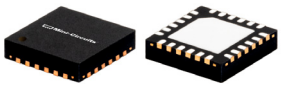
MMIC SURFACE MOUNT

# Power Splitter/Combiner EP2K1+

2 Way-0° 50Ω 2 to 26.5 GHz

## THE BIG DEAL

- Ultra-Wide Bandwidth, Usable Over 1.8 to 28 GHz
- High Power Handling, 2.5 W as a Splitter
- Excellent Amplitude Unbalance, 0.1 to 0.3 dB Typ.
- Good Phase Unbalance, 1.5° to 5.4° Typ.
- High ESD Level
- Small Size, 4x4 mm
- Aqueous Washable
- DC Passing



*Generic photo used for illustration purposes only*

CASE STYLE: DG1847

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

## APPLICATIONS

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

## PRODUCT OVERVIEW

Mini-Circuits EP2K1+ is a MMIC splitter/combiner designed for wideband operation from 2 to 26.5 GHz. This model provides excellent power ratings in a tiny device package (4x4x1 mm), with up to 2.5 W power handling (as a splitter) and up to 1.2 A DC current passing. Manufactured using GaAs IPD technology, it provides a high level of ESD protection and excellent reliability.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Wideband, 2 to 26.5 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<br>2.5 W as a Splitter at +25°C<br>1.7 W Internal Dissipation as a Combiner at +25°C | In power combiner applications, half the power is dissipated internally. EP2K1+ is designed to handle 1.7 W 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, EP2K1+ can handle up to 2.5 W in a very small package. |
| DC Passing Up to 1.2 A | DC current passing is helpful in applications where both RF & DC need to pass through the DUT, such as antenna mounted hardware. |
| Small Size, 4x4 mm QFN Package | Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. |

# Power Splitter/Combiner EP2K1+

## ELECTRICAL SPECIFICATIONS[1] AT +25°C

| Parameter | Frequency (GHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | | 2 | | 26.5 | GHz |
| Insertion Loss[2] Above 3.0 dB | 2-5<br>5-10<br>10-18<br>18-26.5 | | 0.8<br>1.1<br>1.7<br>2.4 | 1.3<br>1.6<br>2.5<br>3.2 | dB |
| Isolation | 2-5<br>5-10<br>10-18<br>18-26.5 | 6<br>13<br>14<br>14 | 14<br>22<br>20<br>21 | | dB |
| Phase Unbalance | 2-5<br>5-10<br>10-18<br>18-26.5 | | 1.5<br>2.3<br>3.7<br>5.4 | 4<br>6<br>8<br>9 | Degree |
| Amplitude Unbalance | 2-5<br>5-10<br>10-18<br>18-26.5 | | 0.1<br>0.1<br>0.1<br>0.3 | 0.3<br>0.3<br>0.5<br>0.7 | dB |
| VSWR (Port S) | 2-5<br>5-10<br>10-18<br>18-26.5 | | 1.5<br>1.4<br>1.4<br>1.4 | | :1 |
| VSWR (Port 1-2) | 2-5<br>5-10<br>10-18<br>18-26.5 | | 1.5<br>1.3<br>1.4<br>1.5 | | :1 |

1. Tested on Mini-Circuits Test Board TB-845+.
2. Insertion Loss Values are de-embedded from Test Board Loss; 0.3 dB at 2 GHz, 0.5 dB at 5 GHz, 0.8 dB at 10 GHz and 1.3 dB at 18 GHz & 2 dB at 26.5 GHz.

## ABSOLUTE MAXIMUM RATINGS

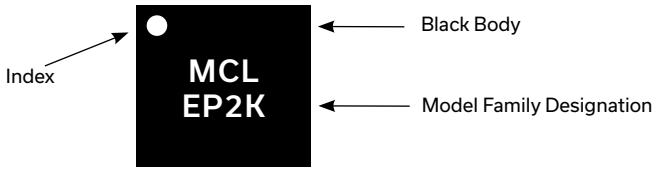
| Parameter | Ratings |
|---|---|
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |
| Power Input (as a Splitter) | 2.5 W max. at +25°C<br>Derate linearly to 1.25 W at +85°C |
| Internal Dissipation (as a Combiner) | 1.7 W max. at +25°C<br>Derate linearly to 1.1 W at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

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

## PAD CONNECTIONS

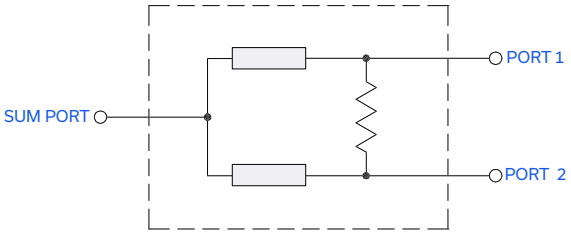
| Function | Pad Number |
|---|---|
| SUM PORT | 3 |
| PORT 1 | 14 |
| PORT 2 | 17 |
| NOT USED,<br>GROUND EXTERNALLY | 1, 2, 4-13,15-16, 18-24,<br>Paddle |

## PRODUCT MARKING




Marking may contain other features or characters for internal lot control.

## SIMPLIFIED ELECTRICAL SCHEMATIC



# Power Splitter/Combiner EP2K1+

**ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE**

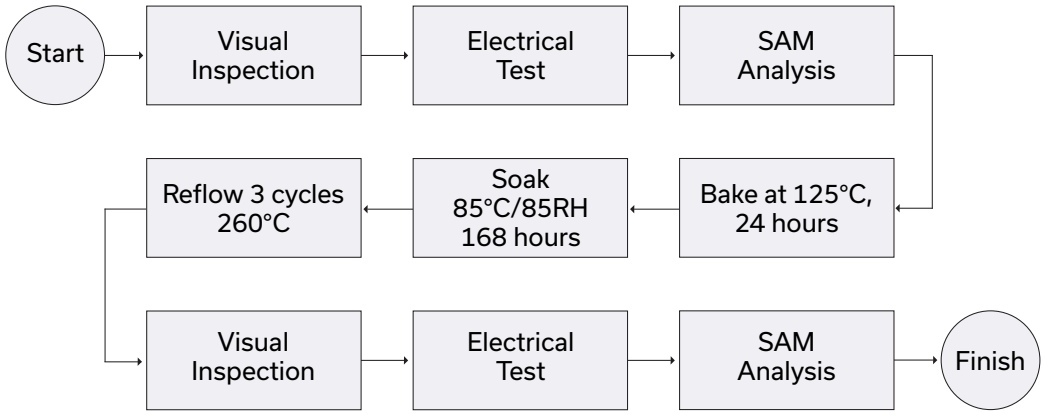
| | |
|---|---|
| **Performance Data** | Data Table<br>Swept Graphs<br>S-Parameter (S3P Files) Data Set (.zip file) |
| **Case Style** | DG1847 Plastic package, exposed paddle; Lead Finish: Matte Tin |
| **Tape & Reel**<br>**Standard Quantities Available on Reel** | F68<br>7" Reels with 20, 50, 100, 200, 500, 1000 devices<br>13" Reels with 2000, 3000, 4000 devices |
| **Suggested Layout for PCB Design** | PL-472 |
| **Evaluation Board** | TB-845+ |
| **Environmental Ratings** | ENV08T1 |

## ESD RATING

Human Body Model (HBM): Class 2 (2000 V to <4000 V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M3 (200 V to <400 V) in accordance with ANSI/ESD STM 5.2 - 1999

## MSL TEST FLOW CHART




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/terms/viewterm.html

# 2 Way-0° Power Splitter/Combiner EP2K1+

*Typical Performance Data*

TEST CONDITIONS: INPUT POWER =-8 dBm @Temperature = +25°C

| FREQUENCY (MHz) | TOTAL LOSS[1] (dB) | | AMPLITUDE UNBALANCE (dB) | ISOLATION (dB) | PHASE UNBALANCE (Deg) | FREQUENCY (MHz) | VSWR (:1) | | |
|---|---|---|---|---|---|---|---|---|---|
| | S-1 | S-2 | | 1-2 | | | S | 1 | 2 |
| 500 | 3.67 | 3.70 | 0.03 | 4.44 | 0.03 | 500 | 1.89 | 1.76 | 1.76 |
| 600 | 3.67 | 3.70 | 0.03 | 4.65 | 0.01 | 600 | 1.88 | 1.75 | 1.74 |
| 700 | 3.67 | 3.71 | 0.04 | 4.88 | 0.01 | 700 | 1.88 | 1.75 | 1.74 |
| 800 | 3.68 | 3.72 | 0.04 | 5.14 | 0.03 | 800 | 1.88 | 1.74 | 1.73 |
| 900 | 3.69 | 3.73 | 0.04 | 5.43 | 0.03 | 900 | 1.87 | 1.74 | 1.74 |
| 1000 | 3.70 | 3.73 | 0.03 | 5.74 | 0.04 | 1000 | 1.87 | 1.75 | 1.74 |
| 1500 | 3.69 | 3.72 | 0.03 | 7.60 | 0.20 | 1500 | 1.82 | 1.83 | 1.81 |
| 2000 | 3.62 | 3.65 | 0.03 | 9.66 | 0.26 | 2000 | 1.71 | 1.83 | 1.81 |
| 2500 | 3.61 | 3.68 | 0.07 | 11.14 | 0.41 | 2500 | 1.68 | 1.74 | 1.73 |
| 3000 | 3.57 | 3.66 | 0.09 | 12.57 | 0.37 | 3000 | 1.62 | 1.59 | 1.60 |
| 3500 | 3.56 | 3.66 | 0.09 | 13.86 | 0.27 | 3500 | 1.58 | 1.48 | 1.50 |
| 4000 | 3.55 | 3.64 | 0.09 | 15.17 | 0.26 | 4000 | 1.54 | 1.44 | 1.45 |
| 4500 | 3.47 | 3.58 | 0.10 | 16.62 | 0.27 | 4500 | 1.39 | 1.37 | 1.37 |
| 5000 | 3.41 | 3.50 | 0.10 | 18.34 | 0.24 | 5000 | 1.21 | 1.24 | 1.22 |
| 5200 | 3.40 | 3.49 | 0.10 | 19.11 | 0.28 | 5200 | 1.16 | 1.18 | 1.17 |
| 5400 | 3.40 | 3.50 | 0.10 | 19.92 | 0.31 | 5400 | 1.13 | 1.12 | 1.12 |
| 5600 | 3.41 | 3.51 | 0.10 | 20.74 | 0.34 | 5600 | 1.13 | 1.06 | 1.06 |
| 5800 | 3.43 | 3.53 | 0.10 | 21.51 | 0.37 | 5800 | 1.14 | 1.01 | 1.01 |
| 6000 | 3.44 | 3.55 | 0.11 | 22.27 | 0.40 | 6000 | 1.17 | 1.04 | 1.05 |
| 6500 | 3.49 | 3.61 | 0.11 | 23.50 | 0.41 | 6500 | 1.22 | 1.14 | 1.14 |
| 7000 | 3.53 | 3.65 | 0.12 | 23.93 | 0.41 | 7000 | 1.27 | 1.18 | 1.17 |
| 7500 | 3.57 | 3.69 | 0.12 | 23.83 | 0.41 | 7500 | 1.31 | 1.18 | 1.13 |
| 8000 | 3.65 | 3.76 | 0.11 | 22.98 | 0.52 | 8000 | 1.41 | 1.24 | 1.20 |
| 8500 | 3.75 | 3.87 | 0.12 | 22.22 | 0.65 | 8500 | 1.55 | 1.39 | 1.37 |
| 9000 | 3.81 | 3.95 | 0.14 | 21.39 | 0.67 | 9000 | 1.61 | 1.51 | 1.50 |
| 9500 | 3.81 | 3.96 | 0.15 | 20.51 | 0.70 | 9500 | 1.54 | 1.50 | 1.51 |
| 10000 | 3.71 | 3.89 | 0.18 | 19.84 | 0.63 | 10000 | 1.33 | 1.36 | 1.40 |
| 10500 | 3.65 | 3.83 | 0.18 | 19.51 | 0.52 | 10500 | 1.11 | 1.20 | 1.24 |
| 11000 | 3.71 | 3.86 | 0.15 | 19.69 | 0.51 | 11000 | 1.18 | 1.09 | 1.11 |
| 11500 | 3.75 | 3.91 | 0.15 | 20.47 | 0.74 | 11500 | 1.24 | 1.04 | 1.05 |
| 12000 | 3.75 | 3.92 | 0.18 | 21.48 | 0.86 | 12000 | 1.18 | 1.04 | 1.04 |
| 12500 | 3.77 | 3.97 | 0.20 | 21.89 | 0.87 | 12500 | 1.21 | 1.10 | 1.08 |
| 13000 | 3.89 | 4.10 | 0.20 | 21.53 | 0.86 | 13000 | 1.38 | 1.21 | 1.15 |
| 13500 | 4.09 | 4.30 | 0.21 | 20.78 | 0.91 | 13500 | 1.59 | 1.39 | 1.31 |
| 14000 | 4.28 | 4.49 | 0.21 | 20.04 | 0.92 | 14000 | 1.74 | 1.55 | 1.49 |
| 14500 | 4.33 | 4.55 | 0.22 | 19.56 | 1.01 | 14500 | 1.79 | 1.60 | 1.55 |
| 15000 | 4.29 | 4.50 | 0.21 | 19.44 | 1.03 | 15000 | 1.73 | 1.53 | 1.46 |
| 15500 | 4.22 | 4.44 | 0.23 | 19.44 | 1.16 | 15500 | 1.59 | 1.42 | 1.40 |
| 16000 | 4.11 | 4.38 | 0.26 | 19.38 | 1.20 | 16000 | 1.40 | 1.33 | 1.37 |
| 16500 | 4.08 | 4.36 | 0.28 | 19.19 | 0.95 | 16500 | 1.29 | 1.29 | 1.27 |
| 17000 | 4.16 | 4.40 | 0.23 | 18.68 | 0.99 | 17000 | 1.28 | 1.26 | 1.16 |
| 17500 | 4.19 | 4.42 | 0.23 | 18.35 | 1.43 | 17500 | 1.21 | 1.22 | 1.15 |
| 18000 | 4.18 | 4.47 | 0.29 | 18.48 | 1.69 | 18000 | 1.06 | 1.25 | 1.23 |
| 18500 | 4.33 | 4.67 | 0.33 | 19.23 | 1.62 | 18500 | 1.33 | 1.39 | 1.38 |
| 19000 | 4.52 | 4.86 | 0.34 | 20.41 | 1.49 | 19000 | 1.54 | 1.45 | 1.46 |
| 19500 | 4.53 | 4.86 | 0.33 | 21.27 | 1.31 | 19500 | 1.54 | 1.36 | 1.40 |
| 20000 | 4.49 | 4.80 | 0.31 | 21.39 | 1.31 | 20000 | 1.42 | 1.23 | 1.26 |
| 20500 | 4.47 | 4.78 | 0.31 | 20.82 | 1.29 | 20500 | 1.36 | 1.15 | 1.10 |
| 21000 | 4.52 | 4.84 | 0.33 | 20.33 | 1.34 | 21000 | 1.43 | 1.23 | 1.14 |
| 21500 | 4.57 | 4.90 | 0.33 | 20.13 | 1.25 | 21500 | 1.54 | 1.36 | 1.30 |
| 22000 | 4.58 | 4.93 | 0.35 | 20.09 | 1.19 | 22000 | 1.56 | 1.42 | 1.35 |
| 22500 | 4.59 | 4.96 | 0.36 | 20.05 | 1.24 | 22500 | 1.46 | 1.41 | 1.26 |
| 23000 | 4.65 | 5.00 | 0.35 | 19.79 | 1.47 | 23000 | 1.31 | 1.37 | 1.18 |
| 23500 | 4.69 | 5.03 | 0.33 | 19.25 | 1.90 | 23500 | 1.14 | 1.30 | 1.16 |
| 24000 | 4.69 | 5.10 | 0.40 | 19.17 | 2.55 | 24000 | 1.00 | 1.28 | 1.25 |
| 24500 | 4.75 | 5.25 | 0.50 | 20.14 | 2.64 | 24500 | 1.13 | 1.38 | 1.42 |
| 25000 | 4.92 | 5.51 | 0.59 | 22.84 | 2.25 | 25000 | 1.27 | 1.53 | 1.68 |
| 25500 | 5.05 | 5.67 | 0.62 | 26.67 | 1.46 | 25500 | 1.31 | 1.53 | 1.74 |
| 26000 | 5.17 | 5.73 | 0.56 | 22.55 | 1.09 | 26000 | 1.19 | 1.33 | 1.42 |
| 26500 | 5.39 | 5.87 | 0.48 | 17.44 | 1.35 | 26500 | 1.15 | 1.17 | 1.07 |
| 27000 | 5.57 | 6.08 | 0.51 | 14.74 | 1.63 | 27000 | 1.34 | 1.27 | 1.29 |
| 27500 | 5.54 | 6.13 | 0.60 | 13.37 | 1.72 | 27500 | 1.43 | 1.36 | 1.33 |
| 28000 | 5.44 | 6.04 | 0.60 | 12.82 | 1.60 | 28000 | 1.41 | 1.48 | 1.35 |
| 28500 | 5.50 | 6.10 | 0.61 | 12.78 | 2.05 | 28500 | 1.56 | 1.75 | 1.54 |
| 29000 | 5.76 | 6.52 | 0.76 | 12.85 | 2.71 | 29000 | 2.05 | 2.10 | 1.89 |
| 29500 | 6.01 | 7.00 | 0.99 | 12.89 | 2.07 | 29500 | 2.80 | 2.29 | 2.26 |
| 30000 | 6.12 | 7.17 | 1.05 | 12.63 | 0.01 | 30000 | 3.30 | 2.07 | 2.29 |

[1]Total Loss = Insertion Loss + 3dB Splitter Loss

## *Typical Performance Data*

TEST CONDITIONS: INPUT POWER =-8 dBm @Temperature = -45°C

| FREQUENCY (MHz) | TOTAL LOSS[1] (dB) | | AMPLITUDE UNBALANCE (dB) | ISOLATION (dB) | PHASE UNBALANCE (Deg) | FREQUENCY (MHz) | VSWR (:1) | | |
|---|---|---|---|---|---|---|---|---|---|
| | S-1 | S-2 | | 1-2 | | | S | 1 | 2 |
| 500 | 3.60 | 3.63 | 0.02 | 4.35 | 0.21 | 500 | 1.90 | 1.81 | 1.80 |
| 600 | 3.62 | 3.62 | 0.01 | 4.54 | 0.05 | 600 | 1.90 | 1.80 | 1.78 |
| 700 | 3.60 | 3.64 | 0.04 | 4.77 | 0.03 | 700 | 1.90 | 1.79 | 1.79 |
| 800 | 3.61 | 3.65 | 0.04 | 5.03 | 0.10 | 800 | 1.90 | 1.79 | 1.78 |
| 900 | 3.61 | 3.64 | 0.03 | 5.32 | 0.17 | 900 | 1.89 | 1.79 | 1.78 |
| 1000 | 3.63 | 3.63 | 0.00 | 5.62 | 0.05 | 1000 | 1.88 | 1.80 | 1.78 |
| 1500 | 3.62 | 3.63 | 0.02 | 7.42 | 0.29 | 1500 | 1.86 | 1.86 | 1.84 |
| 2000 | 3.53 | 3.57 | 0.04 | 9.46 | 0.24 | 2000 | 1.74 | 1.84 | 1.83 |
| 2500 | 3.51 | 3.56 | 0.05 | 11.02 | 0.27 | 2500 | 1.71 | 1.76 | 1.75 |
| 3000 | 3.47 | 3.54 | 0.07 | 12.51 | 0.37 | 3000 | 1.65 | 1.62 | 1.63 |
| 3500 | 3.43 | 3.53 | 0.09 | 13.81 | 0.26 | 3500 | 1.60 | 1.50 | 1.53 |
| 4000 | 3.41 | 3.49 | 0.08 | 15.06 | 0.20 | 4000 | 1.55 | 1.45 | 1.46 |
| 4500 | 3.35 | 3.43 | 0.09 | 16.39 | 0.28 | 4500 | 1.44 | 1.39 | 1.40 |
| 5000 | 3.26 | 3.34 | 0.09 | 17.94 | 0.23 | 5000 | 1.25 | 1.27 | 1.27 |
| 5200 | 3.23 | 3.32 | 0.08 | 18.65 | 0.21 | 5200 | 1.17 | 1.21 | 1.20 |
| 5400 | 3.22 | 3.31 | 0.08 | 19.44 | 0.25 | 5400 | 1.12 | 1.15 | 1.14 |
| 5600 | 3.23 | 3.31 | 0.08 | 20.27 | 0.27 | 5600 | 1.12 | 1.09 | 1.08 |
| 5800 | 3.24 | 3.32 | 0.08 | 21.07 | 0.33 | 5800 | 1.15 | 1.03 | 1.02 |
| 6000 | 3.25 | 3.34 | 0.08 | 21.98 | 0.38 | 6000 | 1.17 | 1.04 | 1.05 |
| 6500 | 3.28 | 3.37 | 0.10 | 23.65 | 0.39 | 6500 | 1.22 | 1.16 | 1.15 |
| 7000 | 3.29 | 3.39 | 0.10 | 24.62 | 0.38 | 7000 | 1.26 | 1.21 | 1.18 |
| 7500 | 3.31 | 3.41 | 0.10 | 24.23 | 0.43 | 7500 | 1.29 | 1.17 | 1.14 |
| 8000 | 3.39 | 3.48 | 0.09 | 22.63 | 0.50 | 8000 | 1.43 | 1.24 | 1.18 |
| 8500 | 3.54 | 3.63 | 0.09 | 21.28 | 0.74 | 8500 | 1.69 | 1.47 | 1.46 |
| 9000 | 3.60 | 3.73 | 0.13 | 20.27 | 0.82 | 9000 | 1.76 | 1.59 | 1.63 |
| 9500 | 3.50 | 3.64 | 0.14 | 19.59 | 0.69 | 9500 | 1.56 | 1.53 | 1.55 |
| 10000 | 3.36 | 3.50 | 0.14 | 19.37 | 0.68 | 10000 | 1.28 | 1.36 | 1.37 |
| 10500 | 3.31 | 3.45 | 0.14 | 19.63 | 0.75 | 10500 | 1.10 | 1.20 | 1.23 |
| 11000 | 3.33 | 3.47 | 0.14 | 20.20 | 0.60 | 11000 | 1.12 | 1.12 | 1.14 |
| 11500 | 3.36 | 3.47 | 0.11 | 20.68 | 0.73 | 11500 | 1.18 | 1.09 | 1.05 |
| 12000 | 3.38 | 3.51 | 0.12 | 20.53 | 1.02 | 12000 | 1.22 | 1.06 | 1.02 |
| 12500 | 3.42 | 3.58 | 0.16 | 19.87 | 1.11 | 12500 | 1.34 | 1.09 | 1.02 |
| 13000 | 3.50 | 3.69 | 0.19 | 19.59 | 1.08 | 13000 | 1.46 | 1.16 | 1.08 |
| 13500 | 3.62 | 3.81 | 0.19 | 19.89 | 1.07 | 13500 | 1.55 | 1.31 | 1.29 |
| 14000 | 3.75 | 3.94 | 0.19 | 20.59 | 1.08 | 14000 | 1.63 | 1.53 | 1.51 |
| 14500 | 3.86 | 4.06 | 0.20 | 21.17 | 1.21 | 14500 | 1.78 | 1.71 | 1.69 |
| 15000 | 3.92 | 4.13 | 0.21 | 20.59 | 1.38 | 15000 | 1.91 | 1.75 | 1.73 |
| 15500 | 3.79 | 4.01 | 0.22 | 19.01 | 1.40 | 15500 | 1.72 | 1.56 | 1.53 |
| 16000 | 3.67 | 3.88 | 0.21 | 17.68 | 1.47 | 16000 | 1.49 | 1.33 | 1.29 |
| 16500 | 3.73 | 3.93 | 0.20 | 17.20 | 1.68 | 16500 | 1.53 | 1.30 | 1.27 |
| 17000 | 3.69 | 3.91 | 0.22 | 17.44 | 1.92 | 17000 | 1.36 | 1.26 | 1.25 |
| 17500 | 3.61 | 3.83 | 0.22 | 18.36 | 1.98 | 17500 | 1.10 | 1.26 | 1.24 |
| 18000 | 3.66 | 3.88 | 0.22 | 19.44 | 2.18 | 18000 | 1.04 | 1.26 | 1.21 |
| 18500 | 3.70 | 3.95 | 0.24 | 19.69 | 2.53 | 18500 | 1.14 | 1.21 | 1.15 |
| 19000 | 3.76 | 4.08 | 0.32 | 18.91 | 2.79 | 19000 | 1.32 | 1.20 | 1.27 |
| 19500 | 3.96 | 4.32 | 0.36 | 18.02 | 2.43 | 19500 | 1.66 | 1.41 | 1.52 |
| 20000 | 4.33 | 4.69 | 0.35 | 17.97 | 2.31 | 20000 | 2.14 | 1.67 | 1.82 |
| 20500 | 4.35 | 4.66 | 0.31 | 18.54 | 2.24 | 20500 | 2.07 | 1.63 | 1.65 |
| 21000 | 3.88 | 4.23 | 0.35 | 20.66 | 2.87 | 21000 | 1.36 | 1.19 | 1.28 |
| 21500 | 3.73 | 4.13 | 0.40 | 25.48 | 2.78 | 21500 | 1.06 | 1.06 | 1.25 |
| 22000 | 3.76 | 4.16 | 0.39 | 22.73 | 2.31 | 22000 | 1.23 | 1.25 | 1.15 |
| 22500 | 4.35 | 4.65 | 0.30 | 18.22 | 2.44 | 22500 | 1.99 | 1.75 | 1.57 |
| 23000 | 4.63 | 4.91 | 0.28 | 16.31 | 3.39 | 23000 | 2.00 | 1.77 | 1.75 |
| 23500 | 4.11 | 4.46 | 0.36 | 15.80 | 3.87 | 23500 | 1.26 | 1.33 | 1.38 |
| 24000 | 4.06 | 4.52 | 0.46 | 17.85 | 3.79 | 24000 | 1.46 | 1.37 | 1.42 |
| 24500 | 4.13 | 4.61 | 0.48 | 22.84 | 3.43 | 24500 | 1.41 | 1.32 | 1.39 |
| 25000 | 4.13 | 4.58 | 0.45 | 25.15 | 3.44 | 25000 | 1.17 | 1.34 | 1.32 |
| 25500 | 4.31 | 4.77 | 0.46 | 21.80 | 3.68 | 25500 | 1.12 | 1.57 | 1.56 |
| 26000 | 4.54 | 5.05 | 0.52 | 20.93 | 3.99 | 26000 | 1.31 | 1.68 | 1.72 |
| 26500 | 4.65 | 5.25 | 0.60 | 20.37 | 3.93 | 26500 | 1.50 | 1.49 | 1.62 |
| 27000 | 4.82 | 5.43 | 0.61 | 16.67 | 3.37 | 27000 | 1.13 | 1.06 | 1.27 |
| 27500 | 5.39 | 5.89 | 0.50 | 13.68 | 3.36 | 27500 | 1.96 | 1.72 | 1.73 |
| 28000 | 5.23 | 5.70 | 0.48 | 11.83 | 4.94 | 28000 | 2.15 | 2.02 | 2.00 |
| 28500 | 4.96 | 5.71 | 0.75 | 11.22 | 6.24 | 28500 | 1.95 | 2.19 | 2.17 |
| 29000 | 5.56 | 6.75 | 1.20 | 12.35 | 5.15 | 29000 | 3.37 | 2.99 | 3.40 |
| 29500 | 5.19 | 6.46 | 1.27 | 13.16 | 1.76 | 29500 | 3.16 | 2.25 | 3.05 |
| 30000 | 4.67 | 5.56 | 0.89 | 12.85 | 0.16 | 30000 | 1.95 | 1.34 | 1.93 |

[1]Total Loss = Insertion Loss + 3dB Splitter Loss

## *Typical Performance Data*

TEST CONDITIONS: INPUT POWER =-8 dBm @Temperature = +85°C

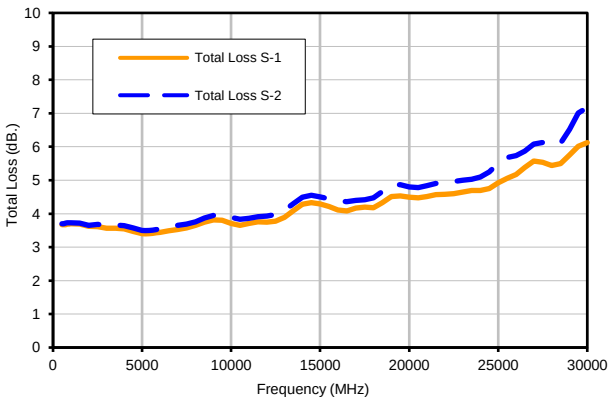
| FREQUENCY (MHz) | TOTAL LOSS[1] (dB) | | AMPLITUDE UNBALANCE (dB) | ISOLATION (dB) | PHASE UNBALANCE (Deg) | FREQUENCY (MHz) | VSWR (:1) | | |
|---|---|---|---|---|---|---|---|---|---|
| | S-1 | S-2 | | 1-2 | | | S | 1 | 2 |
| 500 | 3.69 | 3.72 | 0.03 | 4.50 | 0.06 | 500 | 1.88 | 1.73 | 1.73 |
| 600 | 3.70 | 3.72 | 0.03 | 4.69 | 0.00 | 600 | 1.87 | 1.72 | 1.71 |
| 700 | 3.69 | 3.74 | 0.04 | 4.93 | 0.03 | 700 | 1.88 | 1.72 | 1.71 |
| 800 | 3.71 | 3.75 | 0.04 | 5.19 | 0.04 | 800 | 1.87 | 1.72 | 1.71 |
| 900 | 3.71 | 3.76 | 0.04 | 5.48 | 0.05 | 900 | 1.87 | 1.72 | 1.71 |
| 1000 | 3.72 | 3.76 | 0.04 | 5.79 | 0.01 | 1000 | 1.86 | 1.72 | 1.72 |
| 1500 | 3.70 | 3.74 | 0.04 | 7.68 | 0.05 | 1500 | 1.81 | 1.82 | 1.80 |
| 2000 | 3.63 | 3.66 | 0.03 | 9.73 | 0.13 | 2000 | 1.69 | 1.81 | 1.79 |
| 2500 | 3.62 | 3.70 | 0.08 | 11.14 | 0.23 | 2500 | 1.66 | 1.71 | 1.71 |
| 3000 | 3.58 | 3.68 | 0.10 | 12.53 | 0.10 | 3000 | 1.60 | 1.56 | 1.58 |
| 3500 | 3.60 | 3.69 | 0.09 | 13.83 | 0.02 | 3500 | 1.57 | 1.47 | 1.48 |
| 4000 | 3.59 | 3.68 | 0.10 | 15.18 | 0.01 | 4000 | 1.52 | 1.43 | 1.44 |
| 4500 | 3.50 | 3.62 | 0.11 | 16.73 | 0.08 | 4500 | 1.36 | 1.35 | 1.36 |
| 5000 | 3.45 | 3.56 | 0.10 | 18.60 | 0.17 | 5000 | 1.18 | 1.22 | 1.20 |
| 5200 | 3.46 | 3.56 | 0.10 | 19.44 | 0.14 | 5200 | 1.14 | 1.16 | 1.14 |
| 5400 | 3.47 | 3.57 | 0.10 | 20.28 | 0.11 | 5400 | 1.12 | 1.10 | 1.09 |
| 5600 | 3.48 | 3.59 | 0.11 | 21.12 | 0.09 | 5600 | 1.13 | 1.05 | 1.05 |
| 5800 | 3.50 | 3.62 | 0.11 | 21.86 | 0.08 | 5800 | 1.15 | 1.03 | 1.03 |
| 6000 | 3.53 | 3.64 | 0.12 | 22.51 | 0.08 | 6000 | 1.18 | 1.06 | 1.06 |
| 6500 | 3.58 | 3.71 | 0.12 | 23.40 | 0.12 | 6500 | 1.22 | 1.14 | 1.14 |
| 7000 | 3.64 | 3.77 | 0.13 | 23.53 | 0.13 | 7000 | 1.28 | 1.17 | 1.18 |
| 7500 | 3.70 | 3.82 | 0.13 | 23.47 | 0.20 | 7500 | 1.33 | 1.19 | 1.14 |
| 8000 | 3.77 | 3.89 | 0.12 | 22.94 | 0.13 | 8000 | 1.40 | 1.25 | 1.19 |
| 8500 | 3.84 | 3.98 | 0.14 | 22.54 | 0.06 | 8500 | 1.50 | 1.36 | 1.34 |
| 9000 | 3.91 | 4.06 | 0.15 | 21.91 | 0.12 | 9000 | 1.54 | 1.47 | 1.44 |
| 9500 | 3.94 | 4.10 | 0.16 | 20.95 | 0.06 | 9500 | 1.51 | 1.48 | 1.48 |
| 10000 | 3.87 | 4.07 | 0.21 | 20.03 | 0.18 | 10000 | 1.34 | 1.35 | 1.42 |
| 10500 | 3.81 | 4.02 | 0.21 | 19.46 | 0.45 | 10500 | 1.12 | 1.19 | 1.25 |
| 11000 | 3.90 | 4.07 | 0.17 | 19.46 | 0.52 | 11000 | 1.23 | 1.09 | 1.15 |
| 11500 | 3.96 | 4.13 | 0.17 | 20.31 | 0.22 | 11500 | 1.29 | 1.06 | 1.10 |
| 12000 | 3.93 | 4.13 | 0.20 | 21.87 | 0.16 | 12000 | 1.17 | 1.03 | 1.06 |
| 12500 | 3.96 | 4.18 | 0.21 | 23.23 | 0.27 | 12500 | 1.18 | 1.13 | 1.14 |
| 13000 | 4.08 | 4.29 | 0.21 | 22.99 | 0.32 | 13000 | 1.33 | 1.24 | 1.19 |
| 13500 | 4.34 | 4.55 | 0.21 | 21.51 | 0.29 | 13500 | 1.60 | 1.45 | 1.36 |
| 14000 | 4.60 | 4.82 | 0.22 | 19.97 | 0.27 | 14000 | 1.85 | 1.61 | 1.55 |
| 14500 | 4.60 | 4.84 | 0.24 | 18.98 | 0.32 | 14500 | 1.85 | 1.56 | 1.52 |
| 15000 | 4.51 | 4.74 | 0.23 | 18.75 | 0.46 | 15000 | 1.71 | 1.43 | 1.33 |
| 15500 | 4.47 | 4.70 | 0.23 | 19.17 | 0.30 | 15500 | 1.58 | 1.35 | 1.34 |
| 16000 | 4.34 | 4.65 | 0.30 | 19.83 | 0.26 | 16000 | 1.36 | 1.31 | 1.40 |
| 16500 | 4.29 | 4.62 | 0.34 | 20.16 | 0.79 | 16500 | 1.18 | 1.28 | 1.32 |
| 17000 | 4.40 | 4.66 | 0.26 | 19.46 | 0.94 | 17000 | 1.21 | 1.26 | 1.12 |
| 17500 | 4.51 | 4.73 | 0.23 | 18.53 | 0.28 | 17500 | 1.24 | 1.20 | 1.13 |
| 18000 | 4.47 | 4.80 | 0.33 | 18.24 | 0.10 | 18000 | 1.11 | 1.24 | 1.25 |
| 18500 | 4.69 | 5.09 | 0.39 | 19.00 | 0.19 | 18500 | 1.46 | 1.47 | 1.51 |
| 19000 | 5.00 | 5.39 | 0.39 | 20.66 | 0.52 | 19000 | 1.79 | 1.60 | 1.68 |
| 19500 | 4.91 | 5.27 | 0.36 | 22.93 | 0.82 | 19500 | 1.58 | 1.43 | 1.52 |
| 20000 | 4.72 | 5.06 | 0.34 | 24.64 | 0.75 | 20000 | 1.18 | 1.19 | 1.27 |
| 20500 | 4.67 | 5.03 | 0.36 | 23.00 | 0.80 | 20500 | 1.15 | 1.08 | 1.24 |
| 21000 | 4.81 | 5.21 | 0.40 | 20.30 | 1.10 | 21000 | 1.36 | 1.26 | 1.26 |
| 21500 | 5.22 | 5.60 | 0.38 | 18.88 | 1.30 | 21500 | 1.90 | 1.62 | 1.62 |
| 22000 | 5.26 | 5.67 | 0.40 | 18.43 | 1.17 | 22000 | 1.96 | 1.65 | 1.73 |
| 22500 | 4.96 | 5.44 | 0.47 | 19.06 | 1.23 | 22500 | 1.44 | 1.40 | 1.42 |
| 23000 | 4.93 | 5.39 | 0.46 | 21.05 | 1.42 | 23000 | 1.23 | 1.26 | 1.28 |
| 23500 | 5.02 | 5.42 | 0.40 | 22.00 | 1.28 | 23500 | 1.08 | 1.22 | 1.10 |
| 24000 | 5.15 | 5.55 | 0.40 | 20.72 | 0.21 | 24000 | 1.14 | 1.27 | 1.20 |
| 24500 | 5.22 | 5.71 | 0.49 | 20.00 | 0.32 | 24500 | 1.09 | 1.38 | 1.41 |
| 25000 | 5.42 | 6.06 | 0.65 | 21.92 | 0.11 | 25000 | 1.30 | 1.61 | 1.80 |
| 25500 | 5.61 | 6.36 | 0.75 | 27.25 | 0.99 | 25500 | 1.49 | 1.63 | 2.01 |
| 26000 | 5.64 | 6.32 | 0.68 | 22.46 | 1.91 | 26000 | 1.29 | 1.24 | 1.53 |
| 26500 | 5.98 | 6.50 | 0.52 | 16.70 | 1.93 | 26500 | 1.38 | 1.22 | 1.28 |
| 27000 | 6.16 | 6.67 | 0.50 | 14.20 | 1.17 | 27000 | 1.64 | 1.41 | 1.56 |
| 27500 | 5.90 | 6.60 | 0.70 | 13.20 | 0.77 | 27500 | 1.53 | 1.37 | 1.46 |
| 28000 | 5.84 | 6.64 | 0.80 | 13.34 | 1.53 | 28000 | 1.55 | 1.47 | 1.58 |
| 28500 | 5.90 | 6.61 | 0.71 | 13.86 | 2.17 | 28500 | 1.48 | 1.55 | 1.53 |
| 29000 | 6.00 | 6.63 | 0.63 | 13.52 | 1.28 | 29000 | 1.58 | 1.70 | 1.38 |
| 29500 | 6.36 | 7.22 | 0.85 | 12.89 | 0.58 | 29500 | 2.44 | 2.04 | 1.76 |
| 30000 | 6.97 | 8.07 | 1.10 | 12.62 | 2.54 | 30000 | 4.03 | 2.32 | 2.27 |

[1]Total Loss = Insertion Loss + 3dB Splitter Loss

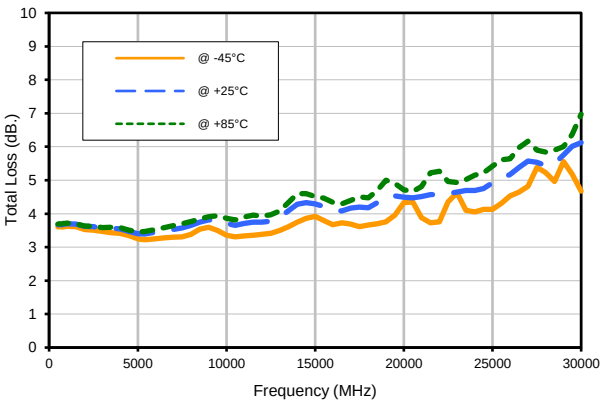
# 2 Way-0° Power Splitter/Combiner EP2K1+

*Typical Performance Curves*

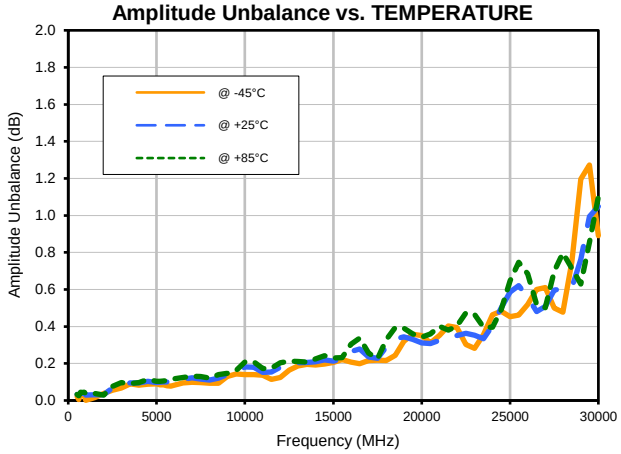
**Total Loss**



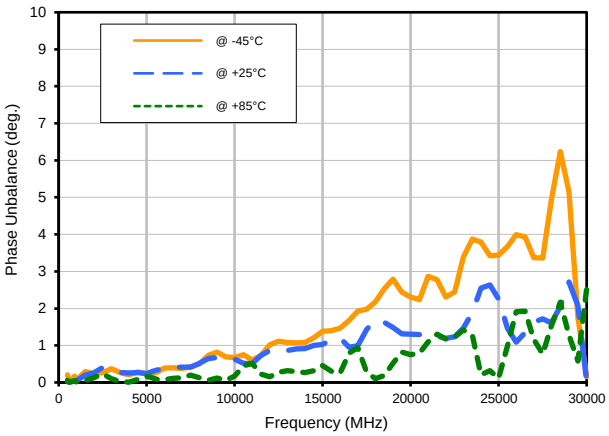

**Total Loss S-1 vs. TEMPERATURE**



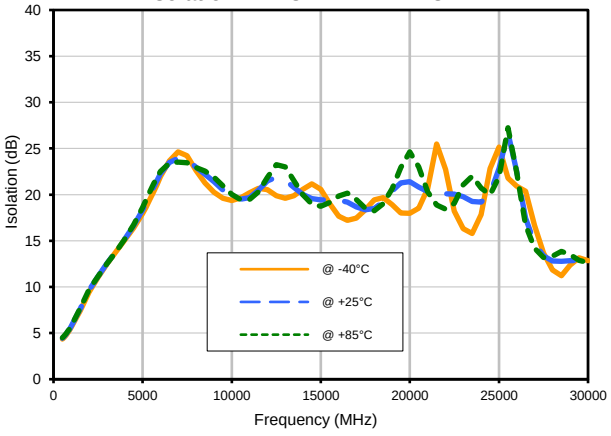

**Amplitude Unbalance vs. TEMPERATURE**



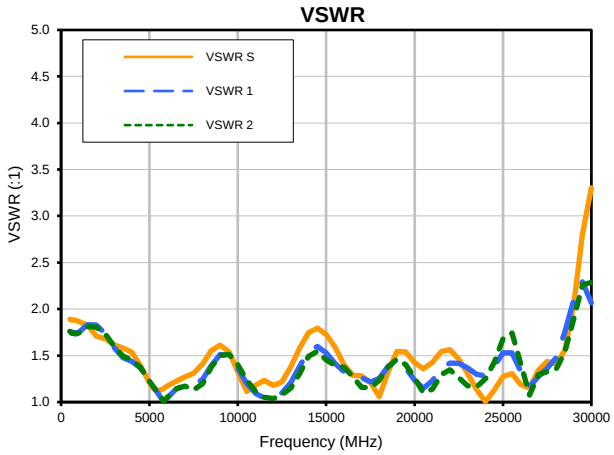

**Phase Unbalance vs. TEMPERATURE**

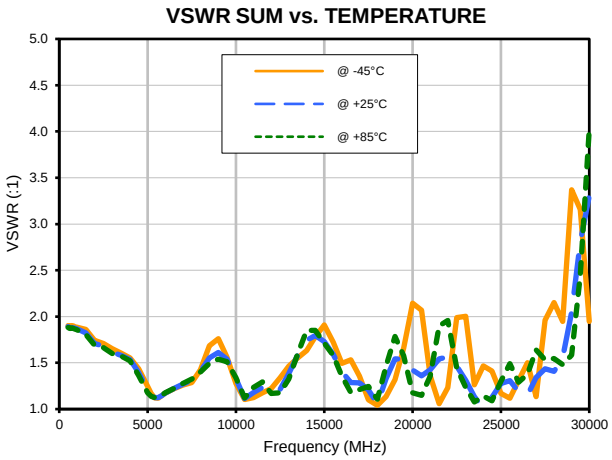


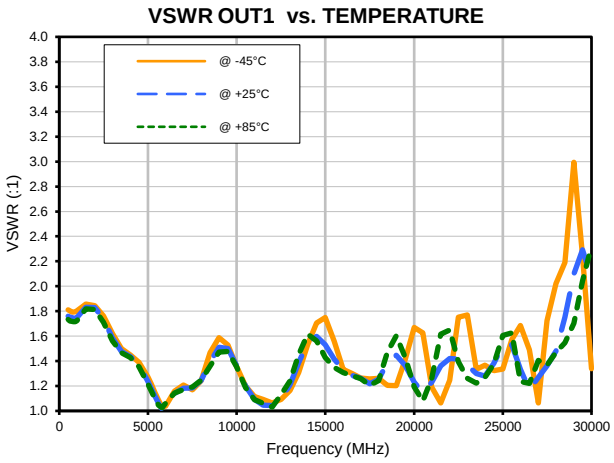

**Isolation 1-2 vs. TEMPERATURE**



## *Typical Performance Curves*



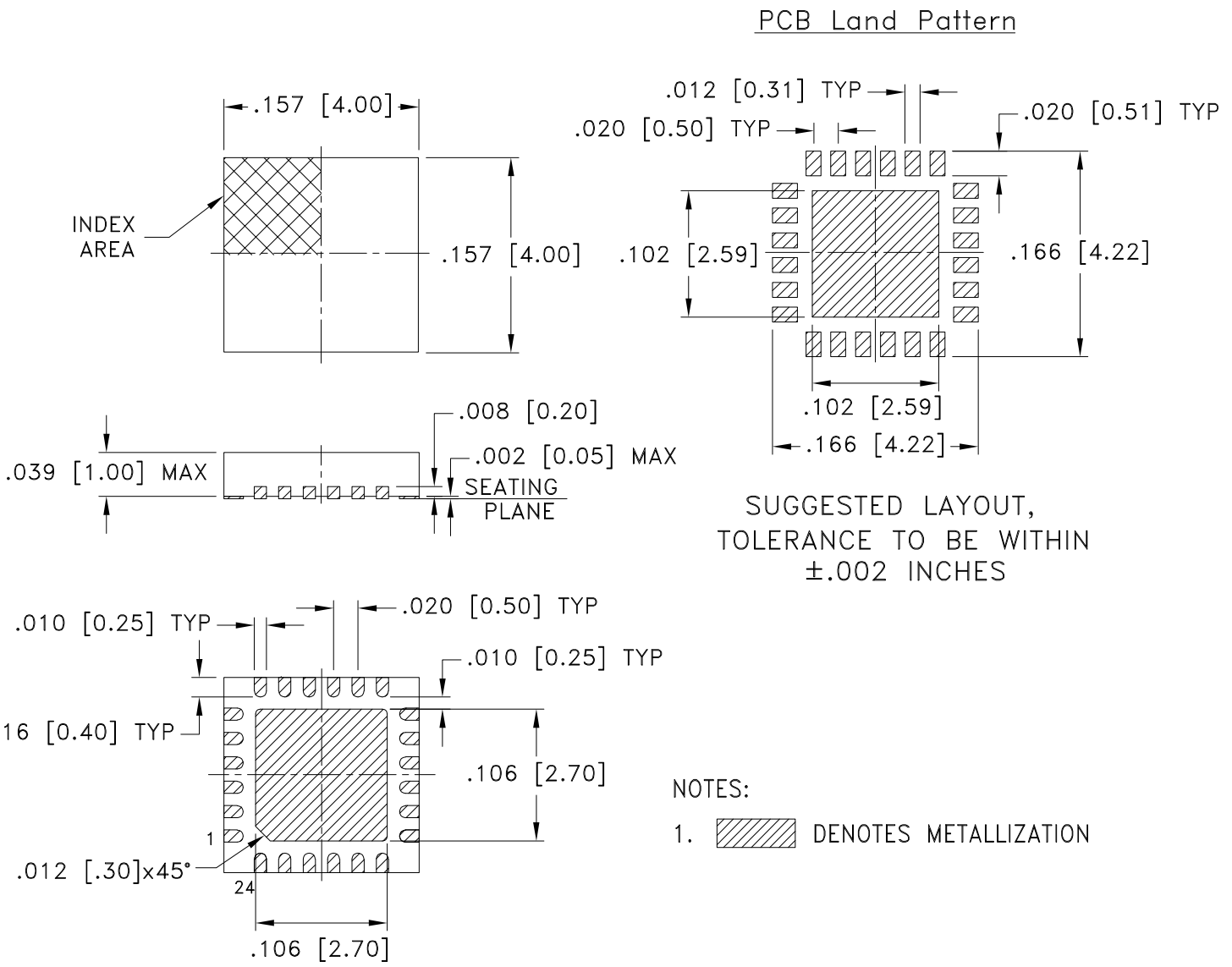



# Case Style DG

## Outline Dimensions

**DG1847**




Weight: .04 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl.±.005 Inches

Notes:

1. Case material: Plastic.
2. Termination finish:

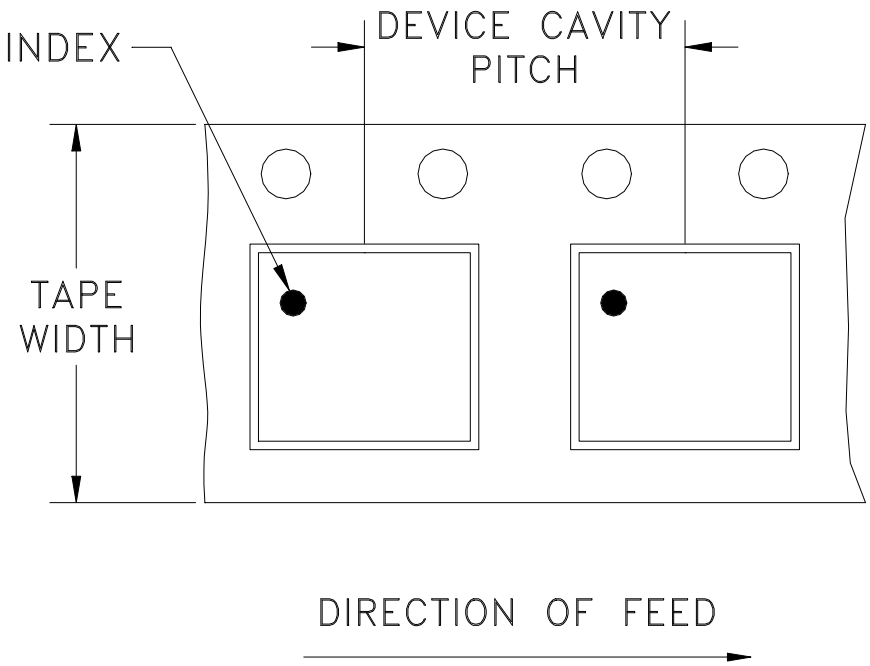
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin or NiPdAu All models, (+) suffix. See model Data sheet.

For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.


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# Tape & Reel Packaging TR-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 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | 7 | Standard | 1000 |
| | | 13 | Standard | 2000 |
| | | | | 3000 |
| | | | | 4000 |

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

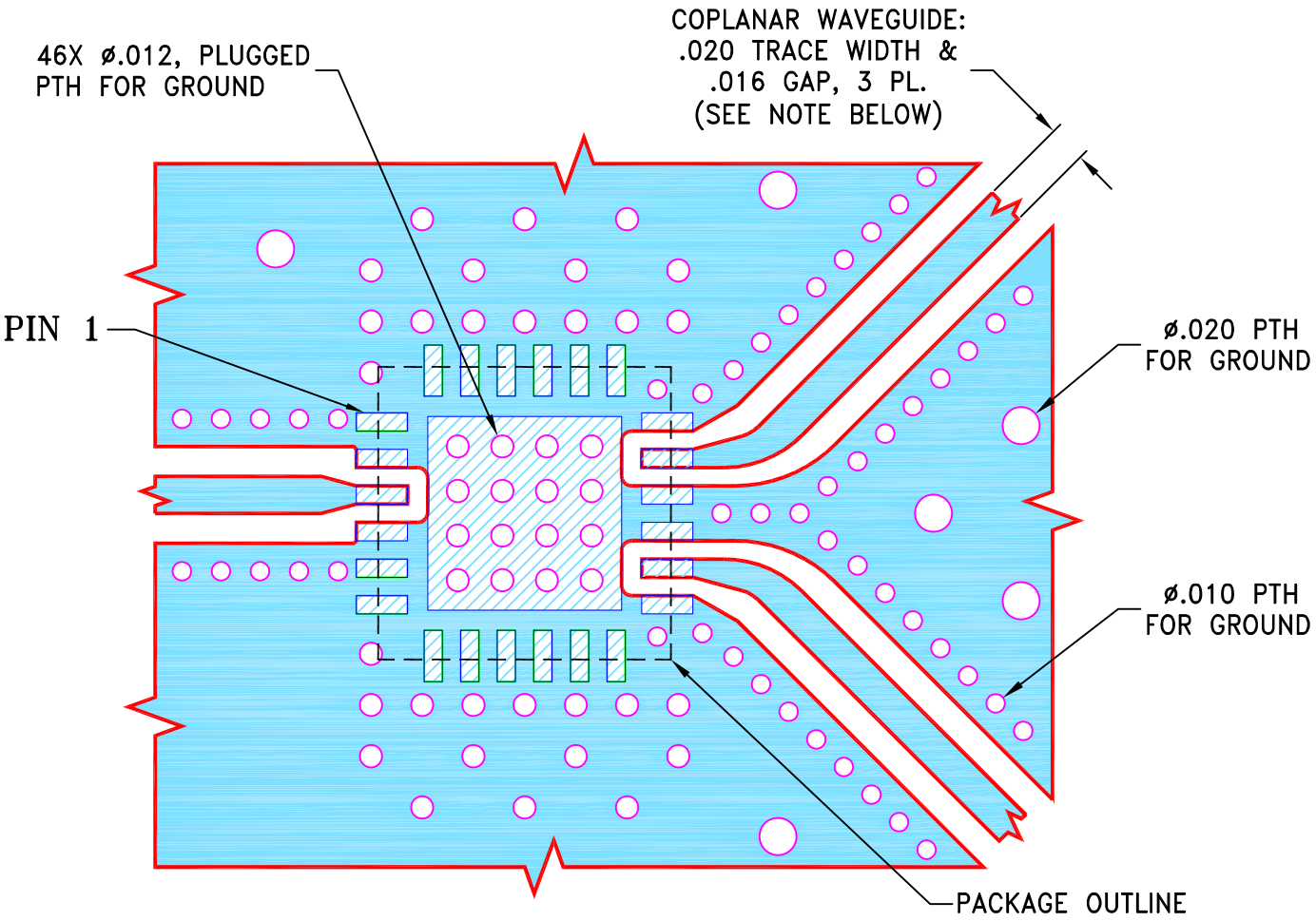
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THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M153829 | NEW RELEASE | 11/16/15 | ITG | RS |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION
# FOR DG1847 CASE STYLE, "24SP01" PIN CODE




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.

| UNLESS OTHERWISE SPECIFIED | | INITIALS | DATE |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | ITG | 11/16/15 |
| TOLERANCES ON: | CHECKED | YL | 11/16/15 |
| 2 PL DECIMALS ± | APPROVED | RS | 11/16/15 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |

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ASHEETA1.DWG REV:A DATE:01/12/95

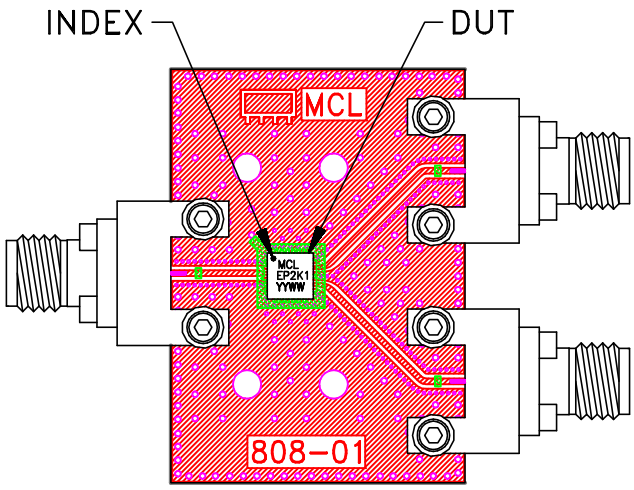
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 24SP01, DG1847, TB-845+

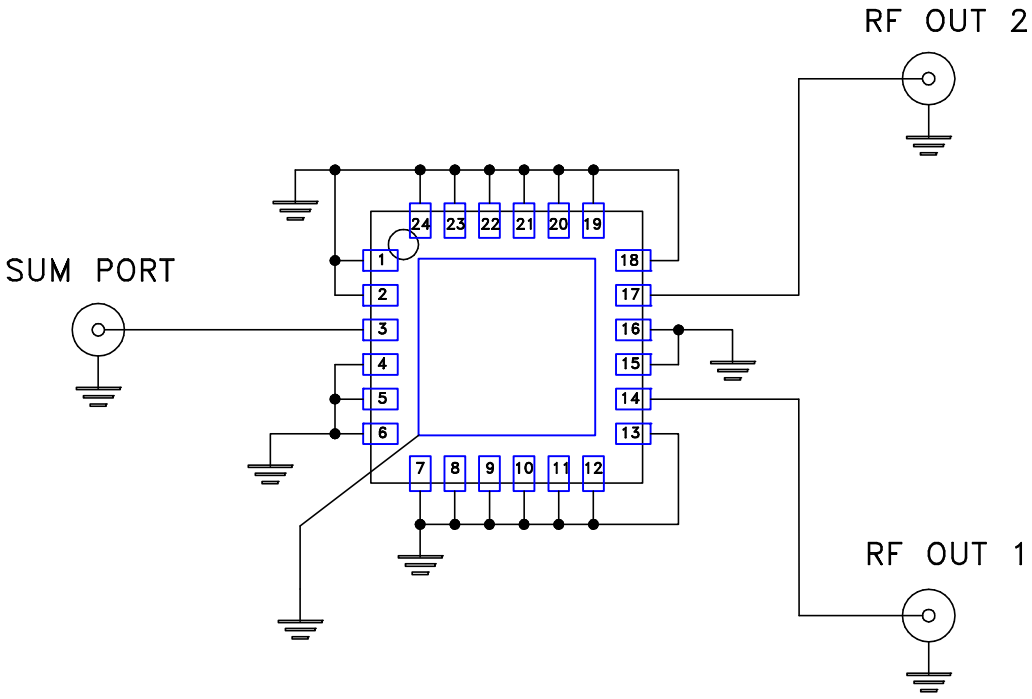
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-472 | OR |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL472 | 10:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-845+




Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

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**Environmental Specifications** **ENV08T1**

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 -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C or -65° to 150°<br>Ambient Environment | Individual Model Data Sheet |
| HTOL | 1000 hours at 125°C | MIL-STD-883, Method 1005, Condition B |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Mechanical Shock | 1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only | MIL-STD-883, Method 2002, Condition B, except Y1 direction only |
| Vibration (Variable Frequency) | 50g peak | MIL-STD-883, Method 2007, Condition B |
| Autoclave | 15 psig, 100% RH, 121°C, 96 hours | JESD22-A102, Condition C |
| HAST | 130°C, 85% RH, 96 hours | JESD22-A110 |
| Solderability | 10X Magnification | J-STD-002, Para 4.2.5, Test S, 95% Coverage |
| Solder Reflow Heat | Sn-Pb Eutetic Process: 240°C peak<br>Pb-Free Process: 260°C peak | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1 |
| Moisture Sensitivity: Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak | J-STD-020 |


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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 |
|---|---|---|
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |



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