

# X2 Frequency Multiplier

50Ω Output 5400 to 9600 MHz

**KBA-40+**  
**KBA-40**



CASE STYLE: SM2

## Maximum Ratings

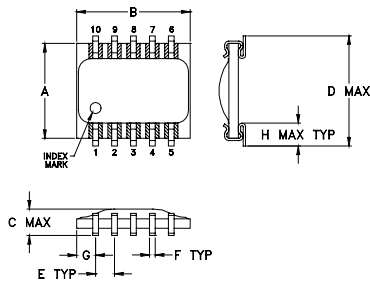
Operating Temperature	-40°C to 85 °C
Storage Temperature	-55°C to 100°C
RF Input Power	200mW
Permanent damage may occur if any of these limits are exceeded.	

## Pin Connections

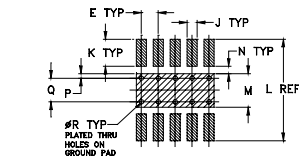
INPUT	10
OUTPUT	6
SAMPLE*	1
GROUND	2,3,4,5,7,8,9

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

## Outline Drawing



## PCB Land Pattern

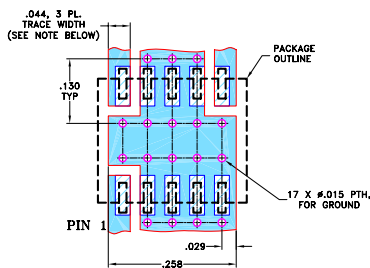


Suggested Layout,  
Tolerance to be within ±.002  
ADJACENT GROUND PINS SHALL BE CONNECTED  
TO EACH OTHER AND TO GROUND PAD

## Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
.250	.300	.095	.290	.050	.15	.050	.060	6.35	7.62	2.41	7.37	1.27	0.38	1.27	1.52	
.030	.080	.300	.100	.020	.015	.070	.014	0.76	2.03	7.62	2.54	0.51	0.38	1.78	0.36	0.3

## Demo Board MCL P/N: TB-74 Suggested PCB Layout (PL-067)



- 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.  
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
4. 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](http://www.minicircuits.com/MCLStore/terms.jsp)

## Features

- wideband, 5400 to 9600 MHz
- low insertion loss, 12.3 dB typ.
- low profile, 0.070" max.
- aqueous washable
- protected by U.S patent 5,534,830

## Applications

- synthesizers
- local oscillators

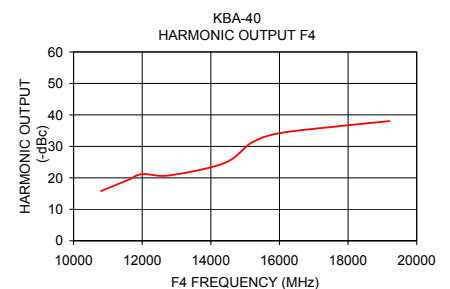
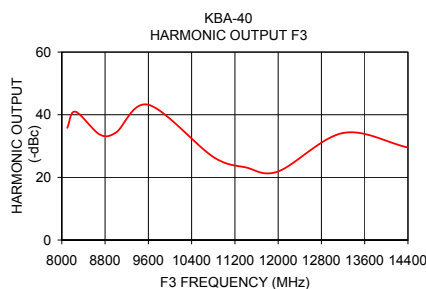
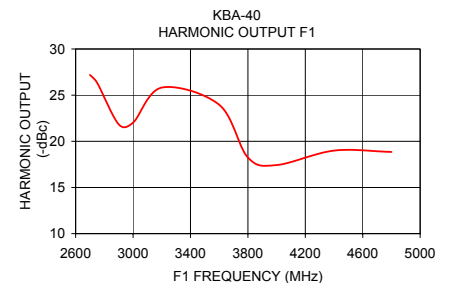
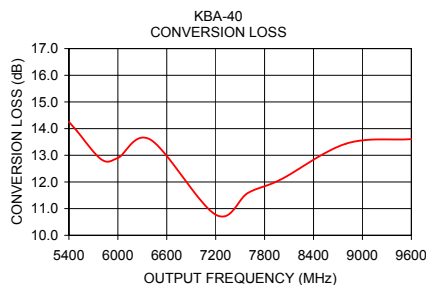
## Electrical Specifications

MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)		*HARMONIC OUTPUT (dBc)					
	F1 Input	F2 Output	Min.	Max.	Typ.	Max.	F1 Typ.	F1 Min.	F3 Typ.	F3 Min.	F4 Typ.	F4 Min.
2	2700-4800	5400-9600	10	16	12.3	17.6	18	10	26	15	24	14
	2700-4800	5400-9600	5	10	13	19	15	8	26	16	26	12

\* Harmonics of input frequency below the power level of F2

## Typical Performance Data 25°C

Input Frequency (MHz)	Conversion Loss (dB) F2	F1	F3 (-dBc)	F4
2700.00	14.26	27.19	35.82	15.80
2750.00	13.90	26.33	40.98	16.70
2900.00	12.84	21.84	33.70	19.39
3000.00	12.90	22.03	34.30	21.18
3200.00	13.59	25.82	43.18	20.79
3600.00	10.77	23.96	26.54	24.70
3800.00	11.60	18.24	23.18	31.24
4000.00	12.09	17.42	21.89	34.19
4400.00	13.44	19.00	34.16	36.27
4800.00	13.61	18.85	29.53	38.03



# Frequency Multiplier (Doublers)

# KBA-40

## Typical Performance Data

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT*		
X 1 OUTPUT	X 2 OUTPUT	X 3 OUTPUT	X 4 OUTPUT	X 2 OUTPUT	X 1 OUTPUT	X 3 OUTPUT	X 4 OUTPUT
2700	5400	8100	10800	14.26	27.19	35.82	15.80
2750	5500	8250	11000	13.90	26.33	40.98	16.70
2900	5800	8700	11600	12.84	21.84	33.70	19.39
3000	6000	9000	12000	12.90	22.03	34.30	21.18
3200	6400	9600	12800	13.59	25.82	43.18	20.79
3600	7200	10800	14400	10.77	23.96	26.54	24.70
3800	7600	11400	15200	11.60	18.24	23.18	31.24
4000	8000	12000	16000	12.09	17.42	21.89	34.19
4400	8800	13200	17600	13.44	19.00	34.16	36.27
4800	9600	14400	19200	13.61	18.85	29.53	38.03

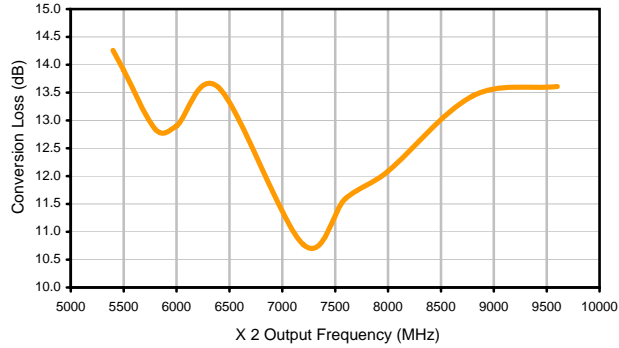
\*Harmonic Output below power level of X 2 Output .

# Frequency Multiplier (Doubler)

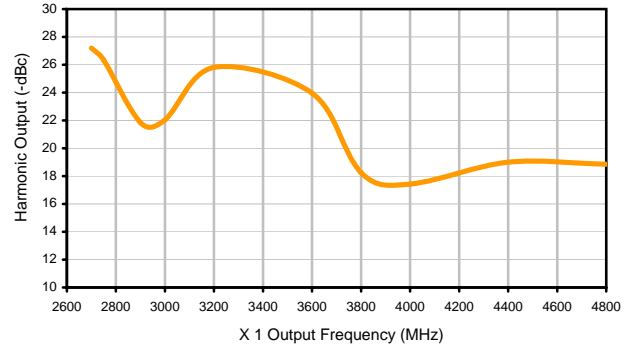
# KBA-40

## Typical Performance Curves

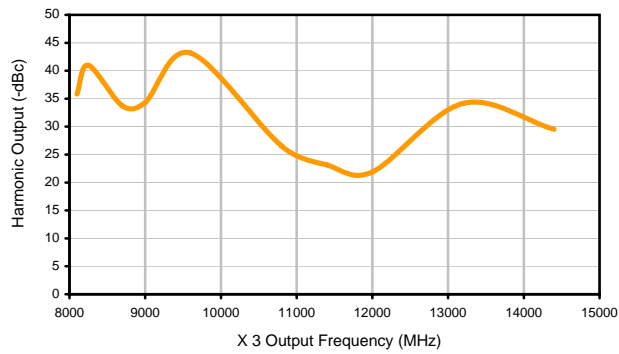
### Conversion Loss X 2 Output



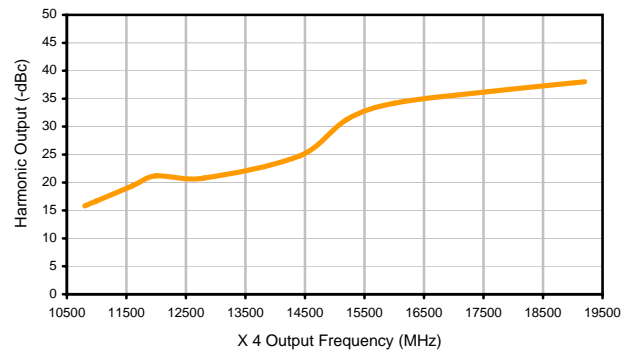
### Harmonic X 1 Output



### Harmonic X 3 Output



### Harmonic X 4 Output

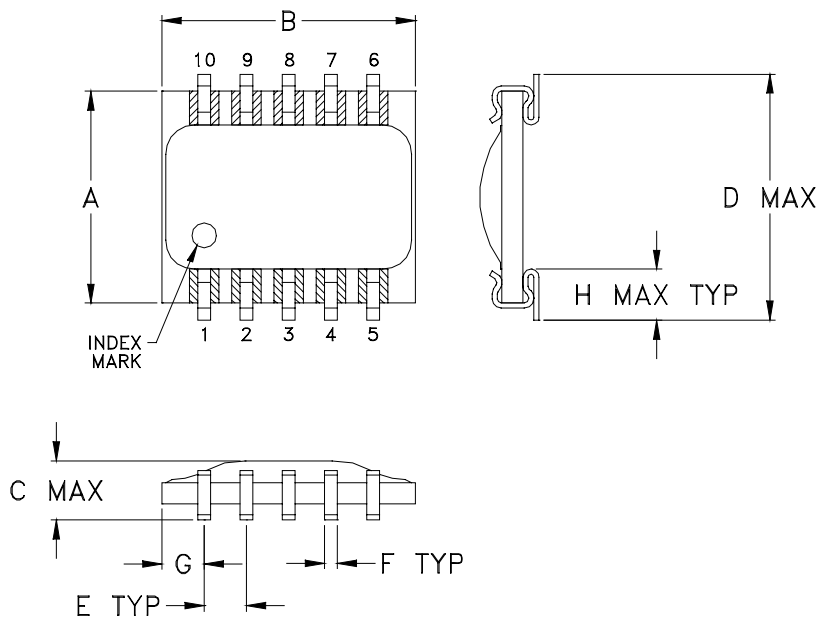


# Case Style

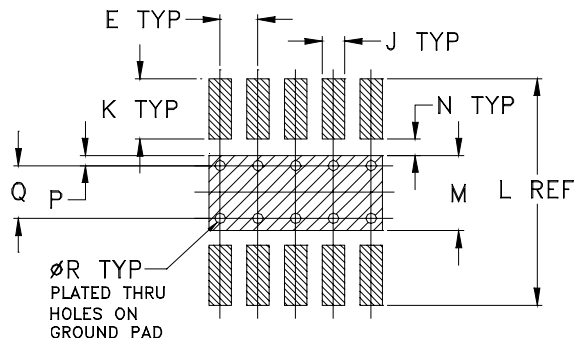
# SM2

SM2

## Outline Dimensions



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

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:  $\pm .005$

### 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.



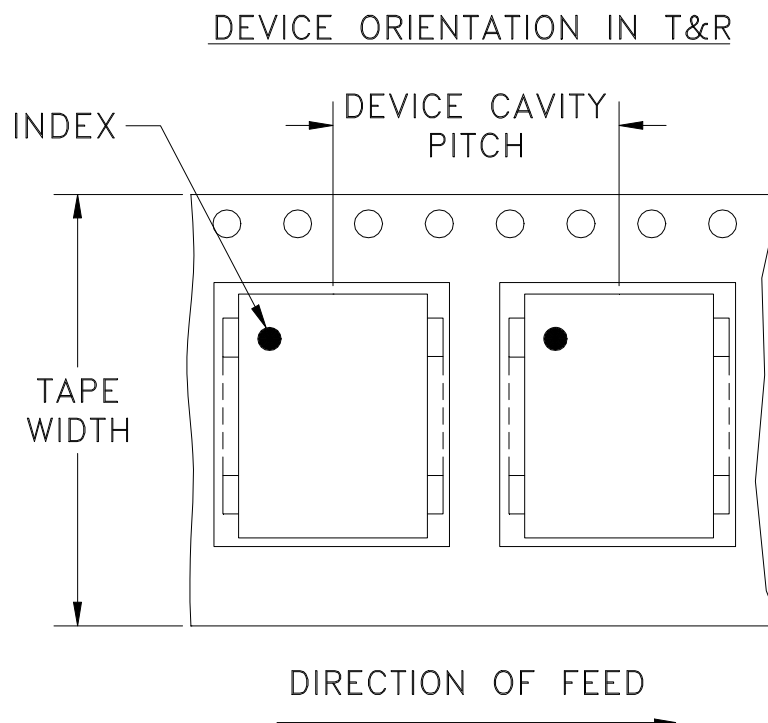
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# Tape & Reel Packaging TR-F34



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



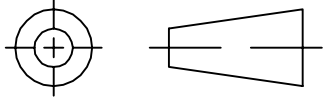
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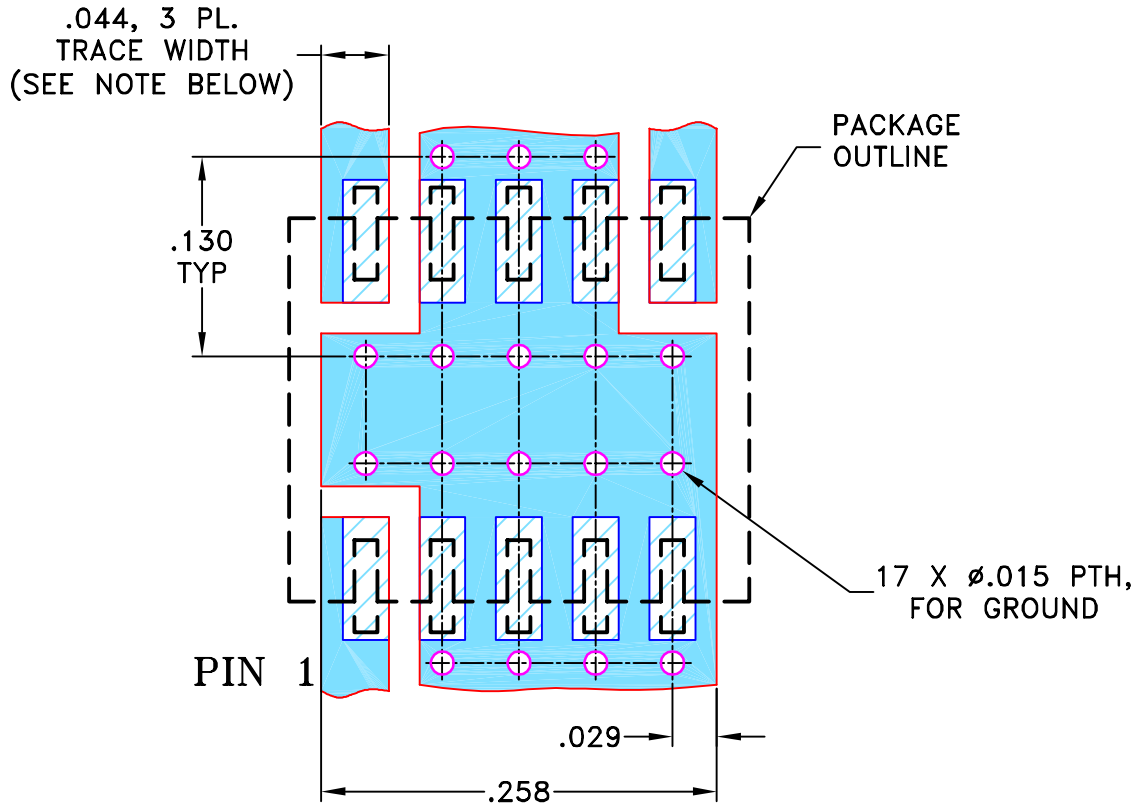
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/02/02	AV	DJ
A	M102713	UPDATED NOTES	01/14/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR SM2 CASE STYLE, "le" 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	AV	07/22/02
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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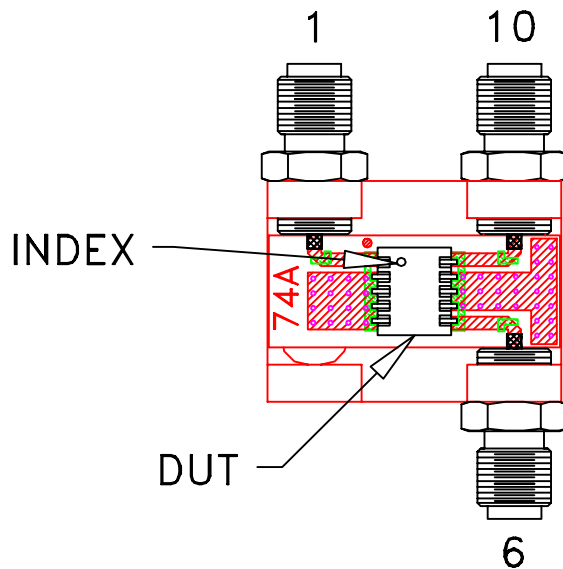
PL, le, SM2, MBA, TB-74

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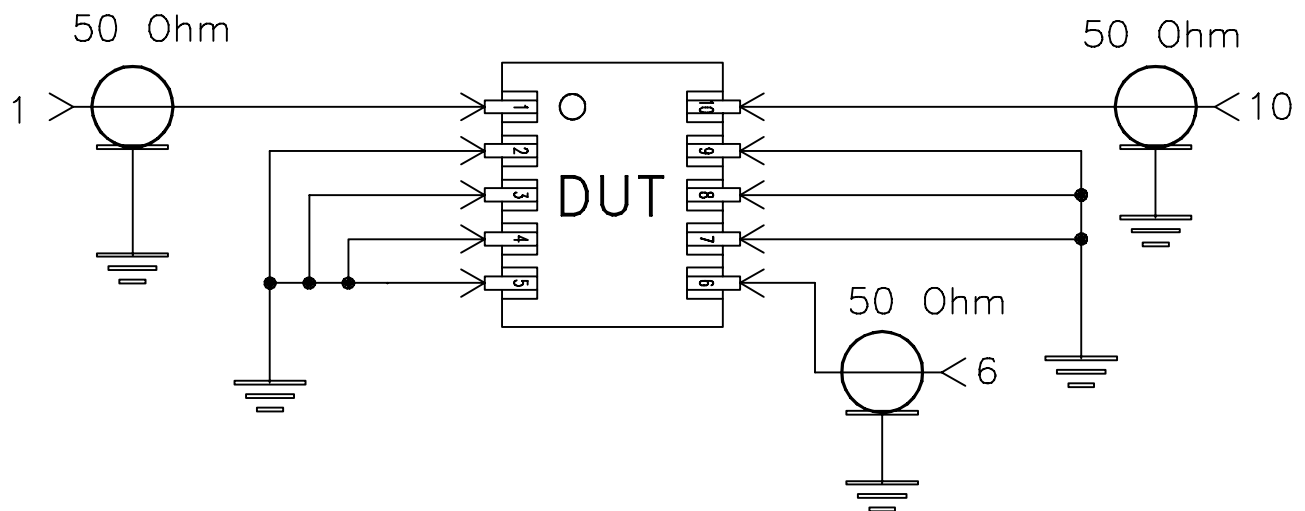
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-067	A
FILE:	98PL067	SCALE:	8:1
		SHEET:	1 OF 1

# Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



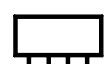
TB-74



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 inch.

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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