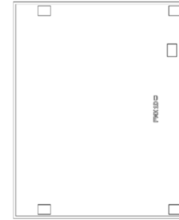
MMIC

Directional Coupler Die

EDC21-24-D+

50Ω 21 dB 4 to 20 GHz



The Big Deal

- Wideband, 4-20 GHz
- Excellent coupling flatness 21±2 dB typ.
- Highly repeatable performance (GaAs based design)

Product Overview

Mini-Circuits' EDC21-24-D+ is a MMIC wideband 21 dB directional coupler die that operates from 4 to 20 GHz. It provides excellent coupling flatness over a broad bandwidth and good return loss. This coupler also provides a quadrature phase shift between the signal at the through port and coupler port. Manufacturing using GaAs Technology, this model results in relatively high repeatablility in performance.

Key Features

Feature	Advantages
Wideband, 4-20 GHz	EDC21-24-D+ can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrumentation.
Excellent coupling flatness	Excellent coupling flatness minimizes need for external compensation to achieve flatness
Unpackaged Die	Enables user to integrate it directly into hybrids.

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Directional Coupler Die

EDC21-24-D+

50Ω   21 dB   4 to 20 GHz

Product Features

- Low mainline loss, 0.7 dB typ.
- Excellent coupling flatness, ±2dB
- Highly repeatable performance (GaAs based design)
- No external termination required

Typical Applications

- Satellite communications
- Wireless infrastructure
- Test and measurements

+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

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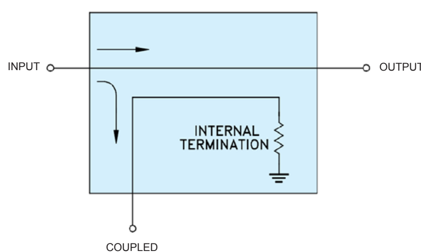
Simplified Schematic and Pad Description



Pad#	Function
1	INPUT
2	COUPLED
3	TERMINATION
4	ISOLATED[1]
5	OUTPUT

Note: 1. Connect to pad 3, see assembly diagram (page 4)

Bonding Pad Position

Dimensions in μm, Typical

L1	L2	L3	L4	H1	H2	H3	H4	Thickness	Die Size	Bond Pad #1,#2,#4, & #5 Size	Bond Pad #3 Size
363	1871	1909	2020	105	1980	2446	2550	100	2020 x 2550	142 x 107	107 x 142

Electrical Specifications[1] at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		4000		20000	MHz
Mainline Loss	4000 - 8000		0.4		dB
	8000 - 10000		0.7		
	10000 - 15000		0.8		
	15000 - 20000		0.9		
Nominal Coupling	4000 - 8000		22		dB
	8000 - 10000		21		
	10000 - 15000		21		
	15000 - 20000		21		
Coupling Flatness(±)	4000 - 20000		2.0		dB
Directivity	4000 - 8000		21		dB
	8000 - 10000		19		
	10000 - 15000		16		
	15000 - 20000		14		
Return Loss (Input)	4000 - 8000		26		dB
	8000 - 10000		16		
	10000 - 15000		17		
	15000 - 20000		21		
Return Loss (Output)	4000 - 8000		26		dB
	8000 - 10000		16		
	10000 - 15000		17		
	15000 - 20000		21		
Return Loss (Coupled)	4000 - 8000		19		dB
	8000 - 10000		16		
	10000 - 15000		15		
	15000 - 20000		21		

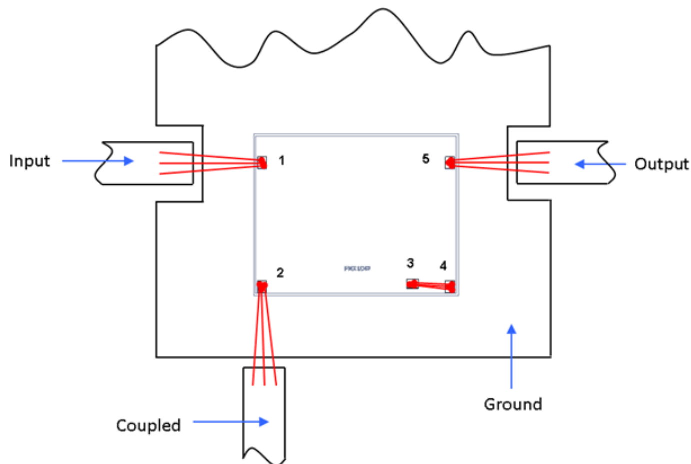
1. Measured on Mini-Circuits Characterization Test Board, TB-978+. Die packaged in 4x4 mm, 24-lead MCLP package.

Maximum Ratings[1,2]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Input Power	32.5 dBm (5 minute max.) 29.5 dBm (continuous)
Power at internal termination	15 dBm (5 minute max.) 12 dBm (continuous)

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

Assembly Diagram



Assembly and Handling Procedure

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

Additional Detailed Technical Information

additional information is available on our dash board.

Performance Data	Data Table
	Swept Graphs
	S-Parameter (S2P Files)
Case Style	Die
Die Ordering and packaging information (Note 5)	Quantity, Package — Model No. Small, Gel - Pak: 5,10,50, KGD* — EDC21-24-DG+ Medium†, Partial wafer: KGD*<300 — EDC21-24-DP+ Large†, Full wafer — EDC21-24-DF+ †**Available upon request contact sales representative** Refer to AN-60-067
Environmental Ratings	ENV-80

*Known Good Dice ("KGD") means that the dice are taken from PCM good wafer and visually inspected in question have been subjected to Mini-Circuits 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 1B (500V) in accordance with ANSI/ESD STM 5.1 - 2001

** Tested in industry standard 4x4 mm, 24-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.

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