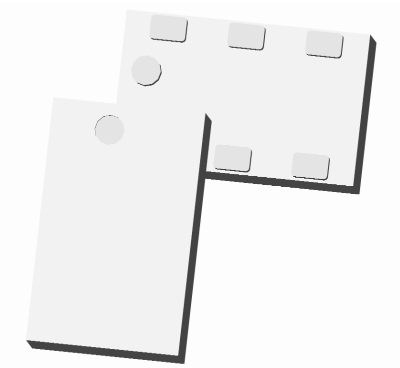
Xinger®

Ultra Low Profile 0805 Power Divider
3 Way 50Ω to 50Ω



Description

The PD4955J5050S3HF is a low profile, sub-miniature Wilkinson power divider in an easy to use surface mount package and is ideal for high volume manufacturing while delivering higher performances than traditional printed and lumped element solutions. It is designed particularly for LTE/4G/5G wireless communication applications. The PD4955J5050S3HF is matched to 50 Ω and has a height profile of 0.81 mm. Three external resistors are required for operation. Components are available on tape and reel for high volume manufacturing pick and place.

Detailed Electrical Specifications:
Specifications subject to change without notice.

Features:

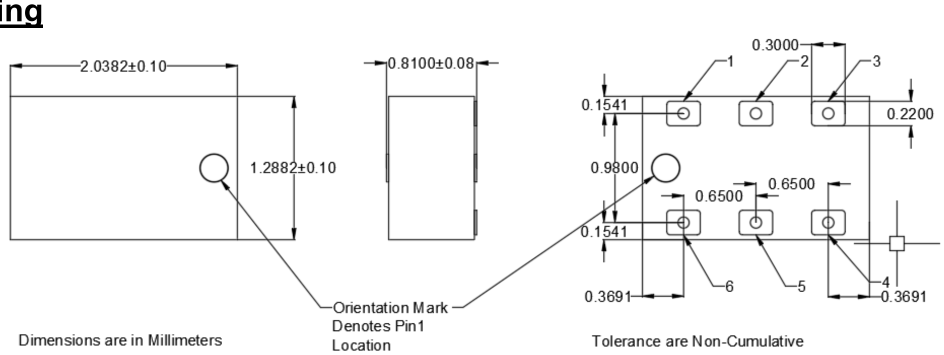
4500-5455 MHz

- 0.81 mm Height Profile
- 50Ω Outputs/Inputs
- DCS/PCS/UMTS/CDMA
- External resistors required
- Low Insertion Loss
- Surface Mountable
- Tape & Reel
- Non-conductive Surface
- RoHS Compliant
- Halogen Free

	ROOM (25°C)						
Parameter	Min.	Typ.	Max.	Min.	Typ.	Max	Unit
Frequency	4500		5100	4905		5455	MHz
Input Port Impedance		50			50		Ω
Output Port Impedance		50			50		Ω
Return Loss	14			14			dB
Insertion Loss*			0.6			0.6	dB
Amplitude Balance			±0.5			±0.6	dB
Phase Balance			±4			±4	Degrees
Isolation (Output Ports)	16			16			dB
Power Handling		5			5		Watts@105ºC
Operation Temperature	-55		+140	-55		+140	ºC

* Insertion Loss stated at room temperature (Insertion Loss is approximately 0.1 dB higher at +85 ºC)

Outline Drawing



Pin	Designation
1	GND
2	Input
3	GND
4	Output1
5	Output2
6	Output3

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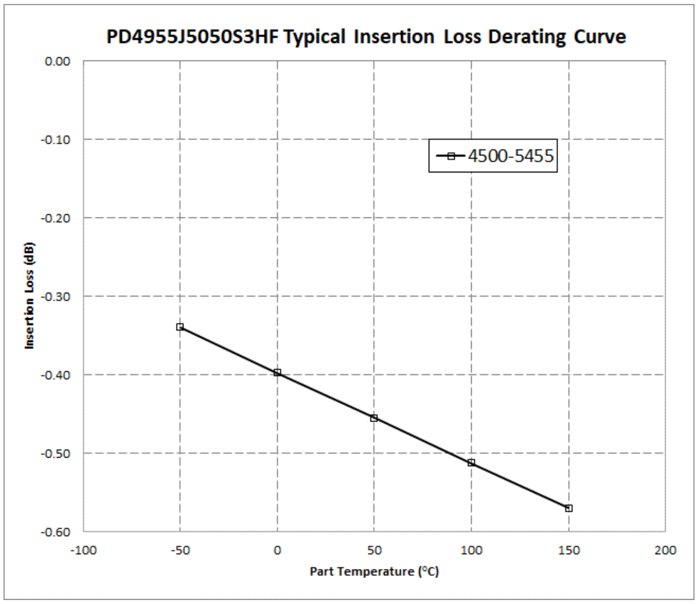
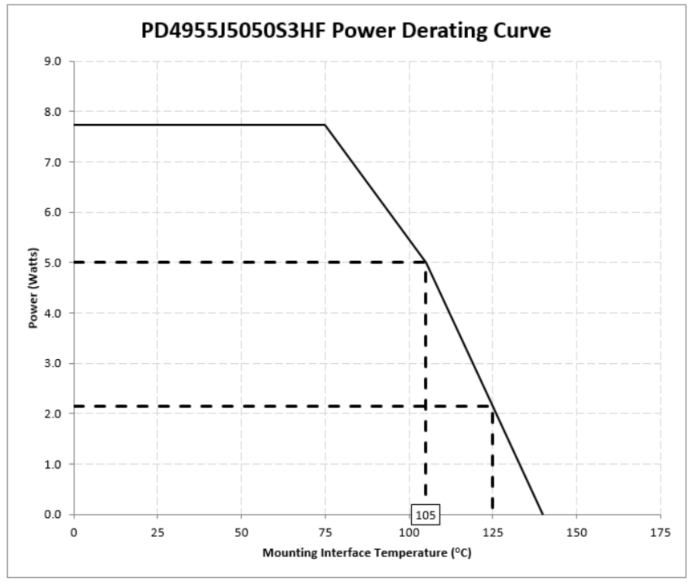
Insertion Loss and Power Derating Curves





Insertion Loss Derating:

The insertion loss, at a given frequency, of a group of power divider is measured at 25°C and then averaged. The measurements are performed under small signal conditions (i.e. using a Vector Network Analyzer). The process is repeated at -55°C, 105°C and 140°C. A best-fit line for the measured data is computed and then plotted from -55°C to 140°C.

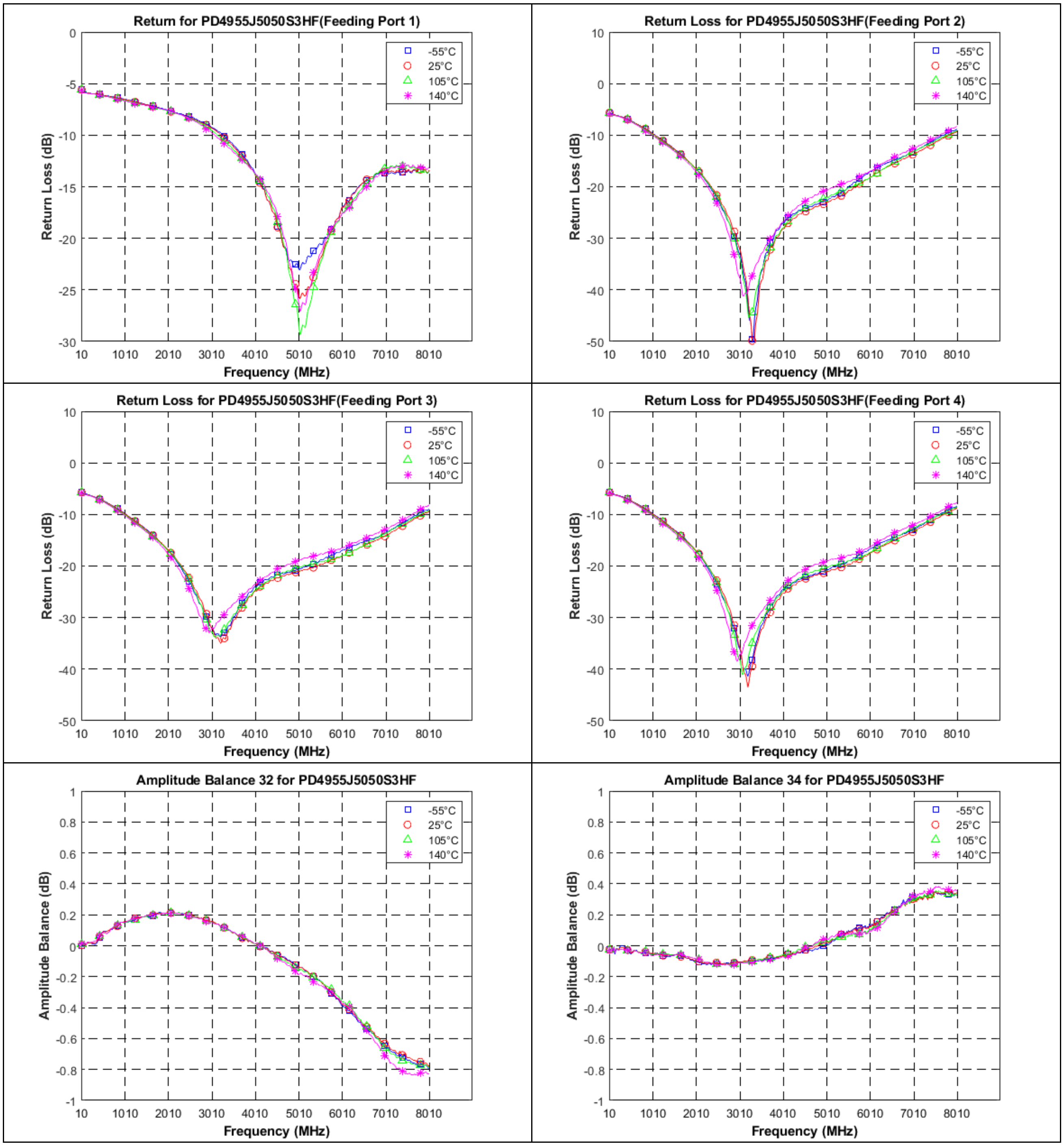
Power Derating:

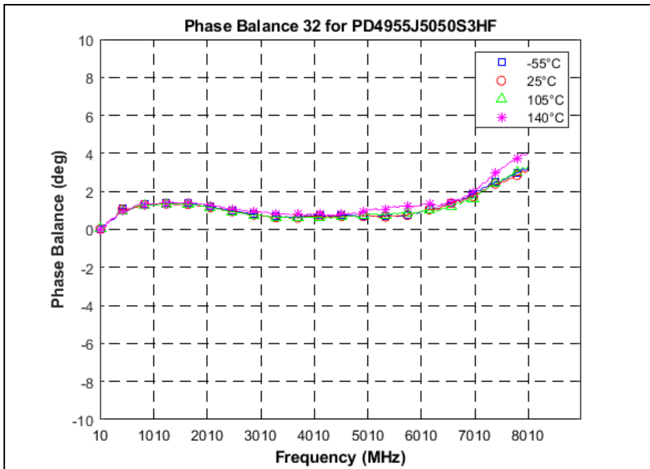
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling section of the data sheet.

As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

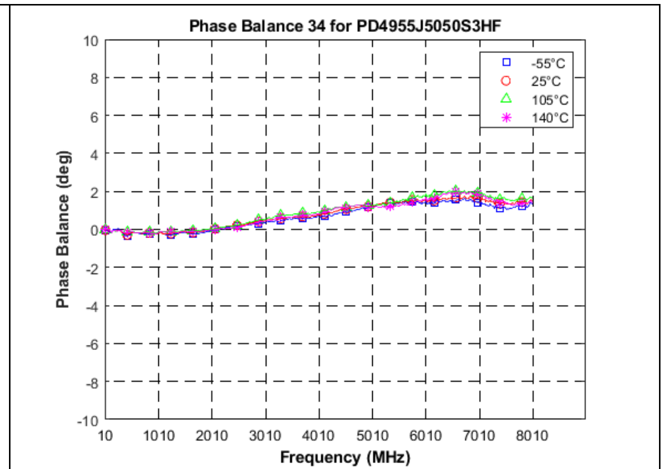
If mounting temperature is greater than 105°C, Power divider will perform reliably as long as the input power is derated to the curve above.

Typical Broadband Performance: 10 MHz to 8.01 GHz

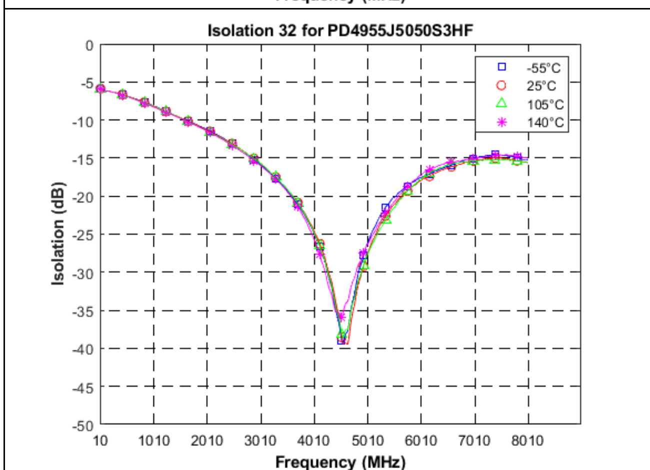




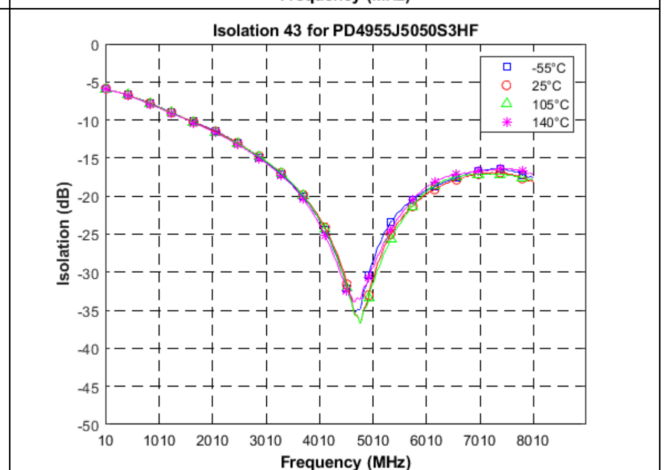
Phase Balance 32 for PD4955J5050S3HF
Phase Balance (deg)
Frequency (MHz)
-55°C
25°C
105°C
140°C



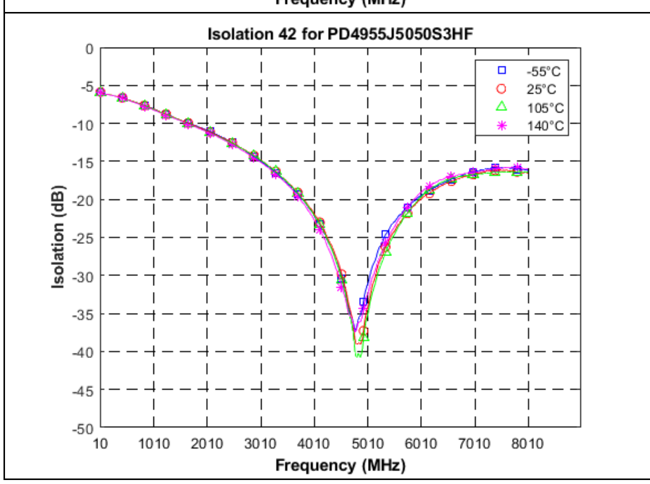
Phase Balance 34 for PD4955J5050S3HF
Phase Balance (deg)
Frequency (MHz)
-55°C
25°C
105°C
140°C



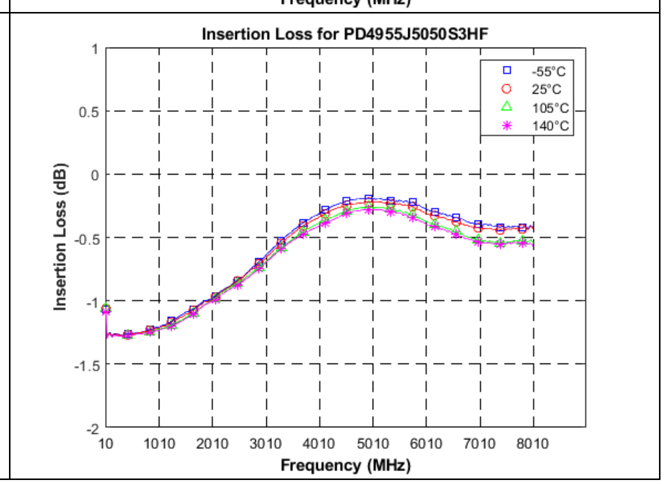
Isolation 32 for PD4955J5050S3HF
Isolation (dB)
Frequency (MHz)
-55°C
25°C
105°C
140°C



Isolation 43 for PD4955J5050S3HF
Isolation (dB)
Frequency (MHz)
-55°C
25°C
105°C
140°C

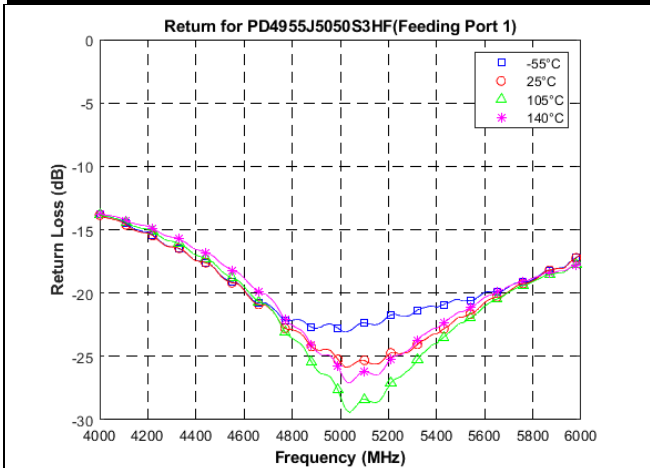


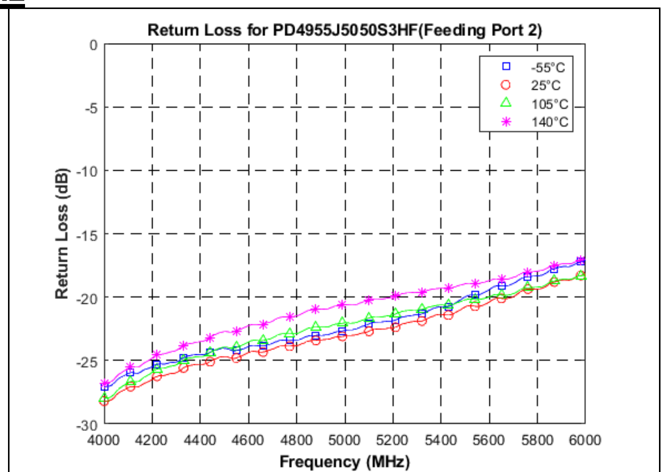
Isolation 42 for PD4955J5050S3HF
Isolation (dB)
Frequency (MHz)
-55°C
25°C
105°C
140°C

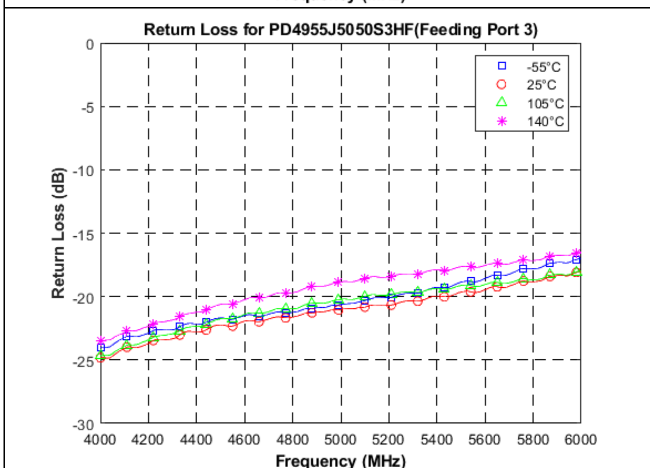


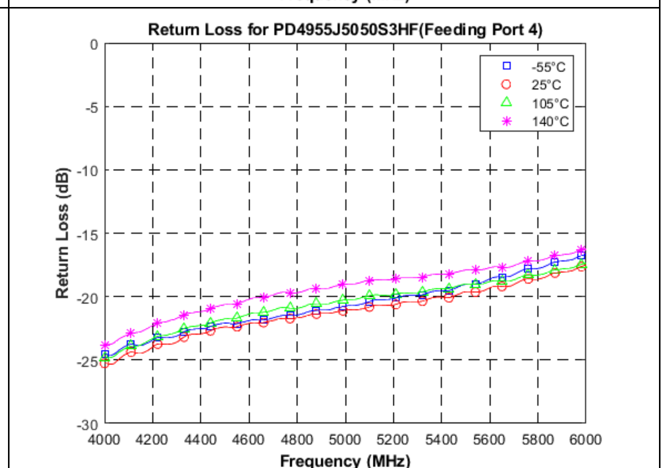
Insertion Loss for PD4955J5050S3HF
Insertion Loss (dB)
Frequency (MHz)
-55°C
25°C
105°C
140°C

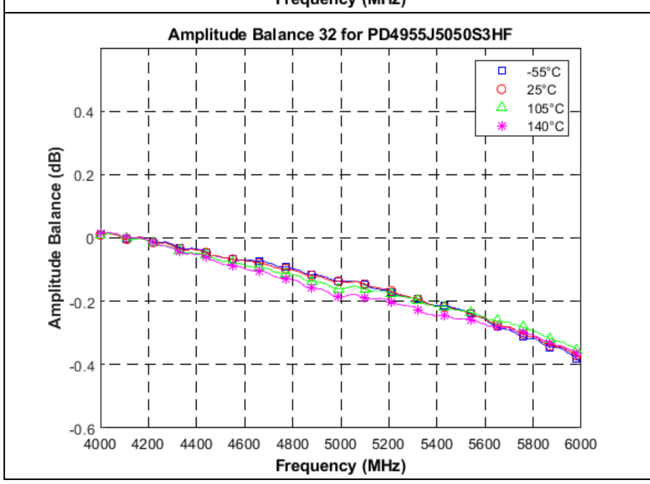
Typical Performance: 4000MHz to 6000 GHz

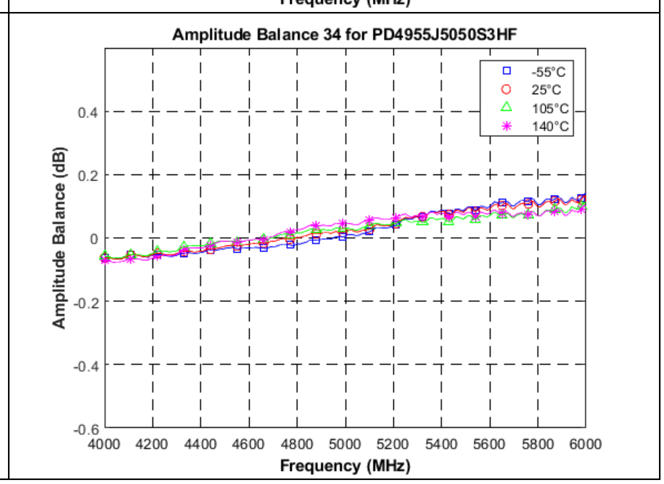


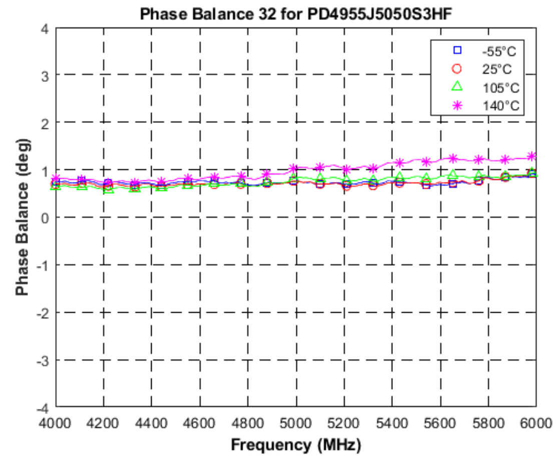


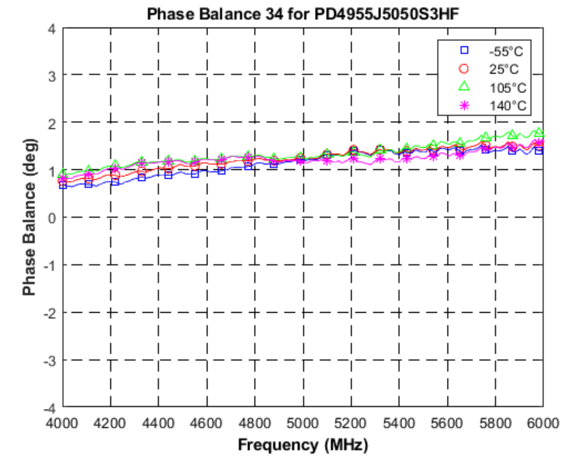


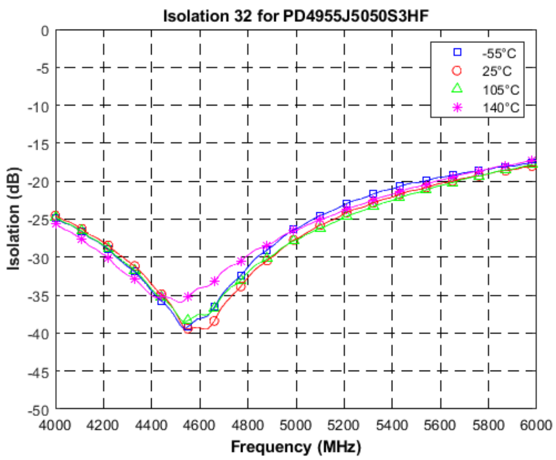


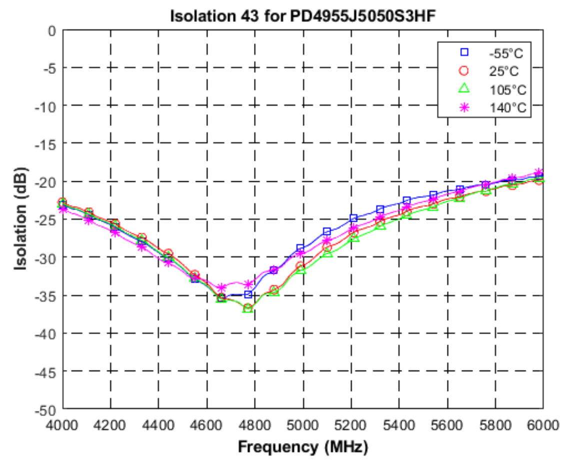


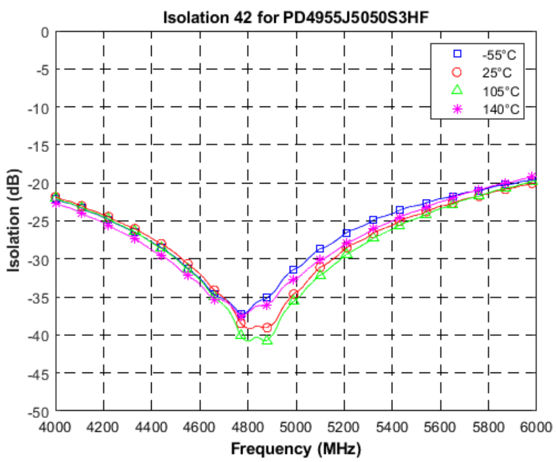


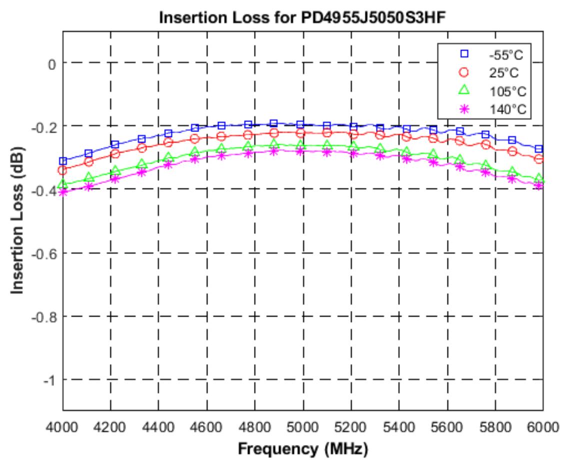












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Definition of Measured Specifications

Parameter	Definition	Mathmedical Representations
Insertion Loss	The measure of the sum of the power at outputs reference to the input power	IL (dB) = $10 \cdot \log_{10} (\lvert S_{21} \rvert^2 + \lvert S_{31} \rvert^2 + \lvert S_{41} \rvert^2)$
Return Loss	The measure of the power of the signal reflected by discontinuity in a transmission line relative to incident power	RL_{IN} (dB) = $20 \cdot \log_{10} (S_{11})$ RL_{Out1} (dB) = $20 \cdot \log_{10} (S_{22})$ RL_{Out2} (dB) = $20 \cdot \log_{10} (S_{33})$ RL_{Out3} (dB) = $20 \cdot \log_{10} (S_{44})$
Isolation	The measure of a signal present on one of the outputs due to excitation of the other output	ISO_{23} (dB) = $20 \cdot \log_{10} (S_{23})$ ISO_{34} (dB) = $20 \cdot \log_{10} (S_{34})$ ISO_{42} (dB) = $20 \cdot \log_{10} (S_{42})$
Amplitude Balance	The measure of the difference in power levels between each of the two outputs	$ABal_{23}$ (dB) = $20 \cdot \log_{10} \lvert S_{21}/S_{31} \rvert$ $ABal_{34}$ (dB) = $20 \cdot \log_{10} \lvert S_{31}/S_{41} \rvert$
Phase Balance	The measure of the difference in phase between each of the two outputs.	$PBal_{23}$ (degree) = $\angle S_{21}/S_{31}$ $PBal_{34}$ (degree) = $\angle S_{31}/S_{41}$

Note: The variables/Pin designations in equation: Port1 to Input; Port2 to output1; Port3 to output2; Port4 to output3

Notes on RF Testing and Circuit Layout:

The effects of the test fixture on the measured data must be minimized in order to accurately determine the performance of the device under test. If the line impedance is anything other than 50Ω and/or there is a discontinuity at the microstrip to SMA interface, there will be errors in the data for the device under test. The test environment can never be "perfect", but the procedure used to build and evaluate the test boards (outlined below) demonstrates an attempt to minimize the errors associated with testing these devices. The lower the signal level that is being measured, the more impact the fixture errors will have on the data. Parameters such as Return Loss and Isolation/Directivity, which are specified as low as 27dB and typically measure at much lower levels, will present the greatest measurement challenge.

Note: The S-parameter files that are available on the https://www.anaren.com/ website include data for frequencies that are outside of the specified band.

Circuit Board Layout

The dimensions for the Anaren test board are shown below. The test board is printed on Rogers RO4003 material that is 0.008" thick. Consider the case when a different material is used. First, the pad size must remain the same to accommodate the part. But, if the material thickness or dielectric constant (or both) changes, the reactance at the interface to the component will also change. Second, the linewidth required for 50Ω will be different and this will introduce a step in the line at the pad where the component interfaces with the printed microstrip trace. Third, the isolation resistor size must be 0402 as indicated in the Figure1 below and should be placed as close as possible to the power divider to minimize the loss. All of these conditions will affect the performance of the part. **To achieve the specified performance, serious attention must be given to the design and layout of the circuit environment in which this component will be used.**

If a different circuit board material is used, an attempt should be made to achieve the same interface pad reactance that is present on the Anaren RO4003 test board. When thinner circuit board material is used, the ground plane will be closer to the pad yielding more capacitance for the same size interface pad. The same is true if the dielectric constant of the circuit board material is higher than is used on the Anaren test board. In both of these cases, narrowing the line before the interface pad will introduce a series inductance, which, when properly tuned, will compensate for the extra capacitive reactance. If a thicker circuit, board or one with a lower dielectric constant is used,

The interface pad will have less capacitive reactance than the Anaren test board. In this case, a wider section of line before the interface pad (or a larger interface pad) will introduce a shunt capacitance and when properly tuned will match the performance of the Anaren test board.

Testing Sample Parts Supplied on Anaren Test Boards

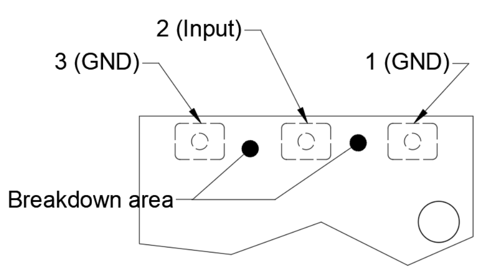
If you have received a power divider installed on an Anaren produced microstrip test board, please remember to remove the loss of the test board from the measured data. The loss is small enough that it is not of concern for Return Loss and Isolation, but it should certainly be considered when using measured result for calculating the insertion loss of the power divider. Upon request, an s-parameter file of a thru board will be supplied. As a first order approximation, one should consider the following loss estimates:

Frequency Band (MHz)	Average Test Board Loss (dB)
2600 - 3000	0.653
3100 - 3500	0.703
4300 - 4700	0.774
4700 - 5300	0.807
5300 - 5700	0.844

It is important to note that the loss of the test board will change with temperature and must be considered if the power divider is to be evaluated at other temperatures.

Peak Power Handling

High-Pot testing of these components during the qualification procedure resulted in a minimum breakdown voltage of 1Kv (minimum recorded value). This voltage level corresponds to a breakdown resistance capable of handling at least 12dB peaks over average power levels, for very short durations. The breakdown location consistently occurred across the pads and the ground pads (see illustration below). The breakdown levels at these points will be affected by any contamination in the gap area around these pads. These areas must be kept clean for optimum performance. It is recommended that the user test for voltage breakdown under the maximum operating conditions and over worst case modulation induced power peaking. This evaluation should also include extreme environmental conditions (such as high humidity).



Mounting

In order for Xinger surface mount components to work optimally, there must be 50Ω transmission lines leading to and from all of the RF ports. Also, there must be a very good ground plane underneath the part to ensure proper electrical performance. If either of these two conditions is not satisfied, electrical performance may not meet published specifications.

Overall ground is improved if a dense population of plated through holes connect the top and bottom ground layers of the PCB. This minimizes ground inductance and improves ground continuity. All of the Xinger components are constructed from ceramic filled PTFE composites, which possess excellent electrical and mechanical stability.

Xinger components are compliant to a variety of ROHS and Green standards and ready for Pb-free soldering processes. Pads are Gold plated with a Nickel barrier.

When a surface mount component is mounted to a printed circuit board, the primary concerns are; ensuring the RF pads of the device are in contact with the circuit trace of the PCB and insuring the ground plane of neither the component nor the PCB is in contact with the RF signal.

Refer to the Mounting Configuration below for details.

Mounting Configuration

In order for Xinger surface mount components to work optimally, the proper impedance transmission lines must be used to connect to the RF ports. If this condition is not satisfied, insertion loss, Isolation and VSWR may not meet published specifications.

Below is a suggested PCB footprint can be used for PD4955J5050S3HF. Since PD4955J5050S3HF is a Wilkinson power divider, external 0402 150Ω resistors must be used to provide the Isolation performance.

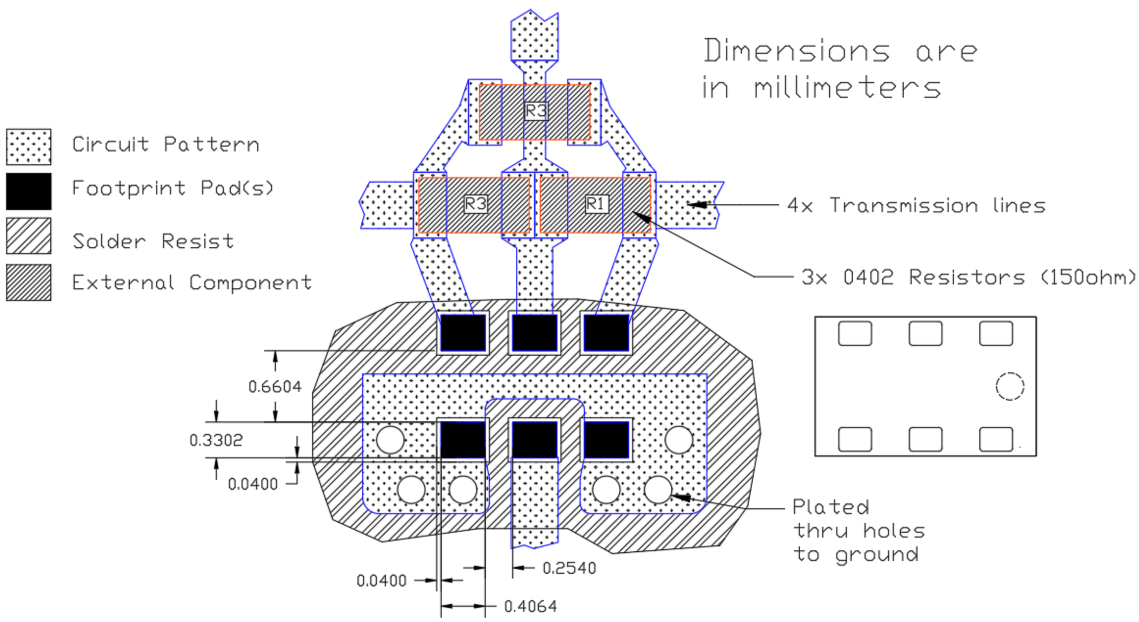


Figure 1: Suggested Pad Footprint with 0402 Resistor Locations

Component Mounting Process

The mounting process for assembling this component is a conventional surface mount process as shown in Figure 2. This process is conducive to both low and high volume usage.

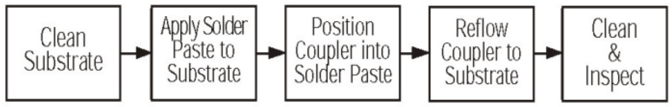


Figure 2: Surface Mounting Process Steps

Storage of Components: The Xinger products are available in an ENIG finish. IPC storage conditions used to control oxidation should be followed for these surface mount components.

Substrate: Depending upon the particular component, the circuit material has a coefficient of thermal expansion (CTE) similar to commonly used board substrates such as RF35, RO4003, FR4, polyimide and G-10 materials. The similarity in CTE minimizes solder joint stresses due to similar expansion rates between component and board. Mounting to “hard” substrates (alumina etc.) is possible depending upon operational temperature requirements. The solder surfaces of the component are all copper plated with an ENIG.

Solder Paste: All conventional solder paste formulations will work well with Anaren Xinger surface mount components. Solder paste can be applied with stencils or syringe dispensers.

***Reflow*:** The surface mount component is conducive to most of today’s conventional reflow methods. The low and high temperature thermal reflow profiles are shown in Figures 3 and 4, respectively. Manual soldering of these components can be done with conventional surface mount non-contact hot air soldering tools. Board pre-heating is highly recommended for these selective hot air soldering methods. Manual soldering with conventional irons should be avoided.

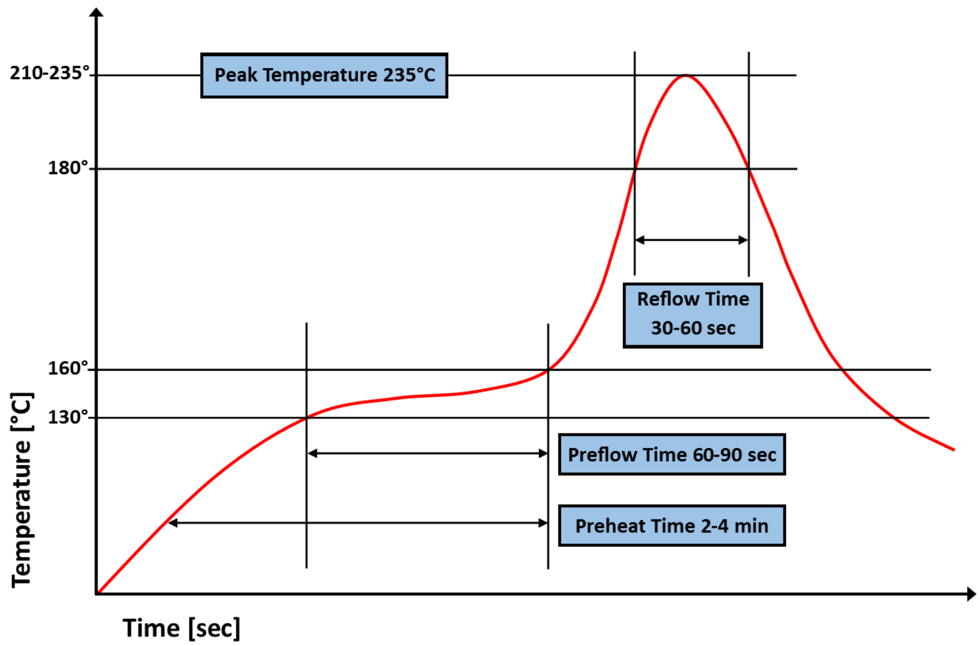


Figure 3 – Low Temperature Solder Reflow Thermal Profile

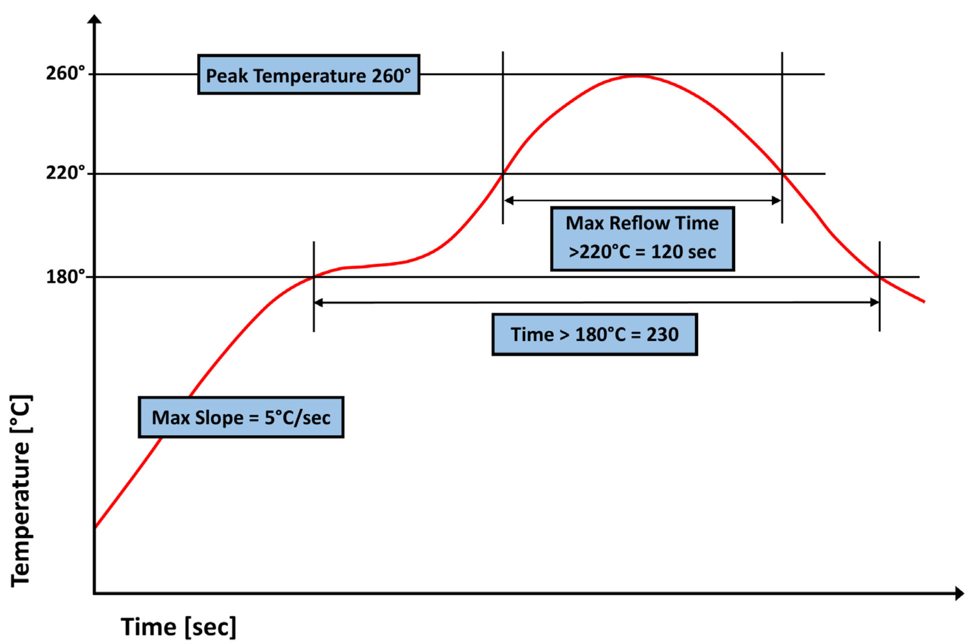


Figure 4 – High Temperature Solder Reflow Thermal Profile

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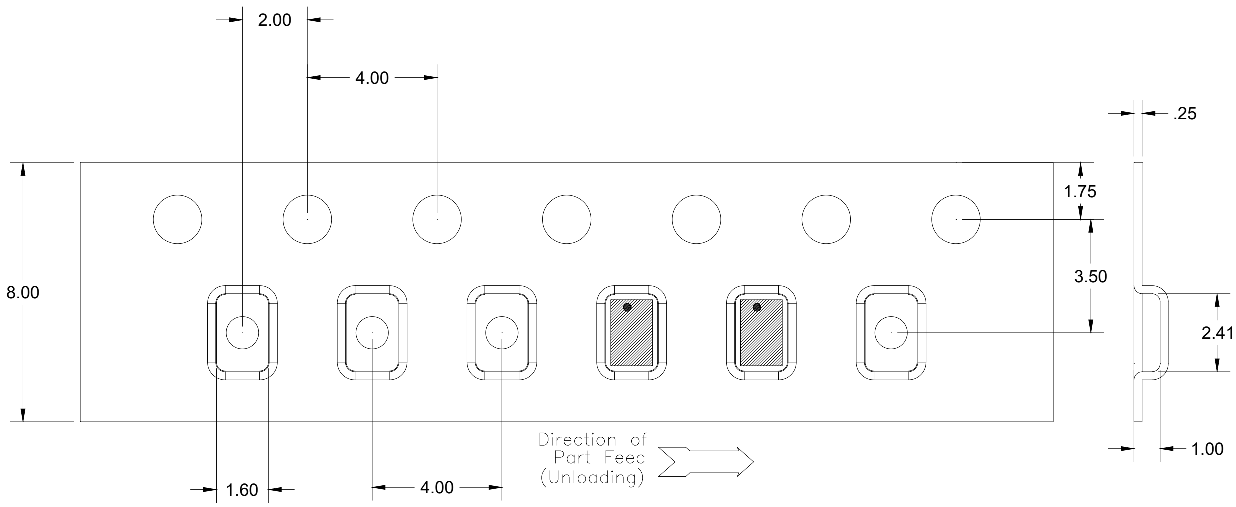
Packaging and Ordering Information

Parts are available in reel and are packaged per EIA 481-D. Parts are oriented in tape and reel as shown below. Minimum order quantities are 4000 per reel.



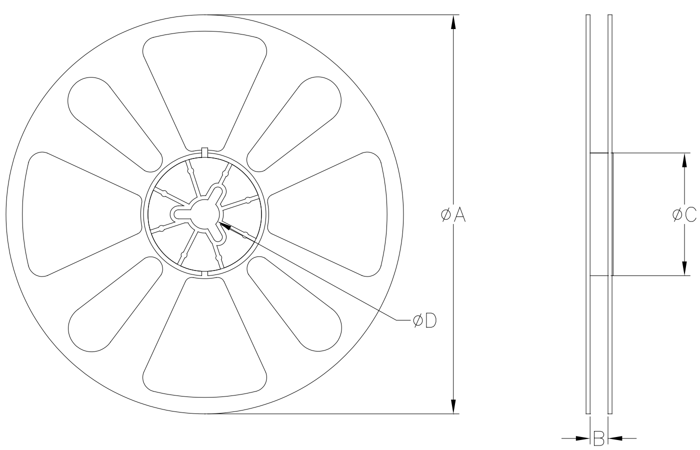


TABLE 1

QUANTITY/REEL	REEL DIMENSIONS mm	
4000	ØA	177.80
	B	8.00
	ØC	50.80
	ØD	13.00

USA/Canada: (315) 233-5510
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