

Surface Mount Frequency Mixer

LRMS-5H+

Level 17 (LO Power +17dBm) 10 to 1500 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, 6.36 dB typ.
- good L-R isolation, 36 dB typ.

Applications

- cellular
- satellite distribution
- VHF/UHF

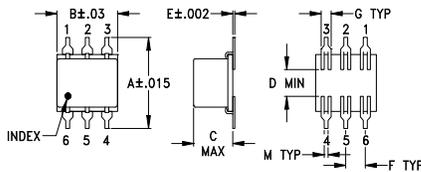
+RoHS Compliant

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

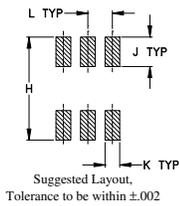
Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500

Outline Drawing



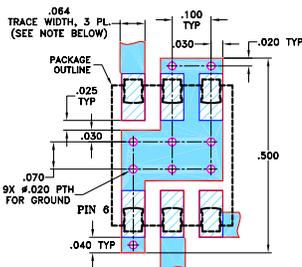
PCB Land Pattern



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G
.40	.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 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-Circuit's 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-Circuit's website at www.minicircuits.com/MCLStore/terms.jsp

Electrical Specifications

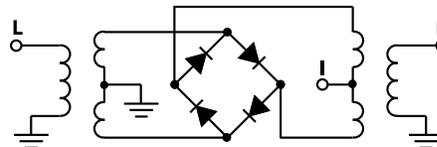
FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			IP3 at center band (dBm)						
LO/RF	IF	Mid-Band		Total Range	L	M	U	L	M	U								
f_L - f_U		\bar{X}	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.						
10-1500	DC-900	6.36	.05	8.0	9.8	65	40	36	20	22	15	50	30	30	18	17	7	22

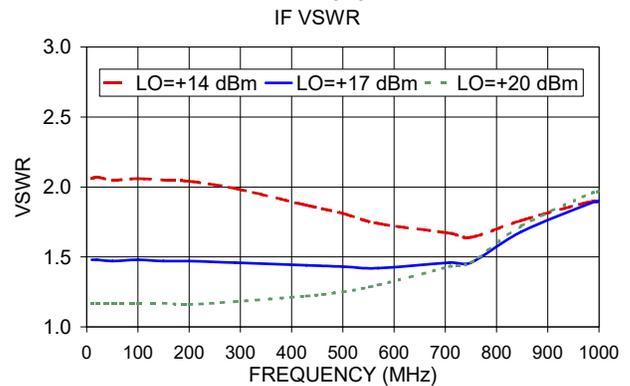
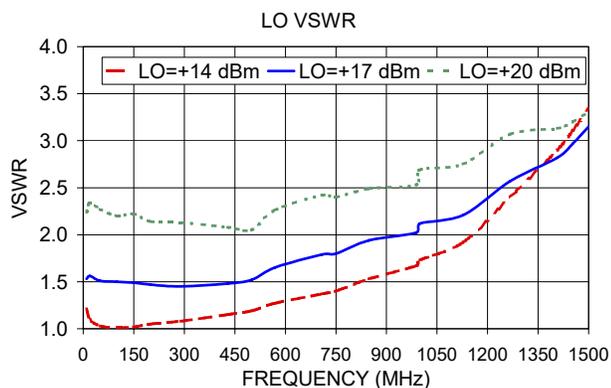
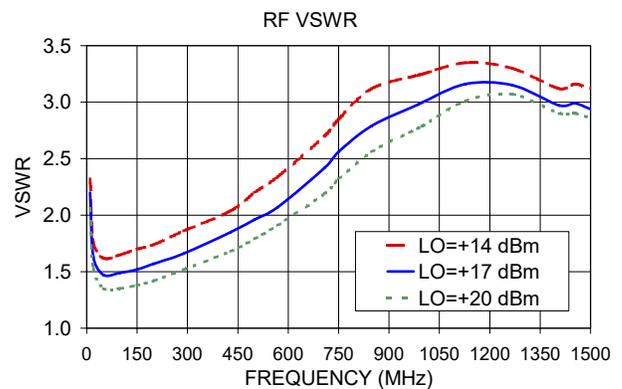
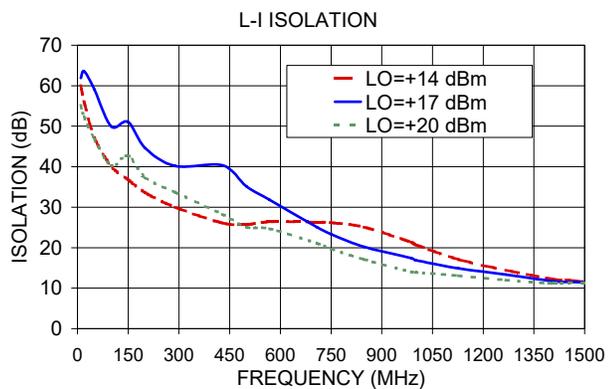
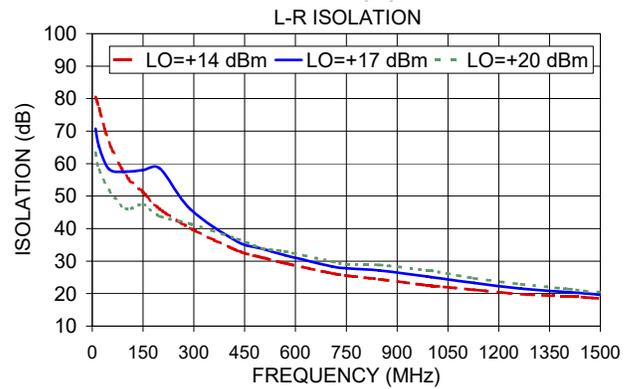
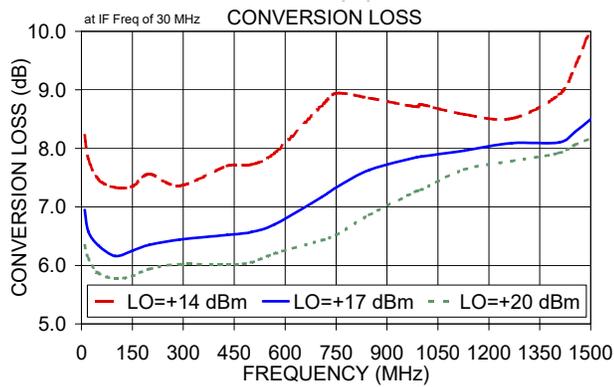
1 dB COMP.: +14 dBm typ. L = low range [f_L to 10 f_L] M = mid range [10 f_L to $f_U/2$] U = upper range [$f_U/2$ to f_U]

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
10.00	40.00	6.95	70.78	61.92	2.20	1.53
20.00	50.00	6.58	65.19	63.52	1.63	1.56
50.00	80.00	6.34	58.27	59.11	1.47	1.51
100.00	70.00	6.16	57.50	49.97	1.49	1.50
149.69	119.69	6.25	57.97	51.05	1.52	1.49
200.00	170.00	6.35	58.46	44.60	1.57	1.47
289.38	259.38	6.44	45.97	40.19	1.66	1.45
429.06	399.06	6.52	35.99	40.36	1.85	1.48
500.00	470.00	6.57	33.86	35.13	1.96	1.52
568.75	538.75	6.70	31.80	31.81	2.07	1.65
708.44	678.44	7.17	28.34	25.09	2.42	1.79
750.00	720.00	7.33	27.82	23.34	2.56	1.80
848.13	818.13	7.63	27.14	20.18	2.79	1.94
987.81	957.81	7.85	25.28	17.43	2.98	2.02
1000.00	970.00	7.86	25.09	16.91	3.00	2.12
1127.50	1097.50	7.96	23.28	14.89	3.16	2.21
1267.19	1237.19	8.09	21.51	13.36	3.15	2.57
1406.88	1376.88	8.10	20.40	11.73	2.97	2.82
1453.44	1423.44	8.28	20.09	11.57	2.99	2.97
1500.00	1470.00	8.50	19.62	11.46	2.94	3.15

Electrical Schematic





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Frequency Mixer

LRMS-5H+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)			RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)			RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+14dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+14	+17	+20			+14	+17	+20			+14	+17	+20
10.1	40.1	7.84	6.81	6.39	10.1	40.1	22.29	25.79	28.92	10.1	40.1	0.43	0.26	0.20
50.3	80.3	7.34	6.46	6.03	50.3	80.3	21.76	25.51	27.11	49.9	79.9	0.71	0.43	0.28
90.5	120.5	7.15	6.29	5.84	90.5	120.5	21.95	24.29	29.19	89.7	119.7	0.91	0.46	0.32
130.7	160.7	7.06	6.14	5.77	130.7	160.7	23.21	28.01	23.40	129.5	159.5	0.90	0.51	0.34
171.0	201.0	7.07	6.18	5.83	171.0	201.0	22.59	23.61	22.99	169.3	199.3	0.81	0.50	0.34
211.2	241.2	6.85	6.10	5.78	211.2	241.2	24.00	21.42	24.45	209.0	239.0	1.09	0.59	0.38
251.4	281.4	6.90	6.22	5.88	251.4	281.4	21.87	21.31	25.09	248.8	278.8	1.09	0.56	0.41
291.6	321.6	6.89	6.20	5.88	291.6	321.6	20.13	21.73	26.11	308.5	338.5	1.02	0.56	0.45
331.8	361.8	6.97	6.31	5.97	331.8	361.8	19.60	22.21	26.42	348.3	378.3	1.22	0.59	0.51
392.1	422.1	7.04	6.37	5.99	392.1	422.1	19.68	24.49	36.98	408.0	438.0	1.17	0.71	0.64
432.3	462.3	7.16	6.42	6.01	432.3	462.3	19.61	23.61	34.83	447.8	477.8	1.14	0.77	0.72
492.7	522.7	7.22	6.54	6.06	492.7	522.7	20.70	24.91	35.08	507.5	537.5	1.45	1.00	0.89
532.9	562.9	7.29	6.64	6.22	532.9	562.9	21.06	26.46	32.24	547.3	577.3	1.57	1.16	0.97
593.2	623.2	7.43	6.56	6.20	593.2	623.2	22.70	27.31	27.44	606.9	636.9	1.73	1.44	1.15
633.4	663.4	7.59	6.56	6.08	633.4	663.4	21.69	23.01	24.02	646.7	676.7	1.66	1.47	1.29
693.7	723.7	7.77	6.65	6.01	693.7	723.7	19.37	23.68	21.64	706.4	736.4	1.81	1.57	1.50
733.9	763.9	7.99	6.92	6.18	733.9	763.9	19.59	26.37	22.67	746.2	776.2	1.73	1.51	1.44
794.2	824.2	8.22	7.14	6.49	794.2	824.2	21.87	23.13	24.59	805.9	835.9	1.63	1.45	1.27
834.5	864.5	8.36	7.23	6.62	834.5	864.5	29.21	24.32	23.47	845.7	875.7	1.52	1.49	1.34
894.8	924.8	8.56	7.37	6.72	894.8	924.8	23.60	33.32	28.64	905.4	935.4	1.31	1.50	1.33
935.0	965.0	8.68	7.55	6.89	935.0	965.0	20.75	25.13	29.74	945.2	975.2	1.18	1.37	1.29
995.3	1025.3	8.74	7.75	7.12	995.3	1025.3	18.28	22.87	25.62	1004.8	1034.8	1.09	1.18	1.12
1035.5	1065.5	8.69	7.79	7.25	1035.5	1065.5	17.66	21.35	24.21	1044.6	1074.6	1.09	1.09	1.04
1095.8	1125.8	8.62	7.88	7.40	1095.8	1125.8	17.41	19.96	23.80	1104.3	1134.3	1.09	1.00	0.95
1136.1	1166.1	8.60	7.91	7.48	1136.1	1166.1	17.20	19.70	23.74	1144.1	1174.1	0.98	0.89	0.84
1196.4	1226.4	8.73	8.12	7.75	1196.4	1226.4	17.11	19.54	25.56	1203.8	1233.8	1.13	0.76	0.69
1236.6	1266.6	8.83	8.35	8.06	1236.6	1266.6	17.14	19.65	27.55	1243.6	1273.6	1.10	0.55	0.46
1296.9	1326.9	8.98	8.77	8.57	1296.9	1326.9	17.49	18.22	24.85	1303.3	1333.3	1.30	0.43	0.31
1337.1	1367.1	8.94	8.87	8.77	1337.1	1367.1	17.63	17.86	23.83	1343.0	1373.0	1.47	0.47	0.28
1397.4	1427.4	8.85	8.79	8.91	1397.4	1427.4	17.29	17.39	21.38	1402.7	1432.7	1.94	0.79	0.41
1437.7	1467.7	8.77	8.70	8.93	1437.7	1467.7	16.88	17.11	20.11	1442.5	1472.5	2.19	0.98	0.54
1498.0	1528.0	8.84	8.74	9.07	1498.0	1528.0	16.10	16.27	17.96	1502.2	1532.2	2.43	1.12	0.55
1538.2	1568.2	8.94	8.84	9.15	1538.2	1568.2	15.61	16.18	17.27	1542.0	1572.0	2.54	1.16	0.56
1598.5	1628.5	9.32	8.99	9.13	1598.5	1628.5	15.10	16.13	16.12	1601.7	1631.7	2.64	1.25	0.64
1638.7	1668.7	9.72	9.15	9.05	1638.7	1668.7	15.17	16.95	16.88	1641.5	1671.5	2.54	1.27	0.68
1699.0	1729.0	10.71	9.32	8.95	1699.0	1729.0	15.20	19.02	20.66	1701.2	1731.2	2.30	1.42	0.80
1739.2	1769.2	11.35	9.29	8.80	1739.2	1769.2	15.48	18.48	23.28	1740.9	1770.9	1.91	1.60	0.89
1799.6	1829.6	12.74	9.52	8.77	1799.6	1829.6	15.18	18.22	23.61	1800.6	1830.6	1.16	1.72	0.95
1839.8	1869.8	13.61	9.82	8.77	1839.8	1869.8	14.74	18.67	23.73	1840.4	1870.4	0.57	1.58	0.95
1900.1	1930.1	15.21	10.59	8.93	1900.1	1930.1	14.93	18.85	23.64	1900.1	1930.1	-0.36	1.30	0.92



Frequency Mixer

LRMS-5H+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=750.1MHz (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)=1500.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+17			+17			+17
730.0	20.1	6.85	10.0	20.1	6.90	900.0	600.1	9.76
711.5	38.6	6.76	29.6	39.7	6.79	880.2	619.9	9.73
693.1	57.0	6.74	49.1	59.2	6.97	860.4	639.7	9.69
674.6	75.5	6.84	68.7	78.8	6.97	840.7	659.4	9.67
656.2	93.9	6.78	88.2	98.3	6.90	820.9	679.2	9.51
637.7	112.4	6.71	107.8	117.9	6.87	801.1	699.0	9.42
619.2	130.9	6.61	127.3	137.4	6.86	781.3	718.8	9.27
600.8	149.3	6.63	146.9	157.0	6.92	761.6	738.5	9.20
582.3	167.8	6.64	166.4	176.5	6.86	741.8	758.3	8.87
563.8	186.3	6.69	186.0	196.1	6.85	722.0	778.1	8.93
545.4	204.7	6.66	205.6	215.7	6.82	702.2	797.9	8.81
526.9	223.2	6.68	225.1	235.2	6.73	682.4	817.7	8.70
508.5	241.6	6.67	244.7	254.8	6.73	662.7	837.4	8.68
490.0	260.1	6.72	264.2	274.3	6.83	642.9	857.2	8.59
471.5	278.6	6.72	283.8	293.9	6.81	623.1	877.0	8.57
453.1	297.0	6.69	303.3	313.4	6.72	603.3	896.8	8.52
434.6	315.5	6.66	322.9	333.0	6.82	583.6	916.5	8.54
416.2	333.9	6.60	342.4	352.5	6.78	563.8	936.3	8.56
397.7	352.4	6.61	362.0	372.1	6.88	544.0	956.1	8.55
379.2	370.9	6.49	381.6	391.7	6.86	524.2	975.9	8.60
360.8	389.3	6.59	401.1	411.2	6.83	504.4	995.7	8.56
342.3	407.8	6.52	420.7	430.8	6.89	484.7	1015.4	8.56
323.8	426.3	6.56	440.2	450.3	6.93	464.9	1035.2	8.49
305.4	444.7	6.55	459.8	469.9	7.02	445.1	1055.0	8.56
286.9	463.2	6.63	479.3	489.4	6.95	425.3	1074.8	8.54
268.5	481.6	6.59	498.9	509.0	7.01	405.6	1094.5	8.53
250.0	500.1	6.62	518.4	528.5	6.99	385.8	1114.3	8.57
231.5	518.6	6.58	538.0	548.1	6.98	366.0	1134.1	8.54
213.1	537.0	6.64	557.1	567.2	6.96	326.4	1173.7	8.62
194.6	555.5	6.61	596.7	606.8	7.01	306.7	1193.4	8.70
176.2	573.9	6.57	635.8	645.9	7.10	267.1	1233.0	8.70
157.7	592.4	6.57	655.3	665.4	7.19	247.3	1252.8	8.72
139.2	610.9	6.54	694.4	704.5	7.30	207.8	1292.3	8.68
120.8	629.3	6.56	714.0	724.1	7.28	188.0	1312.1	8.62
102.3	647.8	6.51	753.1	763.2	7.40	148.4	1351.7	8.62
83.8	666.3	6.62	772.7	782.8	7.42	128.7	1371.4	8.69
65.4	684.7	6.59	811.8	821.9	7.42	89.1	1411.0	8.68
46.9	703.2	6.70	831.3	841.4	7.60	69.3	1430.8	8.71
28.5	721.6	6.72	870.4	880.5	7.71	29.8	1470.3	8.84
10.0	740.1	6.89	890.0	900.1	7.80	10.0	1490.1	8.84



Frequency Mixer

LRMS-5H+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+14	+17	+20	+14	+17	+20
10.1	73.39	71.28	68.50	56.51	62.81	58.61
49.9	69.35	60.85	56.67	44.15	54.39	56.33
89.7	74.54	59.26	53.79	38.74	46.96	59.07
129.5	70.53	57.40	50.74	35.58	45.17	48.48
169.3	61.80	57.74	49.93	33.32	41.76	49.05
209.0	55.67	53.65	47.35	31.68	39.96	48.67
248.8	51.31	52.45	46.48	30.32	38.17	46.20
308.5	46.95	47.04	43.06	28.58	36.85	45.58
348.3	44.20	44.08	41.43	27.35	36.05	44.32
408.0	41.16	40.92	39.02	26.15	35.83	39.79
447.8	39.46	39.55	37.70	25.75	35.84	37.84
507.5	37.07	36.98	35.84	25.20	36.53	34.42
547.3	35.58	35.57	34.51	25.20	38.18	32.04
606.9	33.76	33.99	33.17	25.06	39.85	28.99
646.7	32.46	32.86	32.40	24.81	38.77	27.35
706.4	30.58	31.23	30.96	25.47	37.78	25.40
746.2	29.64	30.26	30.15	26.21	34.34	25.01
805.9	28.29	29.07	28.98	27.84	28.31	22.68
845.7	27.47	28.41	28.61	27.99	25.39	20.90
905.4	26.29	27.50	27.89	28.17	21.89	18.35
945.2	25.59	26.97	27.60	28.08	20.65	17.19
1004.8	24.78	26.17	26.99	27.37	19.13	15.57
1044.6	24.24	25.60	26.49	26.42	18.52	15.03
1104.3	23.55	25.02	25.91	23.91	17.74	14.38
1144.1	23.05	24.55	25.57	22.74	17.31	14.12
1203.8	22.24	23.73	24.85	20.42	16.36	13.49
1243.6	21.75	23.20	24.38	19.05	15.70	13.02
1303.3	21.41	22.77	24.01	17.21	14.75	12.43
1343.0	21.42	22.75	23.95	16.19	14.06	11.99
1402.7	21.15	22.43	23.54	14.85	13.17	11.44
1442.5	20.88	22.25	23.32	14.06	12.81	11.21
1502.2	20.37	21.77	22.85	13.08	12.22	10.92
1542.0	20.14	21.65	22.81	12.47	11.82	10.62
1601.7	19.29	20.83	21.97	11.41	11.27	10.26
1641.5	18.87	20.39	21.55	10.63	10.64	9.78
1701.2	18.43	19.93	21.15	9.42	9.72	9.23
1740.9	18.52	20.02	21.11	8.81	9.17	8.78
1800.6	18.54	20.00	21.05	7.96	8.36	8.20
1840.4	18.88	20.29	21.40	7.57	7.91	7.93
1900.1	19.19	20.43	21.64	7.04	7.31	7.44

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+14	+17	+20
10.1	40.1	58.43	48.39	42.80
49.9	79.9	47.90	43.81	42.62
89.7	119.7	43.11	40.08	38.73
129.5	159.5	40.58	38.27	36.80
169.3	199.3	39.52	37.03	35.63
209.0	239.0	38.44	35.93	34.60
248.8	278.8	37.36	35.19	33.93
308.5	338.5	36.36	34.46	33.18
348.3	378.3	34.31	33.21	32.29
408.0	438.0	31.68	30.99	30.54
447.8	477.8	30.28	30.19	29.67
507.5	537.5	27.41	27.87	28.02
547.3	577.3	25.69	26.25	26.25
606.9	636.9	23.57	23.85	23.50
646.7	676.7	22.38	22.56	22.37
706.4	736.4	20.42	20.45	20.49
746.2	776.2	19.74	19.70	19.75
805.9	835.9	18.65	18.52	18.35
845.7	875.7	18.35	18.23	18.08
905.4	935.4	17.94	18.02	17.81
945.2	975.2	17.61	18.04	17.86
1004.8	1034.8	16.96	17.79	18.02
1044.6	1074.6	16.63	17.44	17.78
1104.3	1134.3	16.12	17.07	17.74
1144.1	1174.1	15.91	16.97	17.78
1203.8	1233.8	15.61	17.03	18.09
1243.6	1273.6	15.70	17.17	18.34
1303.3	1333.3	16.07	17.39	18.52
1343.0	1373.0	16.55	17.64	18.75
1402.7	1432.7	16.97	17.74	18.73
1442.5	1472.5	17.20	17.89	18.79
1502.2	1532.2	16.99	17.65	18.51
1542.0	1572.0	16.88	17.59	18.61
1601.7	1631.7	16.41	17.41	18.43
1641.5	1671.5	16.35	17.33	18.40
1701.2	1731.2	16.52	17.33	18.45
1740.9	1770.9	16.76	17.42	18.29
1800.6	1830.6	17.92	18.52	19.15
1840.4	1870.4	18.67	19.27	19.87
1900.1	1930.1	20.04	20.60	21.23



Frequency Mixer

LRMS-5H+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+14	+17	+20
10.1	40.1	1.81	1.69	1.65
49.9	79.9	1.44	1.25	1.18
89.7	119.7	1.43	1.23	1.13
129.5	159.5	1.42	1.19	1.10
169.3	199.3	1.41	1.18	1.09
209.0	239.0	1.36	1.15	1.08
248.8	278.8	1.38	1.17	1.08
308.5	338.5	1.34	1.16	1.08
348.3	378.3	1.30	1.15	1.08
408.0	438.0	1.30	1.16	1.09
447.8	477.8	1.33	1.19	1.11
507.5	537.5	1.34	1.21	1.14
547.3	577.3	1.37	1.25	1.19
606.9	636.9	1.46	1.32	1.25
646.7	676.7	1.53	1.37	1.29
706.4	736.4	1.66	1.50	1.37
746.2	776.2	1.78	1.61	1.46
805.9	835.9	1.93	1.76	1.62
845.7	875.7	2.05	1.88	1.76
905.4	935.4	2.22	2.05	1.94
945.2	975.2	2.31	2.16	2.06
1004.8	1034.8	2.40	2.28	2.21
1044.6	1074.6	2.44	2.34	2.27
1104.3	1134.3	2.48	2.38	2.31
1144.1	1174.1	2.50	2.41	2.32
1203.8	1233.8	2.55	2.47	2.39
1243.6	1273.6	2.57	2.53	2.45
1303.3	1333.3	2.59	2.61	2.57
1343.0	1373.0	2.59	2.63	2.61
1402.7	1432.7	2.55	2.59	2.60
1442.5	1472.5	2.51	2.54	2.56
1502.2	1532.2	2.49	2.46	2.47
1542.0	1572.0	2.48	2.43	2.43
1601.7	1631.7	2.49	2.37	2.35
1641.5	1671.5	2.51	2.37	2.34
1701.2	1731.2	2.63	2.44	2.39
1740.9	1770.9	2.75	2.48	2.40
1800.6	1830.6	2.98	2.58	2.45
1840.4	1870.4	3.14	2.68	2.51
1900.1	1930.1	3.40	2.89	2.63

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+14	+17	+20
10.1	1.11	1.60	2.32
49.9	1.09	1.72	2.61
89.7	1.06	1.61	2.35
129.5	1.08	1.68	2.52
169.3	1.07	1.62	2.40
209.0	1.07	1.64	2.44
248.8	1.08	1.67	2.49
308.5	1.08	1.68	2.48
348.3	1.10	1.72	2.52
408.0	1.14	1.75	2.55
447.8	1.18	1.79	2.57
507.5	1.24	1.85	2.63
547.3	1.29	1.89	2.65
606.9	1.36	1.96	2.71
646.7	1.42	2.00	2.71
706.4	1.50	2.09	2.80
746.2	1.55	2.13	2.82
805.9	1.64	2.21	2.89
845.7	1.70	2.24	2.89
905.4	1.80	2.32	2.92
945.2	1.85	2.36	2.94
1004.8	1.93	2.42	2.97
1044.6	1.99	2.46	2.99
1104.3	2.05	2.50	3.00
1144.1	2.12	2.55	3.03
1203.8	2.19	2.58	3.02
1243.6	2.28	2.63	3.07
1303.3	2.37	2.67	3.06
1343.0	2.47	2.73	3.09
1402.7	2.57	2.77	3.08
1442.5	2.66	2.82	3.11
1502.2	2.77	2.85	3.08
1542.0	2.86	2.91	3.11
1601.7	3.01	2.94	3.10
1641.5	3.10	3.00	3.10
1701.2	3.33	3.09	3.11
1740.9	3.47	3.18	3.16
1800.6	3.67	3.38	3.26
1840.4	3.86	3.54	3.38
1900.1	4.04	3.76	3.50

IF (OUT) (MHz)	IF VSWR @LO=1500.1MHz (:1)		
	@LO (dBm)		
	+14	+17	+20
10.1	1.35	1.17	1.37
29.9	1.40	1.18	1.21
49.7	1.30	1.10	1.29
69.4	1.32	1.12	1.26
89.2	1.34	1.12	1.25
109.0	1.31	1.09	1.27
128.8	1.36	1.14	1.25
148.5	1.34	1.11	1.26
168.3	1.33	1.10	1.28
188.1	1.36	1.12	1.27
207.9	1.41	1.14	1.25
227.7	1.40	1.14	1.28
247.4	1.37	1.12	1.31
267.2	1.37	1.11	1.32
287.0	1.40	1.13	1.30
306.8	1.40	1.13	1.31
326.5	1.41	1.14	1.35
346.3	1.40	1.13	1.37
366.1	1.38	1.11	1.36
385.9	1.40	1.13	1.35
405.7	1.43	1.15	1.36
425.4	1.45	1.17	1.38
445.2	1.40	1.14	1.41
465.0	1.40	1.14	1.41
484.8	1.42	1.15	1.40
504.5	1.44	1.16	1.40
524.3	1.43	1.18	1.44
544.1	1.42	1.19	1.47
583.7	1.38	1.16	1.46
603.4	1.41	1.18	1.47
643.0	1.40	1.22	1.52
662.8	1.37	1.22	1.55
702.3	1.40	1.23	1.53
722.1	1.41	1.26	1.57
761.7	1.42	1.32	1.64
781.4	1.40	1.31	1.63
821.0	1.43	1.36	1.67
840.8	1.44	1.38	1.68
880.3	1.45	1.43	1.75
900.1	1.45	1.45	1.77

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	5	10	7	26	12	26	19	30	32	36
1	-	12	+0	39	19	36	48	37	27	40	40	49
2	79	41	31	42	29	57	50	47	52	46	68	54
3	100	75	53	55	50	58	61	64	59	60	55	60
4	>100	79	84	69	57	66	56	68	78	71	71	73
5	>100	81	79	84	70	73	64	79	71	85	73	85
6	>100	>92	>92	>92	>92	89	76	85	74	>92	>92	90
7	>100	>92	>92	>92	>92	>92	85	85	79	88	87	>92
8	>100	>92	>92	>92	>92	>92	>92	>92	90	>92	88	>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: 750.1 MHz; -1.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; -7.96 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	10	21	18	46	26	44	33	48	44	59
1	-	13	+0	38	22	40	42	48	34	48	50	57
2	70	35	24	40	22	44	41	45	47	61	48	60
3	>100	47	43	40	47	47	44	53	53	54	47	62
4	>100	52	72	47	45	44	46	54	56	50	63	59
5	>100	65	61	64	59	49	53	50	60	60	70	56
6	>100	67	64	70	75	64	50	57	51	57	67	61
7	>100	83	78	72	72	73	68	64	55	64	62	70
8	>100	83	78	82	76	92	81	68	68	70	64	67
9	>100	89	83	91	85	71	75	75	69	61	64	67
10	>100	94	95	92	81	91	86	77	85	68	70	62
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; 9.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; 2.03 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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 LRMS-5H+
 100817
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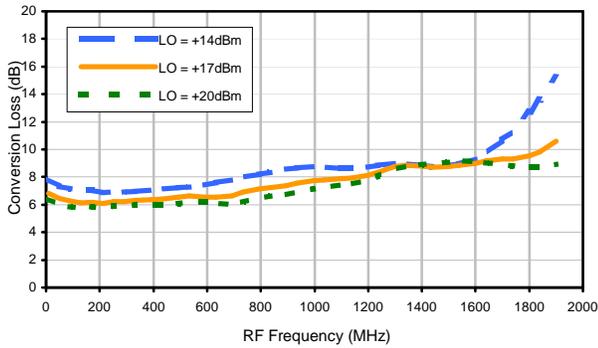
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Frequency Mixer

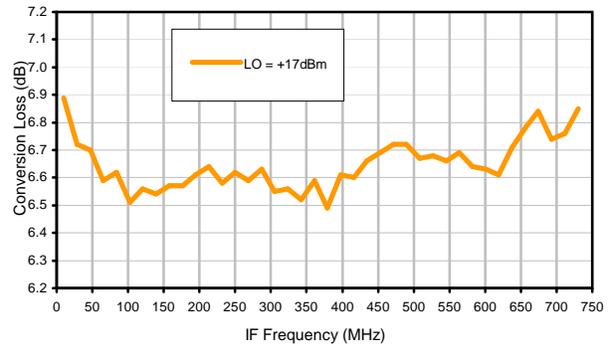
LRMS-5H+

Typical Performance Curves

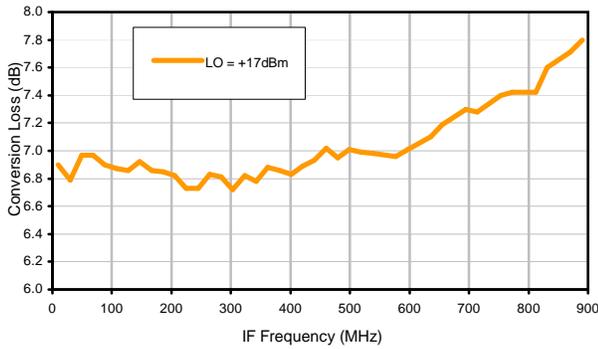
Conversion Loss @ IF=30MHz



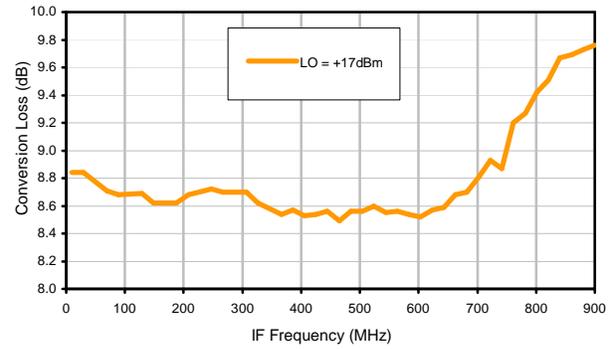
Conversion Loss vs. IF @ RF=750.1MHz



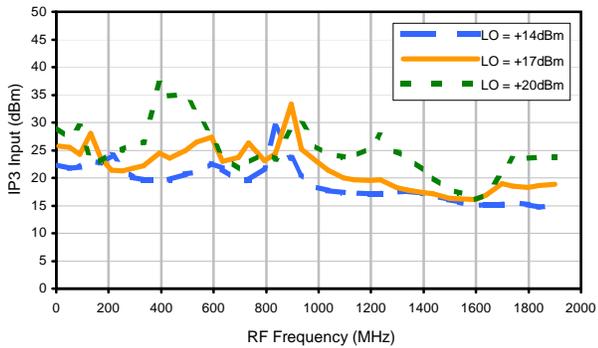
Conversion Loss vs. IF @ RF=10.1MHz



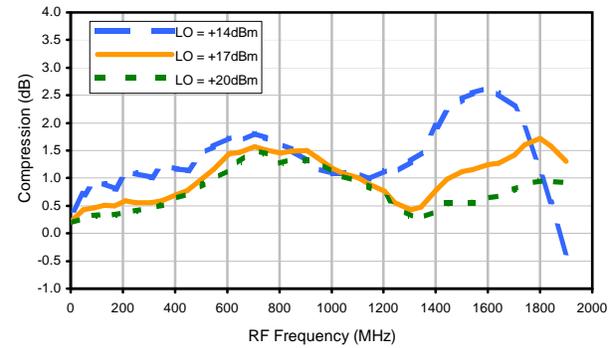
Conversion Loss vs. IF @ RF=1500.1MHz



IP3 Input

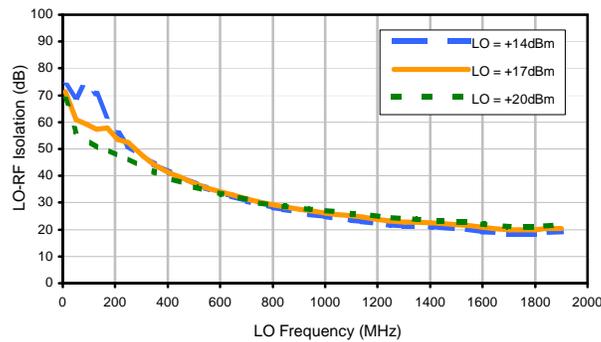


Compression @ RF IN=+14dBm

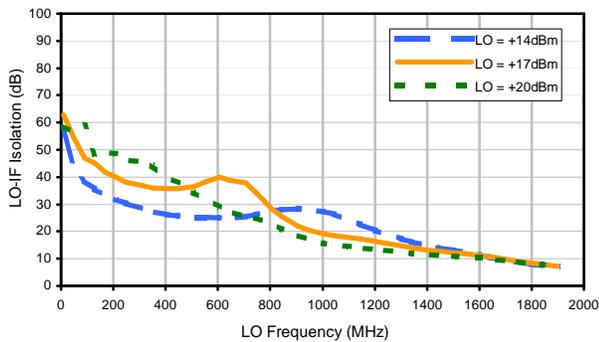


Typical Performance Curves

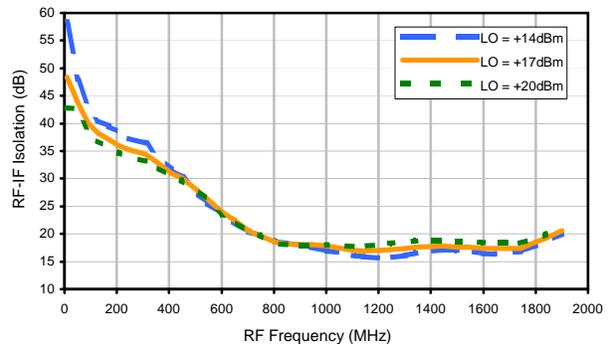
LO-RF Isolation



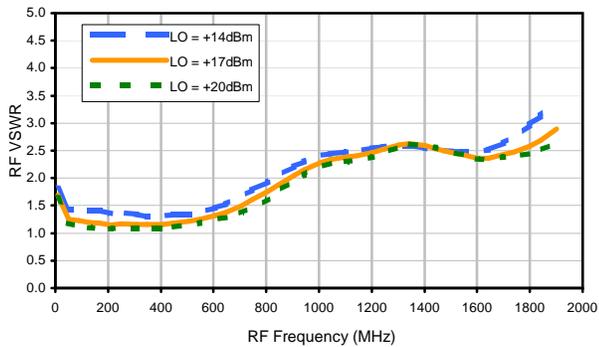
LO-IF Isolation



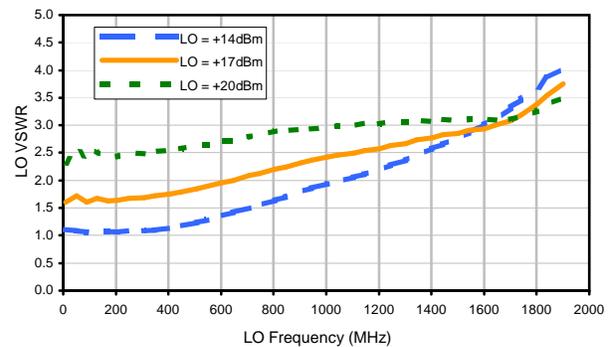
RF-IF Isolation



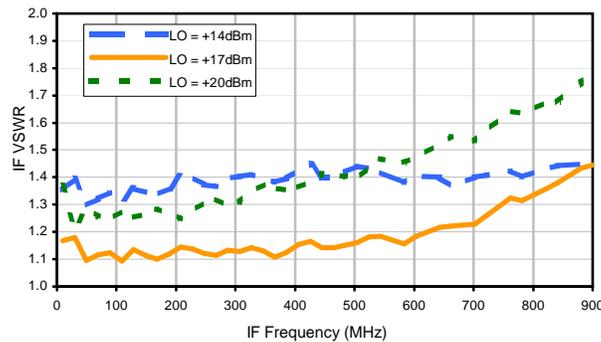
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	5	10	7	26	12	26	19	30	32	36
1	-	12	+0	39	19	36	48	37	27	40	40	49
2	79	41	31	42	29	57	50	47	52	46	68	54
3	100	75	53	55	50	58	61	64	59	60	55	60
4	>100	79	84	69	57	66	56	68	78	71	71	73
5	>100	81	79	84	70	73	64	79	71	85	73	85
6	>100	>92	>92	>92	>92	89	76	85	74	>92	>92	90
7	>100	>92	>92	>92	>92	>92	85	85	79	88	87	>92
8	>100	>92	>92	>92	>92	>92	>92	>92	90	>92	88	>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: 750.1 MHz; -1.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; -7.96 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	10	21	18	46	26	44	33	48	44	59
1	-	13	+0	38	22	40	42	48	34	48	50	57
2	70	35	24	40	22	44	41	45	47	61	48	60
3	>100	47	43	40	47	47	44	53	53	54	47	62
4	>100	52	72	47	45	44	46	54	56	50	63	59
5	>100	65	61	64	59	49	53	50	60	60	70	56
6	>100	67	64	70	75	64	50	57	51	57	67	61
7	>100	83	78	72	72	73	68	64	55	64	62	70
8	>100	83	78	82	76	92	81	68	68	70	64	67
9	>100	89	83	91	85	71	75	75	69	61	64	67
10	>100	94	95	92	81	91	86	77	85	68	70	62
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; 9.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; 2.03 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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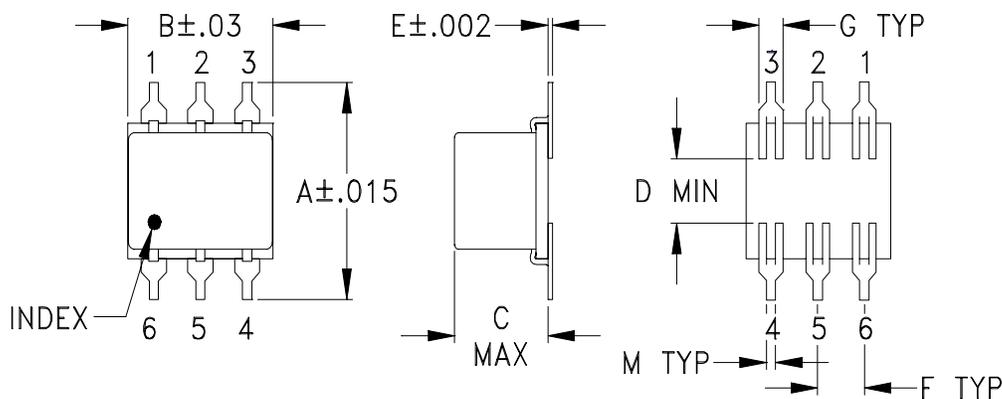
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Case Style

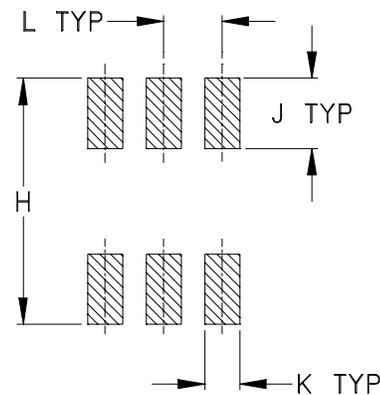
QQQ

QQQ130 (non-waterproof)
QQQ828 (washable)

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
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. $\pm .01$; 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.



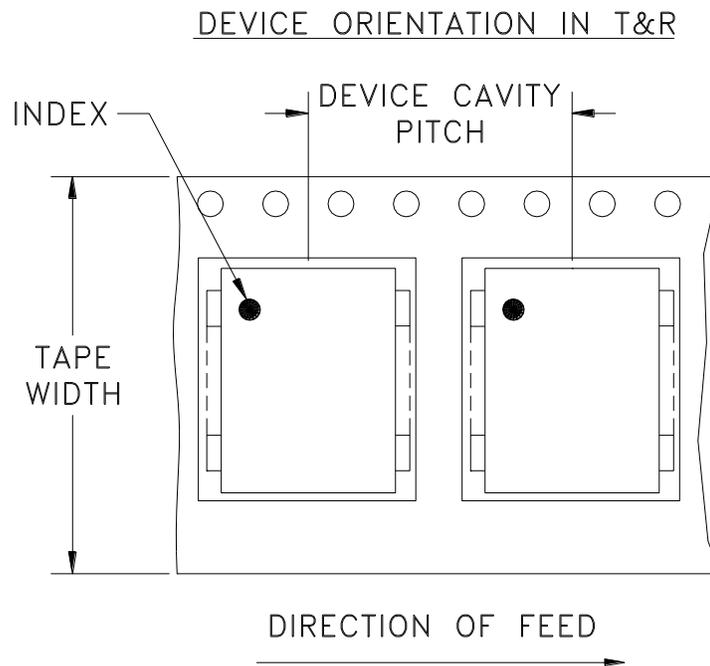
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Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	16	7	10,20,50,100
		13	200,500

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.

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



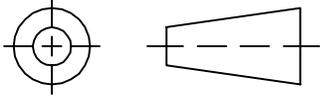
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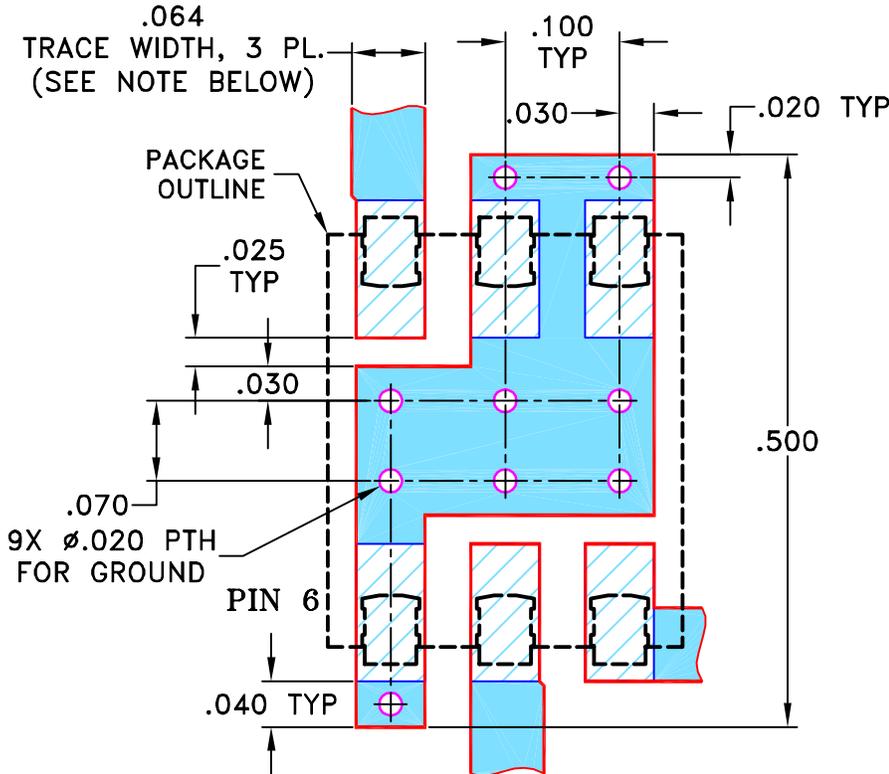
THIRD ANGLE PROJECTION



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 R04350B 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:
2 PL DECIMALS \pm
3 PL DECIMALS \pm .005

CHECKED WL 08/02/02

ANGLES \pm
FRACTIONS \pm

APPROVED DJ 08/02/02

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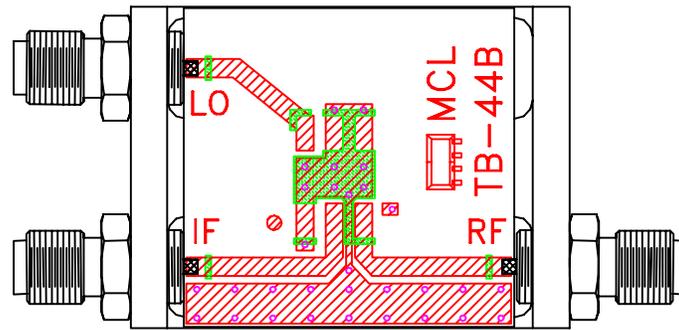
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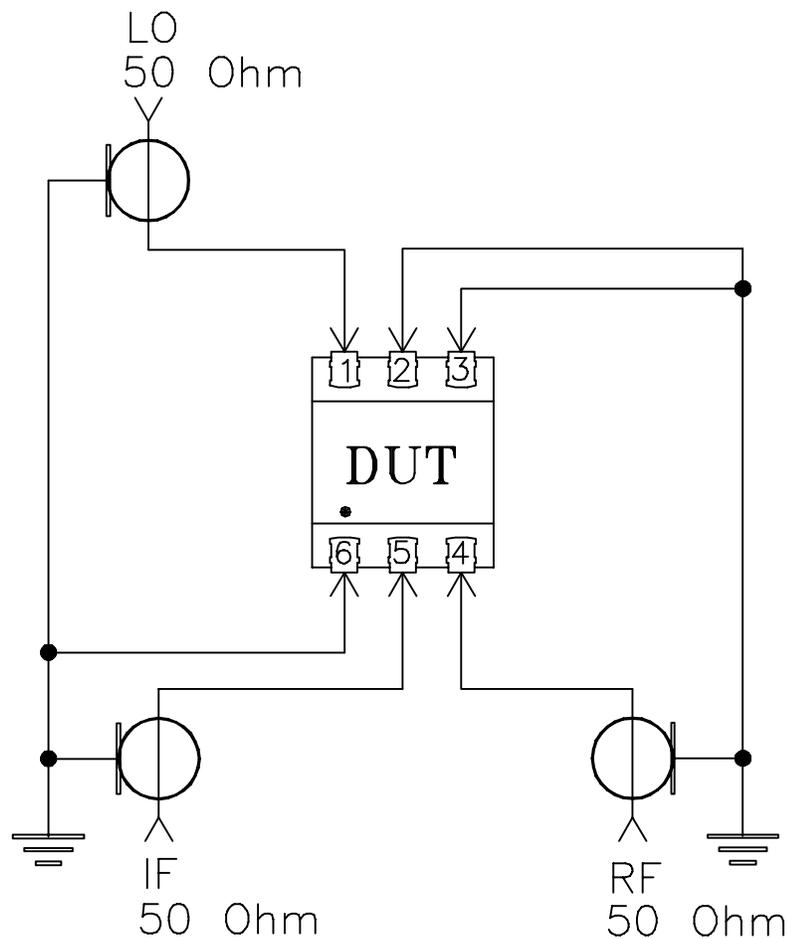
PL, w, QQQ569, LRMS-J, TB-44

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



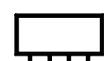
TB-44+



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