



Mini-Circuits®

MMIC MICROWAVE

# Gain Equalizer

**EQY-7-123+**

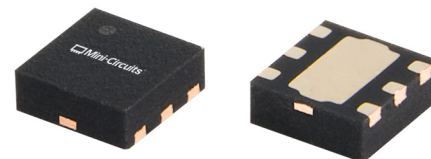
50Ω 7 dB DC to 12 GHz

## THE BIG DEAL

- Wideband, DC to 12 GHz
- Linear Positive Slope Across Operating Band
- Excellent Return Loss, 15 dB Typ.
- 1.5x1.5 mm, 6-Lead QFN-Style Package

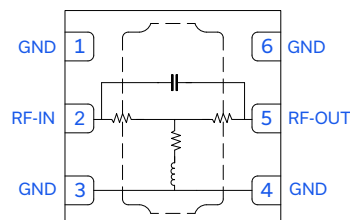
## APPLICATIONS

- Test & Measurement Equipment
- Satellite Communications
- Radar, EW, and ECM Defense Systems



Generic photo used for illustration purposes only

## FUNCTIONAL DIAGRAM (TOP VIEW)



## PRODUCT OVERVIEW

EQY-7-123+ is a wideband, absorptive gain slope equalizer fabricated using a highly reliable and repeatable GaAs MMIC IPD process. Operating from DC to 12 GHz, this model achieves outstanding linear slope while maintaining excellent return loss throughout the entire band due to its absorptive design. This model is packaged in a compact 1.5x1.5 mm package, making it an ideal choice for dense circuit layouts across a wide range of applications such as Test & Measurement, Satellite Communications, Radar, EW, and ECM Defense Systems.

## KEY FEATURES

| Feature                             | Advantages   |
|-------------------------------------|--|
| Wideband Operation, DC to 12 GHz    | Broadband positive gain slope equalization can effectively compensate for negative gain slope of amplifiers, receivers, transmitters and transmission lines to achieve flat gain across frequency in wideband systems. |
| Excellent Return Loss, 15 dB Typ.   | Excellent return loss across the full frequency range minimizes unwanted reflections and enables this model to be seamlessly cascaded within wideband signal chains.   |
| 1.5x1.5 mm 6-Lead QFN-Style Package | Small footprint saves space in dense layouts while providing low inductance and excellent thermal contact to the PCB. Industry-standard packaging allows for ease of assembly in high-volume manufacturing processes.  |





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ELECTRICAL SPECIFICATIONS<sup>1,2</sup> AT +25°C AND  $Z_0 = 50\Omega$ , UNLESS NOTED OTHERWISE

| Parameter          | Condition (GHz) | Min. | Typ. | Max. | Units |
|--------------------|-----------------|------|------|------|-------|
| Frequency Range    |                 | DC   |      | 12   | GHz   |
| Insertion Loss     | 0.01            | 7.2  | 7.7  | 8.1  | dB    |
|                    | 2               | 6.4  | 6.9  | 7.4  |       |
|                    | 5               | 4.2  | 4.7  | 5.2  |       |
|                    | 10              | 0.5  | 1.0  | 1.6  |       |
|                    | 12              | 0.1  | 0.8  | 1.4  |       |
| Input Return Loss  | 0.01            |      | 20   |      | dB    |
|                    | 2               |      | 19   |      |       |
|                    | 5               |      | 15   |      |       |
|                    | 10              |      | 20   |      |       |
|                    | 12              |      | 20   |      |       |
| Output Return Loss | 0.01            |      | 20   |      | dB    |
|                    | 2               |      | 19   |      |       |
|                    | 5               |      | 15   |      |       |
|                    | 10              |      | 20   |      |       |
|                    | 12              |      | 20   |      |       |

1. Tested on Mini-Circuits Characterization Test Board TB-EQY-7-123C+. See Figure 2. Board loss de-embedded to the device.

2. Bi-directional RF-IN and RF-OUT ports can be interchanged.



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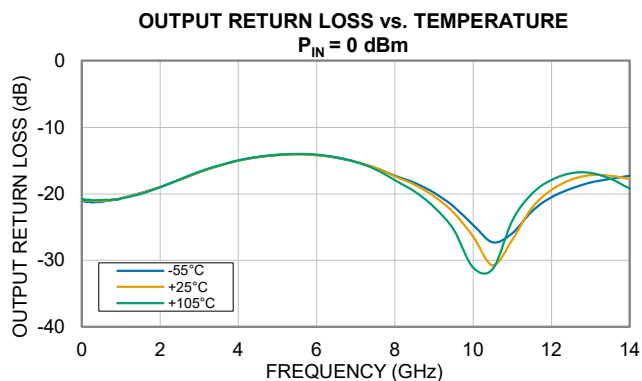
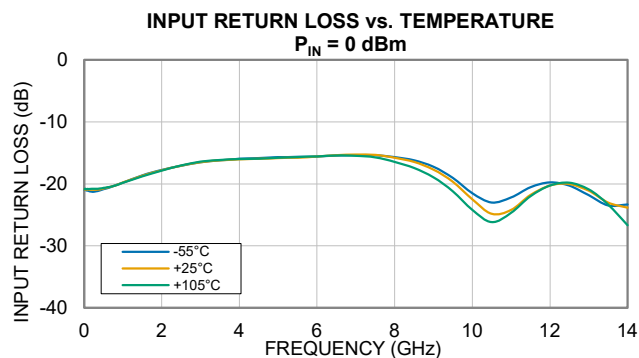
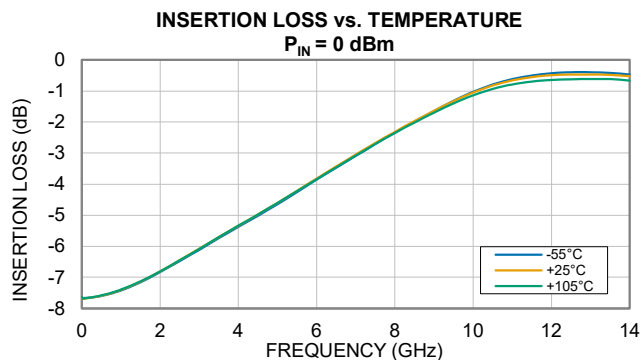
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## TYPICAL PERFORMANCE GRAPHS



ABSOLUTE MAXIMUM RATINGS<sup>3</sup>

| Parameter             | Ratings         |
|-----------------------|-----------------|
| Operating Temperature | -55°C to +105°C |
| Storage Temperature   | -65°C to +150°C |
| RF Input Power        | +30 dBm         |

3. Permanent damage may occur if any of these limits are exceeded. Maximum ratings are not intended for continuous normal operation.

## THERMAL RESISTANCE

| Parameter   | Ratings   |
|---|-----------|
| Thermal Resistance ( $\Theta_{JC}$ ) <sup>4</sup> | 124.8°C/W |

4.  $\Theta_{JC}$  = (Hot Spot Temperature on Die - Temperature at Ground Lead) / Dissipated Power

## ESD RATING

|     | Class | Voltage Range | Reference Standard          |
|-----|-------|---------------|-----------------------------|
| HBM | 1C    | > 1000 V      | ANSI/ESDA/JEDEC JS-001-2023 |
| CDM | C3    | > 1000 V      | ANSI/ESDA/JEDEC JS-002-2022 |



ESD HANDLING PRECAUTION: This device is designed to be Class 1C for HBM. Static charges may easily produce potentials higher than this with improper handling and can discharge into DUT and damage it. As a preventive measure Industry standard ESD handling precautions should be used at all times to protect the device from ESD damage.

## MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020E /JEDEC J-STD-033C



## FUNCTIONAL DIAGRAM (TOP VIEW)

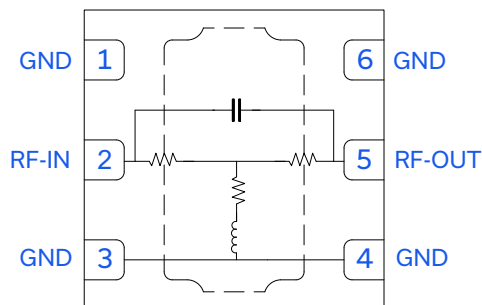


Figure 1. EQY-7-123+ Functional Diagram

## PAD DESCRIPTION

| Function | Pad Number           | Description (Refer to Figure 2)        |
|----------|----------------------|--|
| RF-IN    | 2                    | RF-IN Pad connects to RF Input port.   |
| RF-OUT   | 5                    | RF-OUT Pad connects to RF Output port. |
| GND      | 1, 3, 4, 6, & Paddle | Connects to ground.                    |

## CHARACTERIZATION TEST BOARD

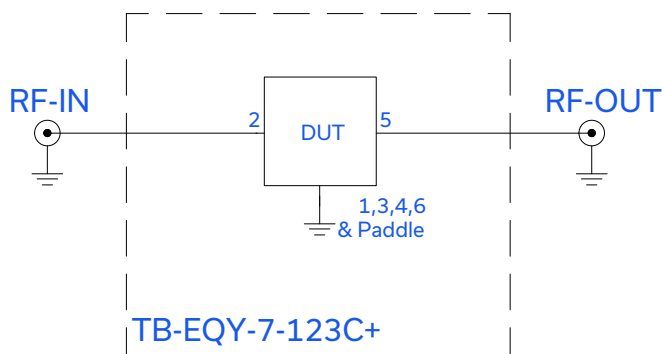


Figure 2. EQY-7-123C+ Evaluation and Application Circuit

## Electrical Parameters and Conditions

Insertion Loss and Return Loss are measured using N5242B PNA-X Microwave Network Analyzer.

## Conditions:

1. Insertion Loss and Return Loss:  $P_{IN} = 0$  dBm



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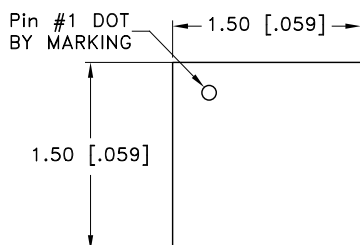
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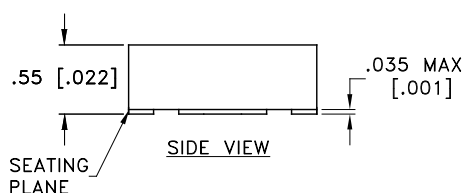
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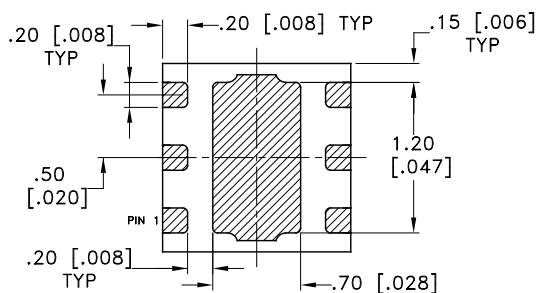
## CASE STYLE DRAWING



TOP VIEW

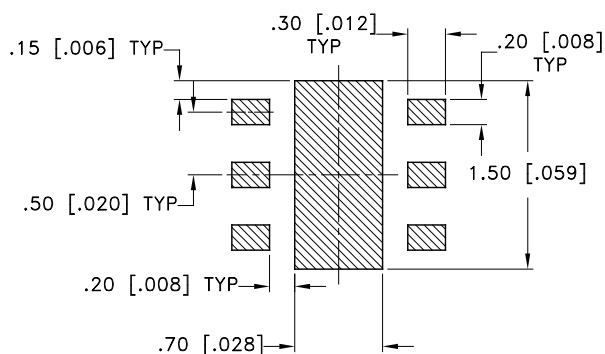


SIDE VIEW



BOTTOM VIEW

## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.050$  mm

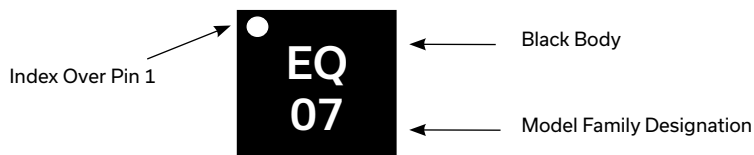
## NOTES:

1.  DENOTES METALLIZATION

Weight: 0.0036 grams

Dimensions are in mm [inches]. Tolerances: 2Pl.  $\pm 0.05$  mm [0.002 inches].

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD

[CLICK HERE](#)

|                                       |  |
|---------------------------------------|--|
| Performance Data                      | Data   |
|                                       | Graphs   |
|                                       | S-Parameter (S2P Files) Data Set (.zip file)                               |
| Case Style                            | KC3011 Plastic package, exposed paddle, Lead Finish: Nickel Palladium Gold |
| RoHS Status                           | Compliant  |
| Tape & Reel                           | F66  |
| Standard Quantities Available on Reel | 7" Reels with 20, 50, 100, 200, 500, 1000, 2000, or 3000 devices           |
| Suggested Layout for PCB Design       | PL-835   |
| Evaluation Board                      | TB-EQY-7-123C+   |
|                                       | Gerber File  |
| Environmental Ratings                 | ENV08T1  |

## NOTES

- 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.
- 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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