



MMIC SURFACE MOUNT

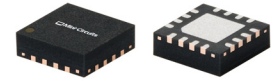
Gain Equalizer

EQY-18-24+

50Ω 6 to 18 GHz

THE BIG DEAL

- 18 dB Slope
- Insertion Loss, 20.4 dB Typ. at 6 GHz
- Insertion Loss, 2.2 dB Typ. at 18 GHz
- Return Loss, 20 dB Typ.
- Small Package 3 x 3 mm MCLP



Generic photo used for illustration purposes only

CASE STYLE: DQ3005

+RoHS Compliant

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

APPLICATIONS

- Test and Measurement
- EW, Radar, and ECM Defense Systems
- Back Haul Radio

PRODUCT OVERVIEW

Mini-Circuits' EQY-18-24+ is a MMIC Gain Equalizer fabricated using highly repeatable GaAs IPD MMIC process incorporating resistors, capacitors, and inductors to accomplish a positive Insertion Loss Slope vs. Frequency. EQY-18-24+ has a nominal Insertion Loss Slope of 18 dB across the wide bandwidth of 6 to 18 GHz and can be applied to compensate for the negative Gain Slope of amplifiers to achieve relative Gain Flatness for the overall system. It is packaged in a tiny 3x3mm, 16-lead MCLP package.

KEY FEATURES

Features	Advantages
Positive Insertion Loss Slope vs. Frequency	Useful for compensating negative gain slope of amplifiers, receivers, transmitters to achieve flat Gain versus Frequency.
Wideband operation, 6 to 18 GHz	Supports a wide array of applications including Test & Measurement, EW, Radar, and ECM Defense Systems, and Back Haul radio.
Excellent Power Handling Capability	Enables its use at the output of a variety of amplifiers.
Small Size and simple to use (3 mm x 3 mm)	As a single chip solution, the EQY-18-24+ occupies less board space than a lumped element approach, minimizes component count and ensures repeatable performance over wide frequency range.

REV. A
ECO-015009
EQY-18-24+
MCL NY
220915



**ELECTRICAL SPECIFICATIONS¹ AT 25°C, 50Ω, UNLESS OTHERWISE NOTED.**

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		6		18	GHz
Insertion Loss	6	18.3	20.4	22.4	dB
	10	12.2	13.5	14.9	
	14	6	6.7	7.3	
	16	-	4.1	-	
	18	-	2.2	-	
VSWR	6-10	-	1.11	-	:1
	10-14	-	1.13	-	
	14-16	-	1.17	-	
	16-18	-	1.35	-	

1. Measured on Mini-Circuits Characterization Test Board TB-EQY-18-24C+. See Characterization & Application Circuit (Fig. 1)

MAXIMUM RATINGS²

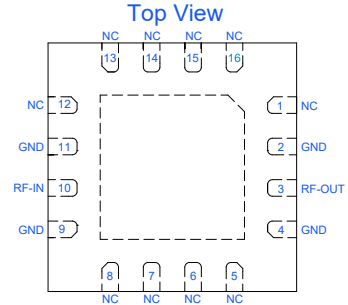
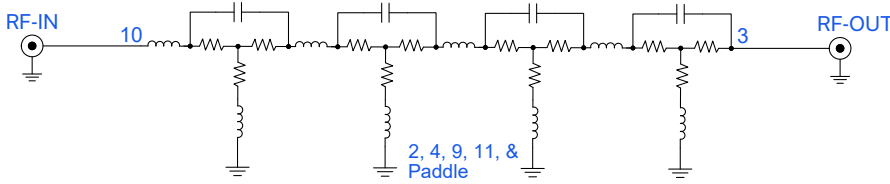
Parameter	Ratings
Operating Case Temperature	-55°C to +105°C
Storage Temperature	-65°C to +150°C
RF Input Power ³	+33 dBm (5-minute max) +30 dBm (continuous)

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

3. Derates linearly to +29 dBm at +105°C



SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	10	RF-Input pad
RF-OUT	3	RF-Output pad
NC	1, 5, 6, 7, 8, 12, 13, 14, 15, & 16	Not used internally. Connected to ground on test board.
GND	2, 4, 9, 11, & Paddle	Connects to ground.

CHARACTERIZATION & APPLICATION CIRCUIT

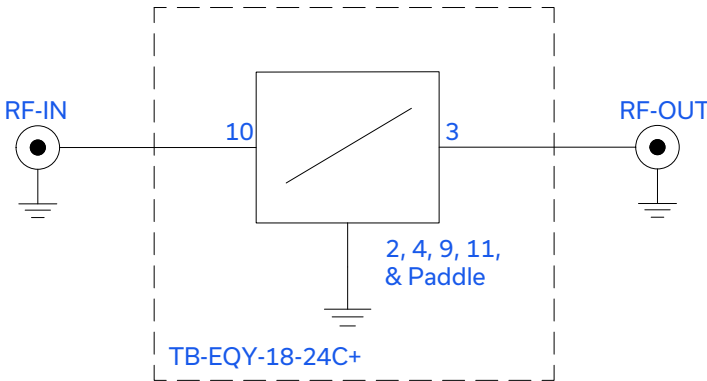
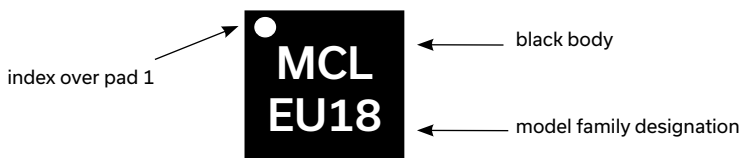


Fig 1. Characterization & Application Circuit
 Note: Block Diagram of Test Circuit used for characterization. TB-EQY-18-24C+ Insertion Loss and Return Loss are measured using Keysight N5245A PNA-X Microwave Network Analyzer.

Condition:
 Insertion Loss & Return Loss: Pin = 0 dBm

PRODUCT MARKING

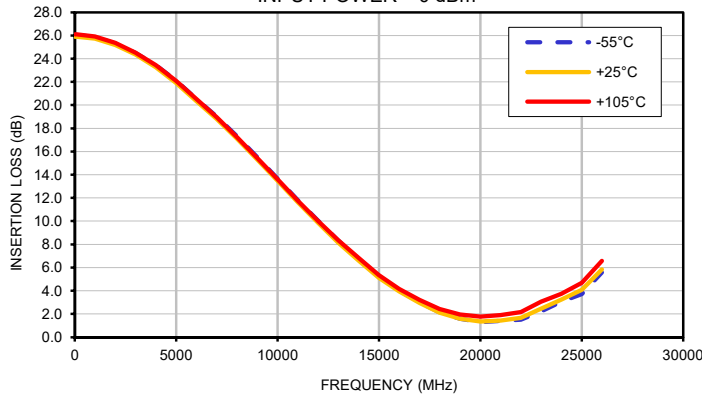


Marking may contain other features or characters for internal lot control

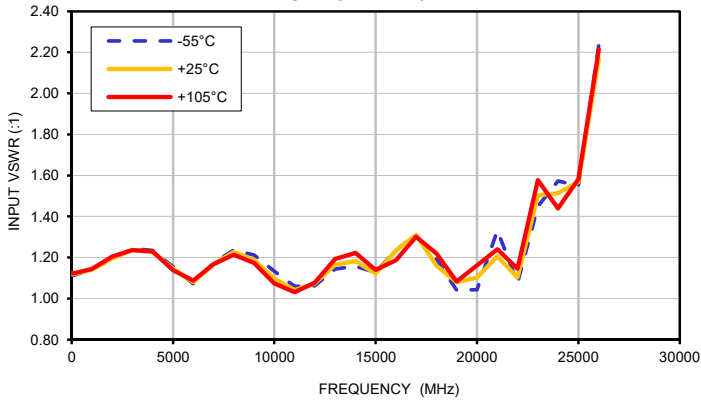


TYPICAL PERFORMANCE CURVES

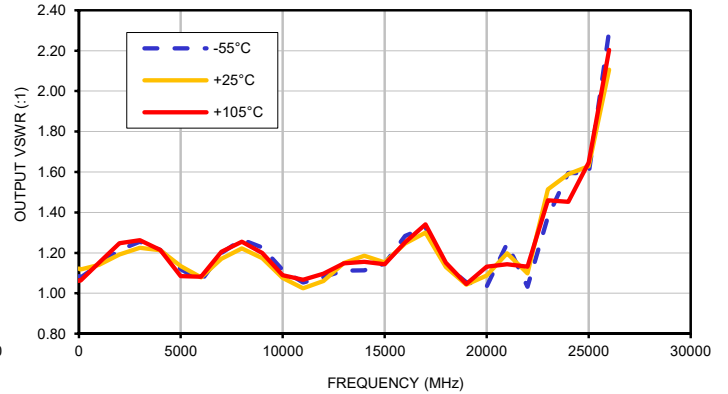
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



INPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm





ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DQ3005 Plastic package, exposed paddle, lead finish: Matte-Tin
Tape & Reel Standard quantities available on reel	TR-F68 7" reels with 20, 50, 100, 200, 500 or 2K devices
Suggested Layout for PCB Design	PL-736
Evaluation Board	TB-EQY-18-24+ (Without connectors) TB-EQY-18-24C+ (With connectors)
Environmental Ratings	ENV08T1

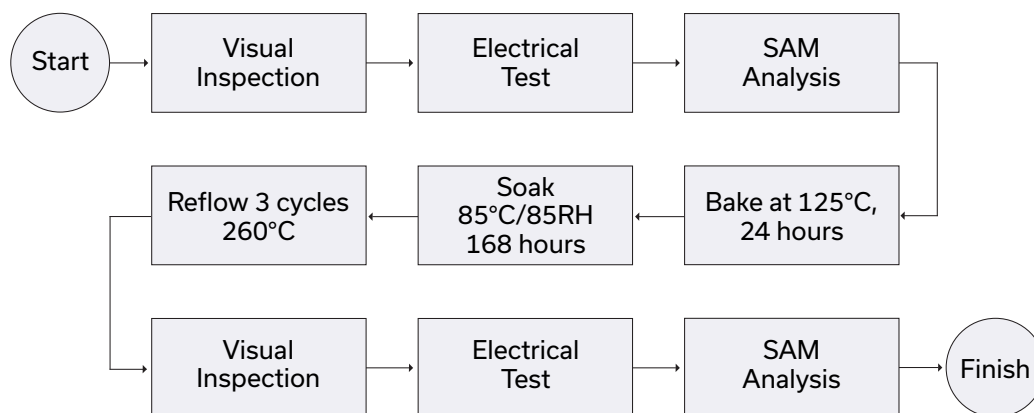
ESD RATING

Human Body Model (HBM): Class 1C (1000V to < 2000V) in accordance with ANSI/ESD STM 5.1 – 2001
Charged Device Model (CDM): Class 1B (500V to < 1000V) in accordance with ANSI/ESD 5.2-2001

MSL RATING

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

MSL TEST FLOW CHART



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/terms/viewterm.html

MMIC Gain Equalizer

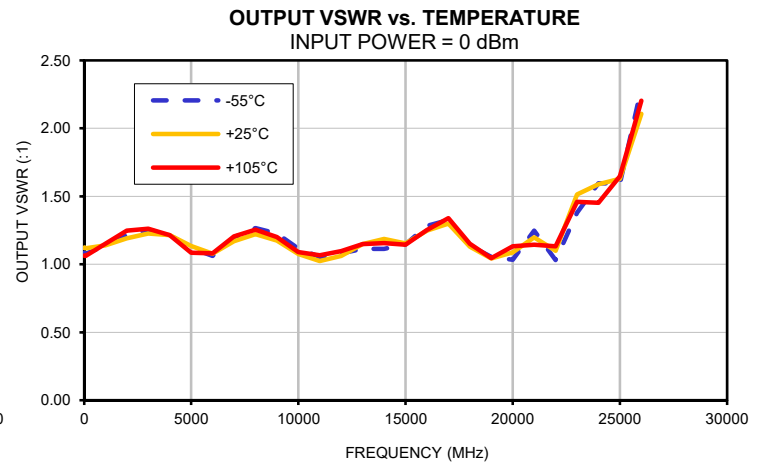
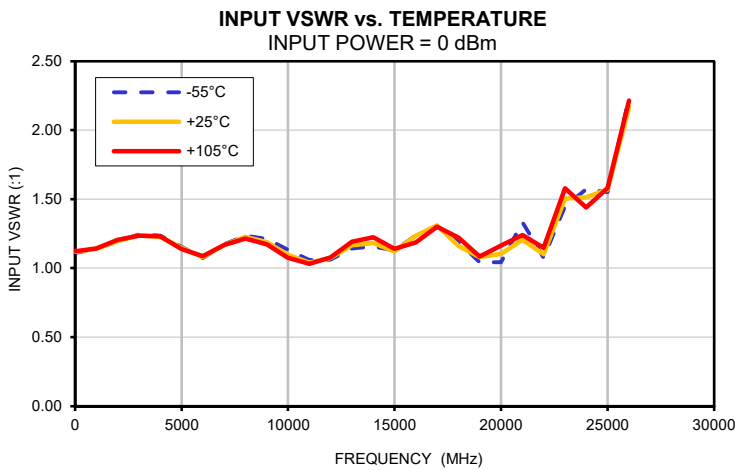
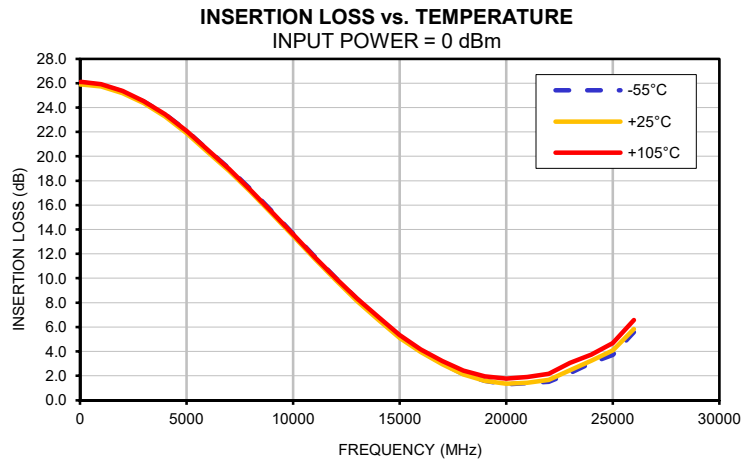
EQY-18-24+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS			INPUT VSWR			OUTPUT VSWR		
	(dB)			(:1)			(:1)		
	@-55°C	@25°C	@+105°C	@-55°C	@25°C	@+105°C	@-55°C	@25°C	@+105°C
10	26.04	25.89	26.08	1.12	1.12	1.13	1.08	1.12	1.06
20	26.03	25.89	26.11	1.12	1.12	1.13	1.08	1.12	1.06
30	26.03	25.89	26.10	1.12	1.12	1.12	1.08	1.12	1.06
40	26.04	25.90	26.10	1.12	1.12	1.12	1.08	1.12	1.06
50	26.04	25.89	26.10	1.12	1.12	1.12	1.08	1.12	1.06
60	26.03	25.90	26.10	1.11	1.12	1.12	1.08	1.12	1.06
70	26.04	25.89	26.10	1.11	1.12	1.12	1.08	1.12	1.06
80	26.04	25.89	26.11	1.11	1.12	1.12	1.08	1.12	1.06
90	26.04	25.90	26.11	1.11	1.12	1.12	1.08	1.12	1.06
100	26.04	25.89	26.10	1.11	1.12	1.12	1.08	1.12	1.06
1000	25.86	25.72	25.92	1.14	1.14	1.14	1.14	1.14	1.15
2000	25.31	25.18	25.36	1.19	1.20	1.21	1.21	1.19	1.25
3000	24.51	24.36	24.52	1.24	1.24	1.24	1.25	1.23	1.26
4000	23.44	23.27	23.45	1.23	1.23	1.23	1.21	1.21	1.21
5000	22.10	21.90	22.08	1.15	1.15	1.14	1.12	1.13	1.08
6000	20.54	20.35	20.53	1.07	1.08	1.09	1.06	1.08	1.08
7000	19.01	18.81	18.96	1.17	1.17	1.17	1.20	1.17	1.20
8000	17.33	17.13	17.26	1.24	1.23	1.21	1.27	1.22	1.25
9000	15.51	15.31	15.44	1.21	1.19	1.17	1.23	1.17	1.20
10000	13.67	13.47	13.61	1.13	1.10	1.07	1.12	1.08	1.09
11000	11.81	11.62	11.78	1.06	1.04	1.03	1.05	1.02	1.07
12000	10.02	9.85	10.01	1.06	1.07	1.08	1.08	1.06	1.10
13000	8.32	8.16	8.35	1.14	1.16	1.19	1.11	1.15	1.15
14000	6.73	6.59	6.83	1.16	1.18	1.22	1.11	1.19	1.16
15000	5.25	5.11	5.34	1.13	1.12	1.14	1.15	1.15	1.14
16000	4.03	3.94	4.15	1.24	1.24	1.19	1.28	1.25	1.25
17000	3.00	2.96	3.22	1.31	1.31	1.30	1.33	1.30	1.34
18000	2.13	2.10	2.43	1.19	1.16	1.22	1.14	1.13	1.15
19000	1.58	1.58	1.94	1.04	1.08	1.08	1.06	1.04	1.05
20000	1.30	1.36	1.77	1.04	1.10	1.16	1.03	1.09	1.13
21000	1.40	1.43	1.89	1.33	1.21	1.24	1.25	1.20	1.14
22000	1.51	1.66	2.17	1.08	1.10	1.15	1.03	1.10	1.13
23000	2.22	2.44	3.06	1.45	1.50	1.58	1.38	1.51	1.46
24000	3.05	3.24	3.74	1.57	1.51	1.44	1.60	1.59	1.45
25000	3.72	4.08	4.67	1.55	1.57	1.58	1.59	1.63	1.65
26000	5.58	5.83	6.57	2.24	2.17	2.21	2.30	2.11	2.20



Typical Performance Curves

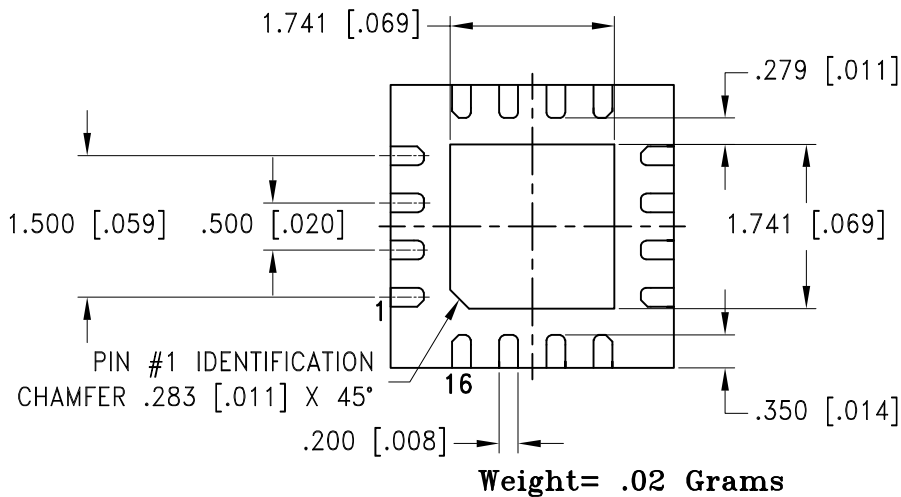
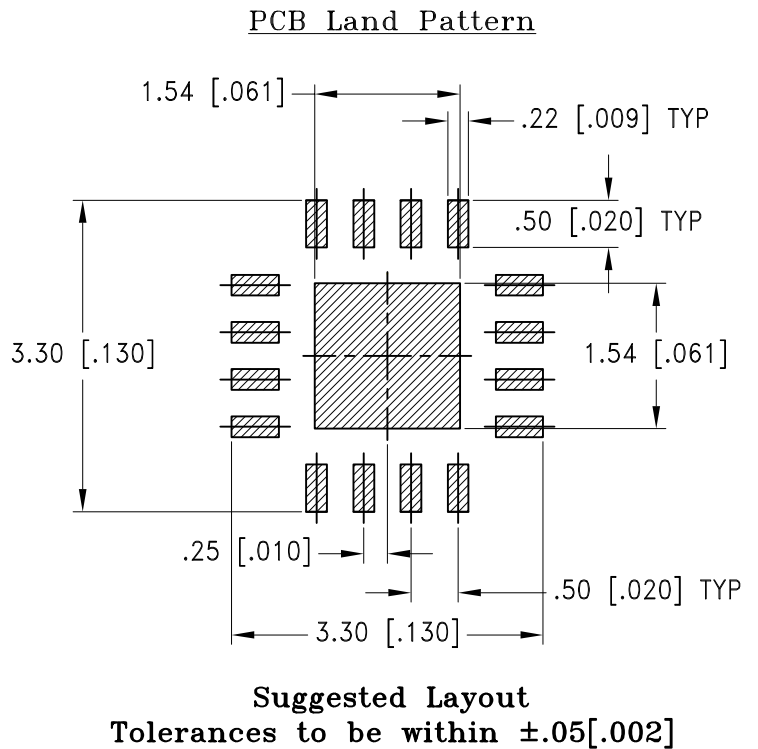
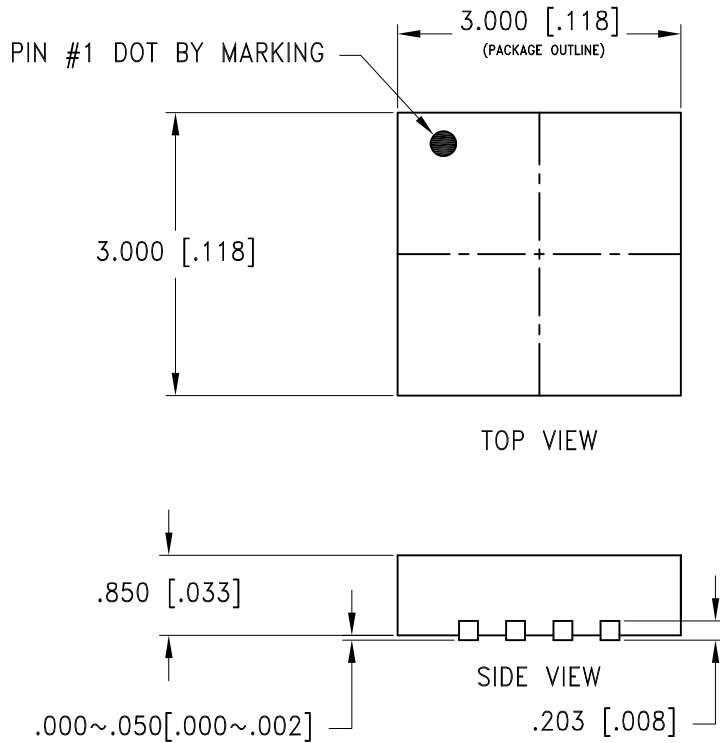


Case Style

DQ

Outline Dimensions

DQ3005



Dimensions are in mm[inches]. Tolerances: 3 Pl. ± 0.05 [.002]

Notes:

1. Case material: Plastic.

2. Termination finish:

For RoHS Case Styles: Matte-Tin. All models, (+) suffix.

For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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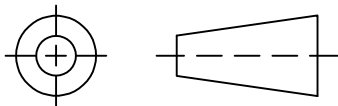
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P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

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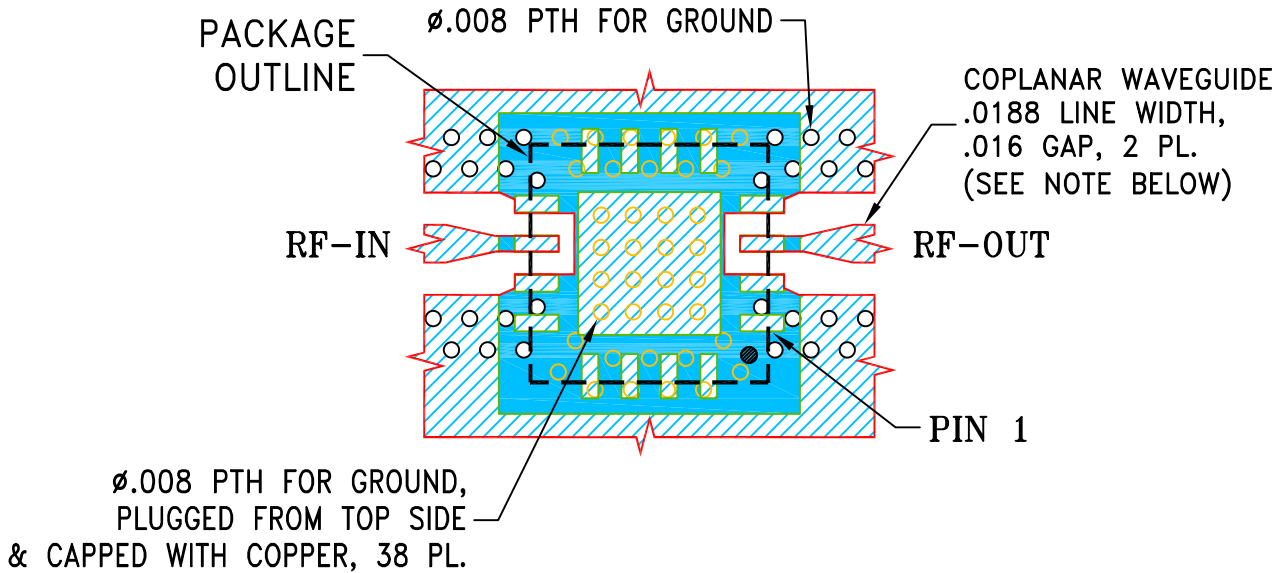
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-014518	NEW RELEASE	08/11/22	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR
DQ3005 CASE STYLE



NOTES:

- TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS $.010 \pm .001$ "; COPPER: 1 OZ. ON EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
- 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	08/11/22
TOLERANCES ON:	CHECKED	GF	08/11/22
2 PL DECIMALS ±	APPROVED	IL	08/11/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			



Mini-Circuits®

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Brooklyn NY 11235

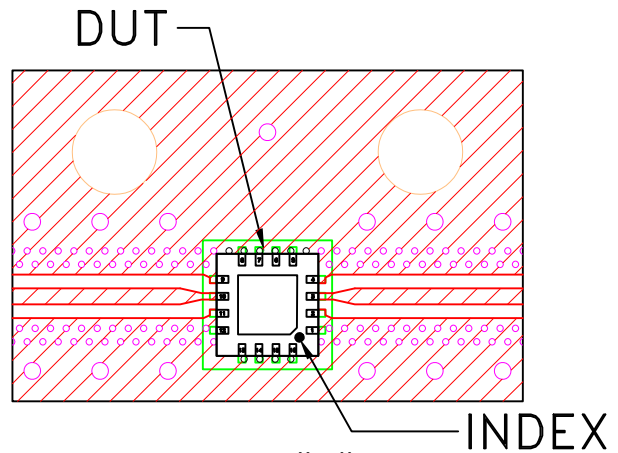
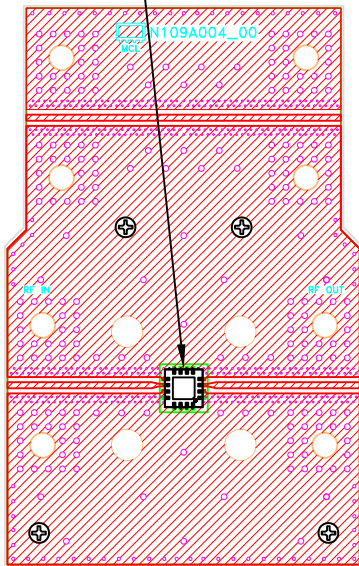
PL, DQ3005, TB-EQY-18-24+/24C+

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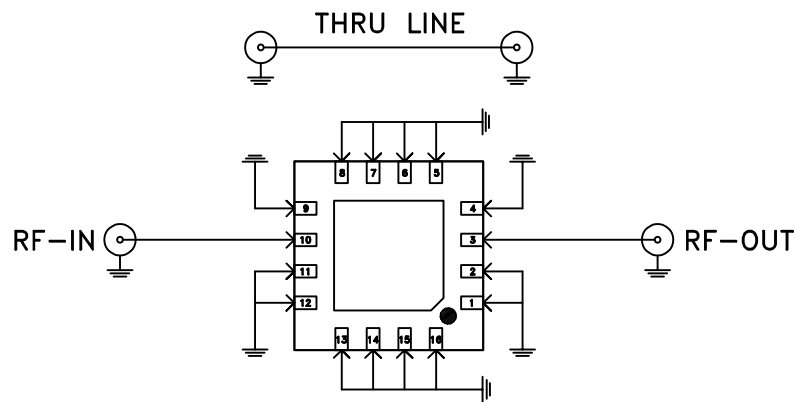
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Evaluation Board and Circuit

SEE DETAIL "A"



DETAIL "A"
(SCALE 3:1)



SCHMATIC DIAGRAM

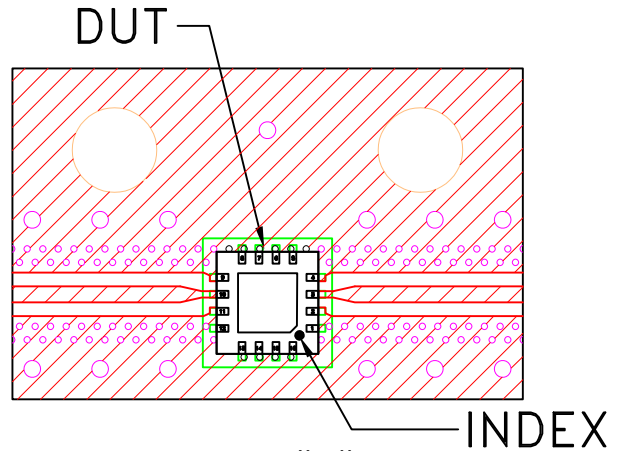
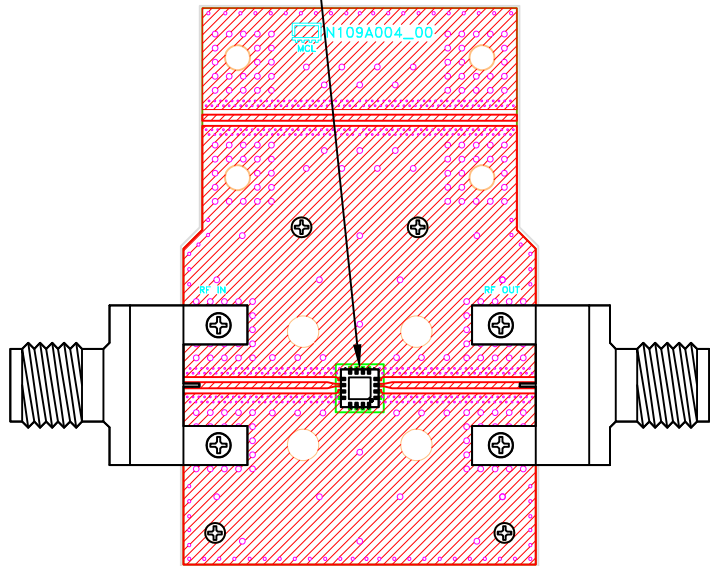
Function	Pad
RF-IN	10
RF-OUT	3
GND	2,4,9,11
NC,GND Externally	1,5,6,7,8,12, 13,14,15,16

Notes:

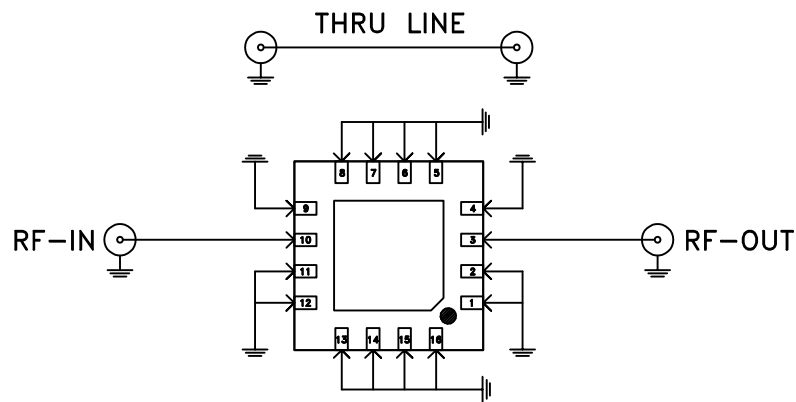
1. PCB Material: Roger R04350B or equivalent,
Dielectric constant=3.5, Thickness=0.010 inch

Evaluation Board and Circuit

SEE DETAIL "A"



DETAIL "A"
(SCALE 3:1)



SCHMATIC DIAGRAM

Function	Pad
RF-IN	10
RF-OUT	3
GND	2,4,9,11
NC,GND Externally	1,5,6,7,8,12, 13,14,15,16

Notes:

1. 2.92mm Female Connectors.
2. PCB Material: Roger R04350B or equivalent,
Dielectric constant=3.5, Thickness=0.010 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 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