X2 Frequency Multiplier

KBA-20+

50Ω Output 3200 to 4400 MHz



Generic photo used for illustration purposes only

CASE STYLE: SM2

+RoHS Compliant

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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	200mW

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

Pin Connections

INPUT	10
OUTPUT	5
SAMPLE*	3
GROUND	1,2,4,6,7,8,9

* Sample port output power, -10 dBc typ.
Terminate in 50 ohms if not used.

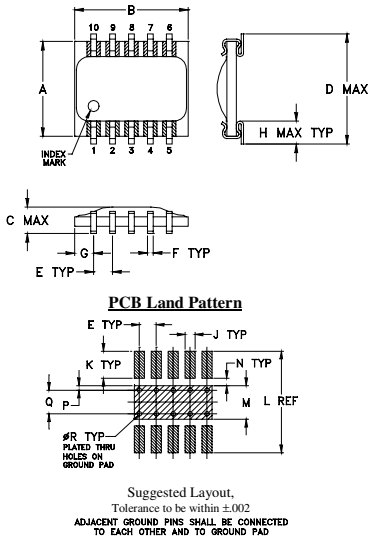
Features

- low conversion loss, 12 dB typ.
- low profile, 0.070" max.
- aqueous washable
- protected by US patent 5,534,830

Applications

- synthesizers
- local oscillators

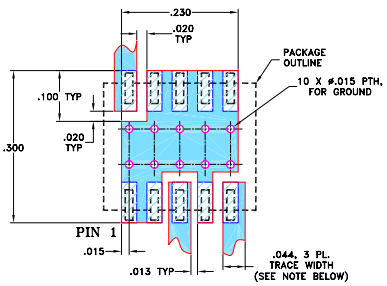
Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	
.250	.300	.095	.290	.050	.015	.050	.060	
6.35	7.62	2.41	7.37	1.27	0.38	1.27	1.52	
J	K	L	M	N	P	Q	R	wt
.030	.080	.300	.100	.020	.015	.070	.014	grams
0.76	2.03	7.62	2.54	0.51	0.38	1.78	0.36	0.3

Demo Board MCL P/N: TB-99
Suggested PCB Layout (PL-066)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

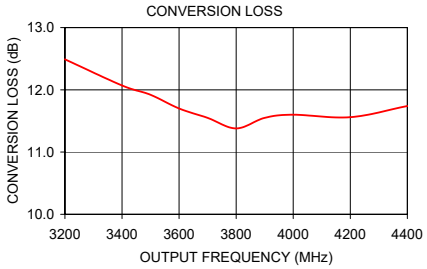
Electrical Specifications

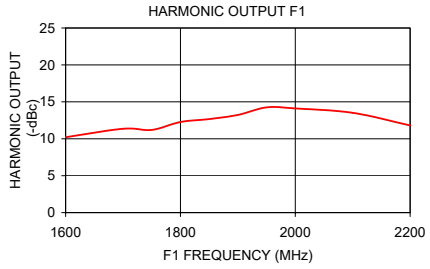
MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)		*HARMONIC OUTPUT (dBc)					
	F1	F2					F1		F3		F4	
	Input	Output	Min.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.
2	1600-2200	3200-4400	11	15	12	15.8	12	7	20	13	23	10

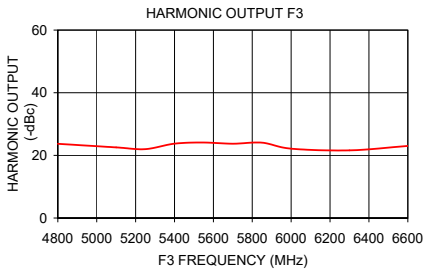
* Harmonics of input frequency below the power level of F2

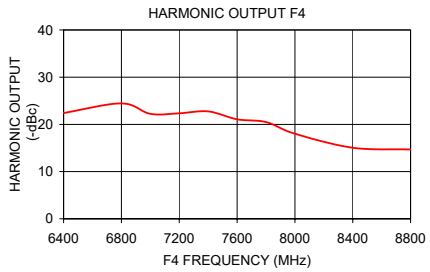
Typical Performance Data 25°C

Input Frequency (MHz)	Conversion Loss (dB) F2	Harmonic Output (-dBc) F1	F3	F4
1600.00	12.49	10.21	23.69	22.41
1700.00	12.07	11.36	22.56	24.44
1750.00	11.92	11.20	22.00	22.24
1800.00	11.70	12.27	23.75	22.35
1850.00	11.55	12.67	24.11	22.75
1900.00	11.38	13.23	23.71	21.07
1950.00	11.55	14.25	24.05	20.49
2000.00	11.60	14.11	22.15	18.03
2100.00	11.56	13.51	21.61	15.05
2200.00	11.74	11.80	23.02	14.68









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

Frequency Multiplier (Doubler) KBA-20+

Typical Performance Data

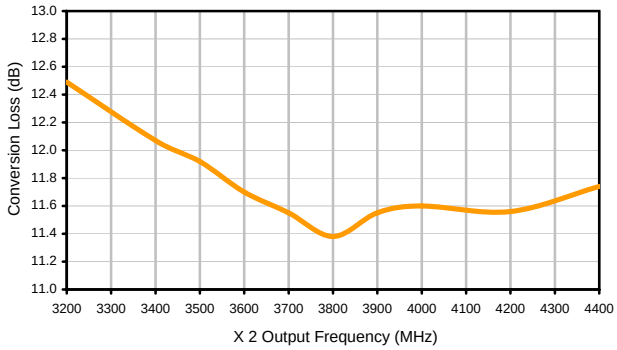
FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X 1 OUTPUT	X 2 OUTPUT	X 3 OUTPUT	X 4 OUTPUT	X 2 OUTPUT	X 1 OUTPUT	X 3 OUTPUT	X 4 OUTPUT
1600	3200	4800	6400	12.49	10.21	23.69	22.41
1700	3400	5100	6800	12.07	11.36	22.56	24.44
1750	3500	5250	7000	11.92	11.20	22.00	22.24
1800	3600	5400	7200	11.70	12.27	23.75	22.35
1850	3700	5550	7400	11.55	12.67	24.11	22.75
1900	3800	5700	7600	11.38	13.23	23.71	21.07
1950	3900	5850	7800	11.55	14.25	24.05	20.49
2000	4000	6000	8000	11.60	14.11	22.15	18.03
2100	4200	6300	8400	11.56	13.51	21.61	15.05
2200	4400	6600	8800	11.74	11.80	23.02	14.68

*Harmonic Output below power level of X 2 Output .

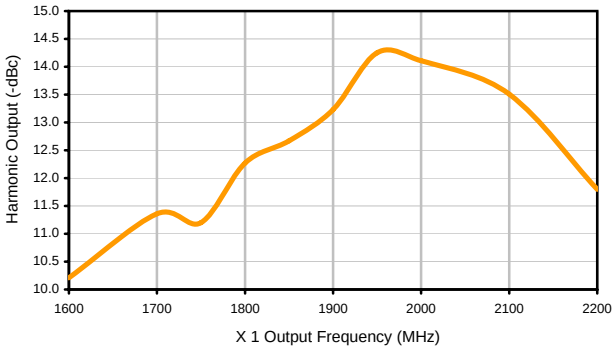
Frequency Multiplier (Doubler) KBA-20+

Typical Performance Curves

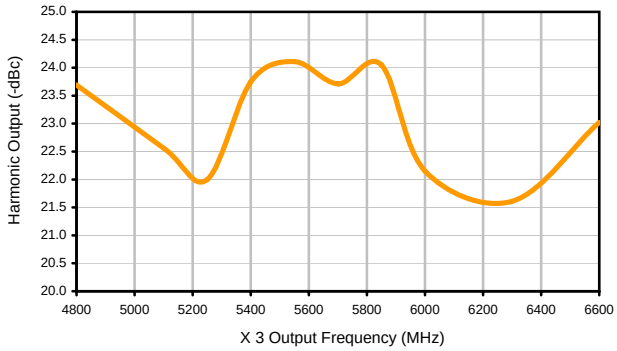
Conversion Loss X 2 Output



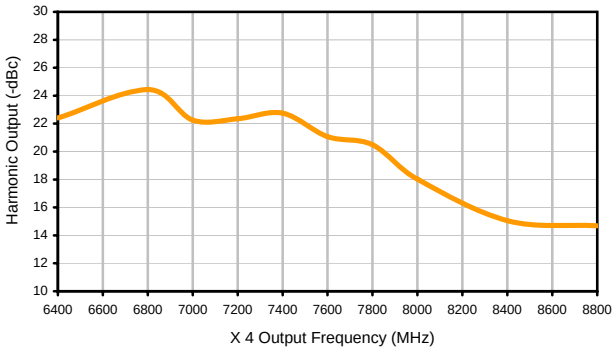
Harmonic X 1 Output



Harmonic X 3 Output



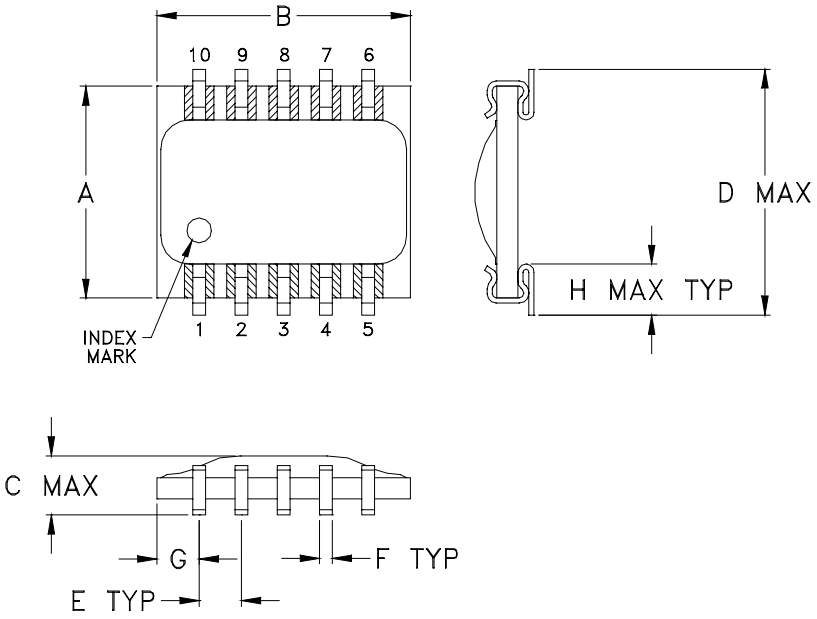
Harmonic X 4 Output



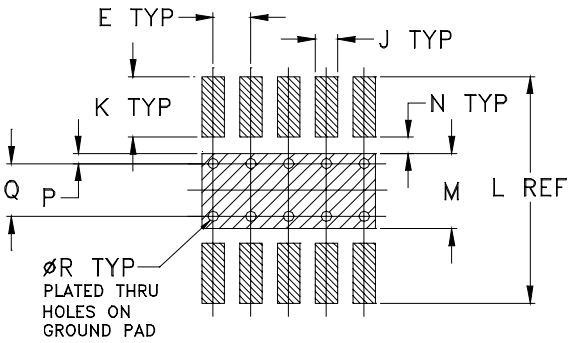
Case Style SM2

SM2

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

ADJACENT GROUND PINS SHALL BE CONNECTED TO EACH OTHER AND TO GROUND PAD

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
SM2	.250 (6.35)	.300 (7.62)	.095 (2.41)	.290 (7.37)	.050 (1.27)	.015 (0.38)	.050 (1.27)	.060 (1.52)	.030 (0.76)	.080 (2.03)	.300 (7.62)	.100 (2.54)	.020 (0.51)	.015 (0.38)

CASE #	Q	R	WT. GRAM
SM2	.070 (1.78)	.014 (0.36)	.3

Dimensions are in inches (mm). Tolerances: ± .005

Notes:

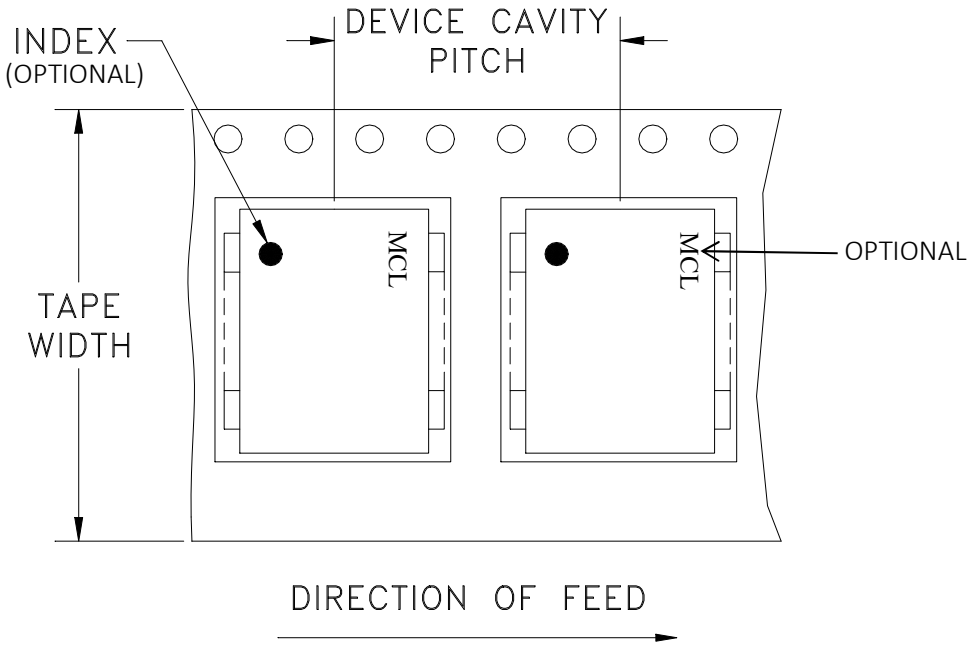
1. Case material: Plastic encapsulation on Ceramic base.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate.
   For RoHS-5 Case Styles: Tin-Lead plate.

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Tape & Reel Packaging TR-F34

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
16	12	7	Small quantity standard (see note)	20
				50
				100
				200
		13	Standard	500
				1000

Note: Availability of small reel quantity varies by model.
Refer to pricing and availability on individual model dashboard.

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

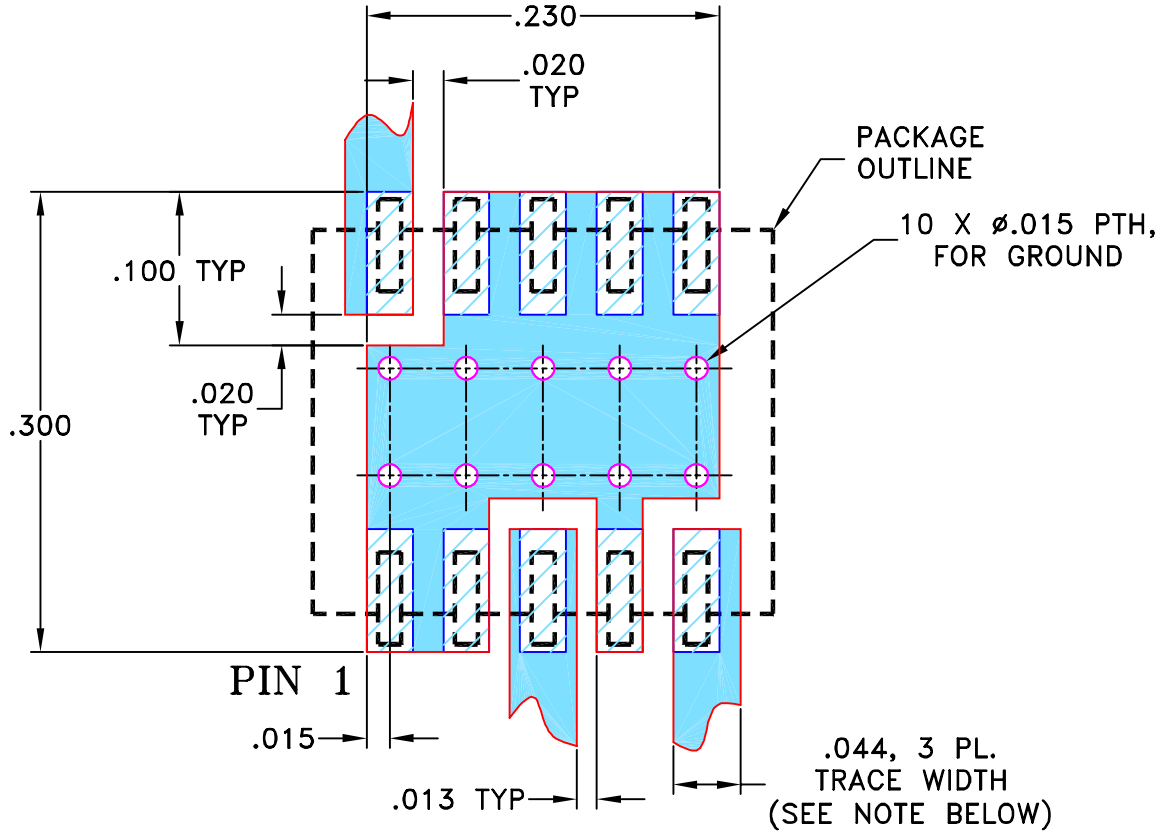
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/02/02	GF	DJ
A	M102713	UPDATED NOTES, ADDED "...WITH SMOBC"	01/16/06	GT	IL

SUGGESTED MOUNTING CONFIGURATION FOR SM2 CASE STYLE, "ld" PIN CONNECTION



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015". 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	GF	07/18/02
TOLERANCES ON:	CHECKED	WL	08/02/02
2 PL DECIMALS ±	APPROVED	DJ	08/02/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

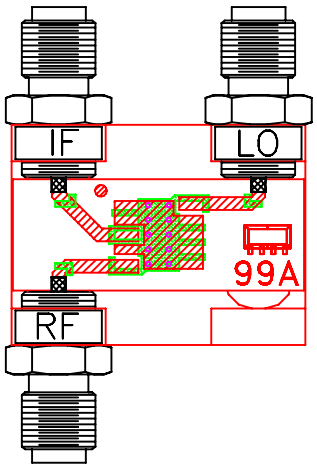
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, ld, SM2, MBA, TB-99

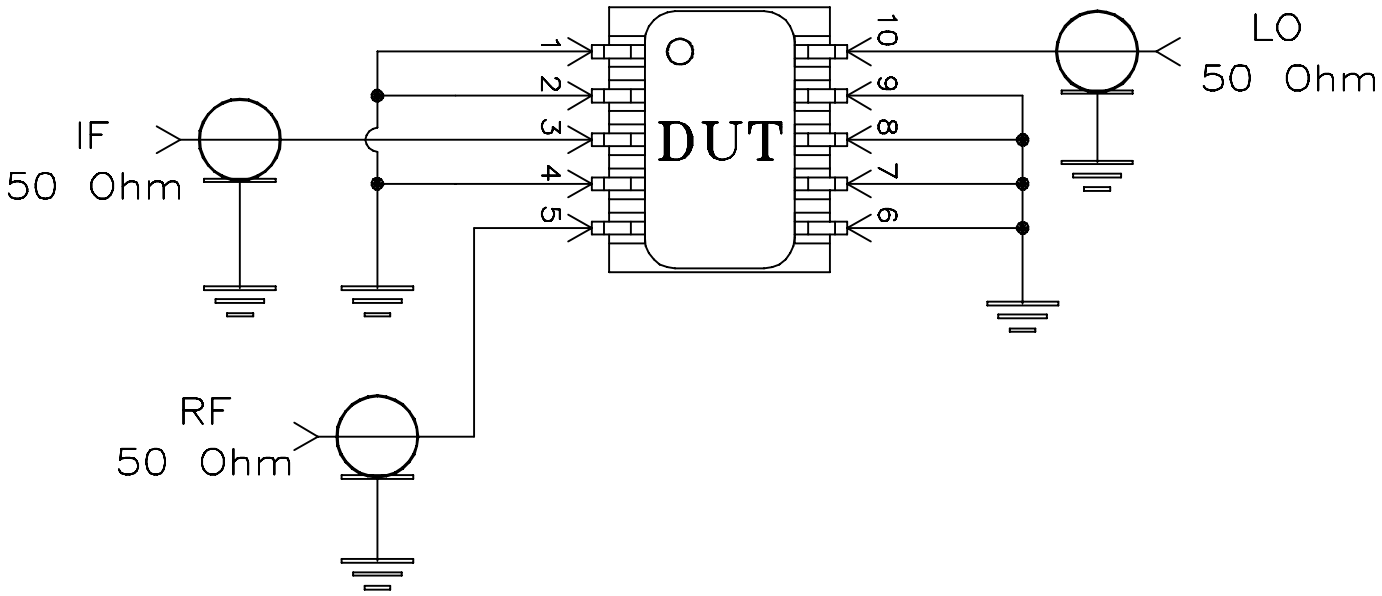
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-066	A

FILE:	SCALE:	SHEET:
98PL066	8:1	1 OF 1

Evaluation Board and Circuit



TB-99



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

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Environmental Specifications ENV02T1

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215

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