®



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