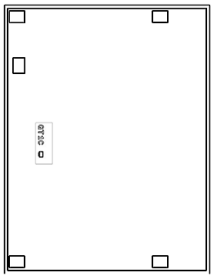
MMIC

Directional Coupler Die

EDC10-273-D+

50Ω 10dB 6 to 26.5 GHz



The Big Deal

- Wideband, 6-26.5 GHz
- Excellent coupling flatness 10±1.5 dB typ.
- Highly repeatable performance (GaAs based design)

Product Overview

Mini-Circuits' EDC10-273-D+ is a 10 dB directional coupler die that operates from 6 to 26.5 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, 6 to 26.5 GHz	EDC10-273-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 yields higher accuracy.
Unpackaged die	Enables user to integrate it directly into hybrids.

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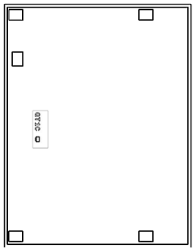

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+RoHS Compliant

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

Ordering Information: Refer to Last Page

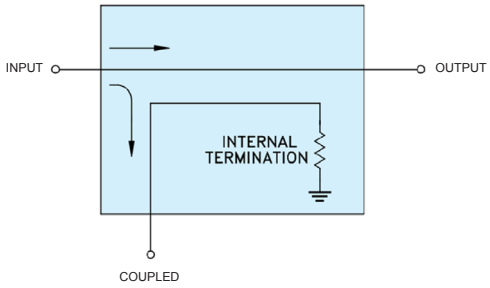
Typical Applications

- Satellite communications
- Wireless infrastructure
- Test and Measurements

General Description

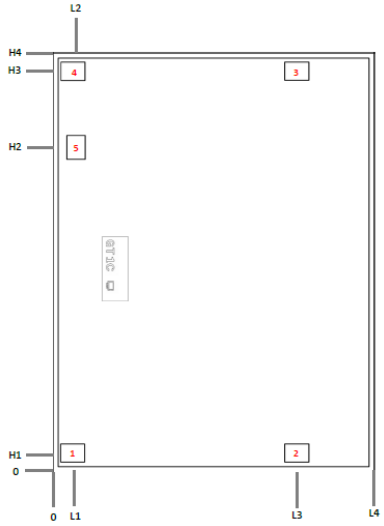
Mini-Circuits' EDC10-273-D+ is a 10 dB directional coupler die that operates from 6 to 26.5 GHz. It provides excellent coupling flatness over a broad bandwidth and good return loss. This coupler also provides a quadrature phase shift between the signal at the through port and coupler port. Manufacturing using GaAs Technology, this model results in relativerly high repeatablility in performance.

Simplified Schematic and Pad description



Pad#	Function
1	Coupled
2	Input
3	Output
4	Isolated
5	Termination
Die Bottom	Ground

Bonding Pad Position



Die dimensions in µm

L1	L2	L3	L4	H1	H2	H3	H4
112	129	1484	1950	104	1980	2446	2550
Thickness		Die size		Bond pad #1, #2, #3 & #4 Size		Bond pad #5 Size	
100		1950 x 2550		142 x 107		107 x 142	

Electrical Specifications[1] at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		6000		26500	MHz
Mainline Loss	6000 - 10000		1.0		dB
	10000 - 18000		1.4		
	18000 - 23000		1.5		
	23000 - 26500		1.8		
Nominal Coupling	6000 - 10000		10.3		dB
	10000 - 18000		10.4		
	18000 - 23000		11.4		
	23000 - 26500		10.1		
Coupling Flatness(±)	6000 - 26500		1.5		dB
Directivity	6000 - 10000		16		dB
	10000 - 18000		15		
	18000 - 23000		14		
	23000 - 26500		11		
Return Loss (Input)	6000 - 10000		24		dB
	10000 - 18000		17		
	18000 - 23000		15		
	23000 - 26500		15		
Return Loss (Output)	6000 - 10000		22		dB
	10000 - 18000		16		
	18000 - 23000		16		
	23000 - 26500		19		
Return Loss (Coupled)	6000 - 10000		24		dB
	10000 - 18000		16		
	18000 - 23000		14		
	23000 - 26500		14		

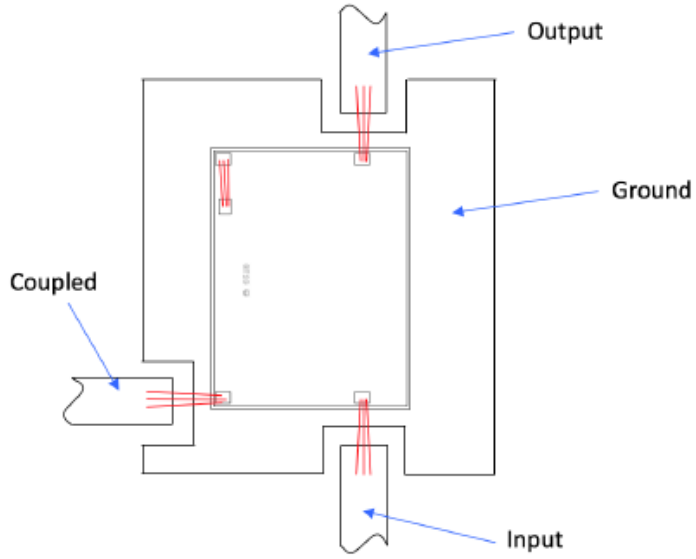
1. Measured on Mini-Circuits Characterization test board. Die is packaged in 4x4mm 24-lead MCLP package and soldered on TB-EDC10-273+.

Absolute Maximum Ratings[2]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Input Power	28 dBm (5 minute max.) 25 dBm (continuous)
Power at internal termination	19 dBm (5 minute max.) 16 dBm (continuous)

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

Assembly Diagram



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 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 (S3P Files)	
Case Style	Die	
Die Ordering and packaging information (Note 5)	Quantity, Package	Model No.
	Small, Gel - Pak: 5,10,50, KGD*	EDC10-273-DG+
	Medium†, Partial wafer: KGD*<455	EDC10-273-DP+
	Large†, Full wafer	EDC10-273-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.

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.

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Directional Coupler Die EDC10-273-D+

Typical Performance Data

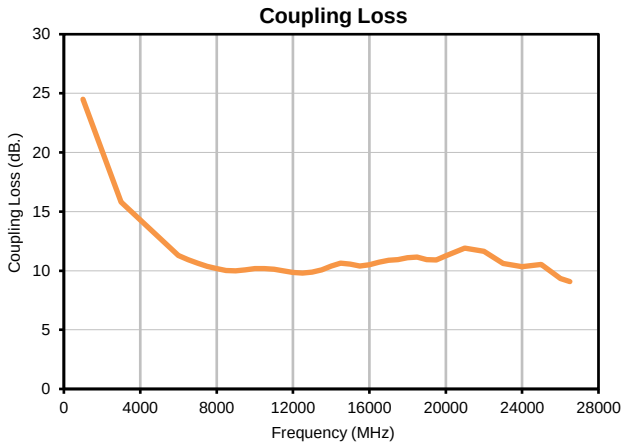
TEST CONDITIONS: INPUT POWER =0 dBm @Temperature = +25°C

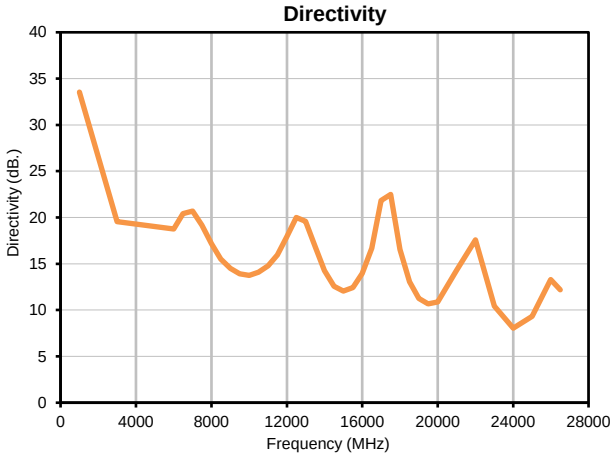
FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
1000	0.25	24.50	33.54	31.29	24.30	33.87
3000	0.61	15.80	19.55	14.03	18.73	13.82
6000	0.77	11.30	18.77	22.56	23.44	22.04
6500	0.81	10.94	20.42	25.32	27.54	24.57
7000	0.84	10.63	20.71	38.48	28.82	33.30
7500	0.89	10.38	19.18	31.27	24.24	31.46
8000	0.94	10.17	17.16	29.87	20.65	37.01
8500	1.03	10.03	15.51	24.67	18.49	25.62
9000	1.15	9.99	14.50	17.34	17.31	16.71
9500	1.33	10.07	13.91	13.19	16.68	12.45
10000	1.47	10.17	13.76	11.26	16.10	10.46
10500	1.50	10.19	14.10	10.94	15.37	10.11
11000	1.42	10.13	14.77	12.16	14.86	11.41
11500	1.28	9.98	15.97	15.41	15.10	15.01
12000	1.16	9.85	17.98	22.28	16.68	24.01
12500	1.14	9.81	20.01	28.84	20.26	31.98
13000	1.16	9.87	19.59	30.57	23.03	22.86
13500	1.22	10.06	16.86	19.28	18.26	16.57
14000	1.38	10.40	14.25	13.32	14.62	12.14
14500	1.47	10.63	12.59	11.74	12.37	10.91
15000	1.37	10.56	12.04	14.68	11.41	13.89
15500	1.30	10.40	12.42	22.21	11.71	19.55
16000	1.48	10.50	13.95	13.27	13.90	11.90
16500	1.66	10.72	16.69	10.45	18.02	9.23
17000	1.52	10.88	21.84	11.72	19.78	10.52
17500	1.25	10.95	22.48	19.25	17.52	17.24
18000	1.19	11.11	16.56	21.51	17.14	19.95
18500	1.28	11.14	13.04	15.91	19.26	14.68
19000	1.29	10.95	11.27	19.97	26.00	16.50
19500	1.36	10.90	10.67	21.57	28.21	15.77
20000	1.63	11.27	10.87	11.95	18.70	10.20
21000	1.59	11.92	14.31	10.31	10.44	9.57
22000	1.31	11.63	17.57	17.42	9.32	17.18
23000	1.58	10.62	10.42	12.76	18.59	11.34
24000	1.76	10.35	8.05	12.19	16.37	11.73
25000	1.85	10.54	9.33	10.10	11.54	9.75
26000	1.64	9.34	13.31	29.10	24.55	21.47
26500	1.78	9.08	12.21	18.07	17.59	19.32

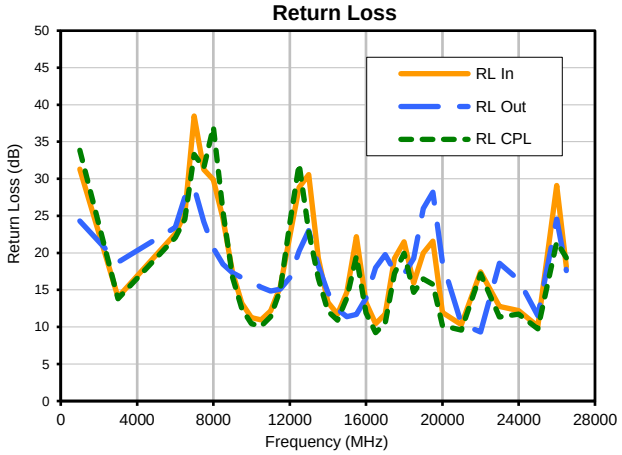
Note: Testdata of Die packaged in 4x4 mm, 24-lead MCLP package

Directional Coupler Die EDC10-273-D+

Typical Performance Curves







Note: Testdata of Die packaged in 4x4 mm, 24-lead MCLP package

Mini-Circuits

Environmental Specifications ENV80

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)	