

Microwave Gain Equalizers

EQY-SERIES

50Ω DC to 6 GHz



CASE STYLE: MC1631-1

The Big Deal

- Excellent Return Loss, 20dB typ.
- Wide bandwidth, DC - 6 GHz
- Small Size, 2 mm x 2 mm

Product Overview

EQY series of absorptive Gain Equalizers are fabricated using highly repetitive GaAs IPD* MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQYs are available with nominal attenuation slope of 1,2,3,4,5,6,8 & 10 dB. They are packaged in tiny 2 x 2 mm 8-Lead MCLP™ package.

Key Features

Feature	Advantages
Negative Insertion Loss Slope vs. Frequency	Useful for compensating negative gain slope of amplifiers, receivers, transmitters to achieve flat gain versus frequency.
Wide range of values 1,2,3,4,5,6,8 & 10 dB	Enables circuit designer to change nominal insertion loss values without motherboard redesign making the EQY series ideal for select at test application.
Wideband operation, DC to 6 GHz	Supports a wide array of applications including wireless cellular, microwave communications, satellite, defense and aerospace, medical broadband and optic applications.
Excellent Power Handling Capability 31/32 dBm	Enables its use at the output of a variety of amplifiers
Small Size and simple to use (2 mm x 2 mm)	As a single chip solution, the EQY series occupies less board space than a lumped element approach, minimizes component count and ensures repeatable performance over wide frequency range.

*GaAs IPD (Gallium Arsenide Integrated Passive Device)

Microwave Gain Equalizer

EQY-4-63+

50Ω 4dB DC to 6 GHz

Product Features

- 4.2 dB Slope
- Small Package 2 x 2 mm MCLP
- Wide Bandwidth, DC-6 GHz
- Excellent Return Loss, 20 dB typ.

Typical Applications

- Cellular
- PCS
- Communications
- Radar
- Defense

General Description

EQY-4-63+ is an absorptive Gain Equalizer fabricated using highly repetitive GaAs IPD MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQY-4-63+ has a nominal attenuation slope of 4.2 dB and is packaged in tiny 2 x 2 mm, 8-Lead MCLP™ package.



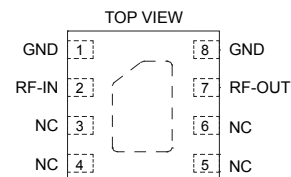
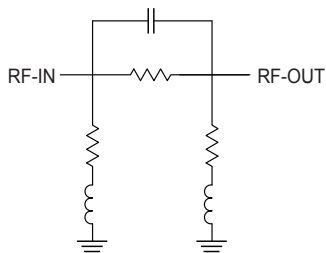
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CASE STYLE: MC1631-1

+RoHS Compliant

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

simplified schematic & pad description



Function	Pad Number	Description
RF-IN	2	RF-Input pad
RF-OUT	7	RF-Output pad
GND	1,8 & Paddle	Ground
NC	3-6	No connection, ground externally

Electrical Specifications¹ at 25°C, 50Ω, unless otherwise noted.

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		DC		6	GHz
Insertion Loss	0.01	4.4	4.8	5.2	dB
	1	—	4.5	—	
	2	—	3.6	—	
	3	2.3	2.7	3.0	
	4	—	1.9	—	
	5	0.6	1.1	1.5	
VSWR	0.01 -1	—	1.07	—	:1
	1 - 2	—	1.11	—	
	2 - 3	—	1.16	—	
	3 - 4	—	1.19	—	
	4 - 5	—	1.25	—	
	5 - 6	—	1.32	—	

1. Measured on Mini-Circuits Characterization Test Board TB-1041-4-63+. See Characterization Test Circuit (Fig. 1)

Absolute Maximum Ratings²

Operating Case Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
RF Input Power	31 dBm

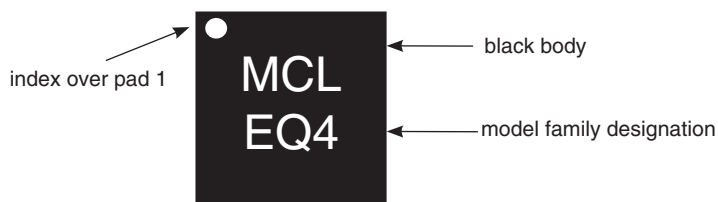
2. Permanent damage may occur if any of these limits are exceeded.

Characterization Test Circuit



Fig 1. Block Diagram of Test Circuit used for characterization. Test Board TB-1041-4-63+
Conditions: Attenuation & Return Loss Pin=0 dBm

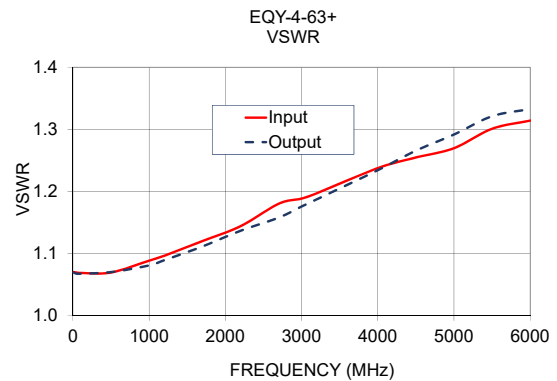
Product Marking



Marking may contain other features or characters for internal lot control

Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Input VSWR (:1)	Output VSWR (:1)
10	4.80	1.07	1.07
50	4.81	1.07	1.07
100	4.81	1.07	1.07
500	4.73	1.07	1.07
1000	4.47	1.09	1.08
1200	4.33	1.10	1.09
1700	3.92	1.12	1.11
2200	3.46	1.14	1.14
2700	2.99	1.18	1.16
3000	2.72	1.19	1.18
3200	2.54	1.20	1.19
4000	1.87	1.24	1.23
4500	1.49	1.25	1.27
5000	1.15	1.27	1.29
5500	0.86	1.30	1.32
6000	0.63	1.31	1.33

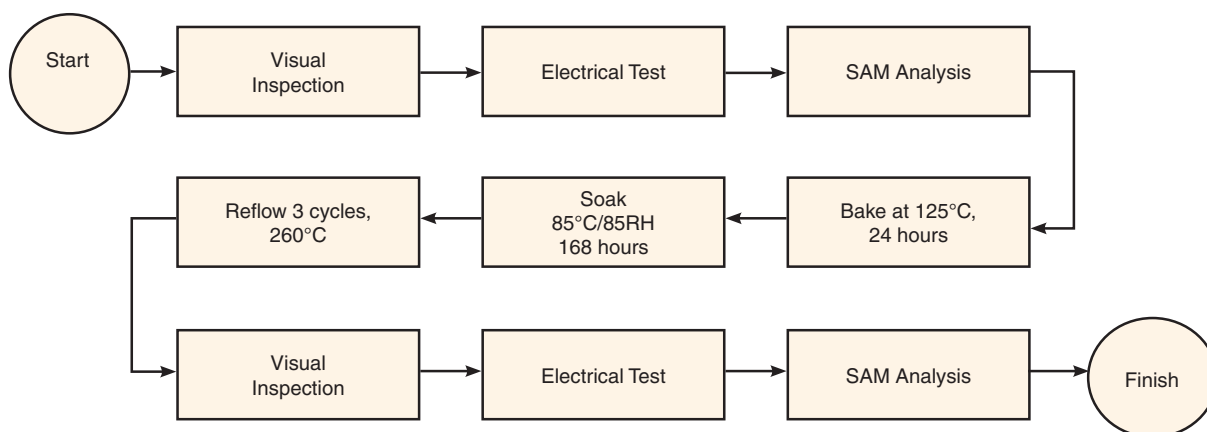


Additional Detailed Technical Information	
<i>additional information is available on our dash board. To access this information click here</i>	
Performance Data	Data Table
	Swept Graphs
Case Style	MC1631-1 <i>Plastic package, Lead finish: Matte-tin</i>
Tape & Reel Standard quantities available on reel	F66 <i>7" reels with 20, 50, 100, 200, 500, 1K or 2K devices</i>
Suggested Layout for PCB Design	PL-576
Evaluation Board	TB-1041-4-63+
Environmental Ratings	ENV08T1

ESD Rating

Human Body Model (HBM): Class 2 (Pass 2000V) in accordance with ANSI/ESD STM 5.1 - 2001 Machine.

MSL Test Flow Chart



Additional Notes

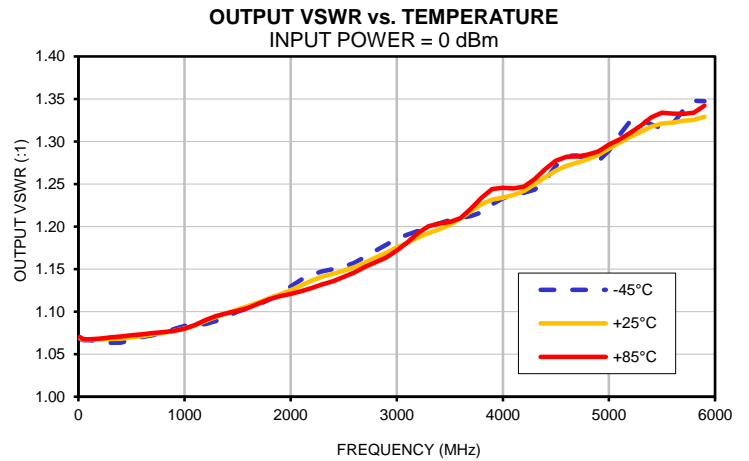
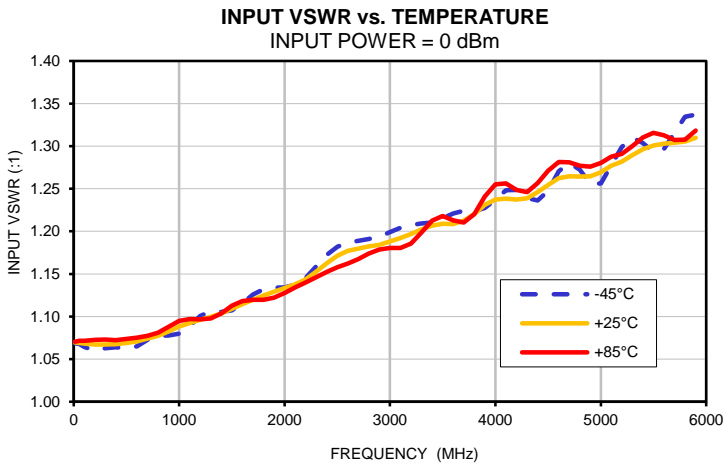
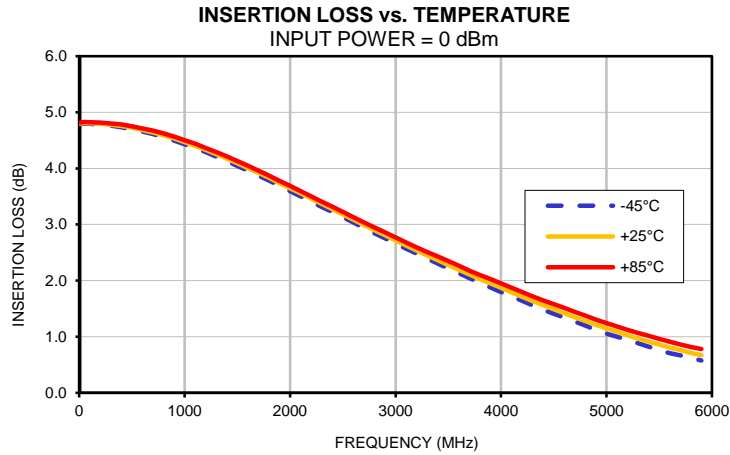
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Typical Performance Data

FREQ. (MHz)	INSERTION LOSS			INPUT VSWR			OUTPUT VSWR		
	(dB)			(:1)			(:1)		
	@-45°C	@25°C	@+85°C	@-45°C	@25°C	@+85°C	@-45°C	@25°C	@+85°C
10	4.79	4.80	4.81	1.07	1.07	1.07	1.07	1.07	1.07
50	4.80	4.81	4.83	1.07	1.07	1.07	1.07	1.07	1.07
100	4.79	4.81	4.82	1.06	1.07	1.07	1.07	1.07	1.07
200	4.78	4.80	4.82	1.06	1.07	1.07	1.07	1.07	1.07
300	4.76	4.78	4.80	1.06	1.07	1.07	1.06	1.07	1.07
400	4.73	4.76	4.78	1.06	1.07	1.07	1.06	1.07	1.07
500	4.70	4.73	4.75	1.06	1.07	1.07	1.07	1.07	1.07
600	4.66	4.69	4.71	1.07	1.07	1.08	1.07	1.07	1.07
700	4.61	4.64	4.67	1.07	1.07	1.08	1.07	1.07	1.07
800	4.56	4.59	4.62	1.08	1.08	1.08	1.08	1.08	1.08
900	4.50	4.53	4.57	1.08	1.08	1.09	1.08	1.08	1.08
1000	4.43	4.47	4.50	1.08	1.09	1.09	1.08	1.08	1.08
1100	4.36	4.40	4.44	1.09	1.09	1.10	1.08	1.08	1.08
1200	4.29	4.33	4.37	1.10	1.10	1.10	1.09	1.09	1.09
1300	4.21	4.25	4.29	1.11	1.10	1.10	1.09	1.09	1.10
1400	4.13	4.17	4.21	1.11	1.10	1.10	1.09	1.10	1.10
1500	4.04	4.09	4.13	1.11	1.11	1.11	1.10	1.10	1.10
1600	3.96	4.01	4.05	1.12	1.11	1.12	1.10	1.11	1.10
1700	3.87	3.92	3.96	1.13	1.12	1.12	1.11	1.11	1.11
1800	3.78	3.83	3.87	1.13	1.12	1.12	1.11	1.12	1.11
1900	3.69	3.74	3.78	1.13	1.13	1.12	1.12	1.12	1.12
2000	3.59	3.65	3.69	1.13	1.13	1.13	1.13	1.13	1.12
2100	3.50	3.55	3.60	1.14	1.14	1.13	1.14	1.13	1.12
2200	3.41	3.46	3.50	1.15	1.14	1.14	1.14	1.14	1.13
2300	3.31	3.37	3.41	1.16	1.15	1.15	1.15	1.14	1.13
2400	3.22	3.27	3.32	1.17	1.16	1.15	1.15	1.14	1.14
2500	3.13	3.18	3.22	1.18	1.17	1.16	1.15	1.15	1.14
2600	3.03	3.09	3.13	1.19	1.18	1.16	1.16	1.15	1.15
2700	2.94	2.99	3.04	1.19	1.18	1.17	1.16	1.16	1.15
2800	2.84	2.90	2.95	1.19	1.18	1.17	1.17	1.16	1.16
2900	2.75	2.81	2.86	1.19	1.18	1.18	1.18	1.17	1.16
3000	2.66	2.72	2.77	1.20	1.19	1.18	1.19	1.18	1.17
3100	2.57	2.63	2.68	1.20	1.19	1.18	1.19	1.18	1.18
3200	2.48	2.54	2.59	1.21	1.20	1.19	1.19	1.19	1.19
3300	2.39	2.45	2.51	1.21	1.20	1.20	1.20	1.19	1.20
3400	2.30	2.36	2.43	1.21	1.21	1.21	1.20	1.20	1.20
3500	2.22	2.28	2.35	1.22	1.21	1.22	1.21	1.20	1.21
3600	2.13	2.19	2.26	1.22	1.21	1.21	1.21	1.21	1.21
3700	2.04	2.11	2.18	1.22	1.21	1.21	1.21	1.22	1.22
3800	1.96	2.03	2.10	1.22	1.22	1.22	1.22	1.23	1.23
3900	1.88	1.95	2.03	1.23	1.23	1.24	1.23	1.23	1.24
4000	1.80	1.87	1.95	1.24	1.24	1.26	1.23	1.23	1.25
4100	1.72	1.79	1.87	1.25	1.24	1.26	1.24	1.24	1.24
4200	1.64	1.71	1.79	1.25	1.24	1.25	1.24	1.24	1.25
4300	1.56	1.64	1.72	1.24	1.24	1.25	1.24	1.25	1.26
4400	1.48	1.56	1.65	1.24	1.25	1.26	1.25	1.26	1.27
4500	1.41	1.49	1.58	1.25	1.25	1.27	1.27	1.27	1.28
4600	1.34	1.42	1.51	1.27	1.26	1.28	1.28	1.27	1.28
4700	1.27	1.35	1.44	1.28	1.26	1.28	1.28	1.28	1.28
4800	1.20	1.28	1.37	1.27	1.26	1.28	1.28	1.28	1.28
4900	1.12	1.21	1.30	1.26	1.26	1.28	1.28	1.28	1.29
5000	1.06	1.15	1.24	1.26	1.27	1.28	1.29	1.29	1.30
5100	1.00	1.09	1.18	1.28	1.28	1.29	1.31	1.30	1.30
5200	0.94	1.03	1.12	1.30	1.28	1.29	1.32	1.31	1.31
5300	0.89	0.97	1.07	1.31	1.29	1.30	1.33	1.31	1.32
5400	0.82	0.91	1.02	1.30	1.30	1.31	1.32	1.32	1.33
5500	0.76	0.86	0.96	1.29	1.30	1.32	1.32	1.32	1.33
5600	0.71	0.81	0.91	1.30	1.30	1.31	1.32	1.32	1.33
5700	0.66	0.76	0.86	1.32	1.30	1.31	1.34	1.32	1.33
5800	0.62	0.71	0.82	1.33	1.31	1.31	1.35	1.33	1.33
5900	0.58	0.67	0.78	1.34	1.31	1.32	1.35	1.33	1.34
6000	0.53	0.63	0.75	1.32	1.31	1.33	1.34	1.33	1.35

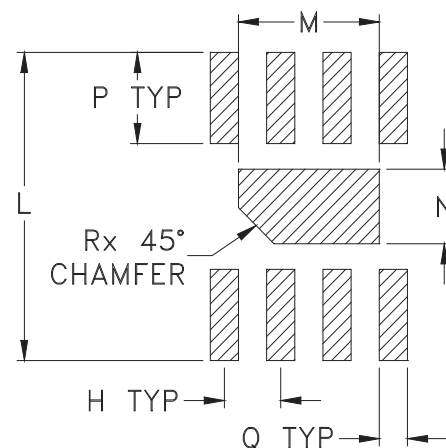
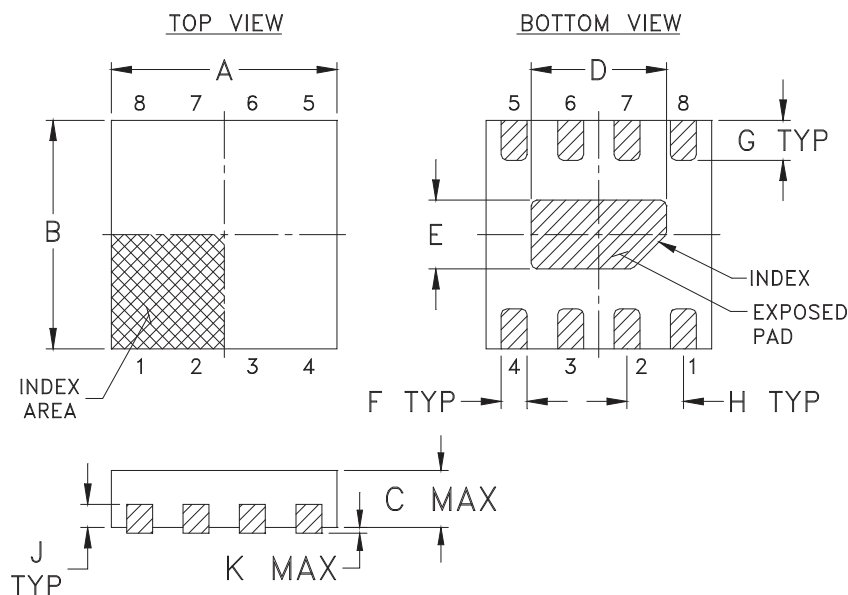


Typical Performance Curves



Outline Dimensions

PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

SE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MC1631-1	.079 (2.00)	.079 (2.00)	.039 (1.00)	.047 (1.20)	.024 (.60)	.009 (.23)	.014 (.35)	.020 (.50)	.008 (.20)	.002 (.05)	.106 (2.70)	.049 (1.25)	.026 (.65)	.031 (.80)

CASE #.	Q	R	WT, GRAM
MC1631-1	.010 (.25)	.012 (.30)	.006

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$

Notes:

- Case material: Plastic.
- Termination finish:
For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin Plated (See Data sheet).
All models, (+) suffix.
- Lead #1 identifier shall be located in the cross-hatched area shown.
Identifier may be either a molded or marked feature.



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

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F66



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000, 3000

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.

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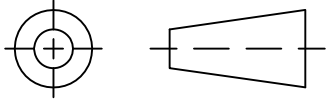
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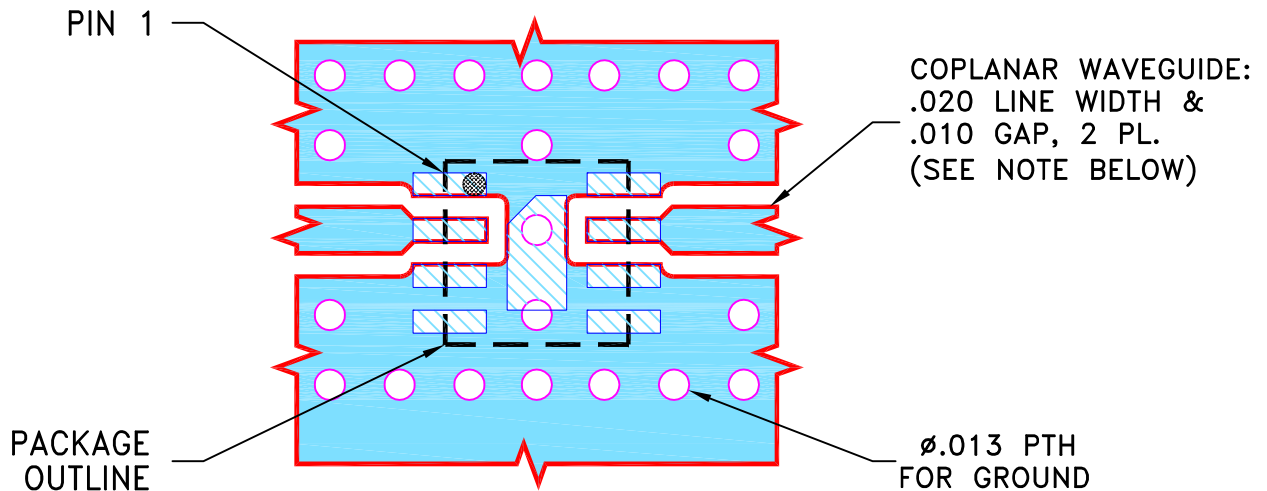
THIRD ANGLE PROJECTION



REVISIONS

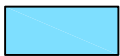
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SUGGESTED MOUNTING CONFIGURATION
FOR MC1631-1 CASE STYLE, "08EQ01" PIN CODE

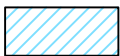


NOTES:

1. LINE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS $.010 \pm .001$. COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS LINE WIDTH & GAP MAY NEED TO BE MODIFIED.
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 ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	ITG	04/06/18
	CHECKED	GF	04/09/18
	APPROVED	RS	04/09/18



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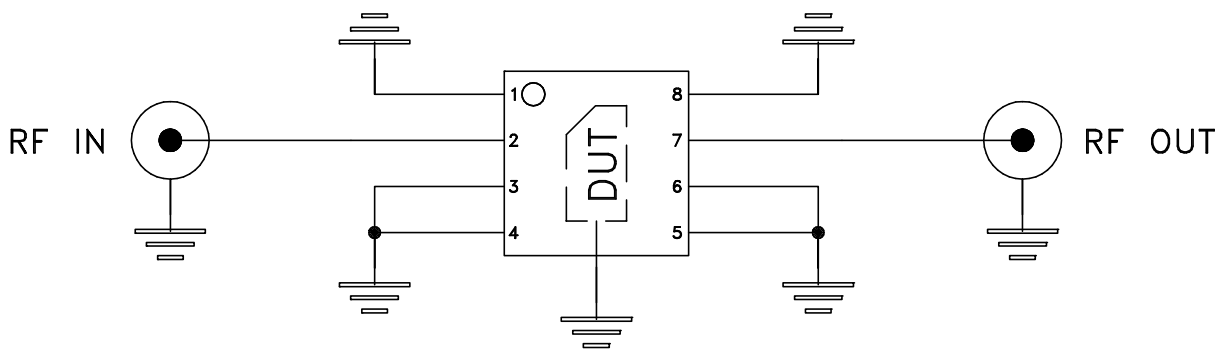
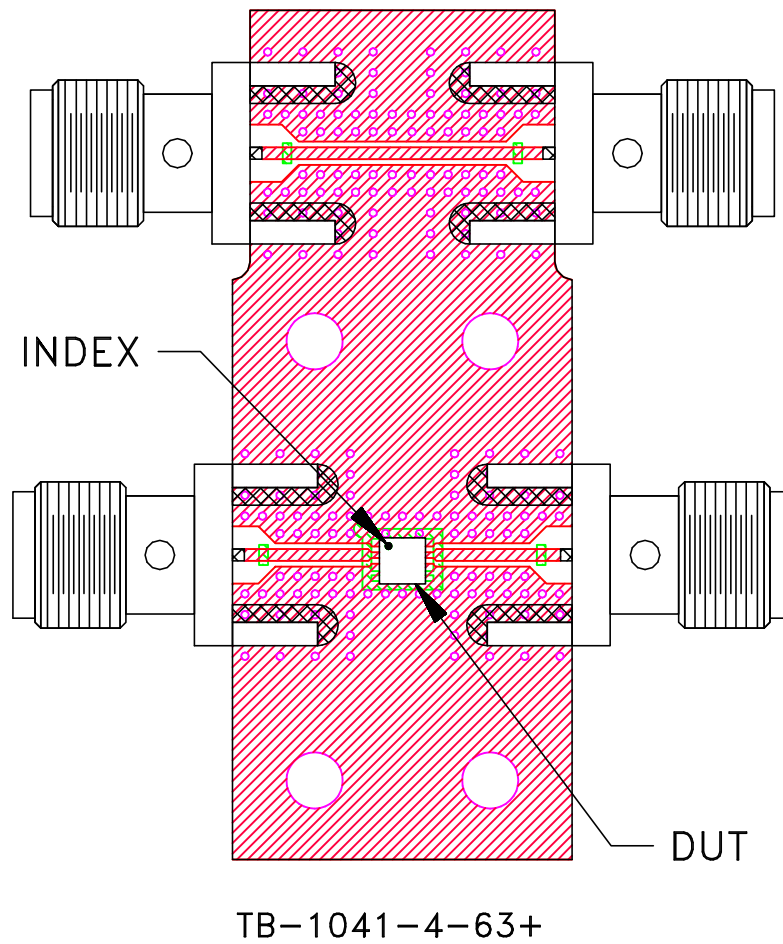
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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-576	OR
FILE:	98PL576	SCALE: 12:1	SHEET: 1 OF 1


Evaluation Board and Circuit



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.010 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 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



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
	monoethanolamine at 63°C to 70°C	