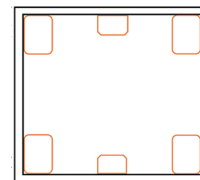


# Fixed Attenuator Die YAT-D-SERIES

50Ω Up to 2W DC to 26.5 GHz

## The Big Deal

- Excellent power handling, up to 2W
- Wideband, DC to 26.5 GHz
- Usable to 40 GHz
- Unpackaged die form



## Product Overview

YAT-D-series MMIC attenuator dice (RoHS compliant) are fixed value, absorptive attenuators fabricated using highly repetitive MMIC processing with thin film resistors on Silicon substrates. They contain through-wafer Cu metallization vias to realize low thermal resistance and very wideband operation. YAT 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
Wideband operation, DC to 26.5 GHz Usable to 40 GHz	YAT-D-series attenuator dice support a wide array of applications including wireless cellular, microwave communications, satellite, defense and aerospace, medical broadband and optical applications. They are also usable in applications up to 40 GHz such as 5G systems (See application note AN-70-019).
High power handling, up to 2W	Power handling up to 2W makes YAT 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-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.
Unpackaged die	Enables the user to integrate the attenuator die directly into hybrids.

Microwave Precision

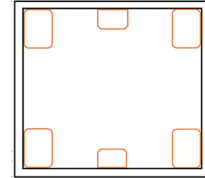
# Fixed Attenuator Die

YAT-4-D+

50Ω 2W 4dB DC to 26.5 GHz

## Product Features

- wide bandwidth, DC-26.5 GHz
- excellent attenuation accuracy & flatness
- exceptional power handling, up to 2W



### +RoHS Compliant

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

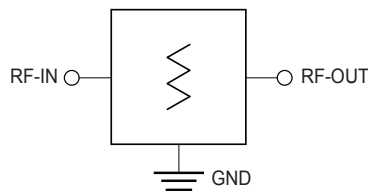
## Typical Applications

- Cellular
- PCS
- communications
- radar
- defense

## General Description

YAT-4-D+ is a absorptive attenuator die fabricated using highly repetitive MMIC process including thin film resistors on Silicon substrate. YAT-4-D+ attenuator die contains through-wafer Cu metallization vias to realize low thermal resistance and wideband operation.

## Simplified Schematic and Pad description



Pad	Description
RF-IN	RF input pad
RF-OUT	RF output pad
GND	GND pads

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

Electrical Specifications at 25°C, 50Ω

Parameter	Condition (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		DC		26.5	GHz
Attenuation <sup>1</sup>	DC - 5		4.0		dB
	5 - 15		4.2		
	15 - 18		4.3		
	18 - 26.5		4.5		
VSWR <sup>1</sup>	DC - 5		1.1		:1
	5 - 15		1.4		
	15 - 18		1.5		
	18 - 26.5		1.7		
Operating Input Power at <sup>2</sup> :	25°C	DC - 18		2	W
	85°C	DC - 18		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 Ratings

Operating Temperature (ground)	-40°C to 85°C
RF Input Power	2W

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

Die Layout

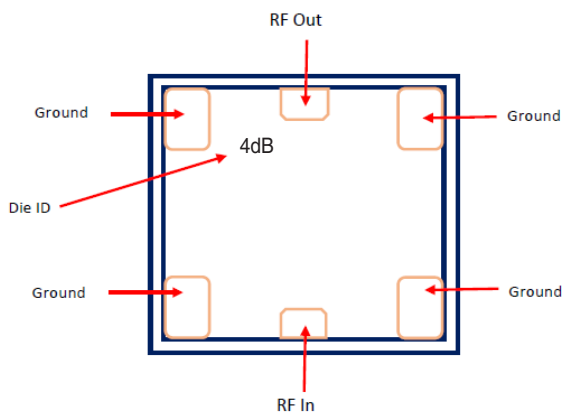


Fig 2. Die Layout

Note: Alternate Die ID: ATN3590\_04

Bonding Pad Position  
(Dimensions in μm, Typical)

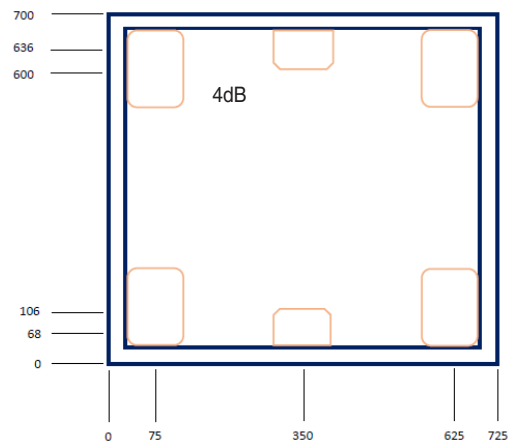


Fig 3. Bonding Pad Positions

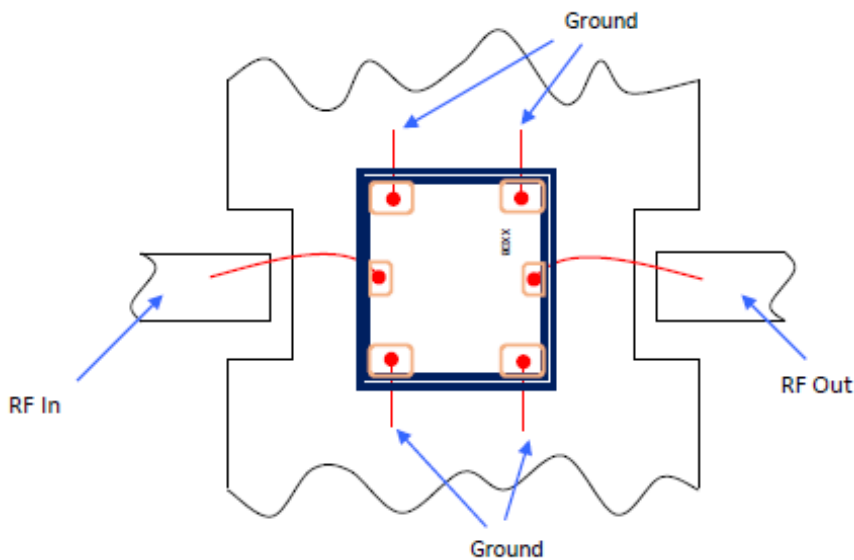
Critical Dimensions

Parameter	Values
Die Thickness, μm	100
Die Width, μm	725
Die Length, μm	700
RF IN and RF OUT Bond Pad Size, μm	110 x 75
Ground Bond Pad Size, μm	110 x 150

### Assembly and Handling Procedure

1. Storage  
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD  
MMIC Silicon 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 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.

### Assembly Diagram



Note: Ground bond wires are optional.

### Recommended Wire Length, Typical

Wire	Wire Length (mm)	Wire Loop Height (mm)
ALL WIRES	0.25	0.15

<b>Additional Detailed Technical Information</b> <i>additional information is available on our dash board.</i>	
<b>Performance Data</b>	Data Table
	Swept Graphs
	S-Parameter (S2P Files) Data Set with port extension(.zip file)
<b>Case Style</b>	Die
<b>Die Ordering and packaging information</b>	Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* YAT-4-DG+ Medium†, Partial wafer: KGD*<2160 YAT-4-DP+ Large†, Full Wafer YAT-4-DF+ †Available upon request contact sales representative  Refer to <a href="#">AN-60-067</a>
<b>Environmental Ratings</b>	ENV-80

\*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 1A (250 to 500V) in accordance with JESD22 - A114

\*\* Tested in industry standard 2x2 mm, 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](http://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 bonding 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.

