Fixed Attenuator Die

KAT-D-Series

 50Ω Up to 2W DC to 50 GHz

The Big Deal

- Ultra-wide band, DC to 50 GHz
- · Excellent power handling, up to 2W
- · Contiguous ground plane for easy installation



Product Overview

Mini-Circuits' KAT-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 50 GHz, these attenuators are ideal for a very wide range of applications up to millimeter wave bands including 5G systems and more. KAT-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 50 GHz	KAT-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 50 GHz with single, contiguous ground plane, simplifying installation into customer hybrids.
High power handling, up to 2W	Power handling up to 2W makes KAT 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 KAT-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.

Millimeter Wave Precision

Fixed Attenuator Die

KAT-20-D+

 50Ω 0.8W 20dB DC to 50 GHz

Product Features

- Wide bandwidth, DC to 50 GHz
- Excellent attenuation accuracy & flatness
- Exceptional power handling, up to 0.8W

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

Ordering Information: Refer to Last Page

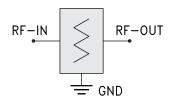
Typical Applications

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

General Description

KAT-20-D+ is an absorptive attenuator Die fabricated using highly repetitive MMIC process including thin film resistors on GaAs substrate. KAT-20-D+ attenuator Die contains through-wafer vias to realize low thermal resistance and wideband operation.

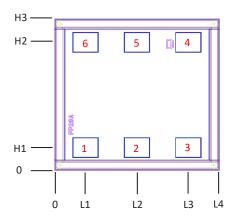
Simplified Schematic



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	НЗ	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)	Die Typ. ¹	Die Eval Board Typ. ²	Unit	
Frequency Range			DC-50	DC-50	GHz	
		DC-5	20.0 ± 0.1	20.2 ± 0.2		
		5-15	20.0 ± 0.1	20.5 ± 0.2		
Attenuation		15-18	20.0 ± 0.1	20.8 ± 0.2	dB	
Attenuation	18-26.5 19.9 ± 0.3 21.1 ± 0.2	uБ				
		26.5-43.5	19.3 ± 1.4	20.4 ± 0.5		
		43.5-50		19.8 ± 0.3		
		DC-5	1.2	1.1		
		5-15	1.2	1.1		
Vewp		15-18	1.2	1.4	.4	
VSWR		18-26.5	1.2	1.6	:1	
		26.5-43.5	1.2	1.3		
		43.5-50		1.5		
O	25°C	DC-50	0.8	0.8	W	
Operating Input Power at ³ :	85°C	DC-50	0.6	0.6	W	

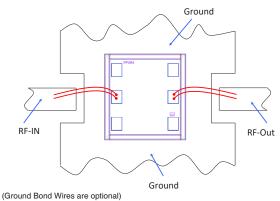
- 1. Electrical specifications are typical measured characteristics on die using MPI Titan Series 250 µm pitch GSG probe.
- Measured on X-Microwave Drop-In / Evaluation Block, XM-B1B1-0204D
 Tested in industry standard 2x2 mm, 6-lead MCLP package.

Absolute Maximum Ratings

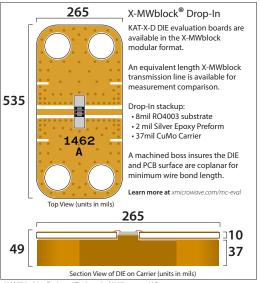
Operating Temperature (ground)	-40°C to 85°C
RF Input Power	0.8W

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

Assembly Diagram



X-Microwave Drop-In / Evaluation Block



X-MWblock is a Registered Trademark of X-Microwave, LLC

Assembly and Handling Procedure

1. Storage

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

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 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.



	Data Table	Data Table			
Performance Data	Swept Graphs	Swept Graphs			
	S-Parameter (S2P Files)	S-Parameter (S2P Files)			
Case Style	Die				
	Quantity, Package				
	Small, Gel - Pak: 5,10,50,100 KGD*	KAT-20-DG+			
Die Ordering and packaging information	Medium [†] , Partial wafer: KGD*<2.115K	KAT-20-DP+			
imormation	Large [†] , Full Wafer	KAT-20-DF+			
	†Available upon request contact sales representative				
	Refer to <u>AN-60-067</u>				
Die TB Reference	XM-B1B1-0204D (Please check X-Microw	XM-B1B1-0204D (Please check X-Microwave's Website)			
Environmental Ratings	ENV-80	ENV-80			

^{*}Known Good Dice ("KGD") means that the dice 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 the 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 STM5.1-2001

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