Preliminary

# Wideband Power Divider, DIE, 2 to 19 GHz

ENGPD00014

## Typical Applications

- Space Hybrids
- Military Hybrids
- Microwave Radios
- Test and Measurement Systems

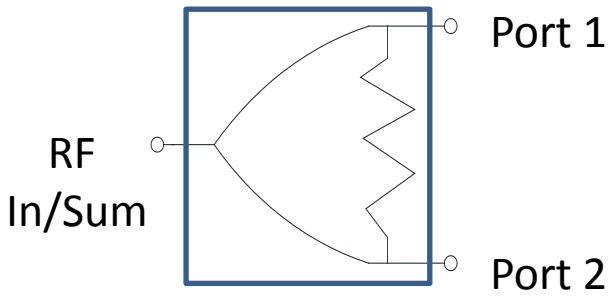
## Features

- Wideband performance
- Excellent return loss
  - > 20 dB typical
- Small Size
  - 2.76 x 2.26 x 0.1 mm
  - 0.109 x 0.089 x 0.004 inch
- Excellent balance
- RF Power handling: +27 dBm

## Description

The ENGPD00014 is a two-way, in-phase Wilkinson-style power splitter / combiner. The device is optimized for performance from 2 to 19 GHz. The chip device offers excellent return loss, high isolation, and very small size. The power divider has gold backside metallization and is designed to be silver epoxy attached. The RF interconnects are designed to account for wire bonds and external microstrip flares for optimal integrated return loss. No additional ground interconnects are required. Nichrome resistors with low temperature coefficients are set up to handle half watt RF input power levels.

## Functional Block Diagram

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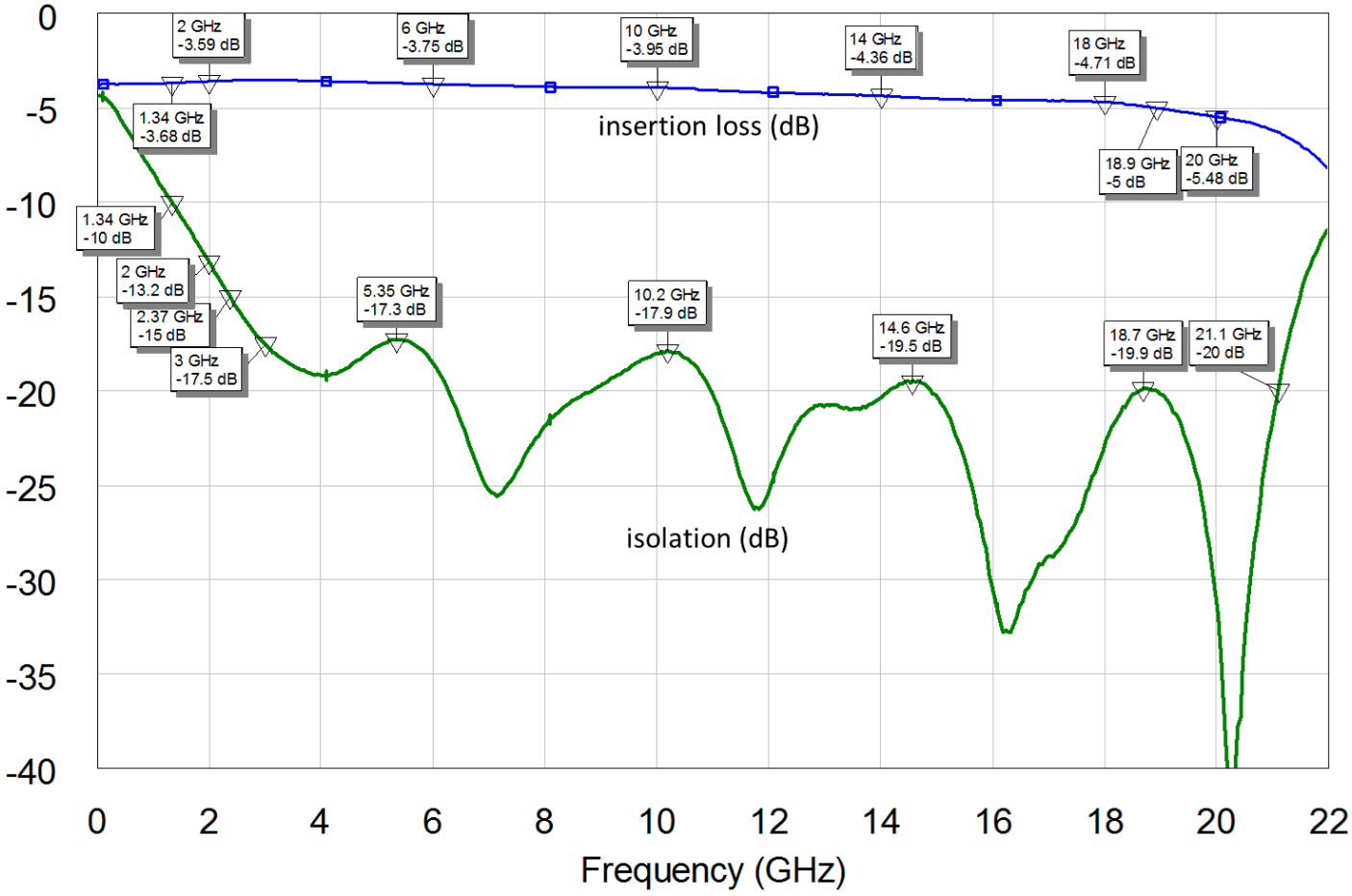
## *Electrical Specifications, T = 25 °C, Typical Data, 2 – 19 GHz*

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|
| Insertion Loss | IL | 0.4 | 1.0 | 2.5 | dB |
| Input Return Loss | S11 | 15.0 | 19.0 | | dB |
| Output Return Loss | S22/S33 | 17.0 | 20.0 | | dB |
| Isolation | Iso | 12.0 | 18.0 | | dB |
| Amplitude Balance | Abal | | +0.1 / -0.1 | +0.2/-0.2 | dB |
| Phase Balance | Pbal | | +1.0 / -1.0 | +3.5 / -3.5 | Deg |
| Power Handling | Phand | | | 27 | dBm |

## *Absolute Maximum Ratings*

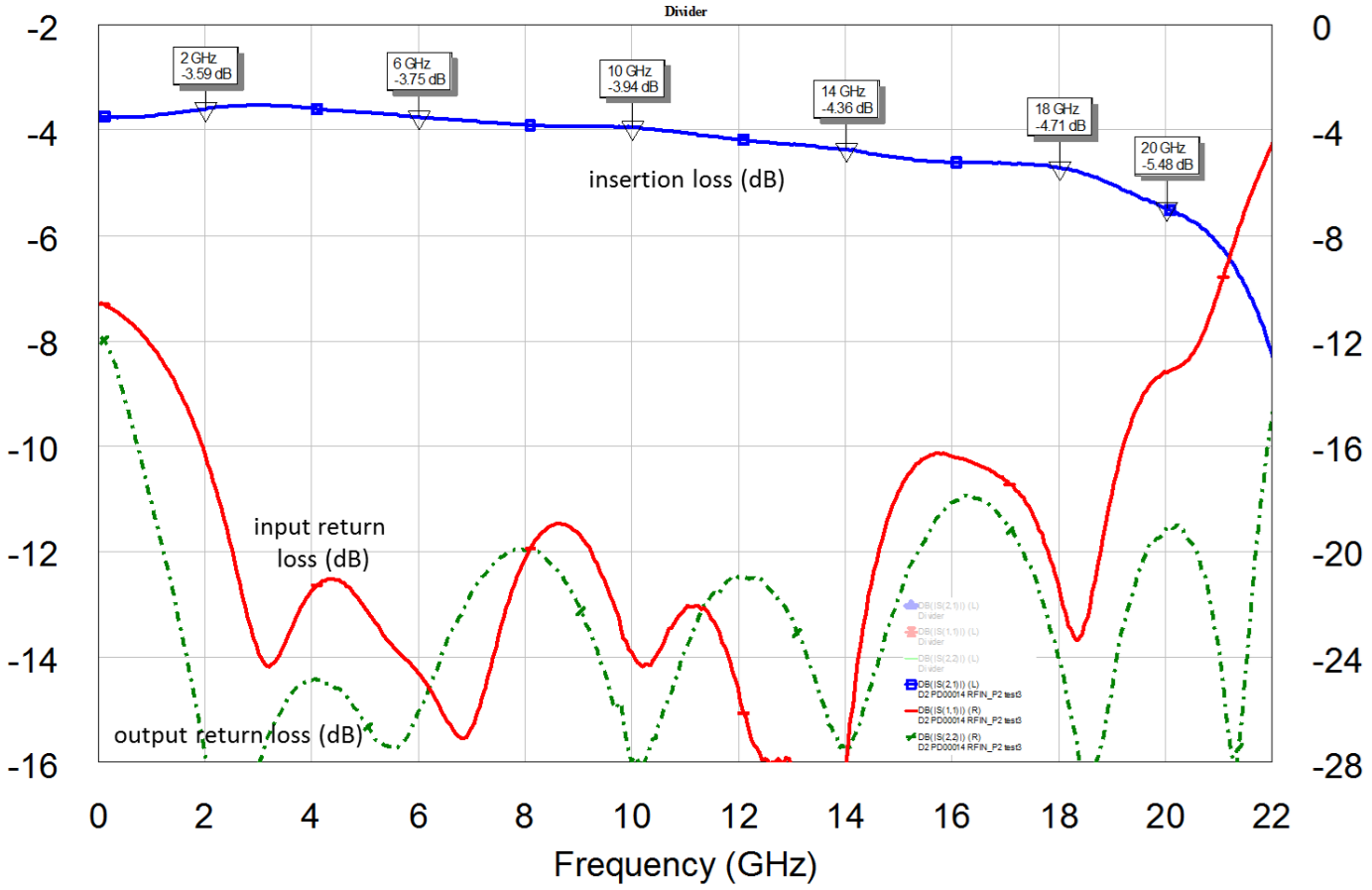
| Parameter | Max level |
|---|---|
| RF Power | +28 dBm |
| Storage Temperature | -65 °C to +150 °C |
| Operating Temperature | -55 °C to +125 °C |

## Measured RF Insertion Loss*, & Isolation Between Output Ports (dB)



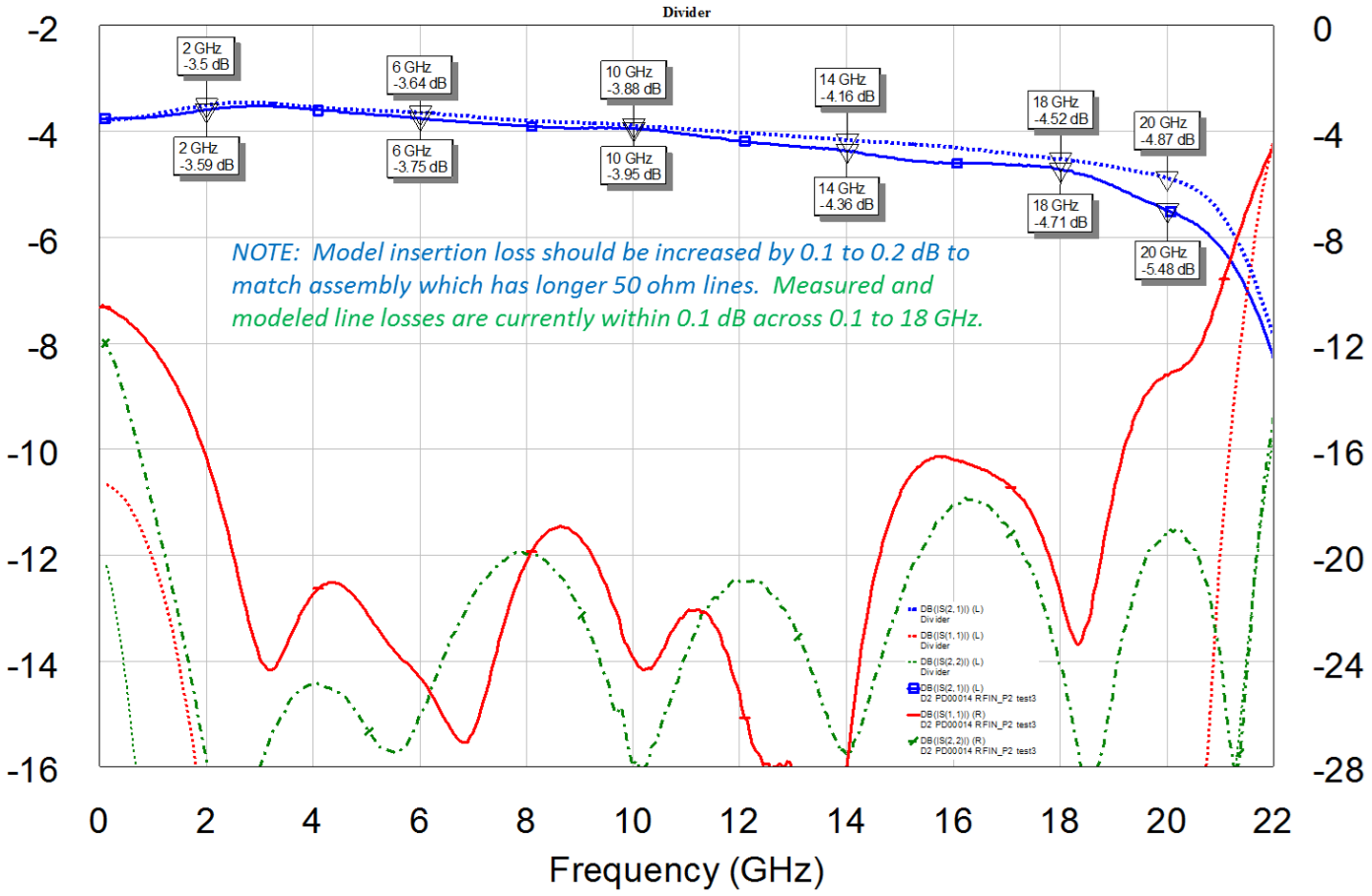

* Note: Insertion loss (from common arm to either output port) is 0.1 - 0.2 dB less than shown in the plot; fixture losses were not fully deembedded

## Measured RF Insertion Loss*, & In / Out Return Loss (dB)



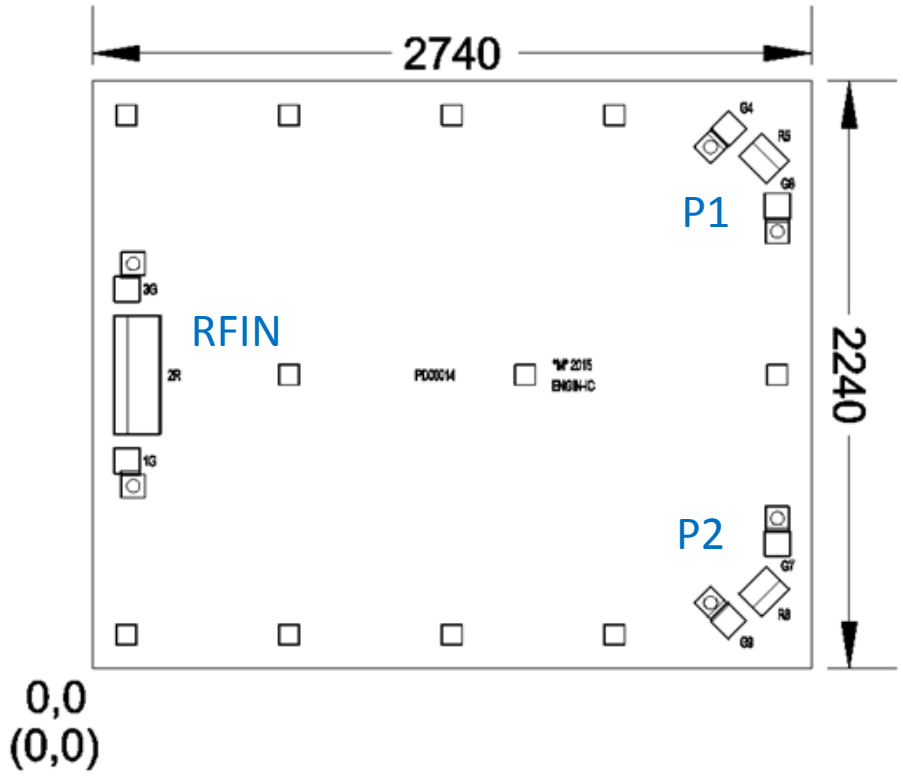

* Note: Insertion loss (from common arm to either output port) is 0.1 - 0.2 dB less than shown in the plot; fixture losses were not fully deembedded

## Measured (solid lines) and Modeled RF Insertion Loss – good agreement to 18 GHz




* Note: Insertion loss (from common arm to either output port) is 0.1 - 0.2 dB less than shown in the plot; fixture losses were not fully deembedded

## *Outline Drawing*




| | Pad Dimensions | | | |
|---|---|---|---|---|
| | Length (x-dim, um) | Width (y-dim, um) | Length (x-dim, mils) | Width (y-dim, mils) |
| RF In / Sum Pad Dimensions | 179 | 454 | 7 | 17.9 |
| Port 1 / Port 2 Dimensions | 125 | 150 | 4.9 | 5.9 |

| | RF Bond Pad Center Point Locations | | | | |
|---|---|---|---|---|---|
| | x-dim, um | y-dim, um | Angle (deg) | x-dim, mils | y-dim, mils |
| RF In / Sum Pad location | 173 | 1120 | 0 | 6.8 | 44.1 |
| Port 1 Location | 2560 | 1945 | 45 | 100.8 | 76.6 |
| Port 2 Location | 2560 | 296 | 45 | 100.8 | 11.7 |

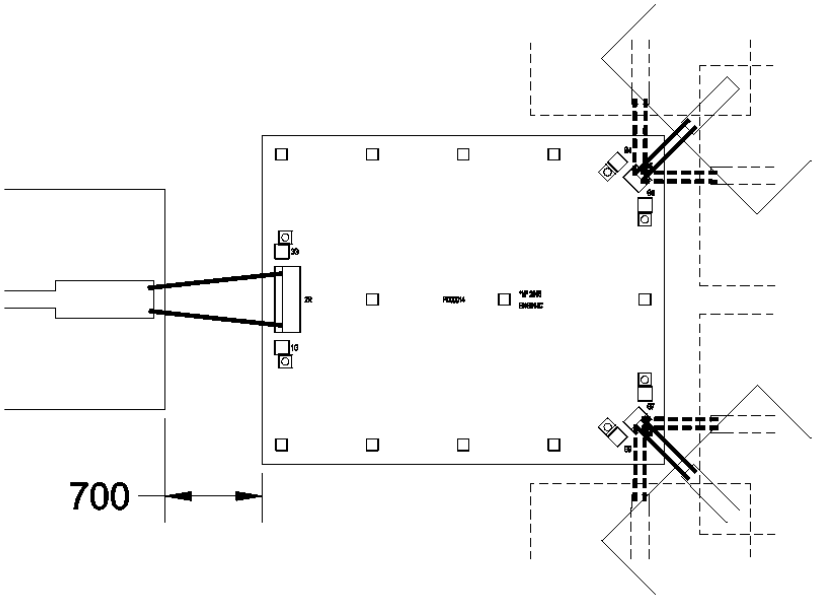
***Notes:***

1. ***All dimensions are given in both µm and mils. Substrate thickness: 100 µm (0.004").***
2. ***Backside metallization is gold.***
3. ***Bond pad metallization is gold.***

## *External I/O Microstrip Flare Dimensions (on 5-mil Alumina) and I/O Bond Wire Inductances for Optimum Insertion and Return Loss Performance*

*S-parameters can be supplied at DIE level such that optimal flare dimensions can be made for the substrate connection medium used (if different from 5-mil Alumina).*

| | RF I/O port - External Microstrip Flares on 5-mil Alumina | | | | |
|---|---|---|---|---|---|
| | Flare Width y-dim, um | Flare Length x-dim, um | Wire Inductance (nH) | Wire Length (um) | Number of Wires |
| **P1 RF Input Pad Flare Dimension** | 205 | 228 | 0.21 | 457 | 2 |
| **P2 RF Output Pad Flare Dimension** | 334 | 409 | 0.35 | 762 | 2 |




***Notes:***

1. ***To achieve bond wire inductance noted, bond the number of wires shown in parallel from each external flare to each associated MMIC RF bond pad as shown above.***
2. ***Gold Wire details:***
   a) ***Diameter: 25.4 µm (1 mil)***
   b) ***Spacing: 4 mils (~ 100 µm) typical***
   c) ***Height above Ground: 8 mils (~ 200 µm) typical (wedge bonds)***
3. ***Wire Length is total length if the wire were made perfectly straight.***
4. ***Ports 1 and 2 can be connected at an angle between 0 and 90 degrees.***