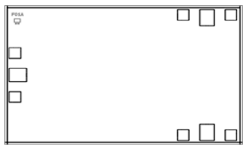
MMIC

Power Splitter/Combiner Die EP2KA-D+

2 Way-0° 50Ω 10 to 43.5 GHz



The Big Deal

- Ultra-Wide Bandwidth, 10 to 43.5 GHz
- Excellent Amplitude Unbalance, 0.18 dB typ.

Product Overview

Mini-Circuits' EP2KA-D+ is a MMIC 2-way 0˚ splitter/combiner Die designed for wideband operation from 10 to 43.5 GHz. Manufactured using GaAs IPD technology, it provides a high level of ESD protection and excellent reliability.

Key Features

Feature	Advantages
Wideband, 10 to 43.5 GHz	One power splitter can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrument.
Excellent Amplitude Unbalance, 0.18 dB and Good Phase Unbalance, 3-6 deg.	Excellent Amplitude and phase unbalance helps to accurately divide the input signals which is essential in test and measurement circuits.
Unpackaged Die	Enables user to integrate it directly into hybrids.

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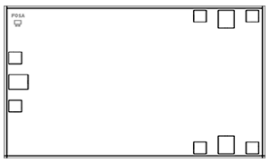


Product Features

- Super wide bandwidth, 10 to 43.5 GHz
- Excellent amplitude unbalance, 0.18 dB typ.
- DC passing

Applications

- Military
- 5G
- Instrumentation

+RoHS Compliant

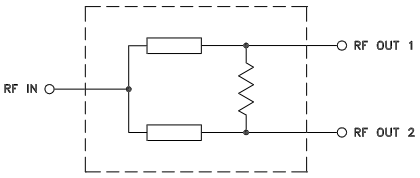
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Ordering Information: Refer to Last Page

General Description

Mini-Circuits' EP2KA-D+ is a MMIC 2-way 0˚ splitter/combiner Die designed for wideband operation from 10 to 43.5 GHz. Manufactured using GaAs IPD technology, it provides a high level of ESD protection and excellent reliability.

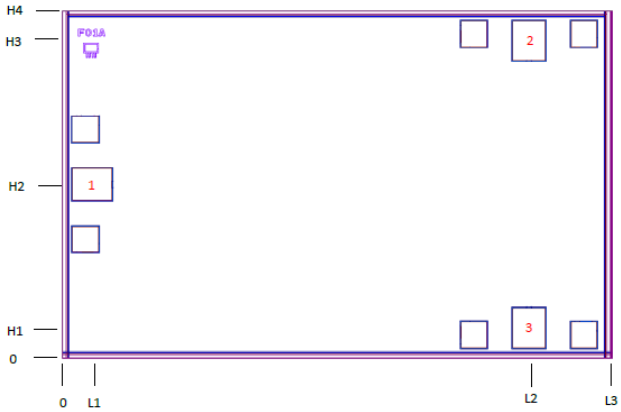
Simplified Schematic and Pad Description



Pad#	Function
1	Sum Port (RF IN)
2	Port 1(RF OUT 1)
3	Port 2 (RF OUT 2)
Die Bottom	Ground

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

Bonding Pad Position



Dimensions in µm, Typical

L1	L2	L3	H1	H2	H3	H4	Thickness	Width	Length	Bond Pad #1 Size	Bond Pad #2 Size
112	1704	2000	112	635	1158	1270	100	1270	2000	150 x 125	150 x 125

Electrical Specifications at 25°C[1]

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		43.5	GHz
Insertion Loss above 3.0 dB	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		0.8 0.5 0.9 1.5 2.2		dB
Isolation	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		17 26 22 26 29		dB
Phase Unbalance	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		3.7 4.7 6.1 9.3 9.6		Degree
Amplitude Unbalance	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		0.13 0.18 0.22 0.36 0.57		dB
VSWR (Port S)	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		1.6 1.1 1.4 1.4 1.5		:1
VSWR (Port 1-2)	10 - 20 20 - 25 25 - 30 30 - 40 40 - 43.5		1.3 1.2 1.3 1.4 1.4		:1

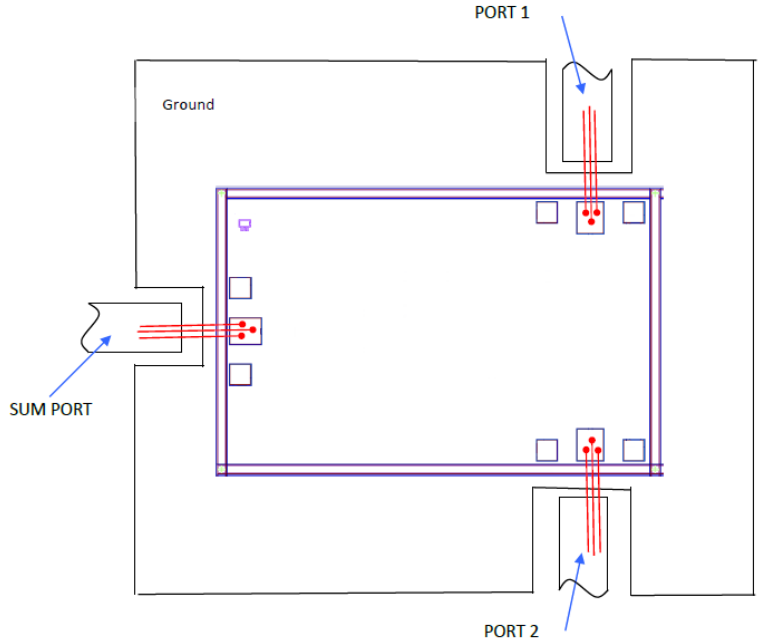
1. Tested in 2.5x3.5mm, Mini-Circuits 10-lead MCLP package.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Power Input (as a splitter)	1.25W
Internal Dissipation	0.63W
DC Current	300 mA

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 (S3P Files) Data Set with and without port extension(.zip file)	
Case Style	Die	
Die Ordering and packaging information (Note 5)	Quantity, Package	Model No.
	Small, Gel - Pak: 5,10,50, KGD*	EP2KA-DG+
	Medium†, Partial wafer: KGD*<790	EP2KA-DP+
	Large†, Full wafer	EP2KA-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 2 (2000V to <4000V) in accordance with ANSI/ESD STM 5.1 - 2001

** Tested in 2.5x3.5mm, Mini-Circuits 10-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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2 Way-0° Power Splitter/Combiner Die EP2KA-D+

Typical Performance Data [2]

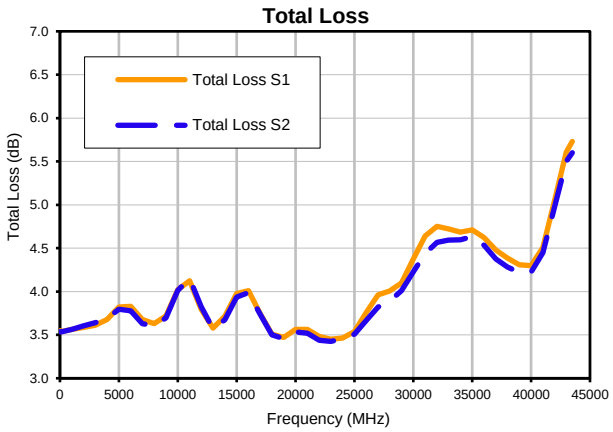
TEST CONDITIONS: INPUT POWER = 0 dBm @Temperature = +25°C

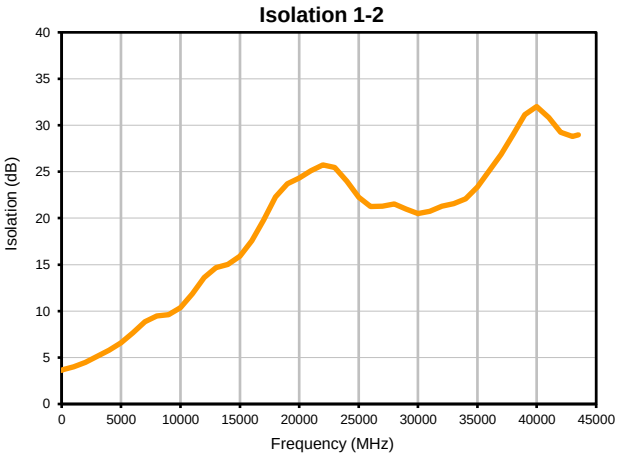
FREQ. (MHz)	TOTAL LOSS[1] (dB)		AMP. UNBAL. (dB)	ISOLATION (dB)	PHASE UNBAL. (deg.)	VSWR (:1)			
	S-1	S-2		1-2		S		1	2
10	3.55	3.54	0.01	3.62	0.01	10	1.98	1.96	1.96
100	3.54	3.53	0.00	3.68	0.02	100	1.94	1.92	1.93
1000	3.56	3.56	0.00	4.01	0.24	1000	1.89	1.83	1.84
2000	3.59	3.60	0.02	4.50	0.42	2000	1.97	1.78	1.79
3000	3.61	3.64	0.03	5.14	0.42	3000	2.03	1.63	1.66
4000	3.68	3.69	0.01	5.80	0.39	4000	2.02	1.44	1.45
5000	3.82	3.80	0.03	6.58	0.54	5000	2.07	1.32	1.32
6000	3.83	3.78	0.05	7.66	0.94	6000	2.03	1.22	1.20
7000	3.68	3.63	0.05	8.86	1.33	7000	1.85	1.13	1.11
8000	3.63	3.61	0.02	9.48	1.57	8000	1.79	1.14	1.13
9000	3.72	3.70	0.02	9.63	1.78	9000	1.91	1.15	1.12
10000	4.02	4.01	0.01	10.37	2.07	10000	2.23	1.39	1.34
11000	4.12	4.15	0.03	11.87	2.20	11000	2.27	1.47	1.42
12000	3.79	3.83	0.03	13.60	2.10	12000	1.87	1.30	1.29
13000	3.58	3.57	0.01	14.68	2.14	13000	1.59	1.12	1.18
14000	3.71	3.67	0.04	15.01	2.45	14000	1.66	1.18	1.27
15000	3.98	3.94	0.04	15.91	2.83	15000	1.92	1.43	1.46
16000	4.01	3.99	0.02	17.57	3.10	16000	1.97	1.54	1.53
17000	3.75	3.74	0.01	19.81	3.28	17000	1.64	1.41	1.39
18000	3.51	3.50	0.01	22.31	3.40	18000	1.32	1.21	1.20
19000	3.47	3.46	0.01	23.72	3.54	19000	1.25	1.13	1.11
20000	3.56	3.54	0.03	24.32	3.73	20000	1.34	1.26	1.20
21000	3.56	3.52	0.04	25.12	4.01	21000	1.34	1.32	1.26
22000	3.48	3.44	0.05	25.72	4.34	22000	1.18	1.25	1.21
23000	3.45	3.43	0.02	25.47	4.60	23000	1.07	1.15	1.16
24000	3.47	3.45	0.01	23.97	4.71	24000	1.08	1.10	1.15
25000	3.54	3.51	0.03	22.24	4.63	25000	1.17	1.14	1.20
26000	3.76	3.67	0.09	21.26	4.75	26000	1.40	1.26	1.30
27000	3.96	3.82	0.14	21.31	5.34	27000	1.53	1.33	1.31
28000	4.01	3.89	0.12	21.52	5.89	28000	1.51	1.28	1.28
29000	4.10	4.01	0.09	21.00	5.97	29000	1.59	1.29	1.38
30000	4.38	4.23	0.15	20.51	6.07	30000	1.85	1.50	1.50
31000	4.64	4.44	0.20	20.75	6.71	31000	1.99	1.67	1.56
32000	4.75	4.57	0.18	21.28	7.47	32000	1.86	1.63	1.53
33000	4.72	4.59	0.13	21.56	7.87	33000	1.74	1.48	1.49
34000	4.69	4.60	0.09	22.08	8.04	34000	1.75	1.43	1.49
35000	4.71	4.63	0.08	23.36	8.10	35000	1.74	1.46	1.48
36000	4.62	4.53	0.09	25.11	8.26	36000	1.61	1.45	1.40
37000	4.48	4.38	0.10	26.88	8.50	37000	1.41	1.41	1.31
38000	4.39	4.28	0.10	28.97	8.82	38000	1.19	1.34	1.26
39000	4.31	4.22	0.09	31.13	9.11	39000	1.06	1.26	1.22
40000	4.30	4.22	0.08	32.02	9.29	40000	1.21	1.21	1.19
41000	4.51	4.45	0.06	30.83	9.34	41000	1.31	1.22	1.24
42000	5.06	4.98	0.07	29.26	9.33	42000	1.56	1.39	1.42
43000	5.61	5.50	0.11	28.80	9.44	43000	1.92	1.60	1.60
43500	5.73	5.60	0.13	28.96	9.60	43500	2.03	1.66	1.62

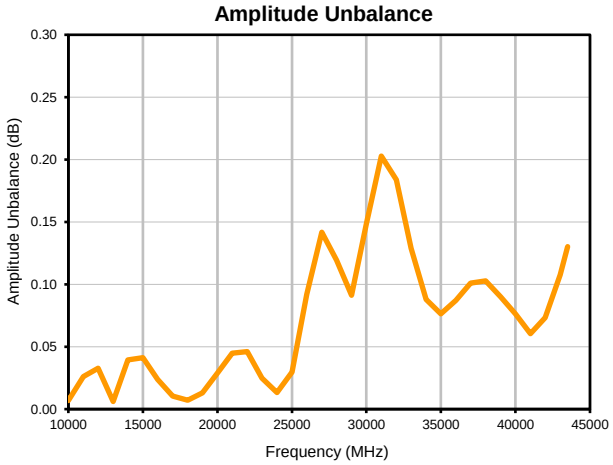
[1] Total Loss = Insertion Loss + 3dB splitter loss.

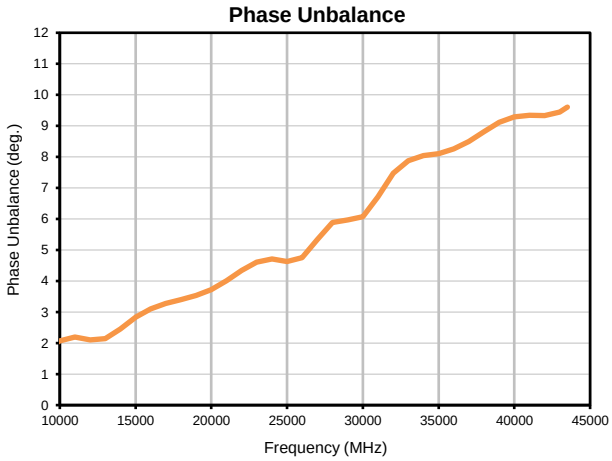
[2] Test data of Die packaged in industry standard, 2.5x3.5 mm, 10-lead MCLP package

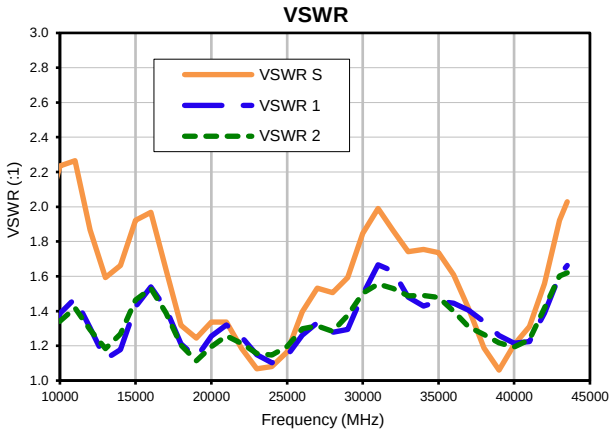
Typical Performance Data [2]











[2] Test data of Die packaged in industry standard, 2.5x3.5 mm, 10-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)	