

MMIC

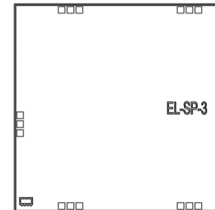
# Power Splitter/Combiner Die

EP4RKU-D+

4 Way-0° 50Ω DC to 18 GHz

## The Big Deal

- Ultra-Wide Bandwidth, DC to 18 GHz
- High Isolation, 20 dB typ. at 9 GHz



## Product Overview

Mini-Circuits' EP4RKU-D+ is a MMIC 4-way 0° splitter/combiner Die designed for wideband operation from DC to 18 GHz supporting many applications requiring high performance across a wide frequency range including all the LTE bands through WiMax and WiFi, as well as instrumentation and more. This model provides low insertion loss, good isolation, and low phase and amplitude unbalance. Manufactured using GaAs IPD technology, the EP4RKU-D+ provides a high level of ESD protection and excellent repeatability.

## Key Features

Feature	Advantages
Wideband, DC to 18 GHz	One power splitter can be used in all the LTE bands through WiMAX and WiFi, saving component count. Also ideal for wideband applications such as military and instrumentation.
Excellent amplitude and phase unbalance 0.2 dB typ at 18 GHz 5° typ. at 18 GHz	Excellent value in applications such as phased array radar
Unpackaged Die	Enables user to integrate it directly into hybrids.



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# Power Splitter/Combiner Die

## EP4RKU-D+

2 Way-0° 50Ω DC to 18 GHz

### Product Features

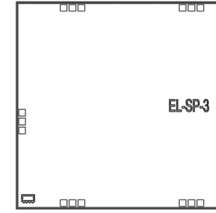
- Wide bandwidth, DC to 18 GHz
- Excellent isolation, 20 dB typ. at 9 GHz
- Excellent amplitude unbalance, 0.3 dB typ. up to 9 GHz
- Good phase unbalance, 2 deg. typ. at 9 GHz
- High ESD level
- Patent pending

### Typical Applications

- WIMAX
- ISM
- Instrumentation
- Radar
- WLAN
- Satellite communications
- LTE

### General Description

Mini-Circuits' EP4RKU-D+ is a MMIC 4-way 0° splitter/combiner Die designed for wideband operation from DC to 18 GHz supporting many applications requiring high performance across a wide frequency range including all the LTE bands through WiMax an WiFi, as well as instrumentation and more. This model provides low insertion loss, good isolation, and low phase and amplitude unbalance. Manufactured using GaAs IPD technology, the EP4RKU-D+ provides a high level of ESD protection and excellent repeatability.



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

**Ordering Information: Refer to Last Page**

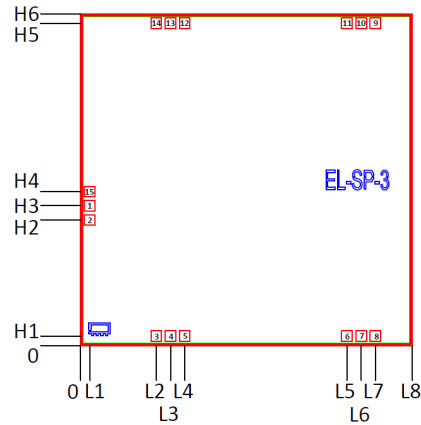
### Simplified Schematic and Pad Description



Pad#	Function
1	Sum Port (RF IN)
4	Port 4 (RF OUT 4)
7	Port 3 (RF OUT 3)
10	Port 2 (RF OUT 2)
13	Port 1 (RF OUT 1)
2,3,5,6,8,9,11,12,14,15	Ground

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

### Bonding Pad Position



L1	L2	L3	L4	L5	L6	L7	L8	H1	H2	H3	H4	H5	H6	Thickness	Die Size	Pad Size 1-15
98	799	949	1099	2811	2961	3111	3500	92	1327	1477	1627	3400	3500	100	3500X3500	112X112



Electrical Specifications at 25°C<sup>1</sup>

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		DC		18	GHz
Insertion Loss, above 6.0 dB	DC - 4	—	4.2	—	dB
	4 - 18	—	3.4	—	
Isolation	DC - 4	—	12.1	—	dB
	4 - 18	—	18.8	—	
Phase Unbalance	DC - 4	—	0.3	—	Degree
	4 - 18	—	1.9	—	
Amplitude Unbalance	DC - 4	—	0.1	—	dB
	4 - 18	—	0.2	—	
VSWR (Port S)	DC - 4	—	1.8	—	:1
	4 - 18	—	1.4	—	
VSWR (Port 1-4)	DC - 4	—	1.6	—	:1
	4 - 18	—	1.5	—	
Power Handling	As a splitter	DC - 18	—	0.6	W
	As a combiner	DC - 18	—	0.6	

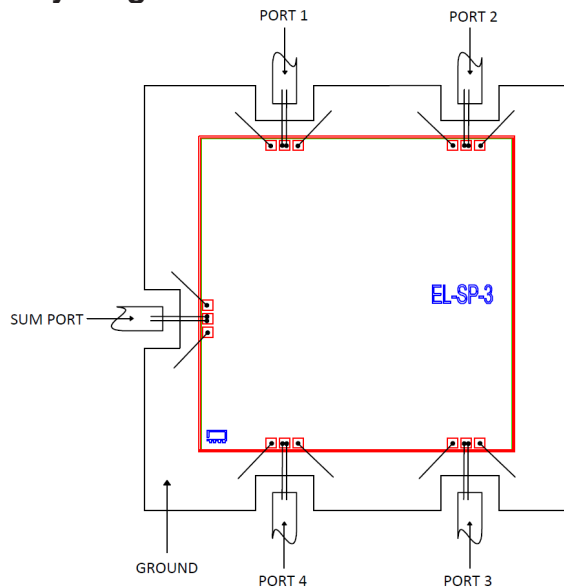
1. Measured on Mini-Circuits characterization test board TB-EP4KUC+. Die packaged in 5x5 mm, 32-lead MCLP package.

## Maximum Ratings

Parameter	Ratings
Operating Temperature	-55°C to 105°C

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.

<b>Additional Detailed Technical Information</b> <i>additional information is available on our dash board.</i>							
<b>Performance Data</b>	Data Table						
	Swept Graphs						
	S-Parameter (S5P Files) Data Set with and without port extension(.zip file)						
<b>Case Style</b>	Die						
<b>Die Ordering and packaging information (Note 5)</b>	<table> <tr> <td>Quantity, Package</td> <td>Model No.</td> </tr> <tr> <td>Small, Gel - Pak: 5,10</td> <td>EP4RKU-DG+</td> </tr> <tr> <td>Medium†, Partial wafer: 225 Max.</td> <td>EP4RKU-DP+</td> </tr> </table> <p>†Available upon request contact sales representative</p> <p>Refer to <a href="#">AN-60-067</a></p>	Quantity, Package	Model No.	Small, Gel - Pak: 5,10	EP4RKU-DG+	Medium†, Partial wafer: 225 Max.	EP4RKU-DP+
Quantity, Package	Model No.						
Small, Gel - Pak: 5,10	EP4RKU-DG+						
Medium†, Partial wafer: 225 Max.	EP4RKU-DP+						
<b>Environmental Ratings</b>	ENV-80						

5. 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. 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 (Pass 2000V) in accordance with ANSI/ESD STM 5.1 - 2001

\*\* Tested in industry standard, 5x5mm, 32-lead MCLP package.

### Additional Notes

- 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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