

## Non-Catalog Model

# Frequency Mixer

### Level 7 (LO Power + 7 dBm)

# LRMS-3+

### Important Note

This is a non-catalog model and can be manufactured on specific request. Pricing and delivery information can be supplied upon request.



Please click "Back", and then click "Contact Us" for Applications support.

**CASE STYLE : QQQ130**

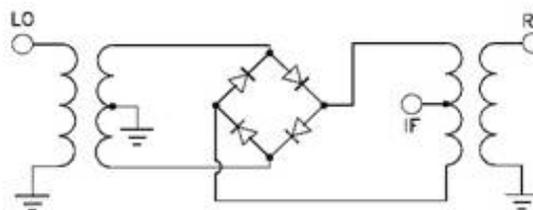
ELECTRICAL SPECIFICATIONS 50Ω @ +25°C					
Parameter		Min.	Typ.	Max.	Units
Frequency	LO (f <sub>L</sub> to f <sub>u</sub> )	.04		400	MHz
	RF (f <sub>L</sub> to f <sub>u</sub> )	.04		400	MHz
	IF	DC		400	MHz
Conversion Loss	mid band		4.95	7	dB
	Total Range		5.35	8	dB
LO-RF Isolation	Low Range	50	60		dB
	Mid Range	35	54		dB
	Upper Range	25	41		dB
LO-IF Isolation	Low Range	40	48		dB
	Mid Range	30	40		dB
	Upper Range	15	26		dB

**Note:** Low Range = [f<sub>L</sub> to 10f<sub>L</sub>]      Mid Range = [10f<sub>L</sub> to f<sub>u</sub>/2]      Upper Range = [f<sub>u</sub>/2 to f<sub>u</sub>]  
 mid band = [2f<sub>L</sub> to f<sub>u</sub>/2]

MAXIMUM RATINGS	
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C

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

### Electrical Schematics



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

REV. X1  
 LRMS-3+  
 2/14/2007  
 Page 1 of 1

# Frequency Mixer

# LRMS-3+

## Typical Performance Data

RF (MHz)	LO (MHz)	CONVERSION LOSS (dB)			LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			LO (MHz)	RF (MHz)	IP3 Input (dBm)
		@LO (dBm)				@LO (dBm)			@LO (dBm)					
		+4	+7	+10		+4	+7	+10	+4	+7	+10			+7
0.1	30.0	6.26	5.80	5.82	30.0	61.70	61.84	62.06	50.52	49.36	49.28	40.0	10.0	15.46
6.4	36.4	4.93	4.73	4.64	36.4	60.04	60.37	60.66	48.75	47.64	47.80	54.8	24.8	18.14
10.0	40.0	5.00	3.99	4.24	40.0	59.87	60.79	62.09	50.27	49.08	50.22	69.5	39.5	18.34
24.8	54.8	4.92	4.74	4.71	54.8	59.32	58.16	61.20	47.37	46.49	47.68	84.3	54.3	18.07
39.5	69.5	5.36	4.93	4.65	69.5	56.59	56.70	58.93	44.84	44.18	45.39	99.0	69.0	17.40
54.3	84.3	5.04	4.96	4.74	84.3	55.23	56.26	58.40	43.64	43.31	44.60	113.8	83.8	16.87
69.0	99.0	5.33	4.74	4.86	99.0	53.71	54.92	56.56	42.28	42.12	43.24	128.5	98.5	15.17
83.8	113.8	5.10	4.79	4.70	113.8	52.99	55.35	56.85	41.41	41.17	42.29	143.3	113.3	13.11
98.5	128.5	5.06	5.02	4.79	128.5	50.92	52.59	53.74	41.33	40.66	41.72	158.0	128.0	12.52
113.3	143.3	5.20	4.94	4.81	143.3	49.83	51.39	52.76	40.31	39.67	40.65	172.8	142.8	11.89
128.0	158.0	5.40	5.04	4.87	158.0	51.09	52.20	53.91	40.55	39.42	40.14	187.5	157.5	10.36
142.8	172.8	5.38	5.05	5.02	172.8	52.07	54.14	55.94	39.65	38.44	39.14	202.3	172.3	11.46
157.5	187.5	5.48	5.06	5.06	187.5	51.27	53.50	56.26	38.95	38.02	38.86	217.0	187.0	13.69
172.3	202.3	5.38	5.12	4.86	202.3	48.79	50.84	53.73	37.81	36.81	37.69	231.8	201.8	14.86
187.0	217.0	5.49	5.18	4.98	217.0	45.53	48.06	50.19	36.86	34.86	35.64	246.5	216.5	12.24
201.8	231.8	5.58	5.21	5.04	231.8	43.70	46.21	48.34	35.08	32.93	33.62	261.3	231.3	9.29
216.5	246.5	5.67	5.27	5.13	246.5	42.02	43.95	45.46	35.54	33.17	33.14	276.0	246.0	7.86
231.3	261.3	5.71	5.39	5.20	261.3	41.24	42.65	43.75	34.91	32.64	32.61	290.8	260.8	7.32
246.0	276.0	5.74	5.42	5.22	276.0	40.63	41.82	42.54	34.11	31.72	31.64	305.5	275.5	7.85
260.8	290.8	5.72	5.40	5.27	290.8	40.35	41.07	41.19	33.20	30.56	30.20	320.3	290.3	9.10
275.5	305.5	5.73	5.36	5.09	305.5	40.54	41.23	41.38	32.18	28.72	28.40	335.0	305.0	10.71
290.3	320.3	5.84	5.37	5.18	320.3	40.77	40.65	40.60	30.37	27.05	26.99	349.8	319.8	13.08
305.0	335.0	6.09	5.46	5.25	335.0	40.57	39.89	39.36	30.07	26.36	26.10	364.5	334.5	16.24
319.8	349.8	6.26	5.47	5.17	349.8	40.09	39.29	39.03	28.73	25.06	25.08	379.3	349.3	11.96
334.5	364.5	6.39	5.52	5.22	364.5	39.46	38.94	38.88	28.05	24.25	24.28	394.0	364.0	9.04
349.3	379.3	6.74	5.74	5.30	379.3	38.97	38.99	39.04	28.13	24.31	23.79	408.8	378.8	8.32
364.0	394.0	6.95	5.85	5.33	394.0	38.76	39.38	40.20	27.42	23.78	22.99	423.5	393.5	8.08
378.8	408.8	7.11	6.03	5.52	408.8	38.93	40.42	41.99	26.33	23.05	22.48	438.3	408.3	7.85
393.5	423.5	7.41	6.42	5.85	423.5	39.05	40.89	42.60	25.84	23.17	22.25	453.0	423.0	8.65
408.3	438.3	7.52	6.58	5.96	438.3	39.53	42.48	44.62	25.00	22.44	21.46	467.8	437.8	8.96
423.0	453.0	7.33	6.60	6.11	453.0	40.88	45.24	44.15	24.14	21.41	20.51	482.5	452.5	11.37
437.8	467.8	7.43	6.96	6.59	467.8	41.79	47.69	43.71	23.47	21.12	20.38	497.3	467.3	14.83
452.5	482.5	7.69	7.21	6.86	482.5	44.49	47.00	39.58	22.54	19.86	19.01	512.0	482.0	18.37
467.3	497.3	7.54	7.20	6.93	497.3	53.93	38.95	34.68	21.33	18.44	17.62	526.8	496.8	16.81
482.0	512.0	7.60	7.33	7.12	512.0	48.10	35.30	32.14	20.19	17.09	16.16	541.5	511.5	14.00
496.8	526.8	7.64	7.35	7.10	526.8	41.22	32.60	30.13	19.10	16.33	15.25	556.3	526.3	12.90
526.3	556.3	7.86	7.73	7.61	556.3	33.23	28.14	26.26	17.22	14.67	13.97	571.0	541.0	11.83
541.0	571.0	8.08	7.91	7.77	571.0	30.49	26.30	24.78	16.33	13.98	13.32	585.8	555.8	11.97
555.8	585.8	8.24	8.14	8.06	585.8	27.95	24.51	23.13	15.51	13.48	12.79	600.5	570.5	12.57
570.5	600.5	8.60	8.51	8.48	600.5	26.18	23.41	22.21	14.74	12.89	12.43	615.3	585.3	11.17
600.0	630.0	9.18	9.11	9.10	630.0	22.91	20.90	20.62	13.43	11.90	10.63	630.0	600.0	9.94

REV. X1  
LRMS-3+  
061024  
Page 1 of 2



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



# Frequency Mixer

# LRMS-3+

## Typical Performance Data

RF/LO (MHz)	RF VSWR (:1)			LO VSWR (:1)			IF (MHz)	IF VSWR (:1)		
	@LO (dBm)			@LO (dBm)				@LO (dBm)		
	+4	+7	+10	+4	+7	+10		+4	+7	+10
0.1	2.70	2.50	2.39	1.68	2.47	3.41	10.0	1.11	1.04	1.19
6.4	1.38	1.28	1.21	1.67	2.46	3.40	24.8	1.11	1.09	1.20
10.0	1.34	1.23	1.15	1.48	2.02	2.63	39.5	1.14	1.13	1.24
24.8	1.34	1.23	1.16	1.48	2.02	2.61	54.3	1.17	1.19	1.28
39.5	1.33	1.23	1.16	1.48	2.01	2.60	69.0	1.18	1.22	1.31
54.3	1.32	1.22	1.16	1.47	2.01	2.60	83.8	1.23	1.28	1.36
69.0	1.31	1.22	1.15	1.49	2.01	2.59	98.5	1.27	1.35	1.43
83.8	1.30	1.21	1.15	1.50	2.04	2.62	113.3	1.26	1.38	1.48
98.5	1.29	1.21	1.15	1.51	2.07	2.65	128.0	1.28	1.41	1.52
113.3	1.28	1.20	1.15	1.53	2.09	2.68	142.8	1.31	1.46	1.58
128.0	1.27	1.20	1.15	1.55	2.11	2.70	157.5	1.31	1.49	1.62
142.8	1.28	1.19	1.15	1.56	2.12	2.70	172.3	1.33	1.51	1.65
157.5	1.27	1.20	1.15	1.60	2.14	2.74	187.0	1.38	1.58	1.72
172.3	1.24	1.17	1.14	1.62	2.19	2.80	201.8	1.38	1.61	1.76
187.0	1.21	1.15	1.12	1.64	2.22	2.85	216.5	1.35	1.58	1.74
201.8	1.19	1.13	1.12	1.69	2.27	2.89	231.3	1.35	1.59	1.76
216.5	1.19	1.13	1.13	1.73	2.32	2.92	246.0	1.37	1.61	1.80
233.0	1.18	1.14	1.13	1.74	2.33	2.93	260.8	1.36	1.61	1.81
246.0	1.17	1.15	1.15	1.77	2.35	2.96	275.5	1.37	1.63	1.82
260.8	1.17	1.15	1.15	1.80	2.39	3.02	290.3	1.38	1.66	1.86
275.5	1.17	1.14	1.14	1.83	2.44	3.10	305.0	1.35	1.62	1.83
290.3	1.17	1.13	1.12	1.86	2.48	3.15	319.8	1.31	1.57	1.78
305.0	1.18	1.12	1.09	1.91	2.51	3.14	334.5	1.33	1.59	1.81
319.8	1.19	1.10	1.05	1.95	2.53	3.14	349.3	1.33	1.60	1.82
334.5	1.20	1.09	1.02	2.00	2.57	3.17	364.0	1.30	1.56	1.77
349.3	1.26	1.12	1.07	2.06	2.65	3.25	378.8	1.33	1.59	1.80
364.0	1.33	1.19	1.14	2.11	2.72	3.34	393.5	1.33	1.60	1.81
378.8	1.39	1.26	1.20	2.15	2.78	3.39	408.3	1.26	1.51	1.71
393.5	1.47	1.34	1.28	2.14	2.76	3.35	423.0	1.27	1.51	1.70
408.3	1.57	1.46	1.41	2.13	2.73	3.31	437.8	1.29	1.55	1.74
423.0	1.64	1.56	1.53	2.14	2.73	3.28	452.5	1.25	1.49	1.67
437.8	1.70	1.65	1.63	2.17	2.76	3.31	467.3	1.24	1.46	1.64
452.5	1.82	1.79	1.78	2.20	2.80	3.34	482.0	1.27	1.50	1.68
467.3	1.93	1.91	1.92	2.21	2.80	3.32	496.8	1.26	1.46	1.62
482.0	2.01	2.01	2.02	2.17	2.73	3.21	511.5	1.25	1.42	1.56
496.8	2.14	2.12	2.14	2.13	2.65	3.10	526.3	1.25	1.43	1.56
526.3	2.25	2.23	2.24	2.17	2.66	3.14	541.0	1.27	1.42	1.54
541.0	2.33	2.30	2.31	2.19	2.69	3.18	555.8	1.23	1.41	1.50
555.8	2.43	2.39	2.40	2.21	2.69	3.19	570.5	1.27	1.41	1.49
570.5	2.50	2.46	2.47	2.21	2.64	3.10	585.3	1.33	1.43	1.50
600.0	2.56	2.50	2.50	2.26	2.64	3.08	600.0	1.37	1.44	1.50

REV. X1  
LRMS-3+  
061024  
Page 2 of 2



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

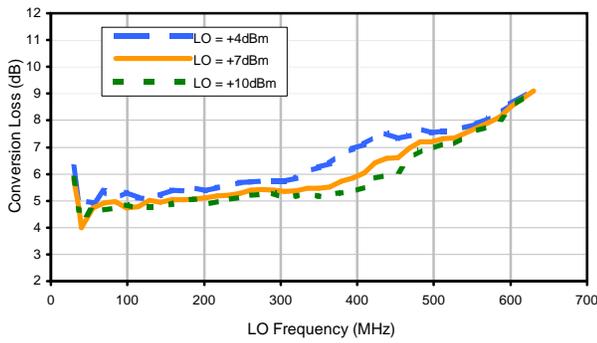


The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see

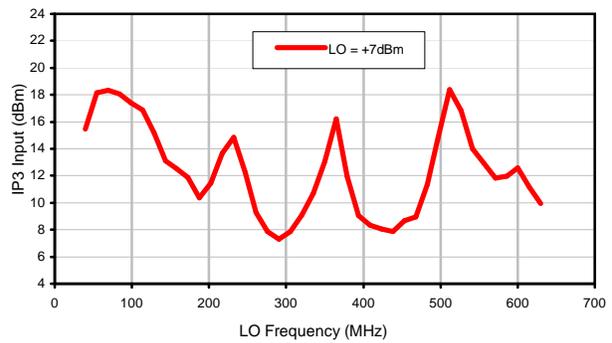


## Typical Performance Curves

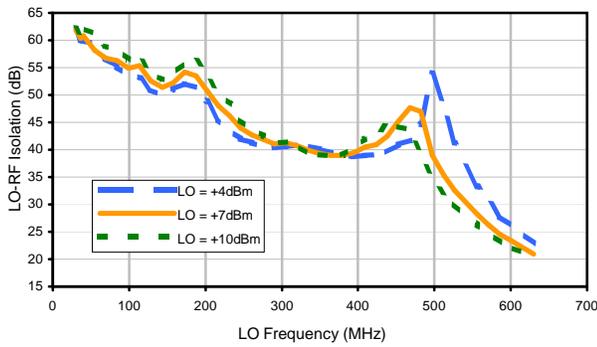
### Conversion Loss



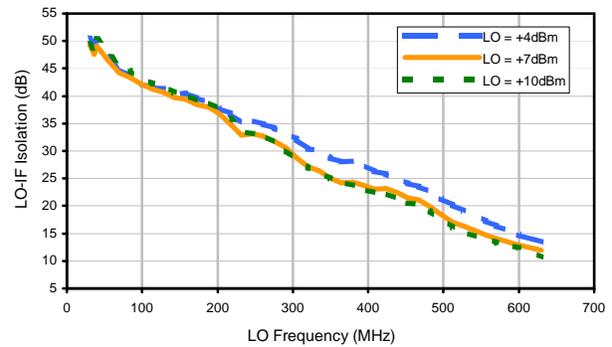
### IP3 Input



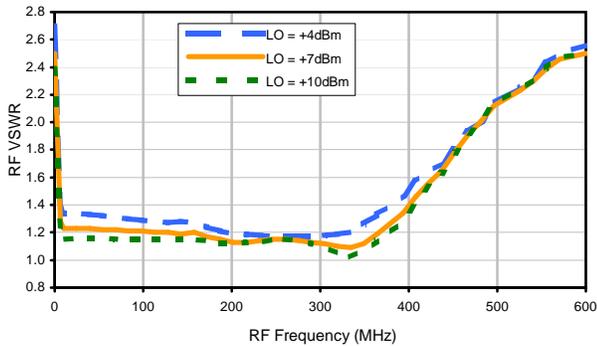
### LO-RF Isolation



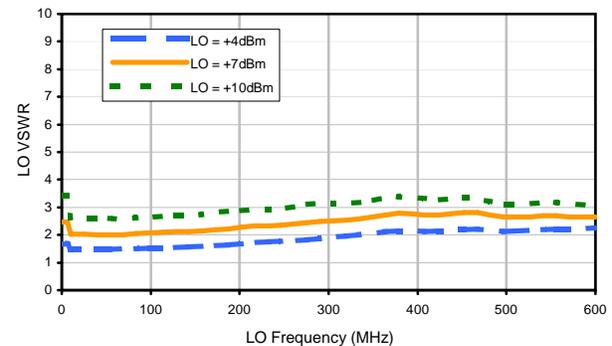
### LO-IF Isolation



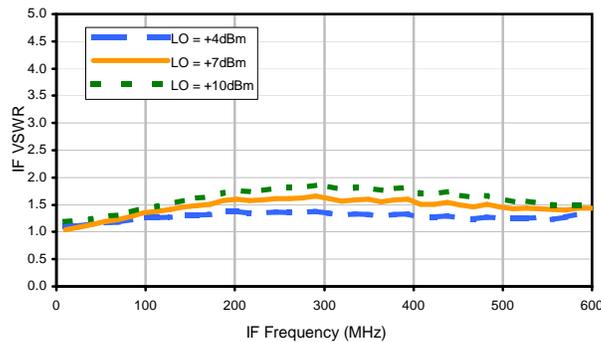
### RF VSWR



### LO VSWR



### IF VSWR

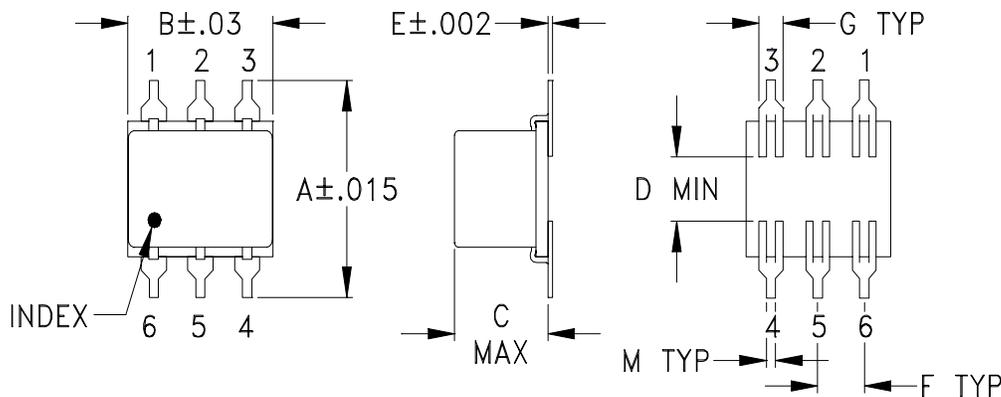


# Case Style

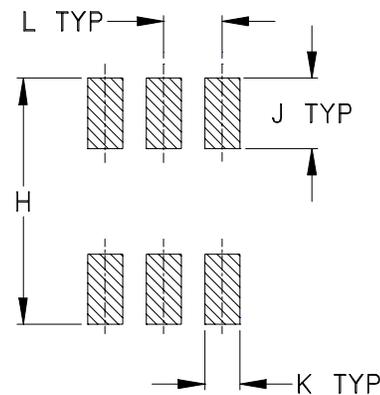
# QQQ

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.



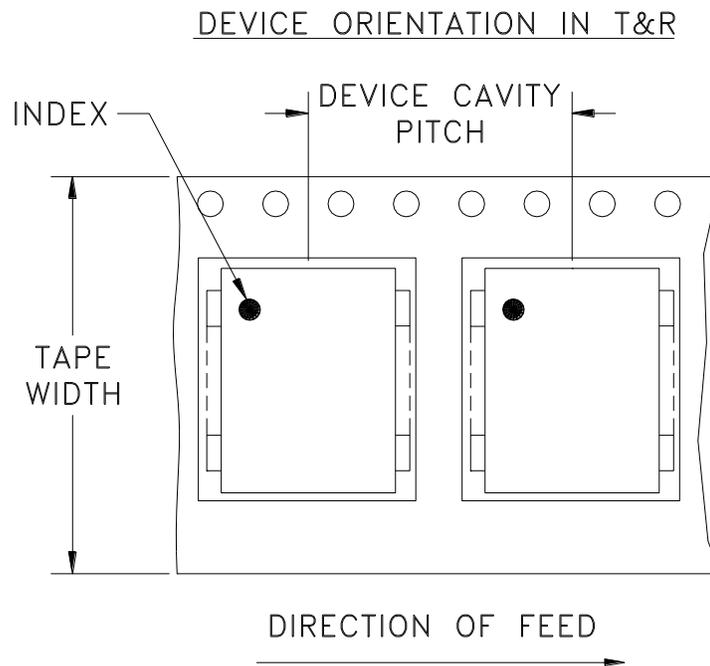
INTERNET <http://www.minicircuits.com>

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

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

Mini-Circuits ISO 9001 & ISO 14001 Certified

# 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](http://www.minicircuits.com/pages/pdfs/tape.pdf)

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



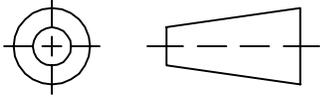
INTERNET <http://www.minicircuits.com>

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

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

Mini-Circuits ISO 9001 & ISO 14001 Certified

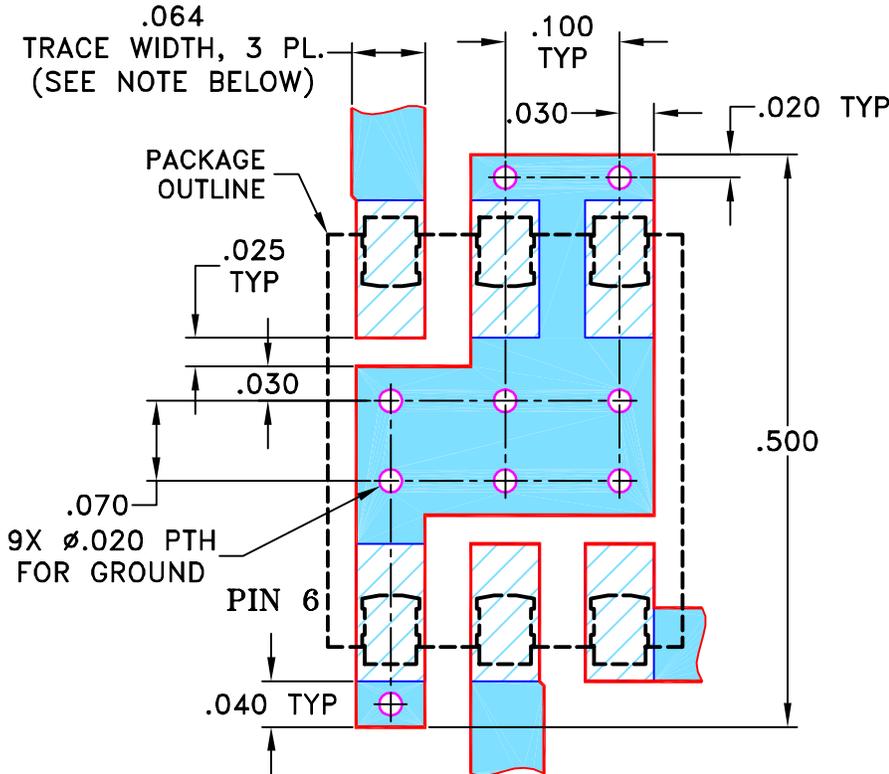
THIRD ANGLE PROJECTION



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" ± 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 ±  
3 PL DECIMALS ± .005  
ANGLES ±  
FRACTIONS ±

CHECKED WL 08/02/02

APPROVED DJ 08/02/02



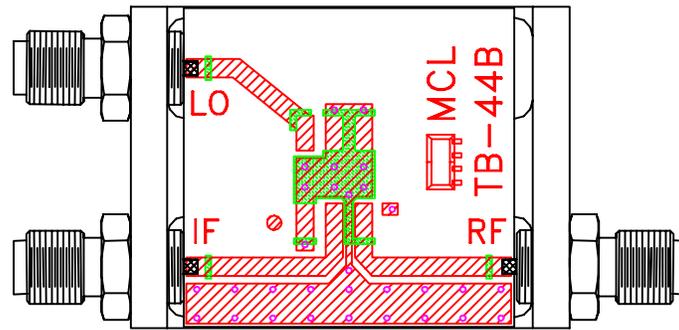
Mini-Circuits® 13 Neptune Avenue  
Brooklyn NY 11235

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

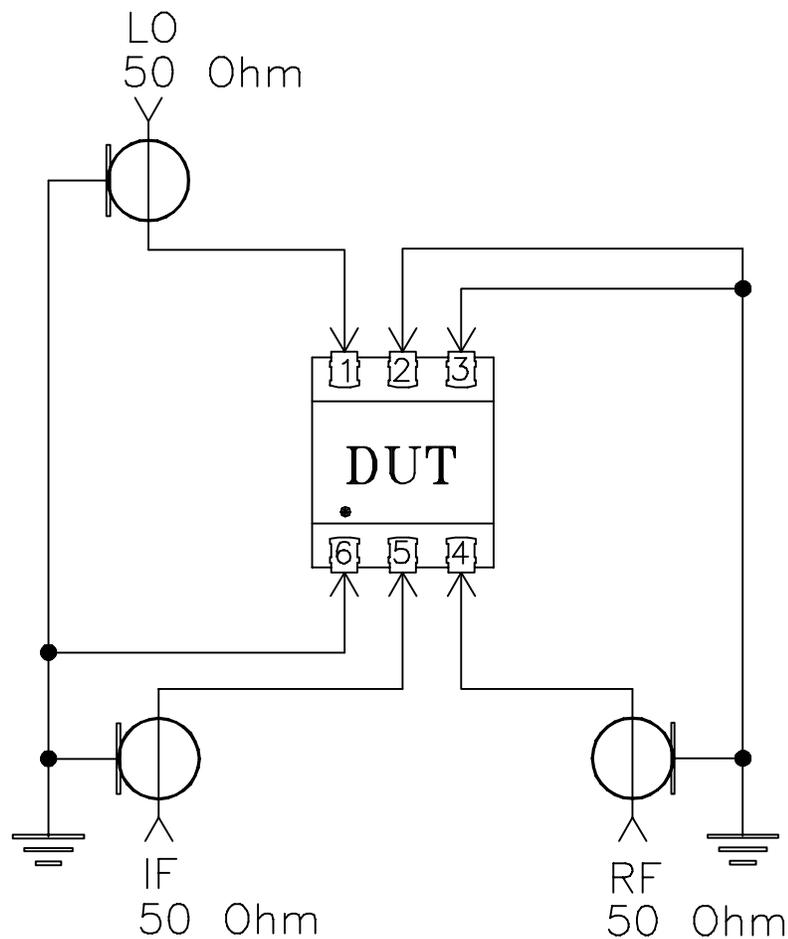
Mini-Circuits®  
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL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

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



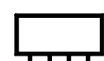
TB-44+



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