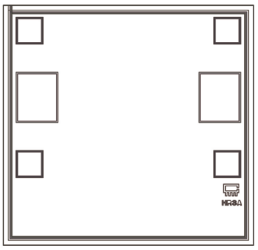
*Microwave*

# Gain Equalizer Die EQY-XX-283-D+ Series

50Ω DC to 28 GHz



## The Big Deal

- Excellent Return Loss, 17dB typ.
- Wide bandwidth, DC - 28 GHz
- Usable up to 30GHz

## Product Overview

EQY-XX-283-D+ series of absorptive Gain Equalizer dice are fabricated using highly repetitive GaAs IPD* MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQY-XX-283-D+ are available with nominal attenuation slope of 3, 4, 5 & 6 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 3,4,5 & 6dB | Enables circuit designer to change nominal insertion loss values without board redesign making the EQY-XX-283-D+ Series ideal for select at test application. |
| Wideband operation, DC to 28 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 | Enables its use at the output of a variety of amplifiers |
| Unpackaged Die | Enables the user to integrate the gain equalizer directly into hybrids. |

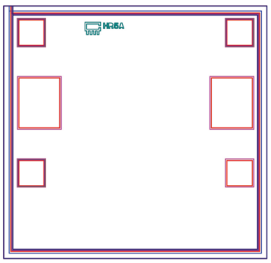
*GaAs IPD (Gallium Arsenide Integrated Passive Device)

*Microwave*

# Gain Equalizer Die

## EQY-5-283-D+

50Ω 5dB DC to 28 GHz



### Product Features

- 5.3 dB Slope from DC to 28 GHz
  Can work up to 30 GHz
- Good Return Loss, 17 dB typ.

### Typical Applications

- Cellular Infrastructure
- 5G
- Wideband Communications
- Test Instrumentation
- Defense

***+RoHS Compliant***

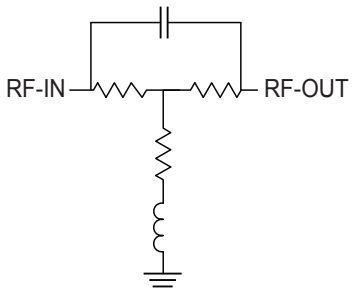
*The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications*

*Ordering Information: Refer to Last Page*

### General Description

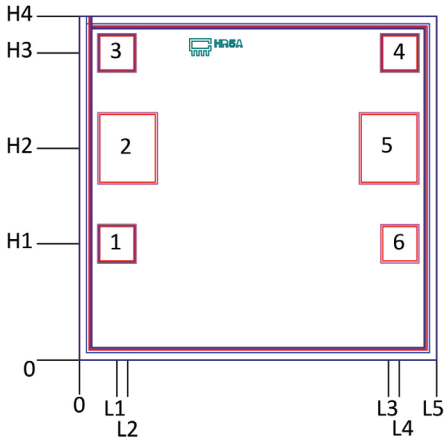
EQY-5-283-D+ is an absorptive Gain Equalizer Die fabricated using highly repetitive GaAs IPD MMIC process incorporating resistors, capacitors and inductors having negative insertion loss slope. EQY-5-283-D+ has a nominal attenuation slope of 5.3 dB.

### Simplified Schematic and Pad description




| Pad Number | Description |
|---|---|
| 2 | RF-Input pad |
| 5 | RF-Output pad |
| 1,3,4,6 & Bottom of Die | Ground |

### Bonding Pad Position




**Dimensions in µm, Typical**

| L1 | L2 | L3 | L4 | L5 | H1 | H2 | H3 | H4 | Thickness | Die Size | Pad Size 2 & 5 | Pad Size 1,3,4,6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 101 | 650 | 673 | 750 | 244 | 444 | 644 | 720 | 100 | 750x720 | 117x142 | 72x72 |

## Electrical Specifications[1] at 25°C, 50Ω, unless otherwise noted.

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | DC | | 28 | GHz |
| Insertion Loss | 0.01 | — | 5.9 | — | dB |
| | 10 | — | 4.4 | — | |
| | 20 | — | 1.8 | — | |
| | 28 | — | 0.6 | — | |
| | 30 | — | 0.6 | — | |
| VSWR | 0.01 - 10 | — | 1.16 | — | :1 |
| | 10 - 20 | — | 1.12 | — | |
| | 20 - 28 | — | 1.12 | — | |
| | 28-30 | — | 1.12 | — | |

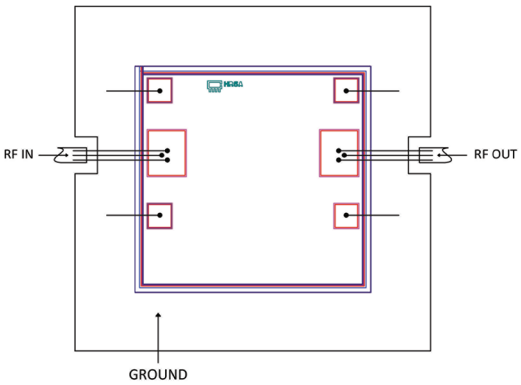
1. Electrical specifications are measured with die being packaged in 2x2 6L MCLP and mounted on Characterization Test Board TB-EQY-5-283+.

## Absolute Maximum Ratings[2]

| | |
|---|---|
| Operating Case Temperature | -55°C to 105°C |
| RF Input Power[3] | 30 dBm |

2. Permanent damage may occur if any of these limits are exceeded.
3. Derates linearly to 26dBm at 105°C

## 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 worksta tion. 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 Ablestik 84-1LMISR4 or equivalent. 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

*additional information is available on our dash board.*

| | | |
|---|---|---|
| **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** | Quantity, Package | Model No. |
| | Small, Gel - Pak: 5,10,50,100 KGD* | EQY-5-283-DG+ |
| | Medium†, Partial wafer: KGD*<2070 | EQY-5-283-DP+ |
| | †*Available upon request contact sales representative* | |
| | Refer to AN-60-067 | |
| **Environmental Ratings** | ENV80 | |

*Known Good Die (KGD) means that the die are taken from PCM good wafer and then visually inspected per Mini-Circuits' criteria. Though this is not definitive, it does provide a higher degree of confidence that die 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, 6-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.

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/MCLStore/terms.jsp

D. Mini-Circuits does not warrant the accuracy or completeness of the information, text, graphics and other items contained within this document and same are provided as an accommodation and on an "As is" basis, with all faults.

E. Purchasers of this part are solely responsible for proper storing, handling, assembly and processing of Known Good Dice (including, without limitation, proper ESD preventative measures, die preparation, die attach, wire bond ing and related assembly and test activities), and Mini-Circuits assumes no responsibility therefor or for environmental effects on Known Good Dice.

F. Mini-Circuits and the Mini-Circuits logo are registered trademarks of Scientific Components Corporation d/b/a Mini-Circuits. All other third-party trademarks are the property of their respective owners. A reference to any third-party trademark does not constitute or imply any endorsement, affiliation, sponsorship, or recommendation by any such third-party of Mini-Circuits or its products.

# MMIC Gain Equalizer Die EQY-5-283-D+

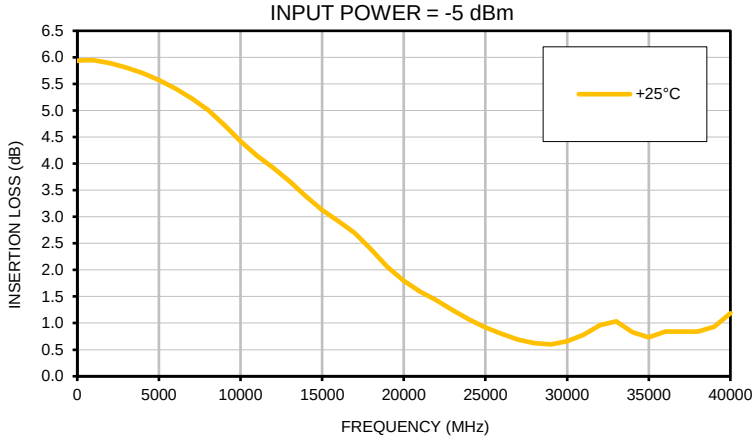
*Typical Performance Data*

| FREQ. (MHz) | INSERTION LOSS (dB) @25°C | INPUT VSWR (:1) @25°C | OUTPUT VSWR (:1) @25°C |
|---|---|---|---|
| 10 | 5.93 | 1.19 | 1.19 |
| 100 | 5.94 | 1.13 | 1.13 |
| 500 | 5.95 | 1.13 | 1.13 |
| 1000 | 5.95 | 1.13 | 1.13 |
| 2000 | 5.89 | 1.17 | 1.16 |
| 3000 | 5.81 | 1.20 | 1.19 |
| 4000 | 5.70 | 1.22 | 1.22 |
| 5000 | 5.57 | 1.21 | 1.23 |
| 6000 | 5.42 | 1.21 | 1.23 |
| 7000 | 5.23 | 1.22 | 1.25 |
| 8000 | 5.01 | 1.24 | 1.28 |
| 9000 | 4.73 | 1.23 | 1.26 |
| 10000 | 4.42 | 1.14 | 1.16 |
| 11000 | 4.15 | 1.06 | 1.02 |
| 12000 | 3.92 | 1.13 | 1.09 |
| 13000 | 3.67 | 1.15 | 1.11 |
| 14000 | 3.39 | 1.13 | 1.09 |
| 15000 | 3.13 | 1.18 | 1.16 |
| 16000 | 2.92 | 1.30 | 1.29 |
| 17000 | 2.70 | 1.36 | 1.36 |
| 18000 | 2.39 | 1.27 | 1.27 |
| 19000 | 2.06 | 1.14 | 1.11 |
| 20000 | 1.80 | 1.11 | 1.03 |
| 21000 | 1.60 | 1.15 | 1.07 |
| 22000 | 1.43 | 1.16 | 1.10 |
| 23000 | 1.24 | 1.12 | 1.06 |
| 24000 | 1.07 | 1.09 | 1.05 |
| 25000 | 0.92 | 1.10 | 1.09 |
| 26000 | 0.80 | 1.12 | 1.10 |
| 27000 | 0.69 | 1.07 | 1.04 |
| 28000 | 0.62 | 1.05 | 1.04 |
| 29000 | 0.60 | 1.06 | 1.07 |
| 30000 | 0.66 | 1.28 | 1.22 |
| 31000 | 0.78 | 1.54 | 1.48 |
| 32000 | 0.96 | 1.80 | 1.78 |
| 33000 | 1.03 | 1.85 | 1.92 |
| 34000 | 0.83 | 1.58 | 1.62 |
| 35000 | 0.73 | 1.30 | 1.16 |
| 36000 | 0.84 | 1.28 | 1.08 |
| 37000 | 0.84 | 1.19 | 1.14 |
| 38000 | 0.84 | 1.18 | 1.05 |
| 39000 | 0.93 | 1.41 | 1.28 |
| 40000 | 1.19 | 1.79 | 1.71 |

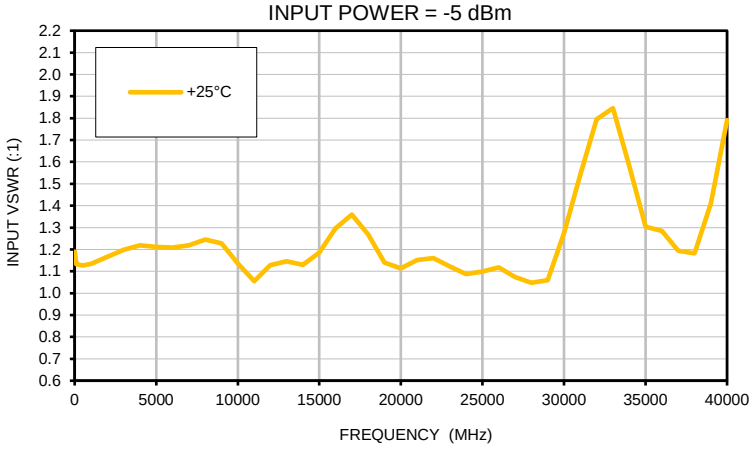
Note: Test data of Die packaged in industry standard 2x2mm 6-Lead MCLP Package

*Typical Performance Curves*

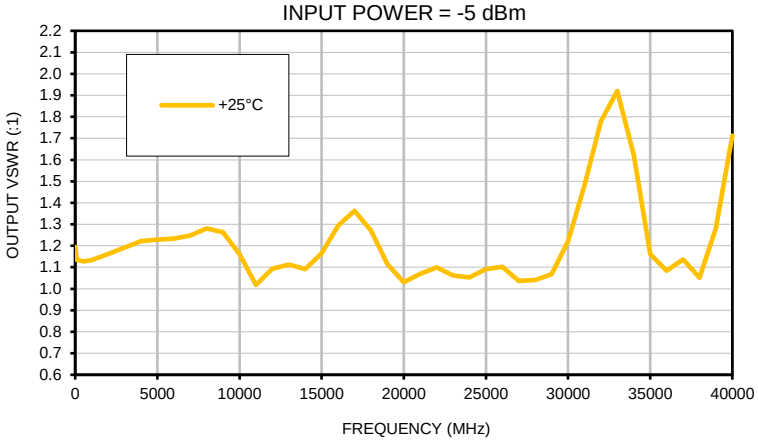
**INSERTION LOSS vs. TEMPERATURE**
INPUT POWER = -5 dBm




**INPUT VSWR vs. TEMPERATURE**
INPUT POWER = -5 dBm




**OUTPUT VSWR vs. TEMPERATURE**
INPUT POWER = -5 dBm




Note: Test data of Die packaged in industry standard 2x2mm 6-Lead MCLP Package

Mini-Circuits

# Environmental Specifications ENV80

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 or -45° to 105° C<br>Ambient Environment | Refer to Individual Model Data Sheet |
| Storage Environment (Die) | -65° to 150°C | Individual Model Data Sheet |
| Storage Environment(Packaging) | -40° to 70°C and 40 to 60% humidity (In Factory Shipped Package) | |


This document and its contents are the property of Mini-Circuits.