

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 +12.2 dBm typ.
- Excellent repeatability
- Low cost
- Aqueous washable

**MNA-5+**

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 and
recommended replacement at:

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

or PCN History on Dash Board

General Description

MNA-5+ is a 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-5+ 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	—	18.5	18.0	dB
	f=1.0 GHz	—	22.8	21.4	
	f=1.5 GHz	—	21.9	20.5	
	f=2.0 GHz	17.0	20.6	19.4	
	f=2.5 GHz	—	18.0	17.4	
Input Return Loss	f=0.75-2.5 GHz		12.5	12.5	dB
Output Return Loss	f=0.75-2.5 GHz		10	10	dB
Output Power @ 1 dB compression	f=0.5 GHz		12.2	10.1	dBm
	f=2.5GHz		8.0	6.5	
Output IP3	f=1 GHz		19.4	18.0	dBm
	f=2 GHz		21.0	20.0	
Noise Figure	f=1 GHz		3.5		dB
Directivity (Isolation - Gain)			17		
DC Current		28	26	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	5dBm (continuous operation)
	25dBm (5 minutes max)

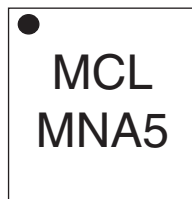
Note: Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.

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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-5+: Plastic package, exposed paddle, lead finish: tin-silver over nickel

Tape & Reel: F104

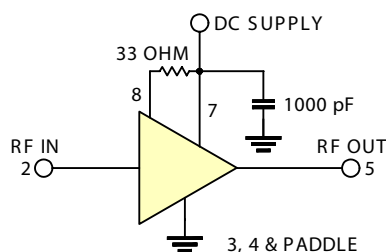
Standard quantities available on reel: 7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices.

Suggested Layout for PCB Design: PL-078

Evaluation Board: TB-186+

Environmental Ratings: ENV08T1

Recommended Application Circuit



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ESD Rating

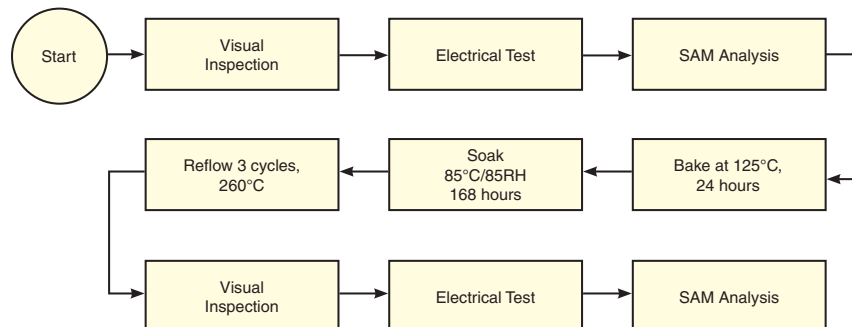
Human Body Model (HBM): Class 1A (250v to < 500v) in accordance with ANSI/ESD STM 5.1 - 2001

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**Notes**

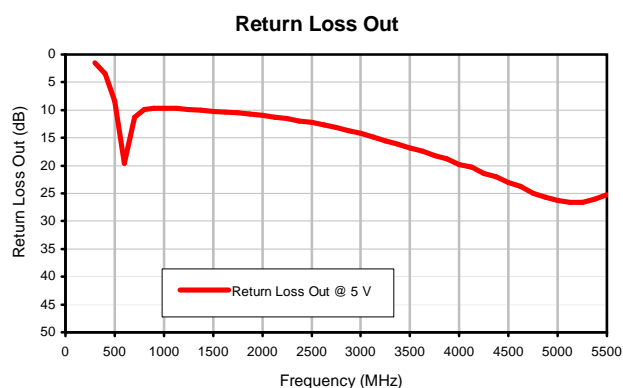
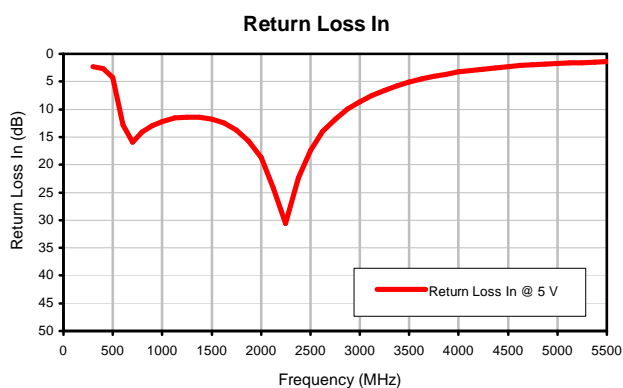
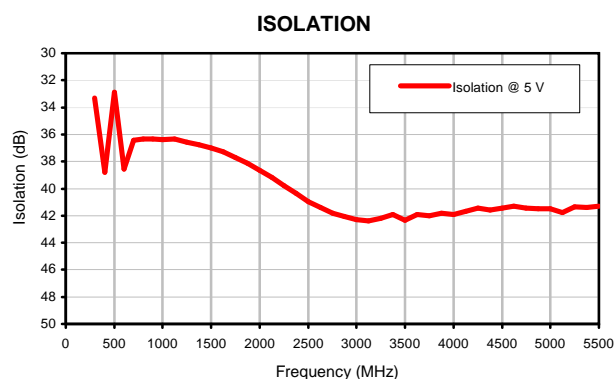
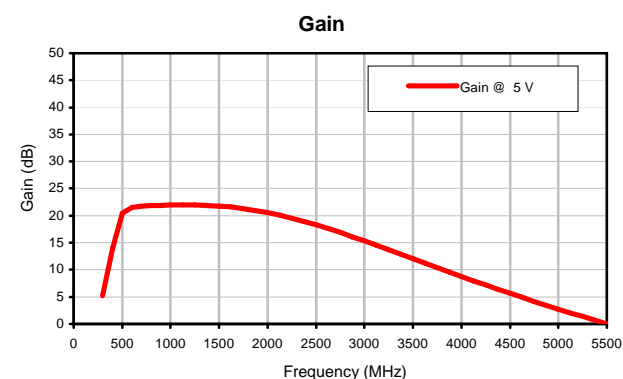
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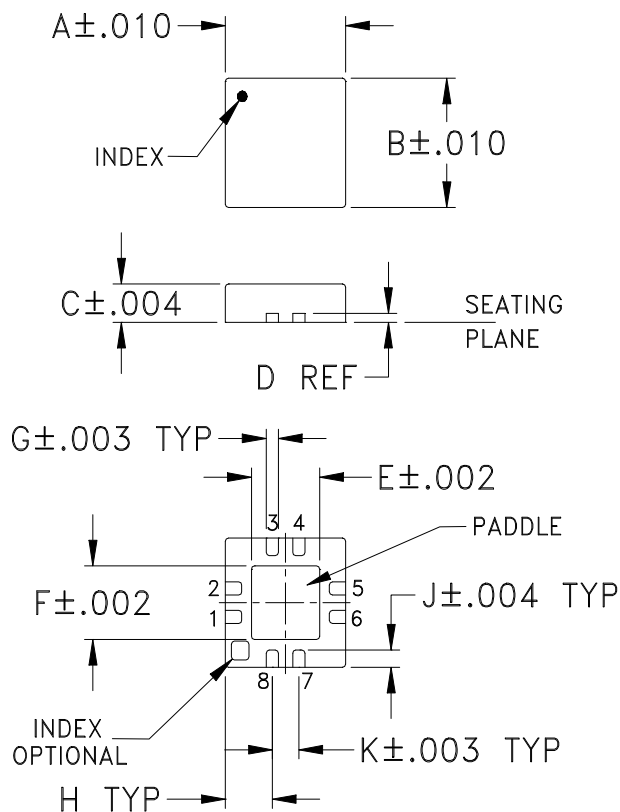
Typical Performance Data

FREQUENCY (MHz)	GAIN (dB) 5 V	ISOLATION (dB) 5 V	RETURN LOSS IN (dB) 5 V	RETURN LOSS OUT (dB) 5 V
300	5.15	33.32	2.29	1.47
400	14.01	38.81	2.71	3.43
500	20.40	32.87	4.32	8.38
600	21.51	38.57	12.80	19.57
700	21.77	36.43	15.89	11.25
800	21.82	36.33	14.06	9.95
900	21.88	36.33	12.92	9.66
1000	21.94	36.38	12.24	9.71
1125	21.98	36.35	11.56	9.69
1250	21.98	36.56	11.40	9.95
1375	21.91	36.76	11.38	10.08
1500	21.78	37.01	11.77	10.25
1625	21.58	37.27	12.52	10.39
1750	21.33	37.70	13.74	10.54
1875	20.98	38.12	15.75	10.77
2000	20.57	38.65	18.75	10.94
2125	20.08	39.19	24.29	11.24
2250	19.53	39.78	30.59	11.52
2375	18.93	40.34	22.42	11.93
2500	18.28	40.98	17.44	12.23
2625	17.59	41.38	14.03	12.71
2750	16.87	41.81	11.83	13.12
2875	16.11	42.06	9.97	13.70
3000	15.33	42.27	8.61	14.21
3125	14.52	42.39	7.45	14.84
3250	13.71	42.22	6.53	15.50
3375	12.88	41.91	5.72	16.14
3500	12.05	42.36	5.08	16.84
3625	11.23	41.93	4.52	17.45
3750	10.38	42.01	4.03	18.25
3875	9.56	41.84	3.65	18.83
4000	8.78	41.92	3.27	19.77
4125	7.97	41.68	3.01	20.28
4250	7.19	41.43	2.72	21.41
4375	6.41	41.59	2.53	21.96
4500	5.65	41.42	2.30	23.01
4625	4.91	41.30	2.11	23.70
4750	4.17	41.44	1.94	25.00
4875	3.45	41.49	1.85	25.73
5000	2.73	41.48	1.73	26.29
5125	2.05	41.77	1.64	26.63
5250	1.36	41.35	1.57	26.66
5375	0.68	41.39	1.50	26.04
5500	0.03	41.31	1.44	25.24

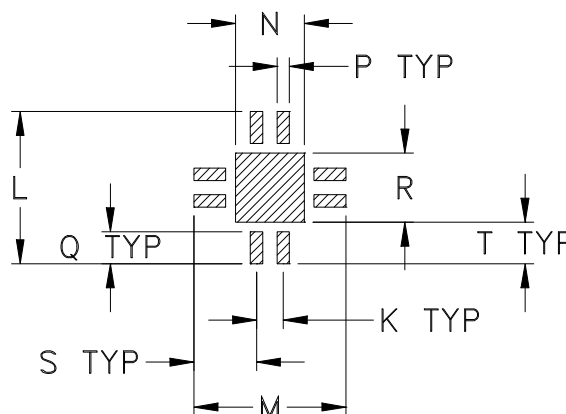
Typical Performance Curves



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	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. $\pm.01$; 3 Pl. $\pm.004$

Notes:

- Case material: Plastic.
- 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.



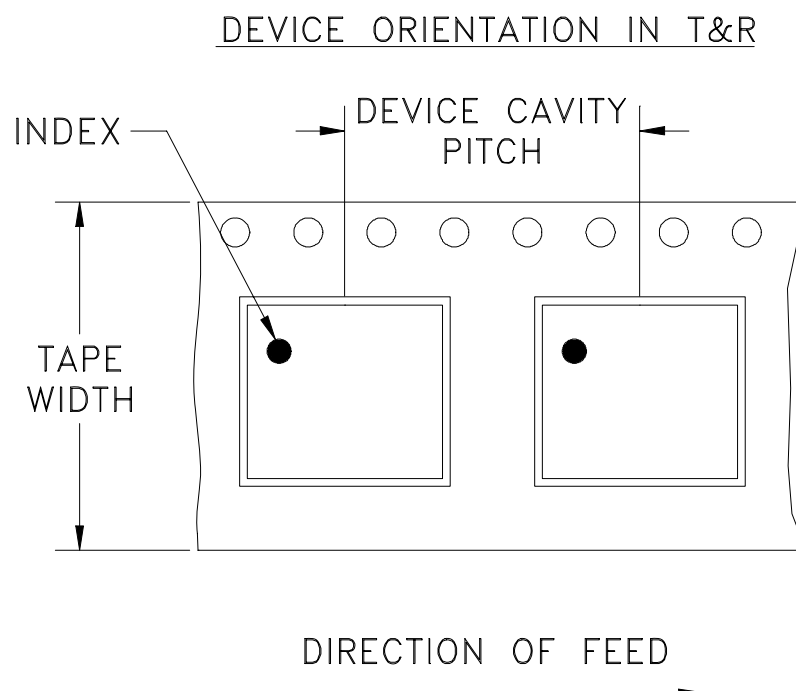
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Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F104



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



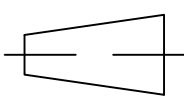
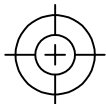
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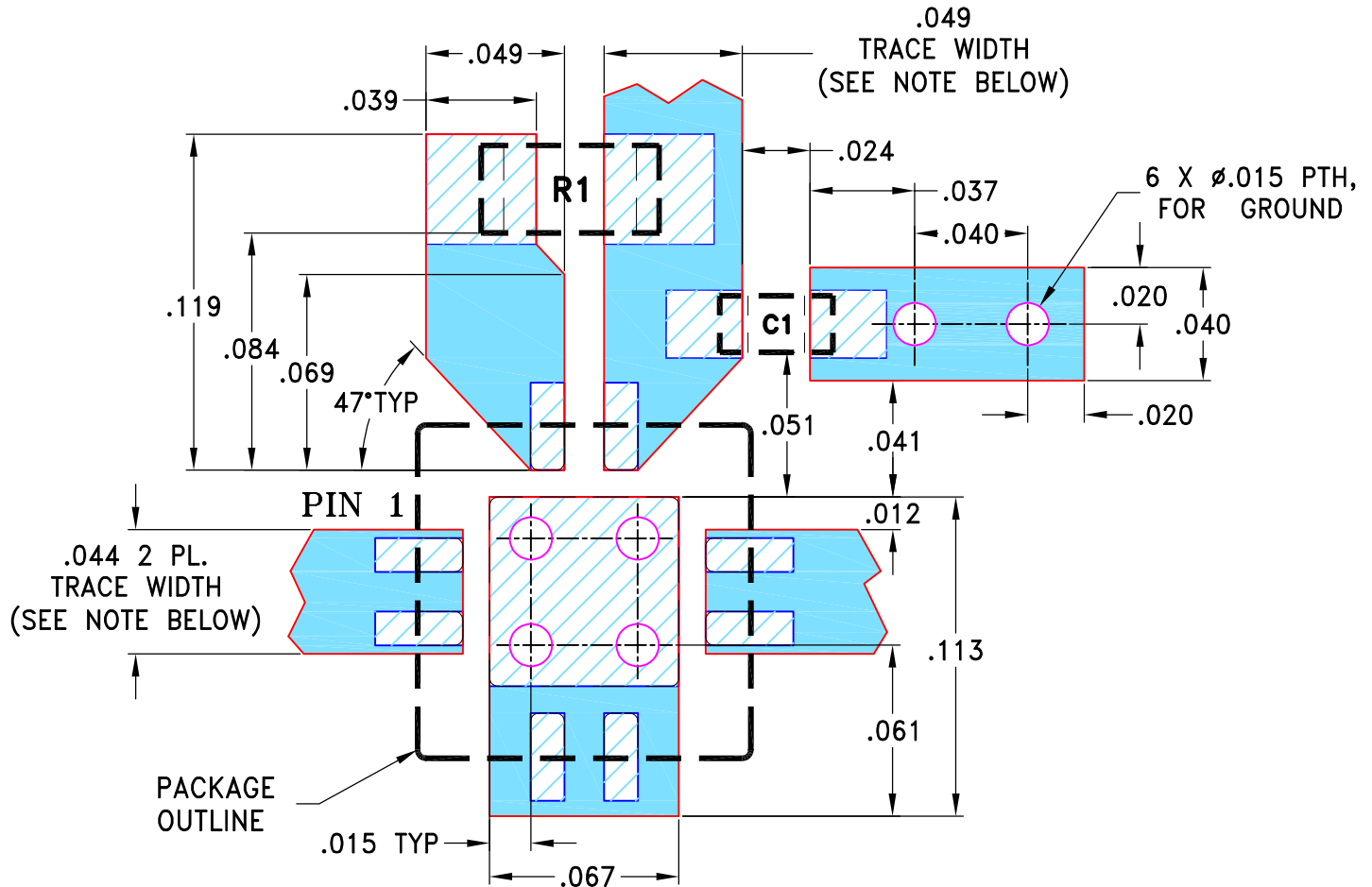
THIRD ANGLE PROJECTION



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 R04350B WITH DIELECTRIC THICKNESS $.020 \pm .0015$;
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

TOLERANCES ON:

2 PL DECIMALS \pm 3 PL DECIMALS $\pm .005$ ANGLES \pm FRACTIONS \pm

DRAWN

GF

07/19/02

CHECKED

LC

08/01/02

APPROVED

DJ

08/05/02



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, DQ849, TB-186-XX+

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-078

REV:

C

FILE:


98PL078

SCALE:

15:1

SHEET:

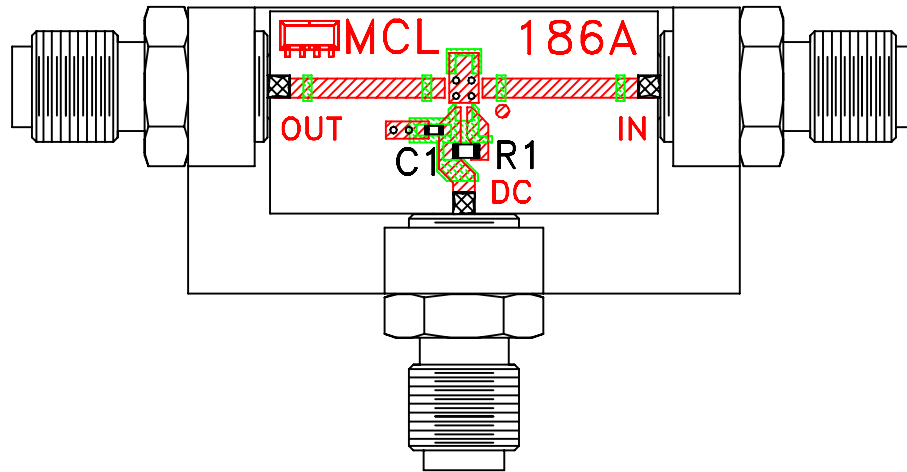
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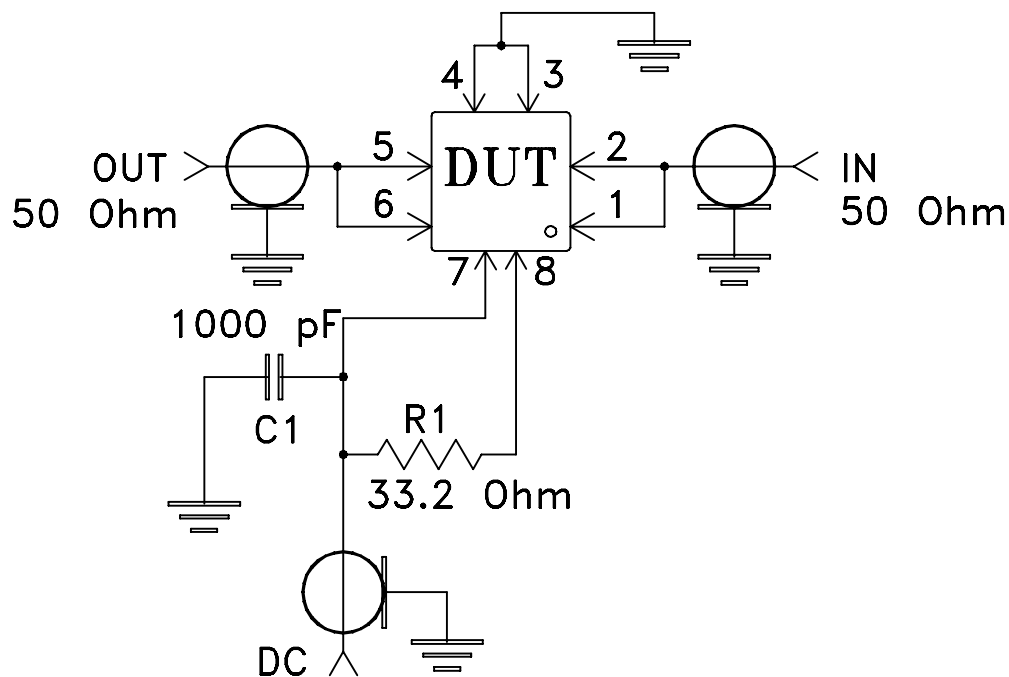
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ASHEETA1.DWG REV:A DATE:01/12/95

Evaluation Board and Circuit




TB-186+



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 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.

 **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 or -45° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether +	MIL-STD-202, Method 215



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Specification	Test/Inspection Condition	Reference/Spec
	monoethanolamine at 63°C to 70°C	