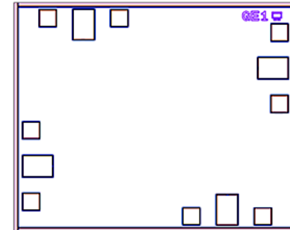
MMIC

Bi-Directional Coupler Die EBDC19-KA-D+

50Ω 5 to 43.5 GHz



The Big Deal

- Ultra-Wide Bandwidth, 5-43.5 GHz
- Excellent Coupling Flatness ±0.6 dB typ over 20-40 GHz

Product Overview

Mini-Circuits' EBDC19-KA-D+ is a Bi-Directional Coupler die designed for wideband operation from 5 to 43.5 GHz with a nominal coupling of 18.7 dB over 20-40 GHz. Manufactured using GaAs IPD technology, it has excellent repeatability and excellent reliability.

Key Features

Feature	Advantages
Wideband, 5 to 43.5 GHz	A single Directional Coupler can be used in many applications, saving component count. Also ideal for applications such as 5G, military and instrumentation.
DC Passing up to 1.3A	DC current passing is helpful in applications where both RF & DC need to pass through the DUT, such as antenna mounted hardware.
Unpackaged die	Enables user to integrate it directly into hybrids.

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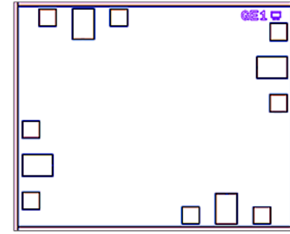


Product Features

- Wide bandwidth, 5 to 43.5 GHz
- Excellent Coupling Flatness, ±0.6 dB over 20 to 40 GHz
- Nominal Coupling 18.6 dB over 20 to 40 GHz
- DC passing

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

Ordering Information: Refer to Last Page

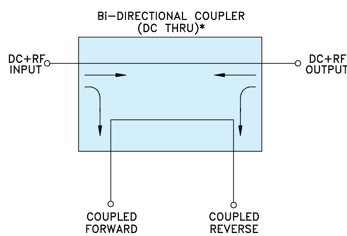
Typical Applications

- 5G
- Instrumentation
- Military

General Description

Mini-Circuits' EBDC19-KA-D+ is a Bi-Directional Coupler die designed for wideband operation from 5 to 43.5 GHz with a nominal coupling of 18.7 dB over 20-40 GHz. Manufactured using GaAs IPD technology, it has excellent repeatability and excellent reliability.

Simplified Schematic and Pad description



Pad#	Function
1	Input
2	Output
4	Couple Forward
3	Couple Reverse
Die Bottom	Ground

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

Bonding Pad Position

Dimensions in µm, Typical

L1	L2	L3	L4	L5	H1	H2	H3	H4	H5	Die Thickness	Bond Pad #1, #3 Size	Bond Pad #2, #4 Size
134	392	1199	1456	1590	124	370	921	1166	1290	100	117 x 167	167 x 117

Electrical Specifications[1] at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range		5		43.5	GHz
Main Line Loss	5 - 10		0.3		dB
	10 - 20		0.6		
	20 - 40		0.6		
	40 - 43.5		0.6		
Nominal Coupling	5 - 10		25.6		dB
	10 - 20		21.0		
	20 - 40		18.7		
	40 - 43.5		19.5		
Coupling Flatness (±)	5 - 10		2.8		dB
	10 - 20		1.9		
	20 - 40		0.6		
	40 - 43.5		0.6		
Directivity	5 - 10		8.8		dB
	10 - 25		9.1		
	25 - 30		10		
	30 - 43.5		6.0		
Return Loss - Input / Output	5 - 10		15.6		dB
	10 - 20		13.7		
	20 - 40		14.7		
	40 - 43.5		16.0		
Return loss - CPL-FWD/CPL-REV	5 - 10		15.8		dB
	10 - 20		14.1		
	20 - 40		14.8		
	40 - 43.5		15.8		

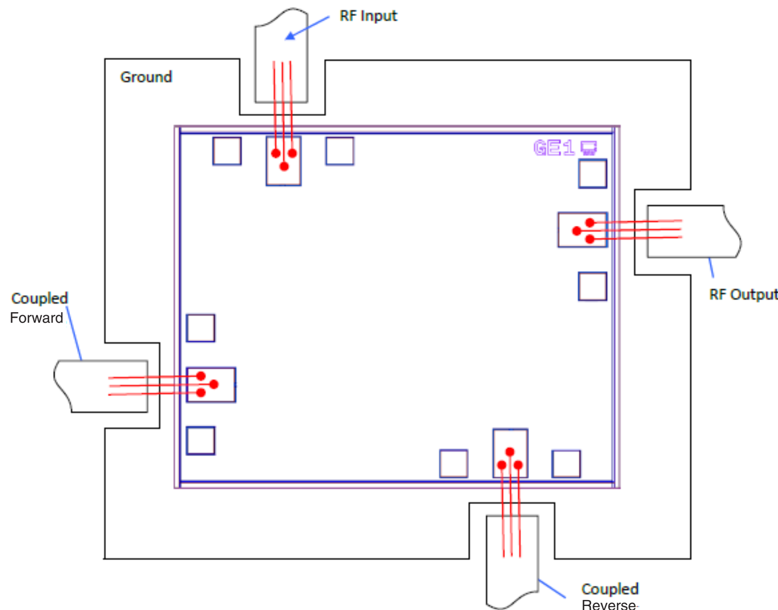
1. Measured on Die using MPI TITAN 200µm GSG probe

Absolute Maximum Ratings[2]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Power Input	1W Max.
Power into Coupled Port	1W Max.
DC Current	1.3A at 25°C. Derate linearly to 0.65A at 85°C

2. Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.

Assembly Diagram



Note: 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 coupler 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 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 *additional information is available on our dash board.*	
Performance Data	Data Table
	Swept Graphs
	S-Parameter (S4P Files)
Case Style	Die
Die Ordering and packaging information	Quantity, Package — Model No. Small, Gel - Pak: 5, KGD* — EBDC19-KA-DG+ Medium†, Partial wafer: 350 KGD* — EBDC19-KA-DP+ †*Available upon request contact sales representative* Refer to AN-60-067
Environmental Ratings	ENV80

*Known Good Dice ("KGD") means that the dice are taken from PCM good wafer and visually inspected according to Mini-Circuits inspection criteria. While this 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 1C (Pass 1000V) in accordance with ANSI/ESD STM 5.1 - 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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