MICROWAVE

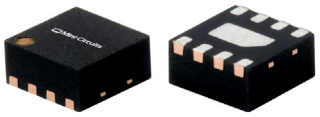
Gain Equalizer

EQY-5-63+

50Ω 5 dB DC to 6 GHz

THE BIG DEAL

- 5.0 dB Slope
- Small Package, 2x2mm MCLP™
- Wide Bandwidth, DC to 6 GHz
- Excellent Return Loss, 20 dB typ.



Generic photo used for illustration purposes only

CASE STYLE: MC1631-1

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

APPLICATIONS

- Cellular
- PCS
- Communications
- Radar
- Defense

PRODUCT OVERVIEW

EQY-5-63+ is an absorptive Gain Equalizer fabricated using highly repetitive GaAs IPD* MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQY-5-63+ has a nominal attenuation slope of 5.0 dB and is 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 dBm	Enables its use at the output of a variety of amplifiers
Small Size and simple to use (2x2 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)

REV. B
ECO-022431
EQY-5-63+
MCL NY
240718

Gain Equalizer

EQY-5-63+

50Ω 5 dB DC to 6 GHz

ELECTRICAL SPECIFICATIONS[1] AT +25°C, 50Ω, UNLESS OTHERWISE NOTED.

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		DC		6	GHz
Insertion Loss	0.01	5.7	6.0	6.4	dB
	1	—	5.6	—	
	2	—	4.6	—	
	3	3.0	3.5	3.8	
	4	—	2.4	—	
	5	—	1.6	—	
	6	0.4	1.0	1.3	
VSWR	0.01 -1	—	1.04	—	:1
	1 - 2	—	1.08	—	
	2 - 3	—	1.11	—	
	3 - 4	—	1.12	—	
	4 - 5	—	1.14	—	
	5 - 6	—	1.24	—	

1. Measured on Mini-Circuits Characterization Test Board TB-1041-5-63+. See Characterization Test Circuit (Fig. 1)

ABSOLUTE MAXIMUM RATINGS[2]

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

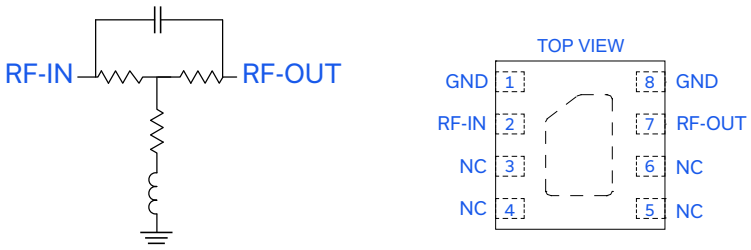
2. Permanent damage may occur if any of these limits are exceeded.

Gain Equalizer

EQY-5-63+

50Ω 5 dB DC to 6 GHz

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, connected to ground externally

CHARACTERIZATION TEST CIRCUIT

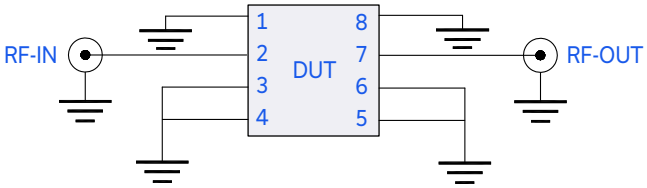
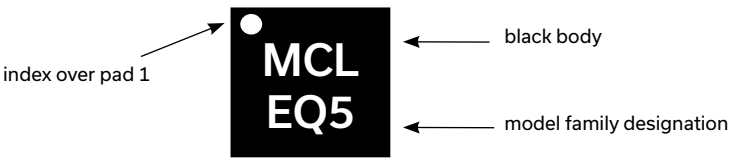


Fig 1. Block Diagram of Test Circuit used for characterization. Test Board TB-1041-5-63+
Conditions: Attenuation & Return Loss P_{IN}=0 dBm

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

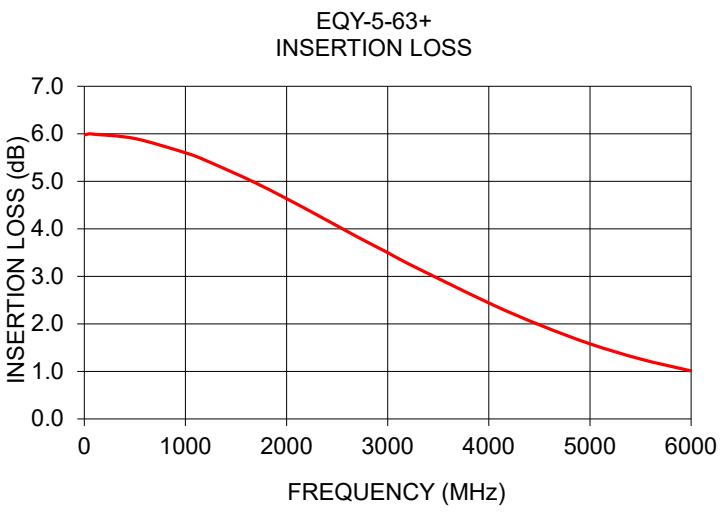
Gain Equalizer

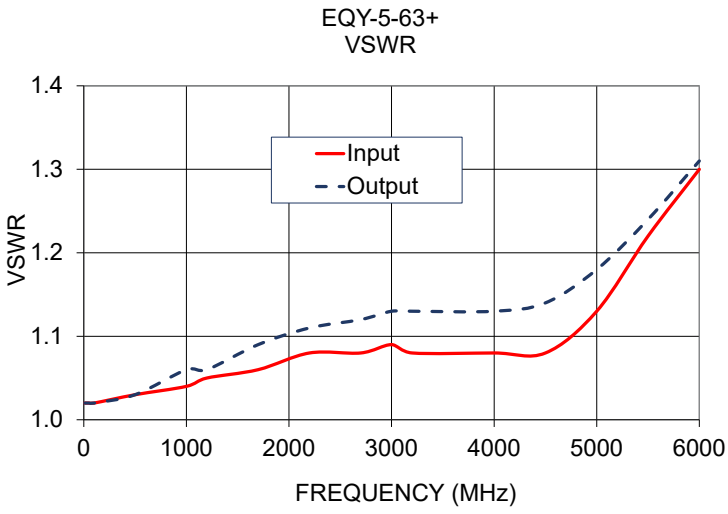
EQY-5-63+

50Ω 5 dB DC to 6 GHz

TYPICAL PERFORMANCE DATA AT +25°C

Frequency (MHz)	Insertion Loss (dB)	Input VSWR (:1)	Output VSWR (:1)
10	5.98	1.02	1.02
50	6.00	1.02	1.02
100	5.99	1.02	1.02
500	5.90	1.03	1.03
1000	5.60	1.04	1.06
1200	5.44	1.05	1.06
1700	4.96	1.06	1.09
2200	4.41	1.08	1.11
2700	3.83	1.08	1.12
3000	3.50	1.09	1.13
3200	3.27	1.08	1.13
4000	2.44	1.08	1.13
4500	1.98	1.08	1.14
5000	1.58	1.13	1.18
5500	1.26	1.22	1.24
6000	1.01	1.30	1.31





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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data	Data Table Swept Graphs
Case Style	MC1631-1 Plastic package, Lead finish: Matte-tin
Tape & Reel **Standard quantities available on reel**	F66 7" reels with 20, 50, 100, 200, 500, 1K, 2K or 3K devices
Suggested Layout for PCB Design	PL-576
Evaluation Board	TB-1041-5-63+
Environmental Ratings	ENV08T1

ESD RATING

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

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.
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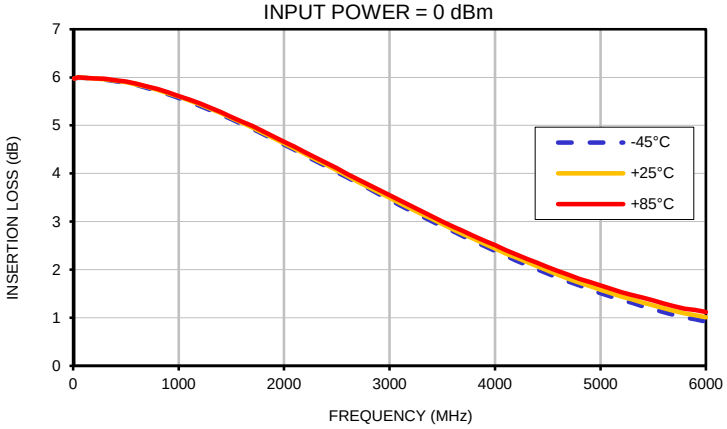
Typical Performance Data

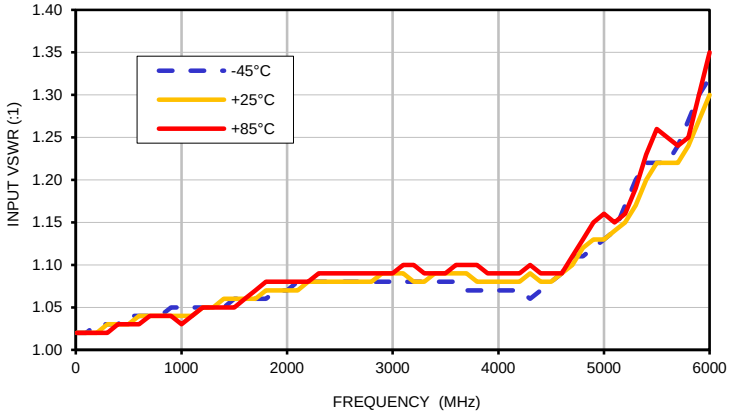
FREQ.	INSERTION LOSS			INPUT VSWR			OUTPUT VSWR		
(MHz)	(dB)			(:1)			(:1)		
	@-45˚C	@25°C	@+85°C	@-45˚C	@25°C	@+85°C	@-45˚C	@25°C	@+85°C
10	5.98	5.98	5.98	1.02	1.02	1.02	1.02	1.02	1.02
50	5.99	6.00	6.00	1.02	1.02	1.02	1.02	1.02	1.02
100	5.99	5.99	5.99	1.02	1.02	1.02	1.02	1.02	1.02
200	5.98	5.98	5.98	1.03	1.02	1.02	1.03	1.02	1.02
300	5.95	5.96	5.97	1.03	1.03	1.02	1.03	1.03	1.02
400	5.92	5.93	5.94	1.03	1.03	1.03	1.03	1.03	1.02
500	5.88	5.90	5.91	1.04	1.03	1.03	1.04	1.03	1.03
600	5.84	5.85	5.87	1.04	1.04	1.03	1.04	1.04	1.03
700	5.78	5.80	5.81	1.04	1.04	1.04	1.04	1.04	1.04
800	5.72	5.74	5.76	1.04	1.04	1.04	1.05	1.05	1.05
900	5.65	5.67	5.69	1.05	1.04	1.04	1.05	1.05	1.05
1000	5.57	5.60	5.61	1.05	1.04	1.03	1.05	1.06	1.06
1100	5.50	5.52	5.54	1.05	1.04	1.04	1.06	1.06	1.06
1200	5.41	5.44	5.46	1.05	1.05	1.05	1.07	1.06	1.06
1300	5.32	5.35	5.37	1.05	1.05	1.05	1.07	1.07	1.07
1400	5.23	5.26	5.28	1.05	1.06	1.05	1.08	1.07	1.07
1500	5.13	5.16	5.18	1.06	1.06	1.05	1.08	1.08	1.08
1600	5.03	5.06	5.08	1.06	1.06	1.06	1.09	1.08	1.08
1700	4.93	4.96	4.99	1.06	1.06	1.07	1.09	1.09	1.09
1800	4.82	4.85	4.88	1.06	1.07	1.08	1.09	1.09	1.09
1900	4.71	4.74	4.77	1.07	1.07	1.08	1.10	1.09	1.10
2000	4.60	4.63	4.66	1.07	1.07	1.08	1.10	1.10	1.10
2100	4.49	4.52	4.56	1.08	1.07	1.08	1.10	1.10	1.11
2200	4.37	4.41	4.44	1.08	1.08	1.08	1.11	1.11	1.12
2300	4.26	4.29	4.33	1.08	1.08	1.09	1.11	1.11	1.12
2400	4.15	4.18	4.22	1.08	1.08	1.09	1.11	1.11	1.13
2500	4.03	4.07	4.11	1.08	1.08	1.09	1.12	1.12	1.13
2600	3.92	3.95	3.99	1.08	1.08	1.09	1.12	1.12	1.13
2700	3.80	3.83	3.88	1.08	1.08	1.09	1.12	1.12	1.14
2800	3.69	3.72	3.77	1.08	1.08	1.09	1.13	1.13	1.14
2900	3.57	3.61	3.66	1.08	1.09	1.09	1.13	1.13	1.14
3000	3.46	3.50	3.55	1.08	1.09	1.09	1.13	1.13	1.14
3100	3.34	3.38	3.44	1.08	1.09	1.10	1.13	1.13	1.14
3200	3.23	3.27	3.33	1.08	1.08	1.10	1.13	1.13	1.14
3300	3.12	3.16	3.22	1.08	1.08	1.09	1.13	1.13	1.14
3400	3.01	3.06	3.11	1.08	1.09	1.09	1.13	1.13	1.14
3500	2.90	2.95	3.00	1.08	1.09	1.09	1.13	1.13	1.14
3600	2.80	2.84	2.90	1.08	1.09	1.10	1.13	1.12	1.14
3700	2.69	2.74	2.80	1.07	1.09	1.10	1.13	1.12	1.13
3800	2.59	2.64	2.70	1.07	1.08	1.10	1.14	1.13	1.14
3900	2.49	2.54	2.60	1.07	1.08	1.09	1.13	1.13	1.14
4000	2.39	2.44	2.51	1.07	1.08	1.09	1.13	1.13	1.15
4100	2.29	2.34	2.41	1.07	1.08	1.09	1.14	1.13	1.15
4200	2.19	2.25	2.32	1.07	1.08	1.09	1.14	1.13	1.15
4300	2.10	2.16	2.23	1.06	1.09	1.10	1.15	1.13	1.15
4400	2.01	2.07	2.14	1.07	1.08	1.09	1.14	1.14	1.16
4500	1.92	1.98	2.05	1.08	1.08	1.09	1.14	1.14	1.17
4600	1.83	1.89	1.97	1.09	1.09	1.09	1.15	1.14	1.17
4700	1.75	1.81	1.89	1.11	1.10	1.11	1.16	1.14	1.17
4800	1.67	1.73	1.81	1.11	1.12	1.13	1.17	1.15	1.18
4900	1.59	1.66	1.74	1.12	1.13	1.15	1.17	1.16	1.20
5000	1.51	1.58	1.67	1.13	1.13	1.16	1.18	1.18	1.21
5100	1.44	1.51	1.60	1.14	1.14	1.15	1.18	1.18	1.21
5200	1.37	1.44	1.53	1.17	1.15	1.16	1.20	1.18	1.21
5300	1.31	1.38	1.47	1.20	1.17	1.19	1.22	1.20	1.22
5400	1.24	1.32	1.42	1.22	1.20	1.23	1.24	1.22	1.25
5500	1.18	1.26	1.36	1.22	1.22	1.26	1.25	1.24	1.28
5600	1.12	1.20	1.30	1.22	1.22	1.25	1.25	1.25	1.29
5700	1.06	1.14	1.24	1.24	1.22	1.24	1.26	1.25	1.29
5800	1.01	1.09	1.19	1.27	1.24	1.25	1.28	1.26	1.29
5900	0.97	1.05	1.16	1.30	1.27	1.30	1.31	1.28	1.32
6000	0.92	1.01	1.12	1.32	1.30	1.35	1.33	1.31	1.36

Typical Performance Curves

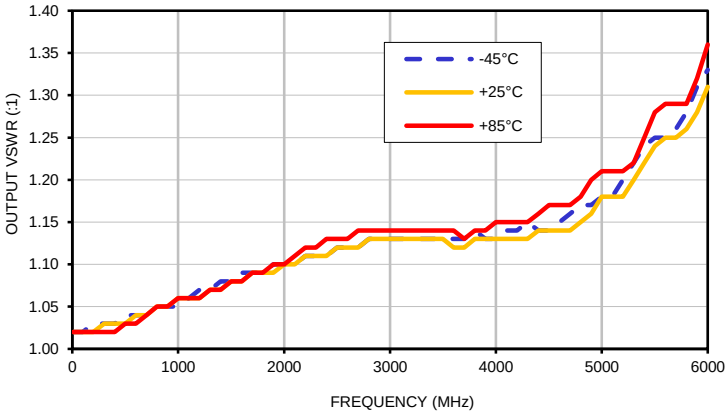
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



INPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm

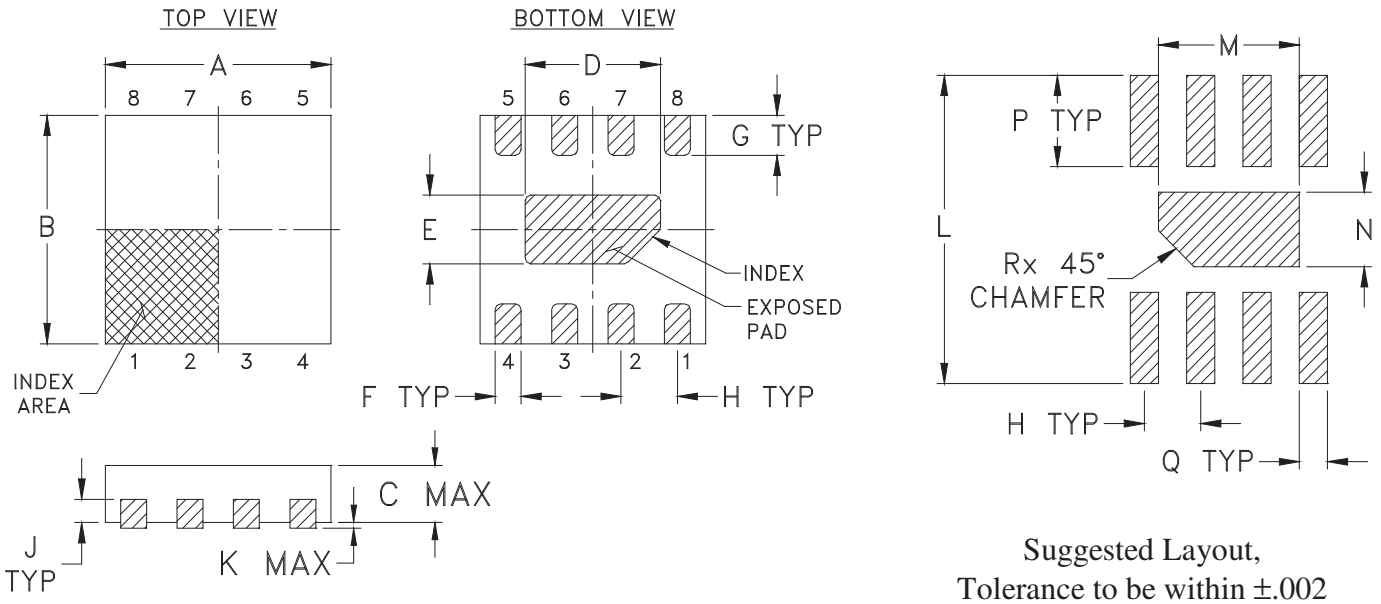


Case Style MC

MC1631-1

Outline Dimensions

PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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. ± .01; 3 Pl. ± .005

Notes:

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

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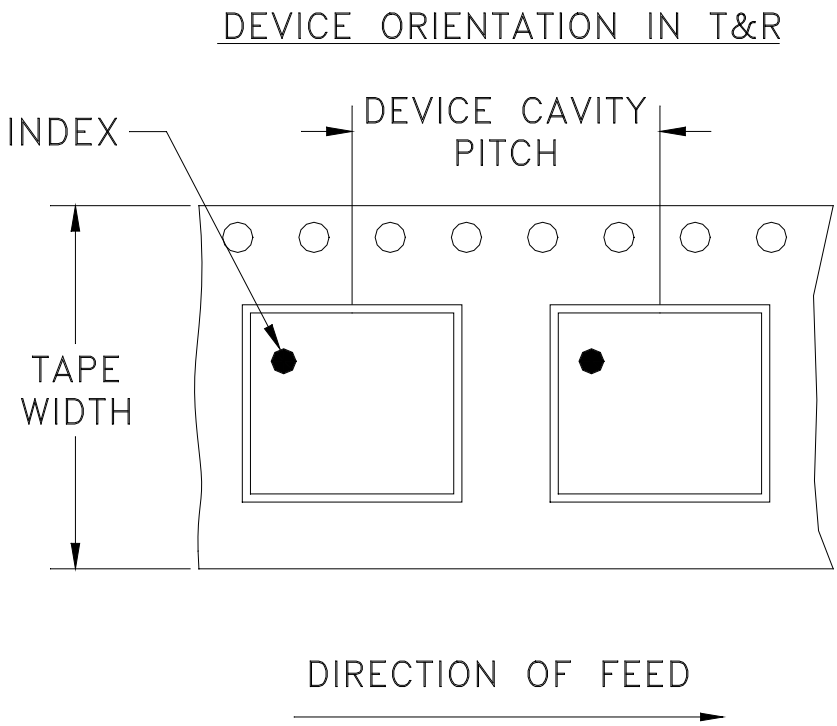
Tape & Reel Packaging TR-F66



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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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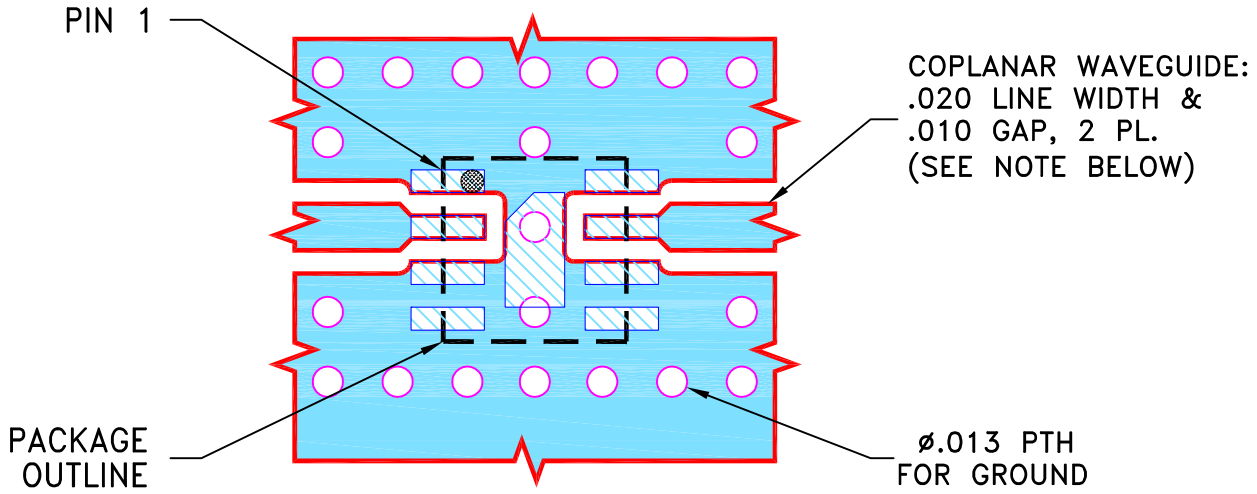
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M167264	NEW RELEASE	04/09/18	ITG	RS

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±.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	DRAWN	ITG	04/06/18
TOLERANCES ON:	CHECKED	GF	04/09/18
2 PL DECIMALS ±	APPROVED	RS	04/09/18
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

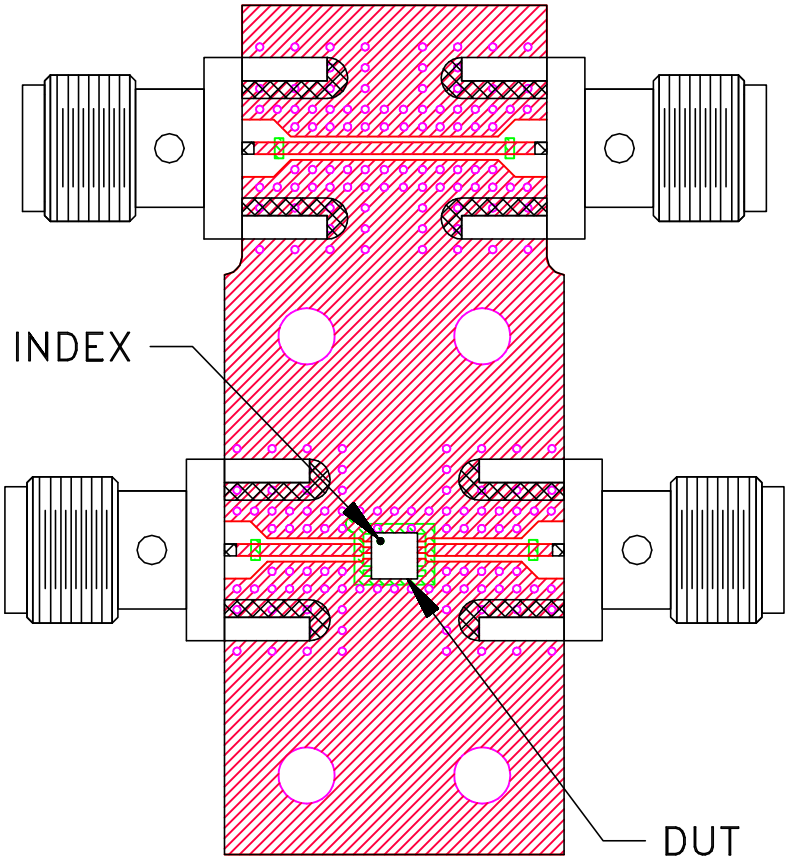
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 08EQ01, MC1631-1, TB-1041-N-63+

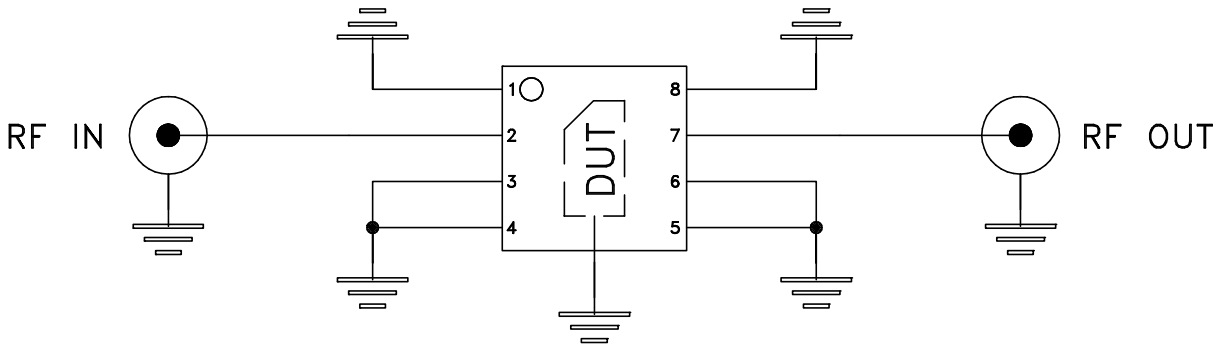
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-576	OR

FILE:	SCALE:	SHEET:
98PL576	12:1	1 OF 1

Evaluation Board and Circuit



TB-1041-5-63+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

Mini-Circuits®

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Mini-Circuits

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

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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
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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