MMIC Surface Mount

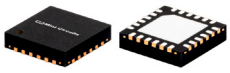
Power Splitter/Combiner

EP2K+

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.

MMIC Surface Mount

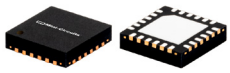
Power Splitter/Combiner

EP2K+

2 Way-0° 50Ω 5 to 20 GHz

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



Generic photo used for illustration purposes only

CASE STYLE: DG1847

+RoHS Compliant

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

Applications

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

Electrical Specifications[1] at 25°C

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

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

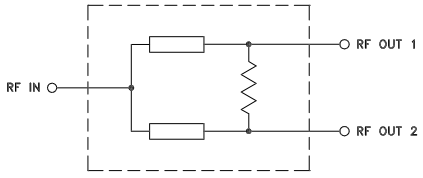
Permanent damage may occur if any of these limits are exceeded.

* 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

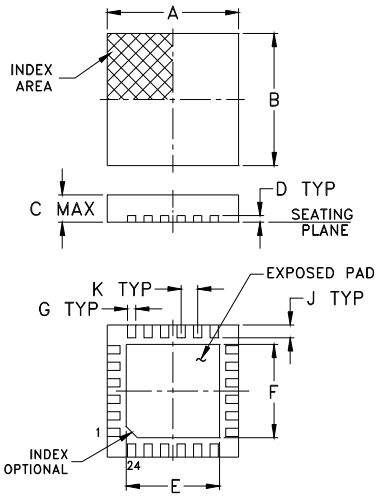
Pad Connections

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

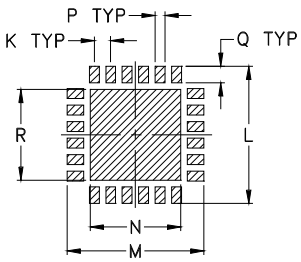
Simplified Electrical Schematic



Outline Drawing



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

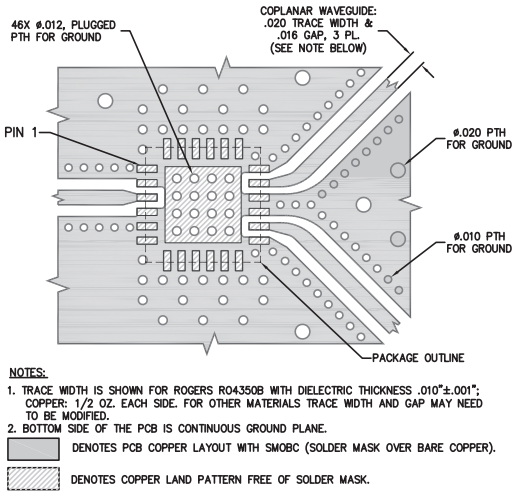
Product Marking

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)



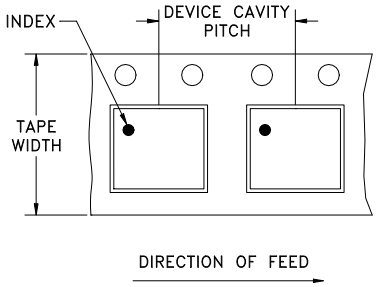
NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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



DIRECTION OF FEED

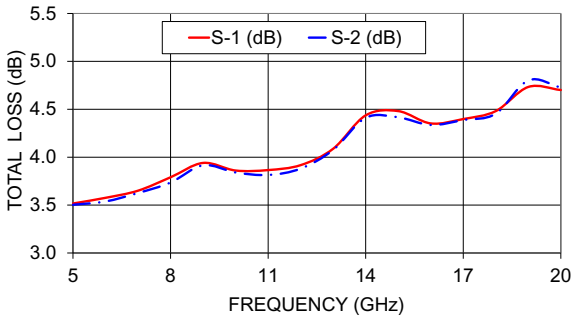
Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
12	8	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000
		13	Standard	2000
				3000
				4000

Typical Performance Data

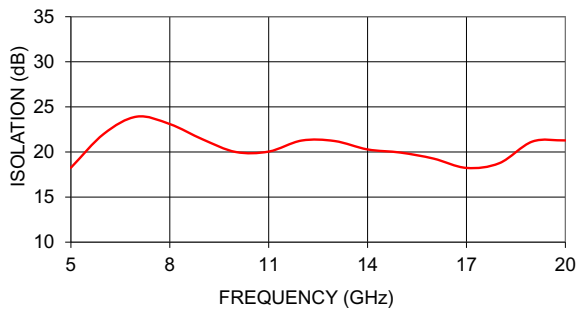
Frequency (GHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
5	3.52	3.50	0.01	18.26	1.33	1.21	1.23	1.24
6	3.58	3.54	0.04	22.01	1.41	1.19	1.04	1.04
7	3.65	3.63	0.02	23.92	1.71	1.25	1.18	1.14
8	3.79	3.74	0.06	23.09	1.82	1.41	1.24	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.

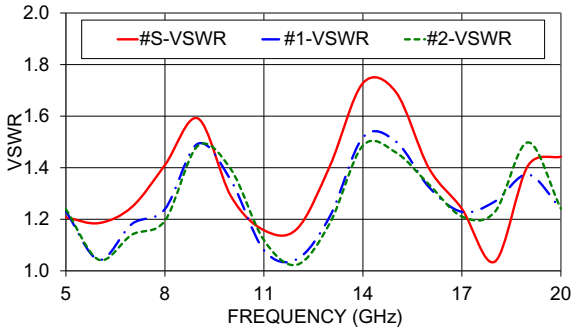
EP2K+
TOTAL LOSS



EP2K+
ISOLATION



EP2K+
VSWR



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.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

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