

Frequency Mixer

LRMS-5HJ

Level 17 (LO Power +17dBm) 10 to 1500 MHz

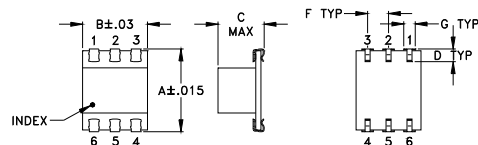
Maximum Ratings

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.	

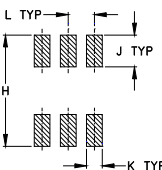
Pin Connections

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

Outline Drawing



PCB Land Pattern

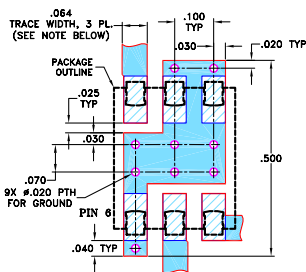


Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch)

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 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.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Features

- low conversion loss, 6.36 dB typ.
- aqueous washable
- J-leads for strain relief

Applications

- cellular
- satellite distribution
- VHF/UHF

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)
LO/RF f_L f_U	IF	Mid-Band m		Total Range Max.		L		M		U		L		M		U		
		$\bar{X}$	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	
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.

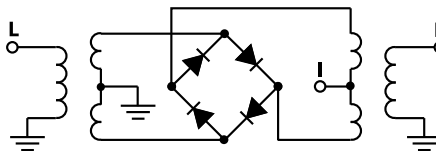
L = low range [f_L to 10 f_L]
m= mid band [$2f_L$ to $f_U/2$]

M = mid range [$10 f_L$ to $f_U/2$]
U = upper range [$f_U/2$ to f_U]

Typical Performance Data

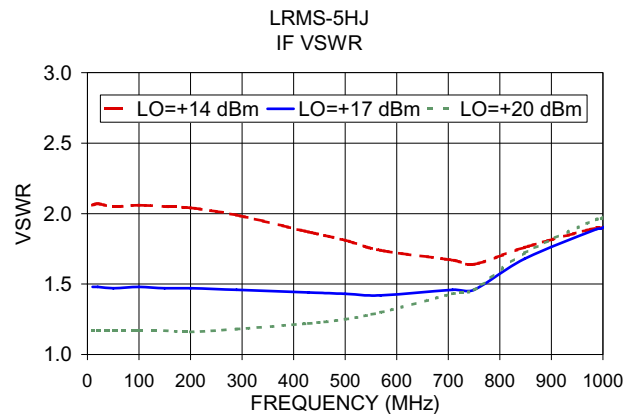
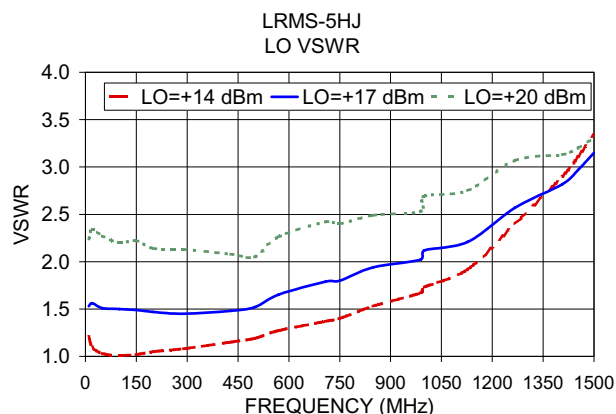
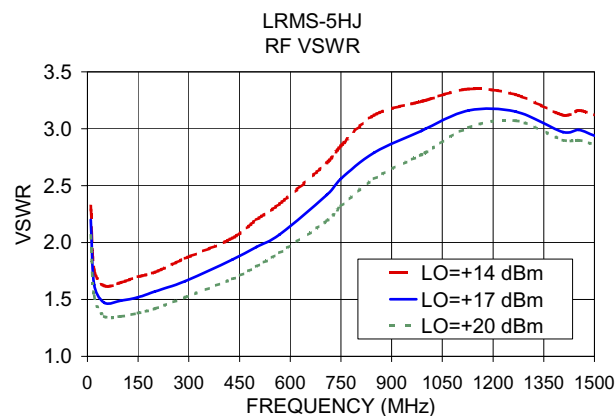
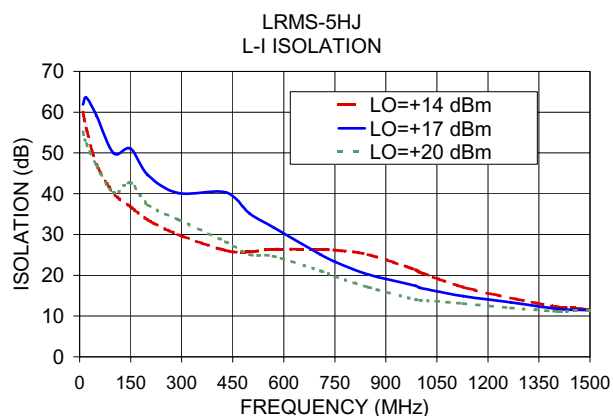
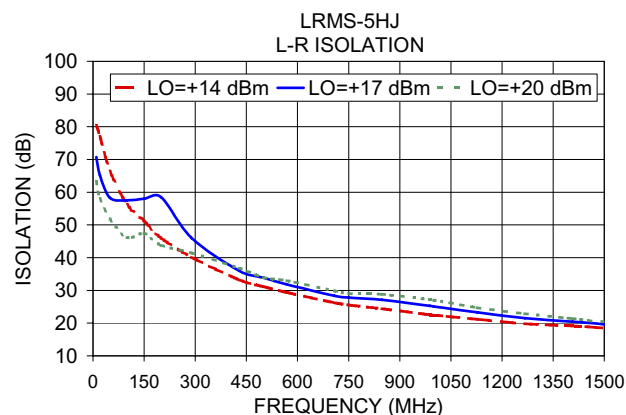
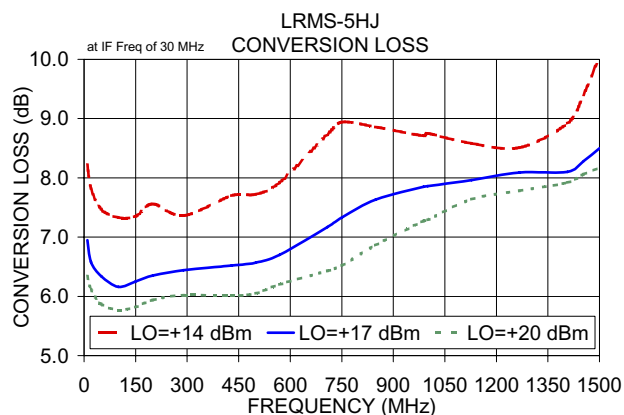
Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm
10.00	40.00	6.95	70.78	61.92	2.20	1.53
20.00	50.00	6.58	65.19	63.52	1.63	1.56
50.00	80.00	6.34	58.27	59.11	1.47	1.51
100.00	70.00	6.16	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



Performance Charts

LRMS-5HJ



Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- 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



Frequency Mixer

LRMS-5HJ

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-5HJ

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	577.1	587.2	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

REV. X2
LRMS-5HJ
100817
Page 2 of 5



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED • RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0006 (718) 934-4500 Fax (718) 332-4661



The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see



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-5HJ

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=1500.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+14	+17	+20		+14	+17	+20		+14	+17	+20
10.1	40.1	1.81	1.69	1.65	10.1	1.11	1.60	2.32	10.1	1.35	1.17	1.37
49.9	79.9	1.44	1.25	1.18	49.9	1.09	1.72	2.61	29.9	1.40	1.18	1.21
89.7	119.7	1.43	1.23	1.13	89.7	1.06	1.61	2.35	49.7	1.30	1.10	1.29
129.5	159.5	1.42	1.19	1.10	129.5	1.08	1.68	2.52	69.4	1.32	1.12	1.26
169.3	199.3	1.41	1.18	1.09	169.3	1.07	1.62	2.40	89.2	1.34	1.12	1.25
209.0	239.0	1.36	1.15	1.08	209.0	1.07	1.64	2.44	109.0	1.31	1.09	1.27
248.8	278.8	1.38	1.17	1.08	248.8	1.08	1.67	2.49	128.8	1.36	1.14	1.25
308.5	338.5	1.34	1.16	1.08	308.5	1.08	1.68	2.48	148.5	1.34	1.11	1.26
348.3	378.3	1.30	1.15	1.08	348.3	1.10	1.72	2.52	168.3	1.33	1.10	1.28
408.0	438.0	1.30	1.16	1.09	408.0	1.14	1.75	2.55	188.1	1.36	1.12	1.27
447.8	477.8	1.33	1.19	1.11	447.8	1.18	1.79	2.57	207.9	1.41	1.14	1.25
507.5	537.5	1.34	1.21	1.14	507.5	1.24	1.85	2.63	227.7	1.40	1.14	1.28
547.3	577.3	1.37	1.25	1.19	547.3	1.29	1.89	2.65	247.4	1.37	1.12	1.31
606.9	636.9	1.46	1.32	1.25	606.9	1.36	1.96	2.71	267.2	1.37	1.11	1.32
646.7	676.7	1.53	1.37	1.29	646.7	1.42	2.00	2.71	287.0	1.40	1.13	1.30
706.4	736.4	1.66	1.50	1.37	706.4	1.50	2.09	2.80	306.8	1.40	1.13	1.31
746.2	776.2	1.78	1.61	1.46	746.2	1.55	2.13	2.82	326.5	1.41	1.14	1.35
805.9	835.9	1.93	1.76	1.62	805.9	1.64	2.21	2.89	346.3	1.40	1.13	1.37
845.7	875.7	2.05	1.88	1.76	845.7	1.70	2.24	2.89	366.1	1.38	1.11	1.36
905.4	935.4	2.22	2.05	1.94	905.4	1.80	2.32	2.92	385.9	1.40	1.13	1.35
945.2	975.2	2.31	2.16	2.06	945.2	1.85	2.36	2.94	405.7	1.43	1.15	1.36
1004.8	1034.8	2.40	2.28	2.21	1004.8	1.93	2.42	2.97	425.4	1.45	1.17	1.38
1044.6	1074.6	2.44	2.34	2.27	1044.6	1.99	2.46	2.99	445.2	1.40	1.14	1.41
1104.3	1134.3	2.48	2.38	2.31	1104.3	2.05	2.50	3.00	465.0	1.40	1.14	1.41
1144.1	1174.1	2.50	2.41	2.32	1144.1	2.12	2.55	3.03	484.8	1.42	1.15	1.40
1203.8	1233.8	2.55	2.47	2.39	1203.8	2.19	2.58	3.02	504.5	1.44	1.16	1.40
1243.6	1273.6	2.57	2.53	2.45	1243.6	2.28	2.63	3.07	524.3	1.43	1.18	1.44
1303.3	1333.3	2.59	2.61	2.57	1303.3	2.37	2.67	3.06	544.1	1.42	1.19	1.47
1343.0	1373.0	2.59	2.63	2.61	1343.0	2.47	2.73	3.09	583.7	1.38	1.16	1.46
1402.7	1432.7	2.55	2.59	2.60	1402.7	2.57	2.77	3.08	603.4	1.41	1.18	1.47
1442.5	1472.5	2.51	2.54	2.56	1442.5	2.66	2.82	3.11	643.0	1.40	1.22	1.52
1502.2	1532.2	2.49	2.46	2.47	1502.2	2.77	2.85	3.08	662.8	1.37	1.22	1.55
1542.0	1572.0	2.48	2.43	2.43	1542.0	2.86	2.91	3.11	702.3	1.40	1.23	1.53
1601.7	1631.7	2.49	2.37	2.35	1601.7	3.01	2.94	3.10	722.1	1.41	1.26	1.57
1641.5	1671.5	2.51	2.37	2.34	1641.5	3.10	3.00	3.10	761.7	1.42	1.32	1.64
1701.2	1731.2	2.63	2.44	2.39	1701.2	3.33	3.09	3.11	781.4	1.40	1.31	1.63
1740.9	1770.9	2.75	2.48	2.40	1740.9	3.47	3.18	3.16	821.0	1.43	1.36	1.67
1800.6	1830.6	2.98	2.58	2.45	1800.6	3.67	3.38	3.26	840.8	1.44	1.38	1.68
1840.4	1870.4	3.14	2.68	2.51	1840.4	3.86	3.54	3.38	880.3	1.45	1.43	1.75
1900.1	1930.1	3.40	2.89	2.63	1900.1	4.04	3.76	3.50	900.1	1.45	1.45	1.77

REV. X2
LRMS-5HJ
100817
Page 4 of 5

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.

REV. X2
LRMS-5HJ
100817
Page 5 of 5



Mini-Circuits®

IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED • RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see

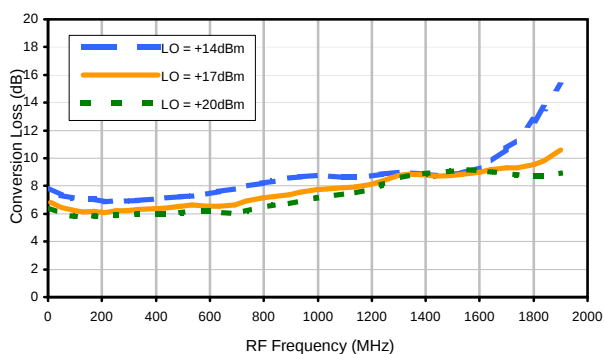


Frequency Mixer

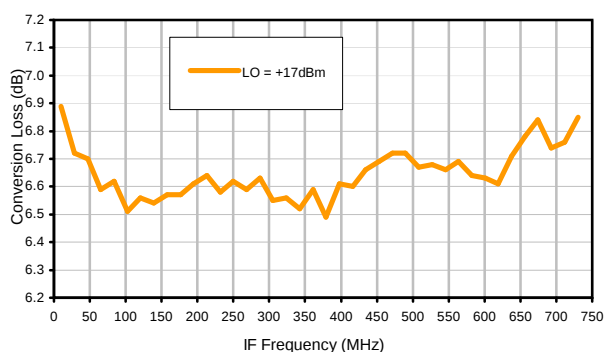
LRMS-5HJ

Typical Performance Curves

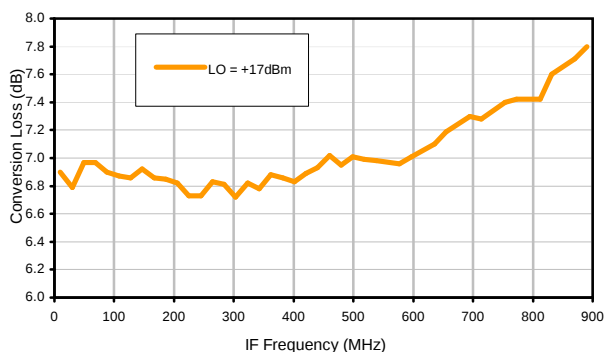
Conversion Loss @ IF=30MHz



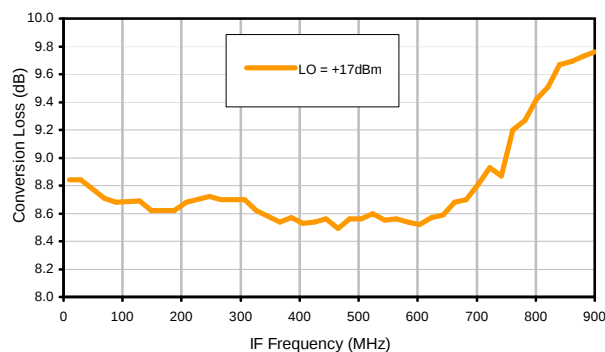
Conversion Loss vs. IF @ RF=750.1MHz



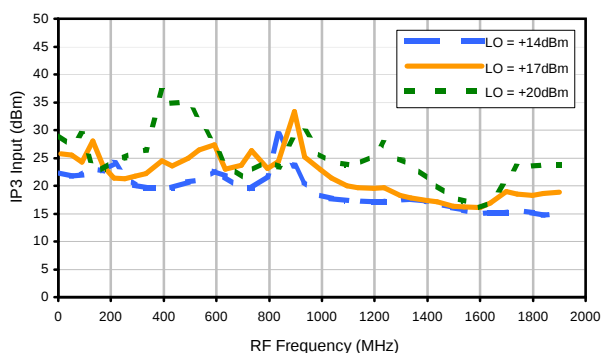
Conversion Loss vs. IF @ RF=10.1MHz



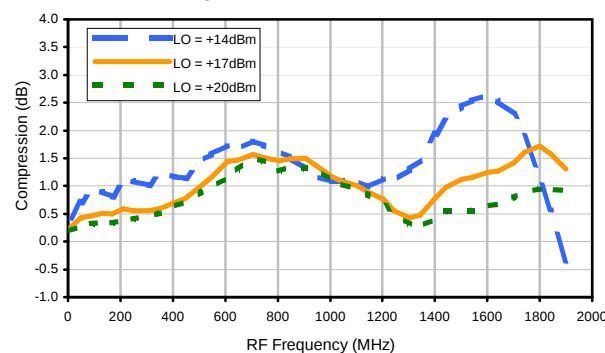
Conversion Loss vs. IF @ RF=1500.1MHz



IP3 Input



Compression @ RF IN=+14dBm



REV. X2
LRMS-5HJ
100817
Page 1 of 3

Mini-Circuits®

IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED • RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

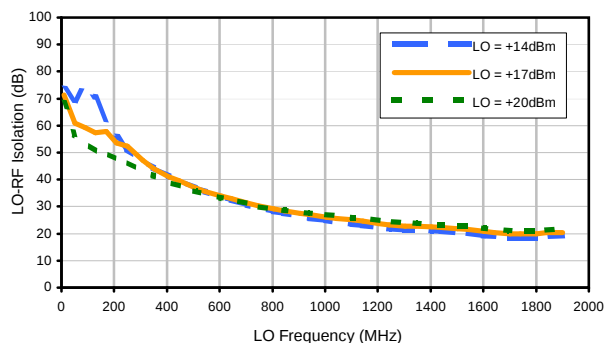


The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see

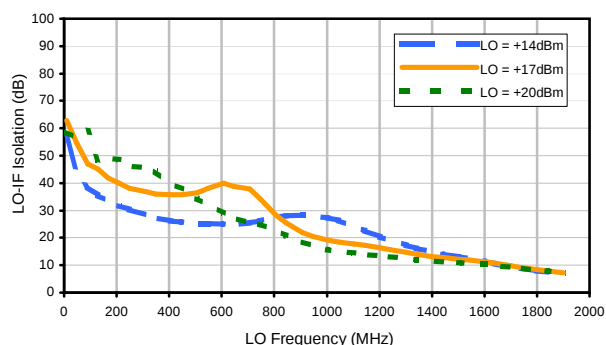


Typical Performance Curves

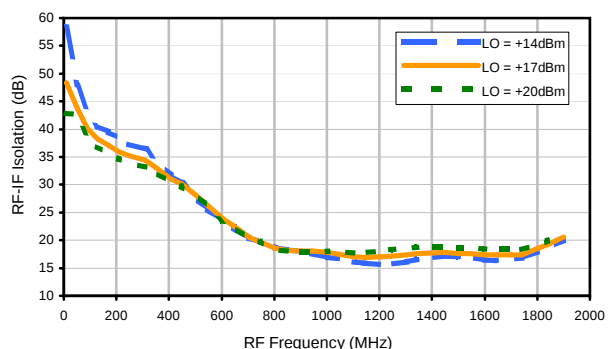
LO-RF Isolation



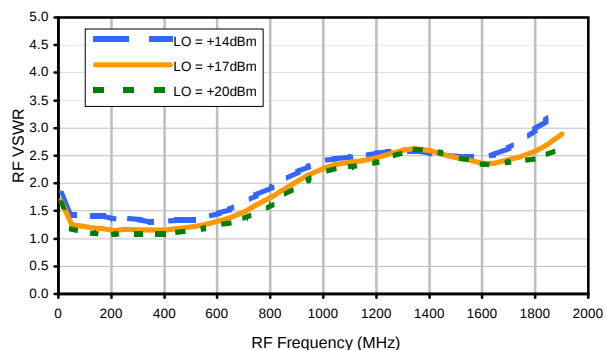
LO-IF Isolation



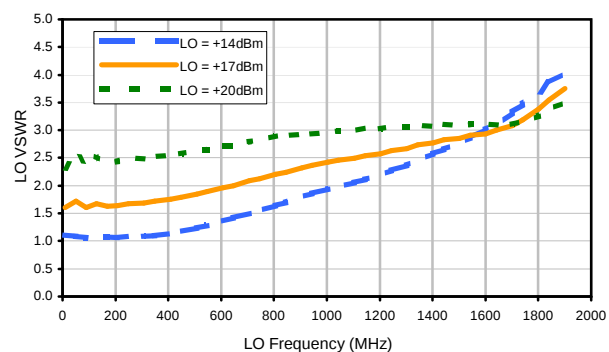
RF-IF Isolation



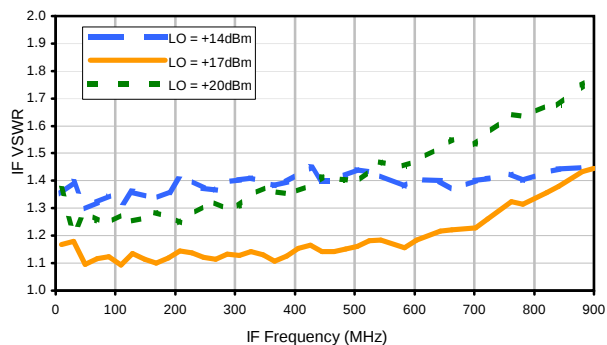
RF VSWR



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

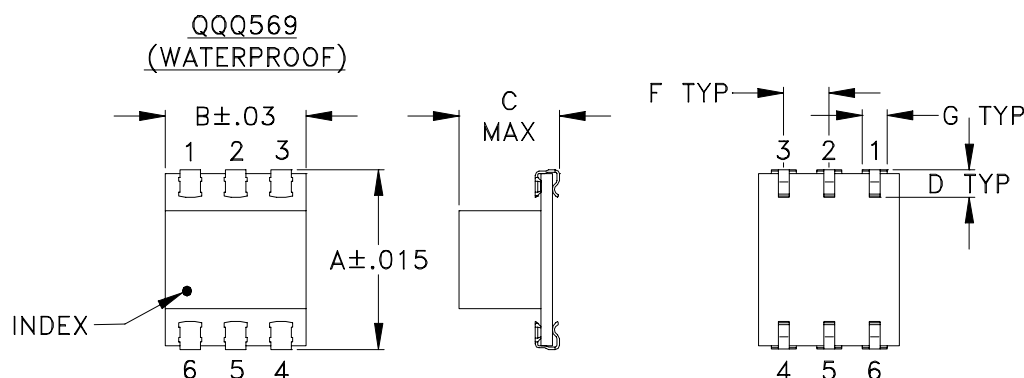
Test conditions: RF IN: 750.1 MHz; 9.00 dBm.
LO IN: 780.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 2.03 dBm

- 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.

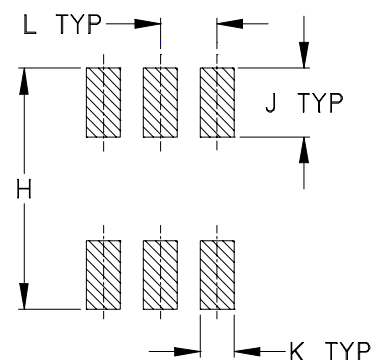
REV. X2
LRMS-5HJ
100817
Page 3 of 3



Outline Dimensions



PCB Land Pattern



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

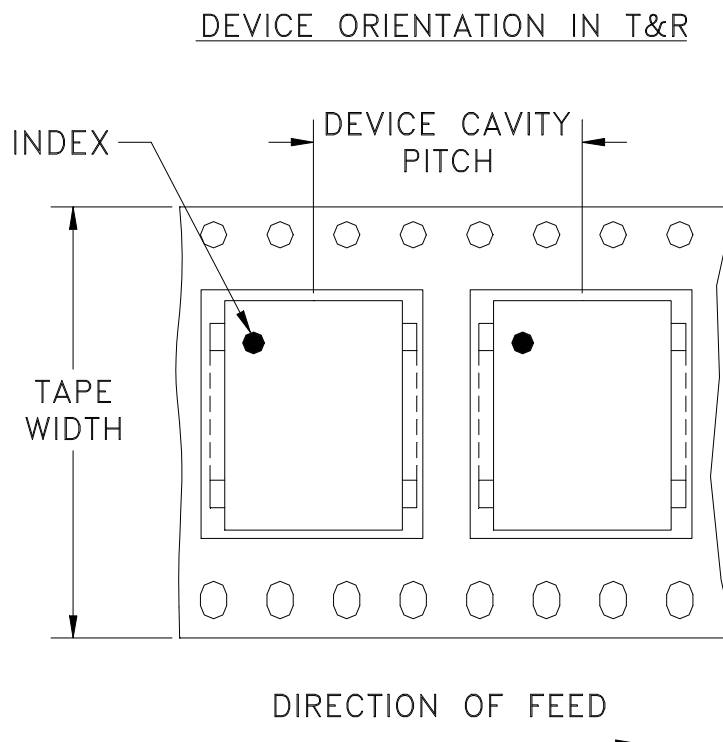
CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT, GRAM
QQQ569	.390 (9.90)	.31 (7.87)	.225 (5.72)	.060 (1.52)	-	.100 (2.54)	.045 (1.14)	.420 (10.67)	.120 (3.05)	.060 (1.52)	.100 (2.54)	-	.50

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.

Tape & Reel Packaging TR-F5



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	16	13	500

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

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



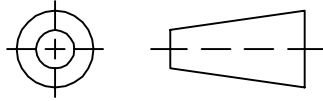
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

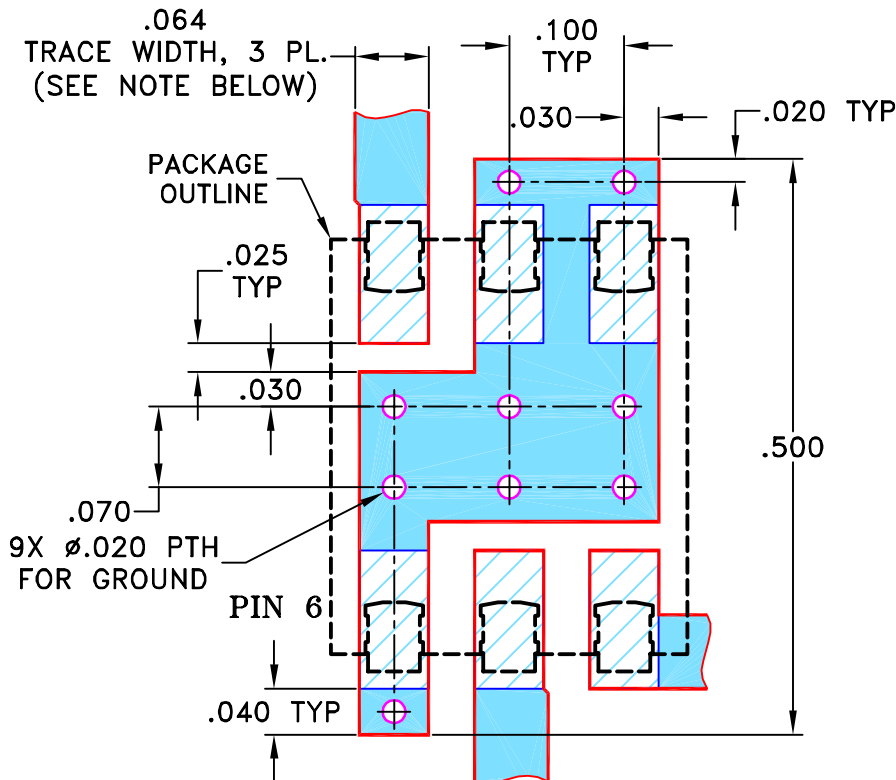
THIRD ANGLE PROJECTION



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 $\pm$

APPROVED

DJ

08/02/02

3 PL DECIMALS $\pm$.005

ANGLES $\pm$

FRACTIONS $\pm$

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

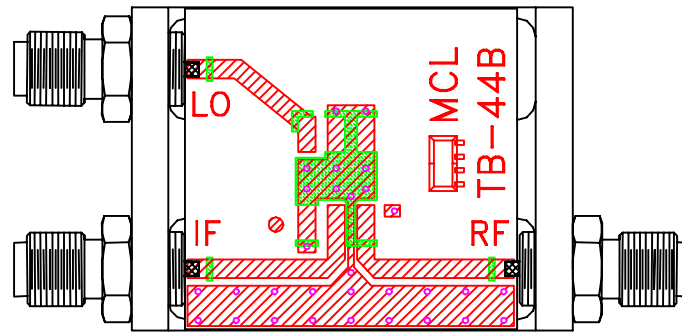
SCALE:

6:1

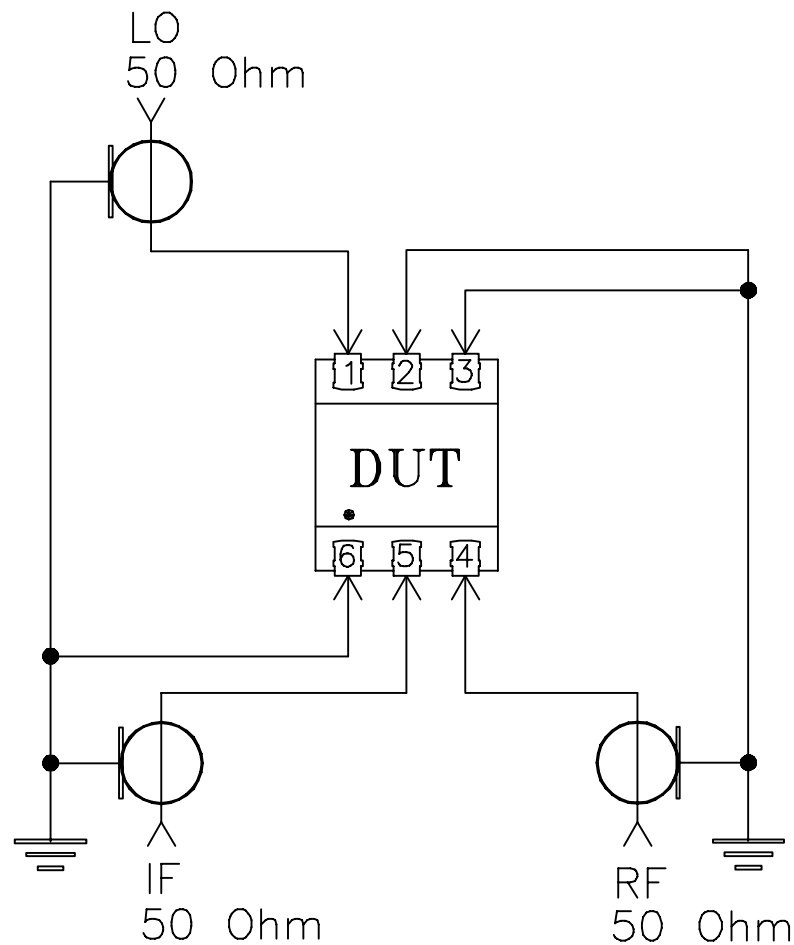
SHEET:

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