High Directivity

Monolithic Amplifier 0.5-2.5 GHz

Product Features

- 2.8V & 5V operation
- Micro-miniature size .120”X.120”
- Internal DC blocking at RF input and output
- High directivity, 17 dB typ.
- Low noise figure
- Output power, up to +11.4 dBm typ.
- Excellent repeatability
- Low cost
- Aqueous washable

MNA-3+

CASE STYLE: DQ849
PRICE:Contact Sales Dept.

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

Typical Applications

- Buffer amplifier
- Cellular
- PCN
- Communications satellite
- Defense

Not Recommended for New Designs

please refer to PCN# 15-055 at:

http://www.minicircuits.com/support/product_change.html

or PCN History on Dash Board

General Description

MNA-3+ is wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in a 3x3 mm MCLP plastic package. MNA-3+ is fabricated using GaAs MESFET technology. Expected MTBF at 85°C case temperature is 120,000 years at 2.8V; 60,000 years at 5V.

Function	Pin Number	Description	
RF IN	2	RF input pin	
RF-OUT	5	RF output pin	
DC	7, with 1000 pF bypass to ground; connect pin 8 via 33 ohms to pin 7 externally		Bias pins
GND	3,4 and paddle in center of bottom		Connections to ground
OPTIONAL	1,6	No internal connection; recommended use: per PCB Layout PL-078	

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

Electrical Specifications at 25°C

Parameter		Min.	Typ.		Max.	Units
Frequency Range		0.5			2.5	GHz
at DC Volts		5.0	5.0	2.8	5.0	V
Gain	f=0.5 GHz		14.6	14.2		dB
	f=1.0 GHz		16.2	15.2		
	f=1.5 GHz		16.1	15.0		
	f=2.0 GHz	13.0	15.0	14.0		
	f=2.5 GHz		11.8	11.0		
Input Return Loss	f=0.75-2.5 GHz		10	10		dB
Output Return Loss	f=0.75-2.5 GHz		14	14		dB
Output Power @ 1 dB compression	f=0.5 GHz		11.4	9.7		dBm
	f=2.5GHz		9.5	8.0		
Output IP3	f=1 GHz		19.6	21.3		dBm
	f=2 GHz		18.0	19.9		
Noise Figure	f=1 GHz		4.9	4.8		dB
Directivity (Isolation - Gain)	f=0.5-2.5 GHz		17			
DC Current			30	28	40	mA
Thermal Resistance, junction-to-case			78			°C/W

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
DC Voltage	7V at pin 7 10V at pins 2 & 5
Power Dissipation	500mW
Input Power	13dBm (continuous operation)
	24dBm (5 minutes max)

Note: Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.

Product Marking

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: DQ849

MNA-3+: Plastic package, exposed paddle, lead finish: tin/silver/nickel

Tape & Reel: F104

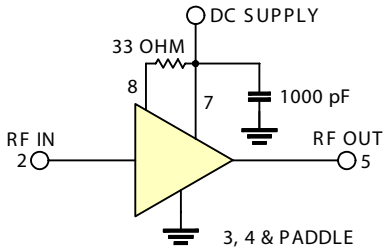
Standard quantities available on reel: 7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices.

Suggested Layout for PCB Design: PL-078

Evaluation Board: TB-186+

Environmental Ratings: ENV08T1

Recommended Application Circuit



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ESD Rating

Human Body Model (HBM): Class 1A (250v to < 500v) in accordance with ANSI/ESD STM 5.1 - 2001

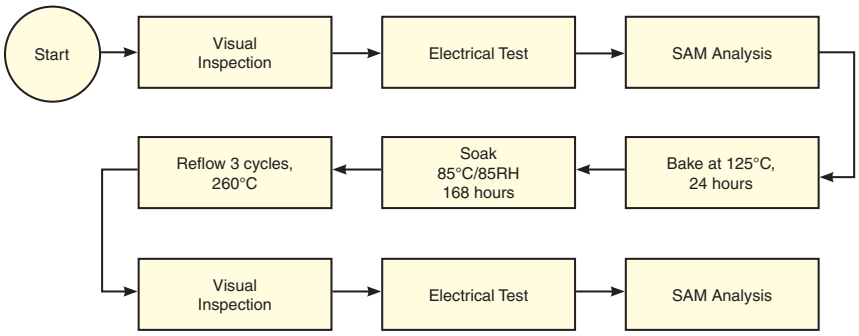
Charged Device Model (CDM): Class III (500 to 1000v) in accordance with JESD22-C101A

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020C

No.	Test Required	Condition	Standard	Quantity
1	Visual Inspection	Low Power Microscope Magnification 40x	MIP-IN-0003 (MCT spec)	45 units
2	Electrical Test	Room Temperature	SCD (MCL spec)	45 units
3	SAM Analysis	Less than 10% growth in term of delamination	J-Std-020C (Jedec Standard)	45 units
4	Moisture Sensitivity Level 1	Bake at 125°C for 24 hours Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak	J-Std-020C (Jedec Standard)	45 units

MSL Test Flow Chart



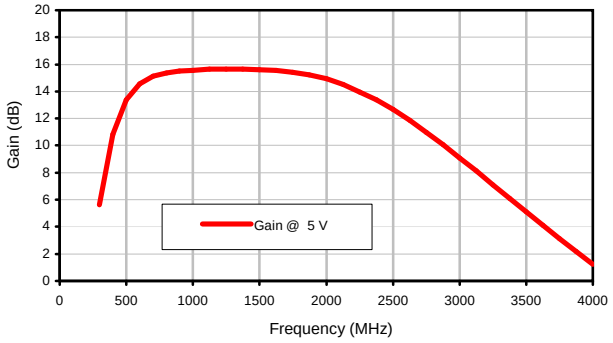
MMIC Amplifier MNA-3+

Typical Performance Data

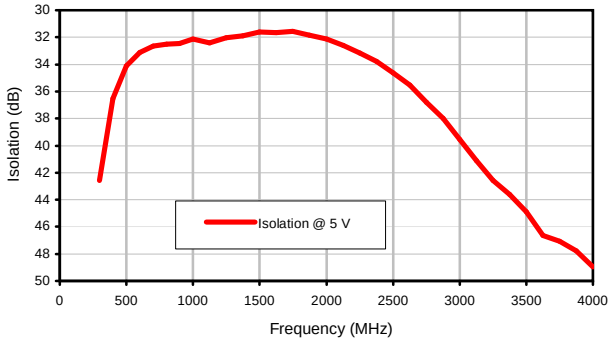
FREQUENCY (MHz)	GAIN (dB) 5 V	ISOLATION (dB) 5 V	RETURN LOSS IN (dB) 5 V	RETURN LOSS OUT (dB) 5 V
300	5.62	42.59	0.25	4.38
400	10.84	36.51	1.22	7.80
500	13.40	34.10	3.07	10.48
600	14.57	33.10	5.31	12.27
700	15.11	32.65	7.52	13.65
800	15.37	32.49	9.40	14.87
900	15.51	32.47	10.66	15.93
1000	15.57	32.15	11.32	17.23
1125	15.64	32.39	11.56	18.00
1250	15.63	32.02	11.43	18.72
1375	15.63	31.87	11.42	18.99
1500	15.60	31.63	11.69	18.53
1625	15.54	31.64	12.32	17.82
1750	15.40	31.56	13.52	16.88
1875	15.21	31.84	15.51	16.23
2000	14.92	32.14	18.87	15.62
2125	14.50	32.58	24.86	14.86
2250	13.97	33.17	25.47	14.73
2375	13.38	33.77	18.50	14.62
2500	12.66	34.63	14.23	14.69
2625	11.86	35.54	11.42	14.91
2750	10.99	36.80	9.44	15.26
2875	10.07	37.99	7.92	15.84
3000	9.08	39.55	6.73	16.51
3125	8.11	41.12	5.78	17.33
3250	7.10	42.57	5.05	18.20
3375	6.10	43.61	4.44	19.17
3500	5.09	44.88	3.96	20.46
3625	4.11	46.65	3.55	21.65
3750	3.12	47.07	3.19	22.93
3875	2.17	47.78	2.91	24.34
4000	1.22	48.95	2.68	26.36

Typical Performance Curves

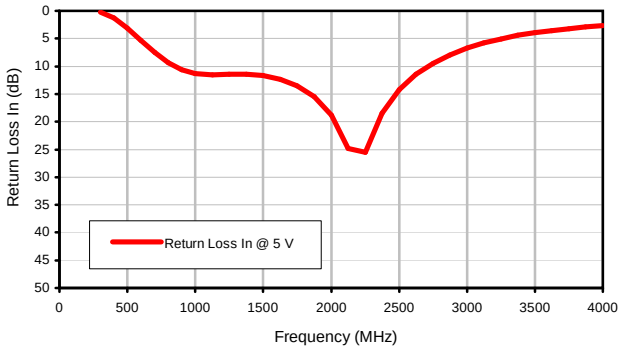
Gain



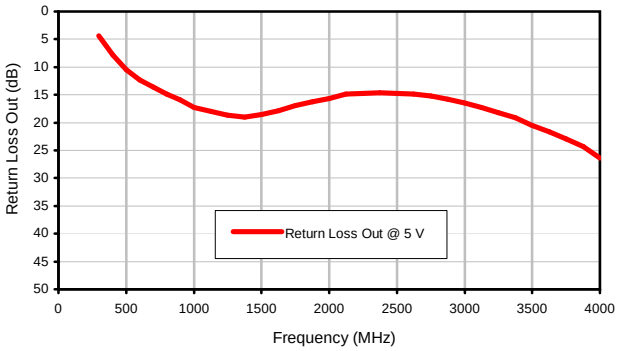
ISOLATION



Return Loss In



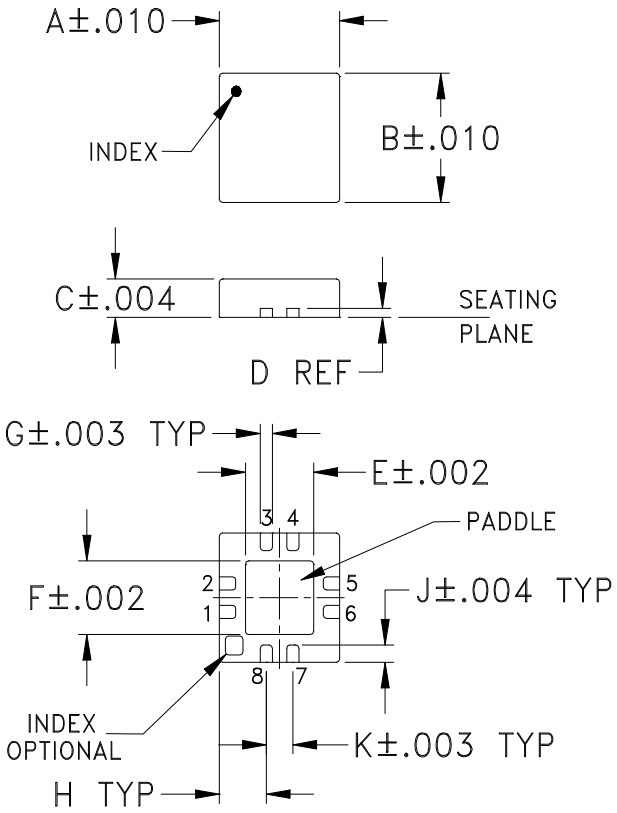
Return Loss Out



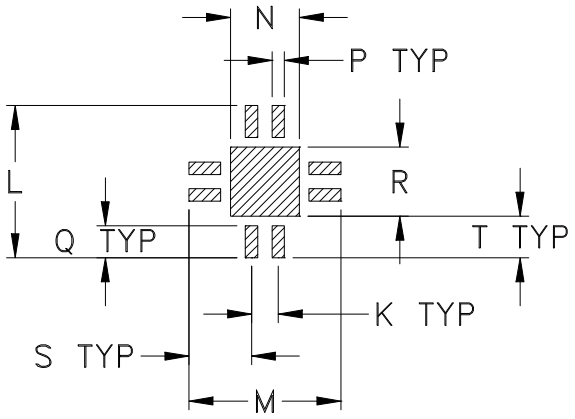
Case Style DQ

DQ849

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
DQ849	.118 (3.00)	.118 (3.00)	.035 (0.89)	.008 (0.20)	.067 (1.70)	.067 (1.70)	.012 (0.30)	.046 (1.17)	.016 (0.41)	.026 (0.66)	.148 (3.76)	.148 (3.76)	.067 (1.70)

CASE #	P	Q	R	S	T	WT. GRAM
DQ849	.012 (0.30)	.031 (0.79)	.067 (1.70)	.061 (1.55)	.041 (1.04)	.02

Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3 Pl. ± .004

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin plated. All models, (+) suffix. See Data sheet.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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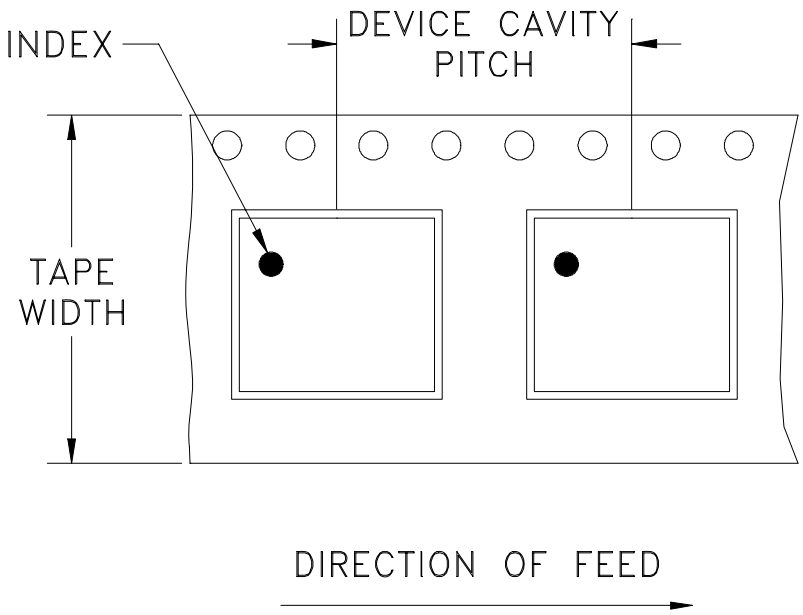
Tape & Reel Packaging TR-F104

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
				1000
		7	Standard	2000

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

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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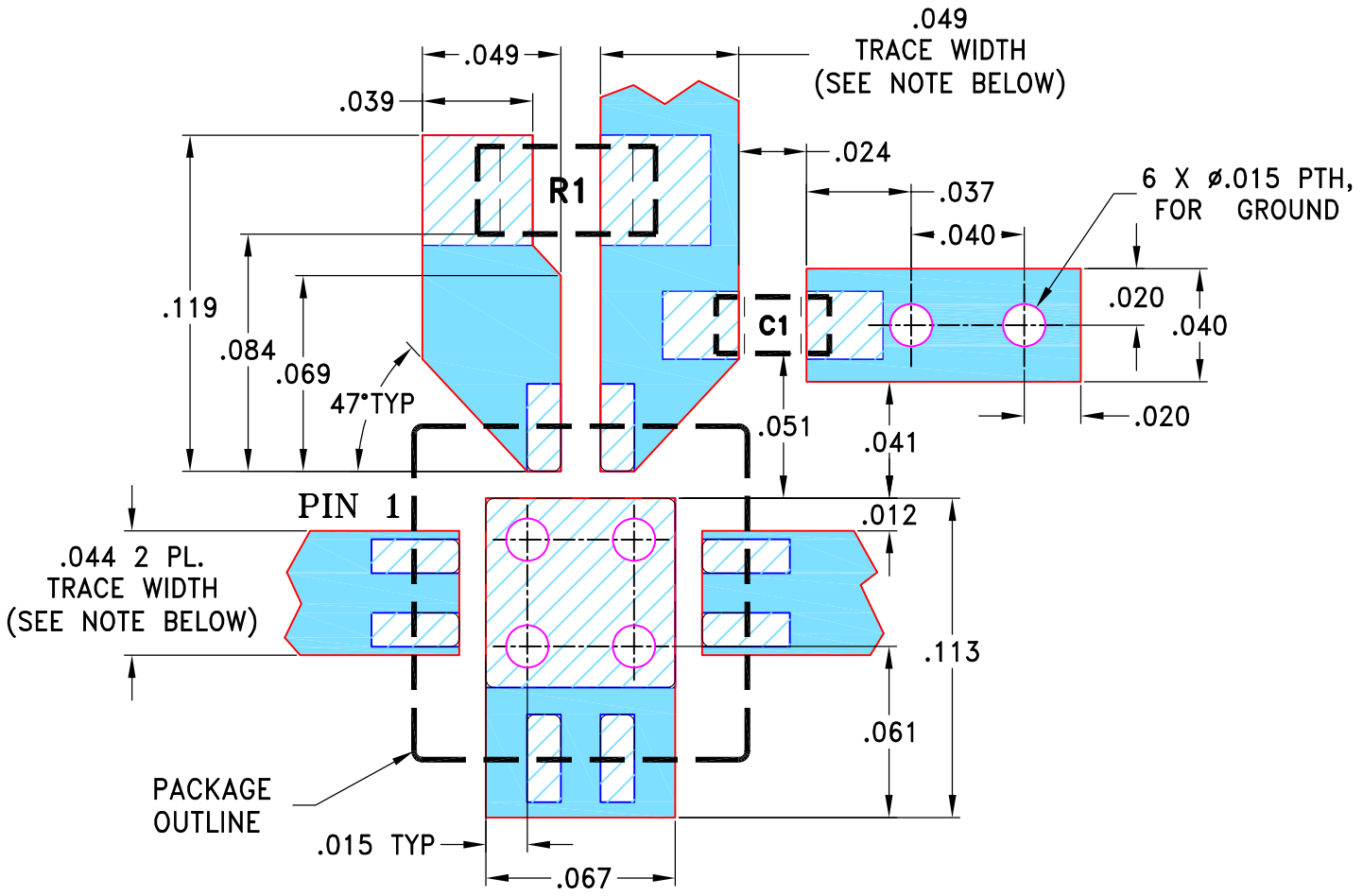
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/05/02	GF	DJ
A	M82598	MODIFIED LAYOUT	08/12/02	GF	MM
B	M102713	ADDED "...WITH SMOBC"	01/14/06	GF	IL
C	ECO-003400	REMOVED COMP. VALUE, ADDED NOTE REF. TO EVAL. BOARD	07/23/20	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR DQ849 CASE STYLE



RESISTOR R1: 0603 SIZE

CAPACITOR C1: 0402 SIZE

NOTES:

1. LINE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020±.0015"; COPPER: 1/2 OZ. FOR OTHER MATERIALS LINE WIDTH MAY NEED TO BE MODIFIED.
2. FOR "R1" & "C1" VALUES REFER TO THE CORRESPONDING EVALUATION BOARD TB-186-XX+.
3. 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	07/19/02
TOLERANCES ON:	CHECKED	LC	08/01/02
2 PL DECIMALS ±	APPROVED	DJ	08/05/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

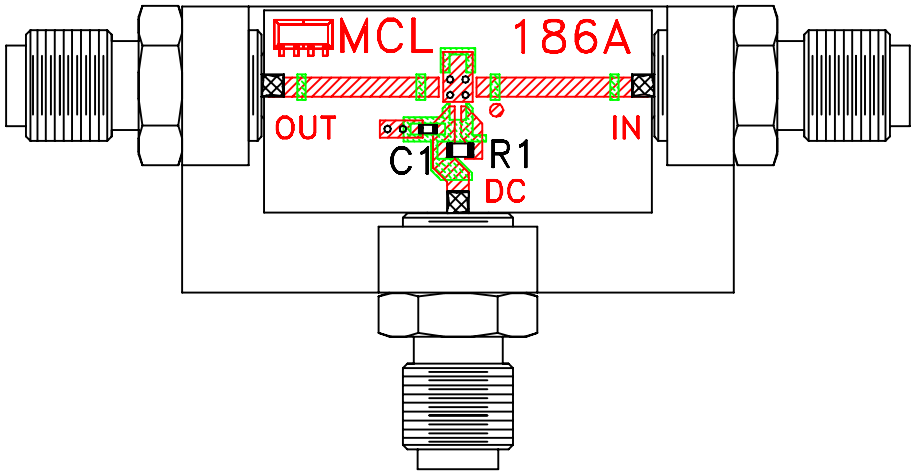
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, DQ849, TB-186-XX+

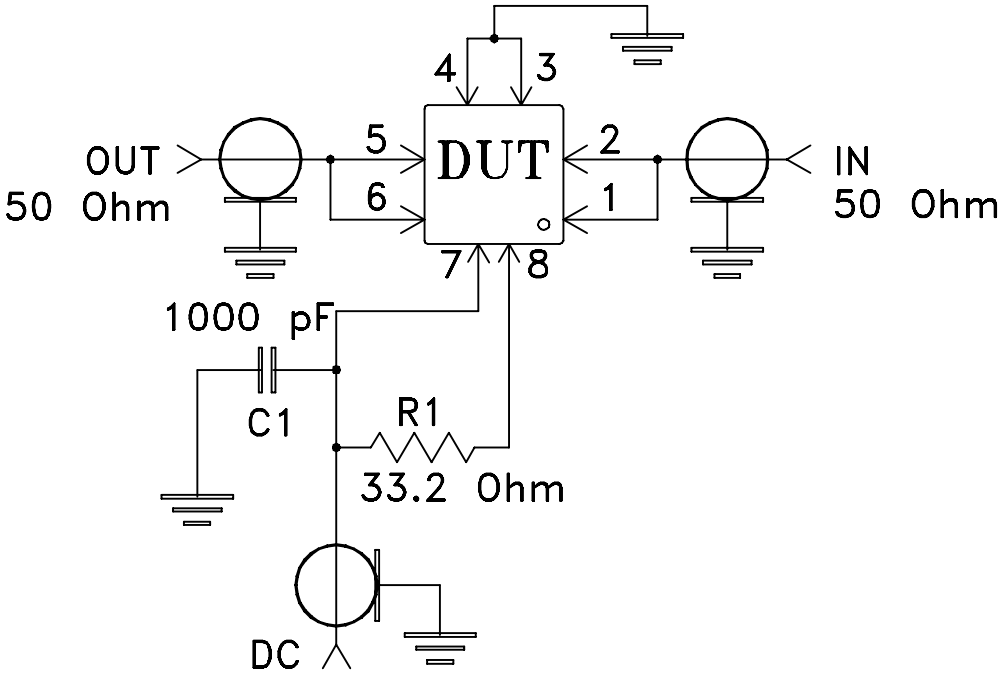
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-078	C

FILE:	SCALE:	SHEET:
98PL078	15:1	1 OF 1

Evaluation Board and Circuit



TB-186+



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.
3. Pins 1 and 6 have no internal connecton.
4. Paddle underneath DUt must be grounded.

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Environmental Specifications **ENV08T1**

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 or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020

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
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