

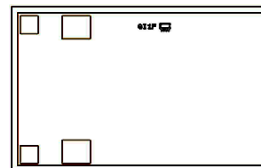
Microwave Gain Equalizer Die

EQY-D-SERIES

50Ω DC to 6 GHz

The Big Deal

- Excellent Return Loss, 20dB typ.
- Wide bandwidth, DC - 6 GHz
- Excellent power handling 31 dBm



Product Overview

EQY Series Dice 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.

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 mother-board 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 |
| Unpackaged Die | Enables the user to integrate the gain equalizer directly into hybrids |

*GaAs IPD (Gallium Arsenide Integrated Passive Device)



Microwave Gain Equalizer Die

EQY-1-63-D+

50Ω 1dB DC to 6 GHz

Product Features

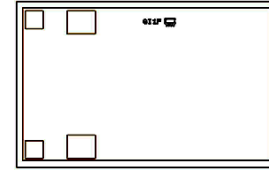
- 1.2 dB Slope
- Excellent power handling 31 dBm
- Wide Bandwidth, DC-6 GHz
- Excellent Return Loss, 20 dB typ.

Typical Applications

- Cellular
- PCS
- Communications
- Radar
- Defense

General Description

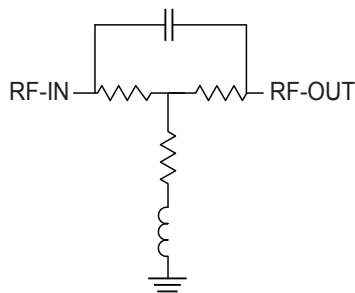
EQY-1-63-D+ is an absorptive Gain Equalizer Die fabricated using highly repetitive GaAs IPD MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQY-1-63-D+ has a nominal attenuation slope of 1.2 dB.



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

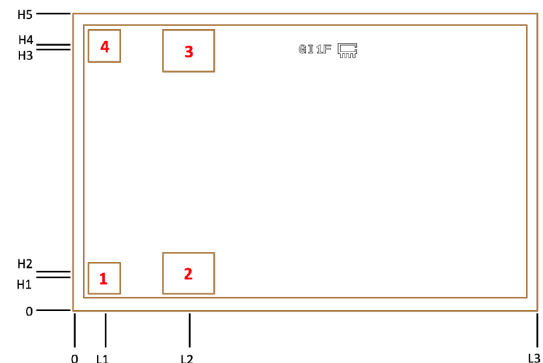
Ordering Information: Refer to Last Page

Simplified Schematic and Pad description



| Pad Number | Function | Description |
|---------------------|----------|---------------|
| 2 | RF-IN | RF-Input pad |
| 3 | RF-OUT | RF-Output pad |
| 1,4 & Bottom of Die | GND | Ground |

Bonding Pad Position



Dimensions in μm, Typical

| L1 | L2 | L3 | H1 | H2 | H3 | H4 | H5 | Thickness | Die Size | Bond Pad #1, #4 | Bond Pad #2, #3 |
|----|-----|------|----|----|-----|-----|-----|-----------|----------|-----------------|-----------------|
| 74 | 274 | 1107 | 74 | 86 | 613 | 626 | 700 | 100 | 1107x700 | 67 X 67 | 117 X 92 |

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 | | 1.6 | | dB |
| | 1 | | 1.5 | | |
| | 2 | | 1.2 | | |
| | 3 | | 0.9 | | |
| | 4 | | 0.7 | | |
| | 5 | | 0.5 | | |
| VSWR | 6 | | 0.4 | | :1 |
| | 0.01 -1 | | 1.08 | | |
| | 1 - 2 | | 1.09 | | |
| | 2 - 3 | | 1.08 | | |
| | 3 - 4 | | 1.06 | | |
| | 4 - 5 | | 1.13 | | |
| | 5 - 6 | | 1.24 | | |

1. Measured on Mini-Circuits Characterization Test Board. Die is packaged in 2x2mm, 8-lead MCLP and soldered on testboard TB-1041-1-63+ See Characterization Test Circuit (Fig. 1)

Absolute Maximum Ratings²

| | |
|----------------------------|---------------|
| Operating Case Temperature | -40°C to 85°C |
| RF Input Power | 31 dBm |

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

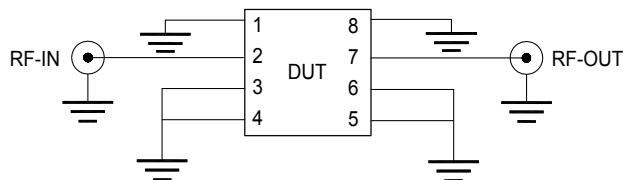
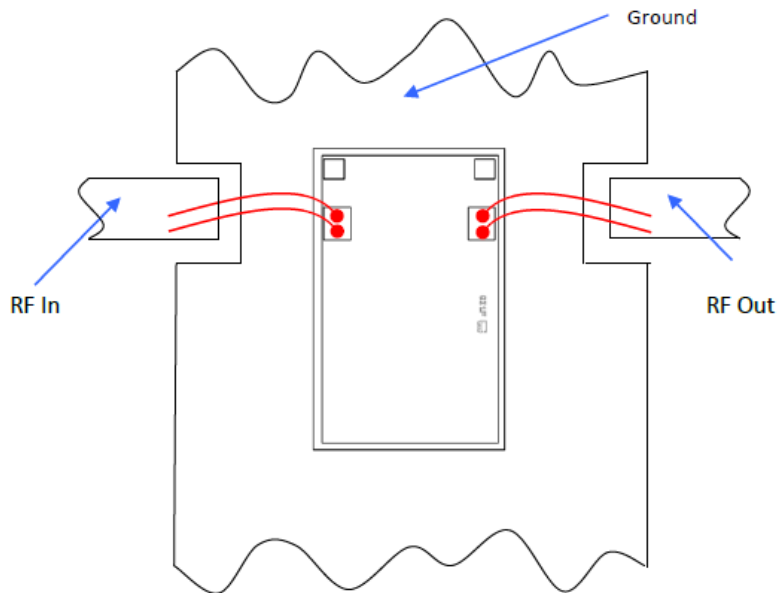
Characterization Test Circuit

Fig 1. Block Diagram of Test Circuit used for characterization. Die is packaged in 2x2mm, 8-lead MCLP and soldered on testboard TB-1041-1-63+
Conditions: Attenuation & Return Loss Pin=0 dBm

Assembly Diagram



Assembly and Handling Procedure

- 1. Storage**
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
- 2. ESD**
MMIC GaAs Gain equalizer dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickup tips or sharp antistatic tweezers to deter ESD damage to dice.
- 3. Die Attach**
The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are DieMat DM6030HK-PT/H579 or Ablestik 84-1LMISR4. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total die periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. It is recommended to use antistatic die pick up tools only.
- 4. Wire Bonding**
Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermosonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1 mil diameter. Bonds must be made from the bond pads on the die to the package or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.

| Additional Detailed Technical Information <i>additional information is available on our dash board.</i> | | | | | | | | | |
|---|--|-------------------|-----------|------------------------------------|--------------|--|--------------|---------------------------------|--------------|
| Performance Data | Data Table | | | | | | | | |
| | Swept Graphs | | | | | | | | |
| | S-Parameter (S2P Files) Data Set with and without port extension(.zip file) | | | | | | | | |
| Case Style | Die | | | | | | | | |
| Die Ordering and packaging information | <table> <tr> <td>Quantity, Package</td> <td>Model No.</td> </tr> <tr> <td>Small, Gel - Pak: 5,10,50,100 KGD*</td> <td>EQY-1-63-DG+</td> </tr> <tr> <td>Medium[†], Partial wafer: KGD*<1690</td> <td>EQY-1-63-DP+</td> </tr> <tr> <td>Large[†], Full Wafer</td> <td>EQY-1-63-DF+</td> </tr> </table> <p>[†]<i>Available upon request contact sales representative</i></p> <p>Refer to AN-60-067</p> | Quantity, Package | Model No. | Small, Gel - Pak: 5,10,50,100 KGD* | EQY-1-63-DG+ | Medium [†] , Partial wafer: KGD*<1690 | EQY-1-63-DP+ | Large [†] , Full Wafer | EQY-1-63-DF+ |
| Quantity, Package | Model No. | | | | | | | | |
| Small, Gel - Pak: 5,10,50,100 KGD* | EQY-1-63-DG+ | | | | | | | | |
| Medium [†] , Partial wafer: KGD*<1690 | EQY-1-63-DP+ | | | | | | | | |
| Large [†] , Full Wafer | EQY-1-63-DF+ | | | | | | | | |
| Environmental Ratings | ENV80 | | | | | | | | |

*Known Good Dice ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does help to provide a higher degree of confidence that dice are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ESD Rating**

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

** Tested in industry standard 2 x 2mm, 8-lead MCLP package

Additional 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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MMIC Gain Equalizer Die EQY-1-63-D+

Typical Performance Data

Temperature = 25°C

| FREQUENCY | INSERTION LOSS | INPUT VSWR | OUTPUT VSWR |
|-----------|----------------|------------|-------------|
| (MHz) | (dB) | (:1) | (:1) |
| 10 | 1.57 | 1.07 | 1.07 |
| 50 | 1.58 | 1.07 | 1.07 |
| 100 | 1.58 | 1.07 | 1.07 |
| 200 | 1.58 | 1.07 | 1.07 |
| 300 | 1.57 | 1.07 | 1.07 |
| 400 | 1.56 | 1.07 | 1.07 |
| 500 | 1.55 | 1.07 | 1.07 |
| 600 | 1.54 | 1.07 | 1.07 |
| 700 | 1.53 | 1.07 | 1.07 |
| 800 | 1.51 | 1.07 | 1.07 |
| 900 | 1.49 | 1.07 | 1.07 |
| 1000 | 1.46 | 1.07 | 1.07 |
| 1100 | 1.44 | 1.07 | 1.07 |
| 1200 | 1.42 | 1.07 | 1.07 |
| 1300 | 1.39 | 1.07 | 1.07 |
| 1400 | 1.36 | 1.07 | 1.07 |
| 1500 | 1.33 | 1.07 | 1.07 |
| 1600 | 1.30 | 1.07 | 1.06 |
| 1700 | 1.27 | 1.07 | 1.06 |
| 1800 | 1.24 | 1.07 | 1.06 |
| 1900 | 1.21 | 1.07 | 1.06 |
| 2000 | 1.18 | 1.07 | 1.06 |
| 2100 | 1.15 | 1.07 | 1.06 |
| 2200 | 1.12 | 1.07 | 1.06 |
| 2300 | 1.09 | 1.06 | 1.05 |
| 2400 | 1.06 | 1.06 | 1.05 |
| 2500 | 1.04 | 1.06 | 1.05 |
| 2600 | 1.01 | 1.07 | 1.05 |
| 2700 | 0.98 | 1.07 | 1.05 |
| 2800 | 0.95 | 1.07 | 1.06 |
| 2900 | 0.93 | 1.06 | 1.06 |
| 3000 | 0.90 | 1.06 | 1.06 |
| 3100 | 0.88 | 1.06 | 1.06 |
| 3200 | 0.85 | 1.05 | 1.06 |
| 3300 | 0.83 | 1.06 | 1.06 |
| 3400 | 0.81 | 1.06 | 1.06 |
| 3500 | 0.79 | 1.06 | 1.06 |
| 3600 | 0.77 | 1.05 | 1.07 |
| 3700 | 0.75 | 1.06 | 1.07 |
| 3800 | 0.73 | 1.06 | 1.08 |
| 3900 | 0.71 | 1.07 | 1.08 |
| 4000 | 0.69 | 1.08 | 1.08 |
| 4100 | 0.68 | 1.08 | 1.09 |
| 4200 | 0.66 | 1.09 | 1.10 |
| 4300 | 0.64 | 1.09 | 1.11 |
| 4400 | 0.63 | 1.10 | 1.12 |
| 4500 | 0.61 | 1.11 | 1.13 |
| 4600 | 0.59 | 1.13 | 1.14 |
| 4700 | 0.58 | 1.14 | 1.14 |
| 4800 | 0.56 | 1.15 | 1.15 |
| 4900 | 0.55 | 1.15 | 1.16 |
| 5000 | 0.53 | 1.16 | 1.17 |
| 5100 | 0.51 | 1.17 | 1.18 |
| 5200 | 0.50 | 1.19 | 1.20 |
| 5300 | 0.48 | 1.21 | 1.21 |
| 5400 | 0.47 | 1.22 | 1.22 |
| 5500 | 0.45 | 1.22 | 1.23 |
| 5600 | 0.43 | 1.23 | 1.23 |
| 5700 | 0.42 | 1.24 | 1.24 |
| 5800 | 0.41 | 1.25 | 1.25 |
| 5900 | 0.40 | 1.26 | 1.26 |
| 6000 | 0.39 | 1.27 | 1.27 |

Note: Test data of Die packaged in industry standard 2x2mm 8-Lead MCLP Package

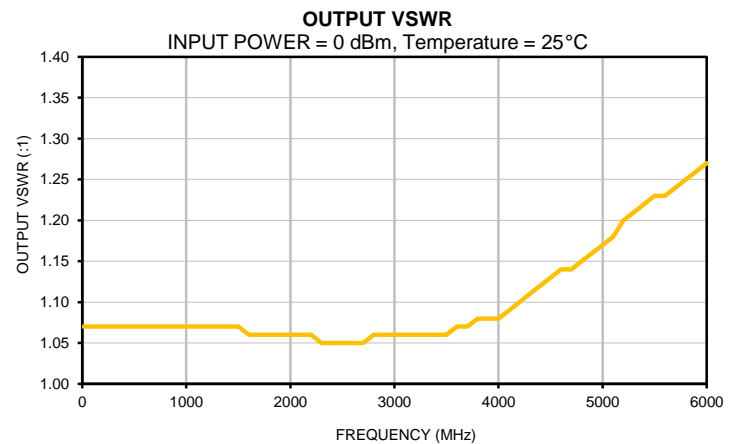
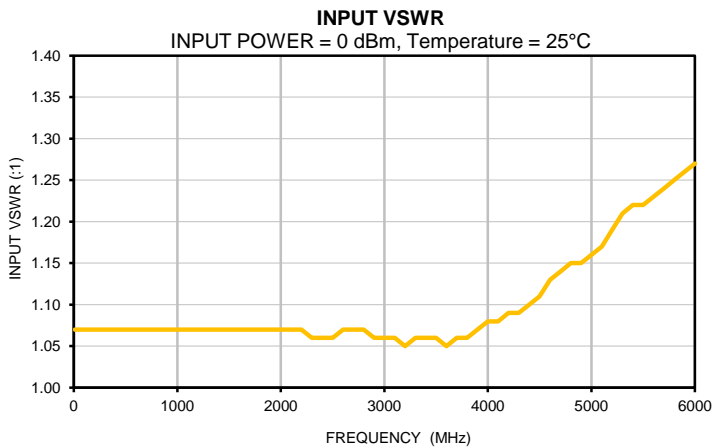
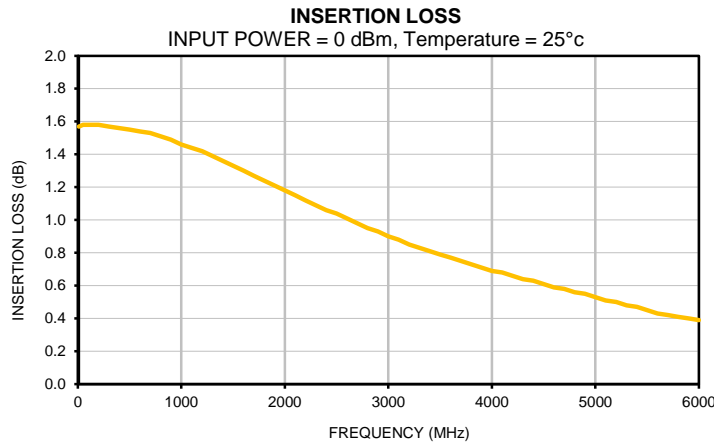


P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site
 The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com



IF/RF MICROWAVE COMPONENTS

Typical Performance Curves



Note: Test data of Die packaged in industry standard 2x2mm 8-Lead MCLP Package



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 -40° to 105° C or -55° to 105° C Ambient Environment | Refer to Individual Model Data Sheet |
| Storage Environment | 20° to 35° C and 40 to 60% humidity (In Factory Shipped Package) | Individual Model Data Sheet |