

2 Way-0° 50Ω 5 to 20 GHz

The Big Deal

- Ultra-Wide Bandwidth, 5-20 GHz
- Tiny Size, 4 x 4 x 1 mm
- High Power Handling, 2.5W as a Splitter



CASE STYLE: DG1847

Product Overview

Mini-Circuits EP2K+ is a MMIC splitter/combiner designed for wideband operation from 5 to 20 GHz. This model provides excellent power ratings in a tiny device package (4x4x1 mm), with up to 2.5W power handling (as a splitter) and up to 1.2A DC current handling. Manufactured using GaAs IPD technology, it provides a high level of ESD protection and excellent reliability.

Key Features

Feature	Advantages
Wideband, 5 to 20 GHz	One power splitter can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrumentation.
Excellent power handling 2.5W as a splitter at 25°C 1.7W internal dissipation as a combiner at 25°C	In power combiner applications, half the power is dissipated internally. EP2K+ is designed to handle 1.7W internal dissipation as a combiner allowing reliable operation without excessive temperature rise. Similar splitters implemented as Wilkinson splitters on PCB require big resistors and additional heat sinking. As a splitter, EP2K+ can handle up to 2.5W in a very small package.
DC Passing up to 1.2A	DC current passing is helpful in applications where both RF & DC need to pass through the DUT, such as antenna mounted hardware.
Small size 4 x 4mm QFN package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

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Features

- Wide bandwidth, 5 to 20 GHz
- Excellent amplitude unbalance, 0.1 dB typ.
- Good phase unbalance, 2 to 5 deg. typ.
- Small size, 4x4 mm
- High ESD level*
- Aqueous washable
- DC passing

Applications

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



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+RoHS Compliant

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

Electrical Specifications¹ at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		5		20	GHz
Insertion Loss ² above 3.0 dB	5 - 10	—	1.1	1.6	dB
	10 - 18	—	1.7	2.5	
	18 - 20	—	2.1	2.9	
Isolation	5 - 10	13	22	—	dB
	10 - 18	14	20	—	
	18 - 20	14	20	—	
Phase Unbalance	5 - 10	—	2.3	6.0	Degree
	10 - 18	—	3.7	8.0	
	18 - 20	—	4.2	9.0	
Amplitude Unbalance	5 - 10	—	0.1	0.3	dB
	10 - 18	—	0.1	0.5	
	18 - 20	—	0.1	0.5	
VSWR (Port S)	5 - 10	—	1.4	—	:1
	10 - 18	—	1.4	—	
	18 - 20	—	1.5	—	
VSWR (Port 1-2)	5 - 10	—	1.3	—	:1
	10 - 18	—	1.3	—	
	18 - 20	—	1.4	—	

1. Tested on Mini-Circuits Test Board TB-840+

2. Insertion Loss values are de-embedded from Test Board Loss; 0.5 dB at 5 GHz, 0.8 dB at 10 GHz, 1.3 dB at 18 GHz and 1.5 dB at 20 GHz

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Power Input (as a splitter)	2.5W max. at 25°C. Derate linearly to 1.25W at 85°C
Internal Dissipation	1.7W max. at 25°C. Derate linearly to 1.1W at 85°C
DC Current	1.2A max. at 25°C. Derate linearly to 0.6A at 85°C

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

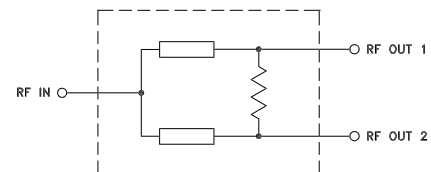
* ESD rating

Human body model (HBM): Class 2(2000 to <4000 V) in accordance with ANSI/ESD 5.1-2001
Machine model (MM): Class M3 (200 to <400 V) in accordance with ANSI/ESD 5.2-1999

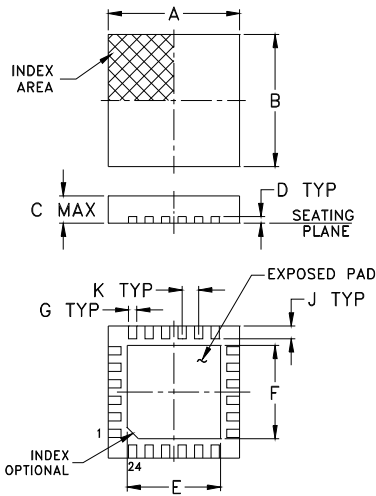
Pad Connections

Function	Pad Number
SUM PORT	3
PORT 1	14
PORT 2	17
NOT USED, GROUND EXTERNALLY	1, 2, 4-13,15-16, 18-24, Paddle

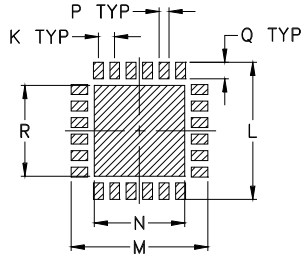
Simplified Electrical Schematic



Outline Drawing



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

Product Marking

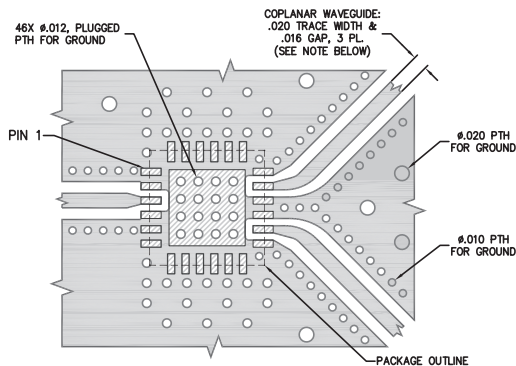


Lead finish: Tin-Silver over Nickel

Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J
.157	.157	.039	.008	.104	.104	.009	--	.016
4.0	4.0	1.0	0.20	2.64	2.64	0.23	--	0.41
K	L	M	N	P	Q	R		wt
.020	.166	.166	.102	.012	.020	.102		grams
0.50	4.22	4.22	2.59	0.30	0.51	2.59		0.04

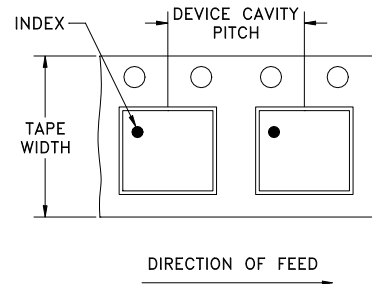
Demo Board MCL P/N: TB-845-1+
Suggested PCB Layout (PL-472)



- NOTES:
- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010"±.001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
 - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
 - DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Tape and Reel (F68)

DEVICE ORIENTATION IN T&R

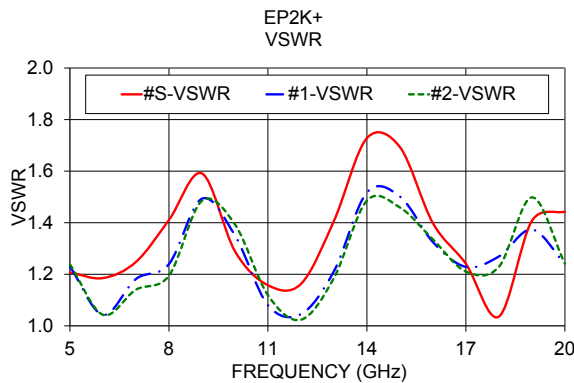
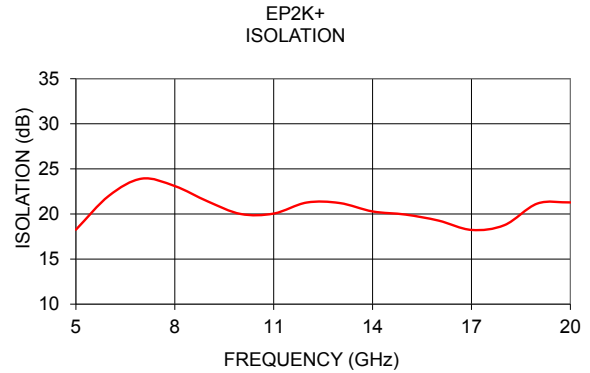
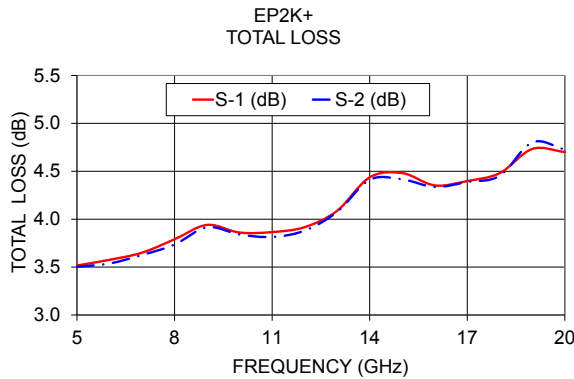


Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
12	8	7	Small quantity standard
			20
			50
		13	Standard
			1000
			2000
			3000
			4000

Typical Performance Data

Frequency (GHz)	Total Loss ¹ (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
5	3.52	3.50	0.01	18.26	1.33	1.21	1.23	1.24
6	3.58	3.54	0.04	22.01	1.41	1.19	1.04	1.04
7	3.65	3.63	0.02	23.92	1.71	1.25	1.18	1.14
8	3.79	3.74	0.06	23.09	1.82	1.41	1.24	1.19
9	3.94	3.92	0.02	21.39	1.96	1.59	1.49	1.48
10	3.86	3.84	0.02	20.00	2.26	1.29	1.35	1.39
11	3.87	3.81	0.05	20.04	2.51	1.16	1.08	1.12
12	3.92	3.88	0.04	21.27	2.49	1.16	1.05	1.02
13	4.09	4.08	0.01	21.21	2.87	1.41	1.21	1.19
14	4.44	4.41	0.03	20.28	3.16	1.73	1.52	1.49
15	4.48	4.42	0.06	19.93	3.08	1.69	1.50	1.46
16	4.35	4.34	0.02	19.27	2.87	1.40	1.33	1.34
17	4.40	4.39	0.01	18.23	3.50	1.24	1.23	1.21
18	4.48	4.45	0.03	18.76	3.02	1.04	1.27	1.23
19	4.73	4.80	0.07	21.16	3.56	1.41	1.37	1.50
20	4.70	4.73	0.03	21.28	3.79	1.44	1.24	1.24

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



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-Circuits' applicable established test performance criteria and measurement instructions.
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