

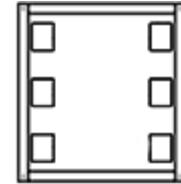
Fixed Attenuator Die

YAT-A-D-series

50Ω Up to 2W DC to 26.5 GHz

The Big Deal

- Wide band, DC to 26.5 GHz
- Excellent power handling, up to 2W
- Contiguous ground plane for easy installation
- Usable to 40 GHz



Product Overview

Mini-Circuits' YAT-A-D-Series MMIC attenuator dice (RoHS compliant) are fixed value, absorptive attenuators fabricated using highly repetitive MMIC processing with thin film resistors on GaAs substrates. Providing precise attenuation from DC up to 26.5 GHz, these attenuators are ideal for a very wide range of applications. YAT-A-D-Series attenuator dice are available from stock with nominal attenuation values of 0 to 10 dB (in 1 dB steps), and 12, 15, 20, and 30 dB.

Key Features

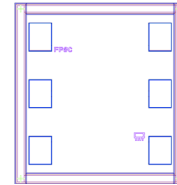
| Feature | Advantages |
|---|---|
| Ultra-wide band operation, DC to 26.5 GHz | YAT-A-D-series attenuator dice support a wide array of applications including 5G systems, microwave communications, satellite, defense and aerospace, medical broadband and optical applications |
| Single, contiguous ground plane | The attenuators achieve ultra-wide band performance up to 26.5 GHz with single, contiguous ground plane, simplifying installation into customer hybrids. |
| High power handling, up to 2W | Power handling up to 2W makes YAT-A attenuator dice suitable for a wide range of system power requirements. |
| Wide range of nominal attenuation values: 0 to 10 dB (in 1 dB steps) and 12, 15, 20 and 30 dB | Small increment offerings enable circuit designers to change attenuation values without motherboard redesign, making the YAT-A-D-series ideal for adjusting attenuation values based on test results. |
| Excellent attenuation flatness | Provides precise, consistent attenuation across the entire frequency band, ideal for broadband and multi-band usage. |

Product Features

- Wide bandwidth, DC to 26.5 GHz
- Excellent attenuation accuracy & flatness
- Exceptional power handling, up to 2W

Typical Applications

- Cellular
- PCS
- Communications
- Radar
- Defense
- 5G

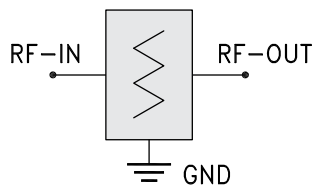
**+RoHS Compliant**

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

Ordering Information: Refer to Last Page

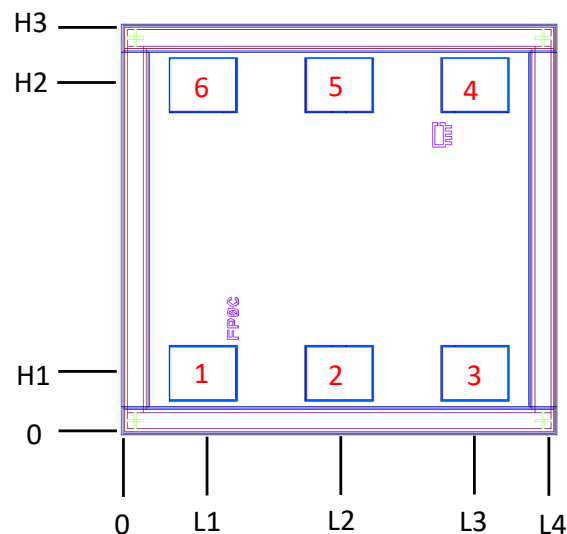
General Description

YAT-0A-D+ is an absorptive attenuator Die fabricated using highly repetitive MMIC process on GaAs substrate. YAT-0A-D+ attenuator Die contains through-wafer vias to realize low thermal resistance and wideband operation.

Simplified Schematic

| Pad # | Description |
|------------|-------------|
| 2 | RF-IN |
| 5 | RF-OUT |
| 1,3,4,6 | Ground |
| Die bottom | Ground |

Note: 1. Bond Pad material - Gold
2. Bottom of Die - Gold plated

Bonding Pad Position / Description

Die dimensions in μm

| L1 | L2 | L3 | L4 | H1 | H2 | H3 | Thickness | Bond pad size |
|-----|-----|-----|-----|----|-----|-----|-----------|---------------|
| 125 | 375 | 625 | 750 | 85 | 615 | 700 | 100 | 125 x 100 |

(Numbers on bond pads are for identification only, not marked on Die)

Electrical Specifications at 25°C, 50Ω

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Unit |
|---|-----------------|-----------|---------|------|------|
| Frequency Range | | DC | | 26.5 | GHz |
| Attenuation ¹ | DC - 5 | | 0.1±0.1 | | dB |
| | 5 - 15 | | 0.1±0.1 | | |
| | 15 - 18 | | 0.1±0.1 | | |
| | 18 - 26.5 | | 0.2±0.2 | | |
| VSWR ¹ | DC - 5 | | 1.1 | | :1 |
| | 5 - 15 | | 1.1 | | |
| | 15 - 18 | | 1.1 | | |
| | 18 - 26.5 | | 1.2 | | |
| Operating Input Power at ² : | 25°C | DC - 26.5 | 2 | | W |
| | 85°C | DC - 26.5 | 1 | | W |

1. Electrical specifications are typical measured characteristics on die using MPI Titan Series 250 μm pitch GSG probe.

2. Tested in industry standard 2x2 mm, 6-lead MCLP package.

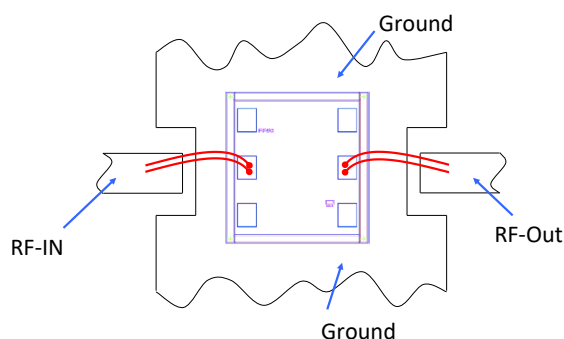
Absolute Maximum Ratings³

| | |
|----------------------------------|-----------------|
| Operating Temperature (ground) | -40°C to +85°C |
| Storage Temperature ⁴ | -65°C to +150°C |
| RF Input Power | 2 W |

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

4. For Die shipped in Gel-Pak see ENV80 (limited by packaging)

Assembly Diagram



(Ground Bond Wires are optional)

Assembly and Handling Procedure

1. Storage

Dice should be stored in a dry nitrogen purged desiccators or equivalent.

2. ESD

MMIC GaAs Attenuator 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 epoxy is Ablestik 84-1LMISR4 or equivalent epoxies. 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) |
| Case Style | Die |
| Die Ordering and packaging information | Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* YAT-0A-DG+ Medium†, Partial wafer: KGD* <2.115K YAT-0A-DP+ Large†, Full Wafer YAT-0A-DF+ †Available upon request contact sales representative Refer to AN-60-067 |
| Environmental Ratings | ENV-80 |

*Known Good Die (KGD) means the die in question are taken from a wafer that has been RF tested at select frequencies and visually inspected per Mini-Circuits' criteria. While this is not definitive, it does provide a high 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 STM5.1-2001

** Tested in industry standard 2x2 mm, 6-lead MCLP package.

Additional 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.
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Fixed Attenuator Die

YAT-0A-D+

Typical Performance Data

| FREQUENCY (GHz) | ATTENUATION (dB) | VSWR (:1) |
|--------------------|---------------------|--------------|
| 0.01 | 0.00 | 1.00 |
| 0.02 | 0.00 | 1.00 |
| 0.04 | 0.00 | 1.00 |
| 0.06 | 0.00 | 1.00 |
| 0.08 | 0.00 | 1.00 |
| 0.10 | 0.00 | 1.00 |
| 0.20 | 0.00 | 1.00 |
| 0.40 | 0.00 | 1.00 |
| 0.60 | 0.00 | 1.00 |
| 0.80 | 0.00 | 1.00 |
| 1.00 | 0.00 | 1.00 |
| 1.20 | 0.00 | 1.00 |
| 1.40 | 0.00 | 1.01 |
| 1.60 | 0.01 | 1.01 |
| 1.80 | 0.00 | 1.01 |
| 2.00 | 0.00 | 1.01 |
| 3.00 | 0.00 | 1.01 |
| 4.00 | 0.00 | 1.01 |
| 5.00 | 0.01 | 1.02 |
| 6.00 | 0.00 | 1.02 |
| 7.00 | 0.01 | 1.02 |
| 8.00 | 0.02 | 1.03 |
| 9.00 | 0.02 | 1.03 |
| 10.0 | 0.03 | 1.04 |
| 11.0 | 0.04 | 1.05 |
| 12.0 | 0.05 | 1.05 |
| 13.0 | 0.08 | 1.06 |
| 14.0 | 0.08 | 1.06 |
| 15.0 | 0.08 | 1.07 |
| 16.0 | 0.09 | 1.07 |
| 17.0 | 0.13 | 1.08 |
| 18.0 | 0.14 | 1.08 |
| 19.0 | 0.14 | 1.08 |
| 20.0 | 0.11 | 1.08 |
| 21.0 | 0.13 | 1.09 |
| 22.0 | 0.16 | 1.10 |
| 23.0 | 0.16 | 1.10 |
| 24.0 | 0.15 | 1.11 |
| 25.0 | 0.17 | 1.12 |
| 26.0 | 0.19 | 1.13 |
| 27.0 | 0.21 | 1.14 |
| 28.0 | 0.21 | 1.14 |
| 29.0 | 0.27 | 1.16 |
| 30.0 | 0.32 | 1.16 |



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IF/RF MICROWAVE COMPONENTS

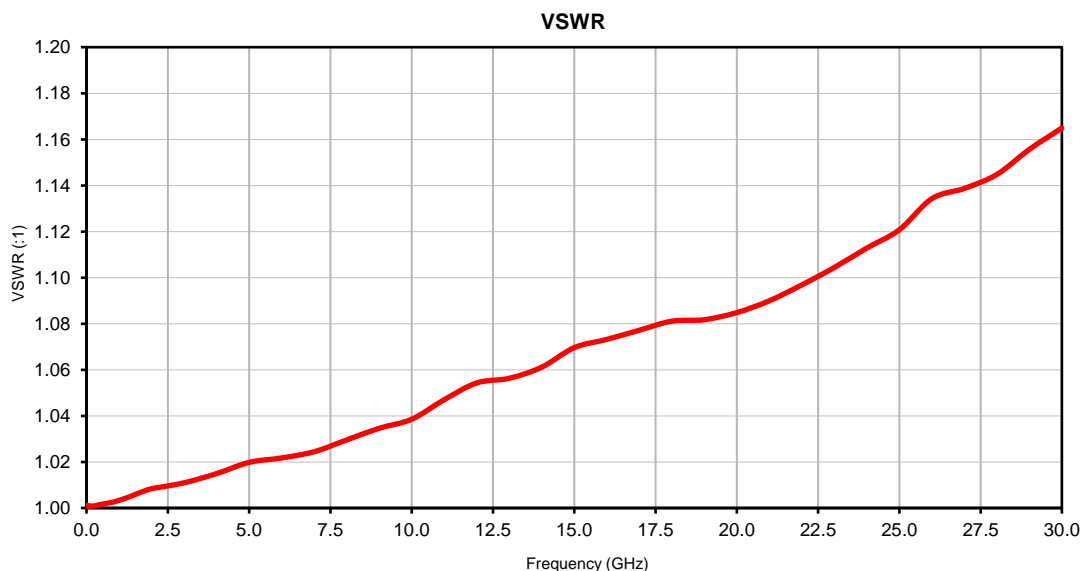
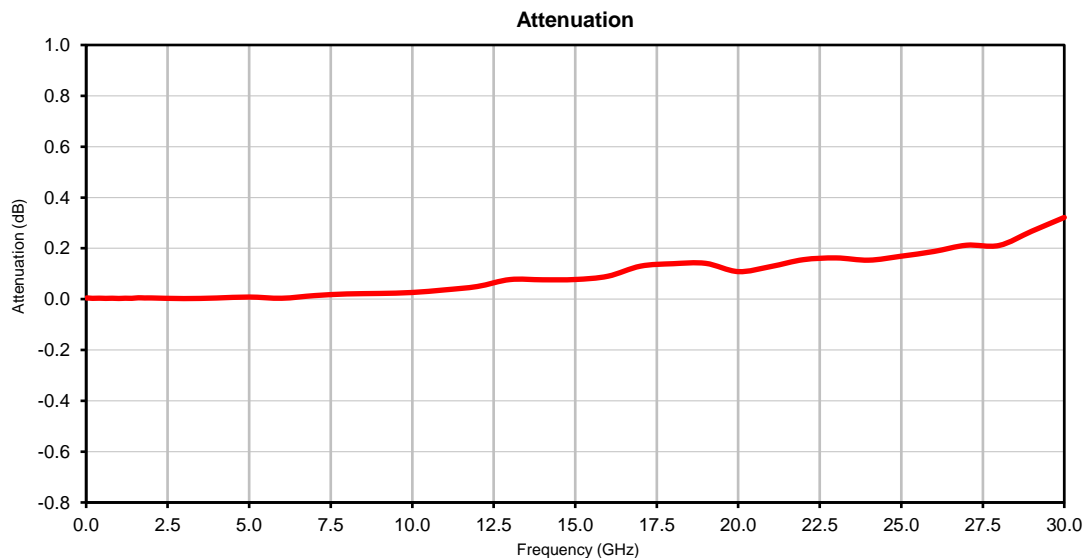


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Fixed Attenuator Die

Typical Performance Curves

YAT-0A-D+



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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 |
|--------------------------------|--|--------------------------------------|
| Operating Temperature | -40° to 85° C or -40° to 105° C or -55° to 105° C or -45° to 105° C 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) | |