Hybrid Couplers
3 dB, 90°



Description

The JP503S Pico Xinger is a low profile, miniature 3dB hybrid coupler in an easy to use surface mount package designed for W-CDMA and other 3G applications. The JP503S is designed for balanced amplifiers, variable phase shifters and attenuators, LNAs, signal distribution and is an ideal solution for the ever-increasing demands of the wireless industry for smaller printed circuit boards and high performance. Parts have been subjected to rigorous qualification testing and units are 100% tested. They are manufactured using materials with x and y thermal expansion coefficients compatible with common substrates.

Features:

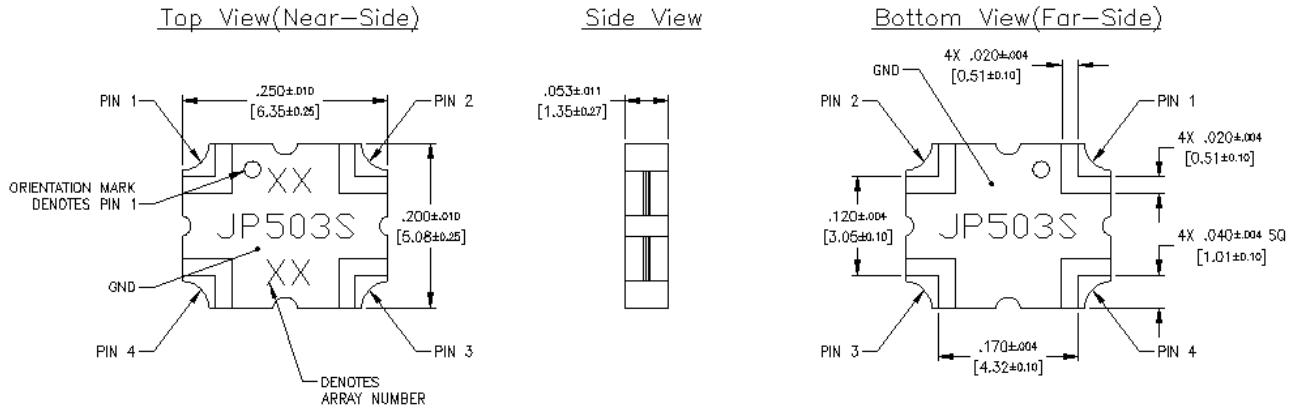
- **2.0 – 2.3 GHz.**
- **3G Frequencies**
- **Low Loss**
- **High Isolation**
- **90^{O} Quadrature**
- **Surface Mountable**
- **Tape And Reel**
- **Available in Lead-Free (as illustrated**

ELECTRICAL SPECIFICATIONS**

Frequency	Isolation	Insertion Loss	VSWR	
GHz	*dB Min*	*dB Max*	*Max:1*	
2.0 – 2.3	20	0.30	1.20	
Amplitude Balance	**Phase Balance**	**Power**	**ΘJC**	**Operating Temp.**
dB Max	*Degrees*	*Ave. CW Watts*	*°C/Watt*	*°C*
± 0.25	± 3	25	27.5	-55 to +85

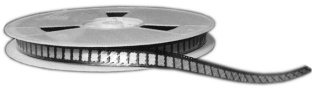
**Specification based on performance of unit properly installed on microstrip printed circuit boards with 50 Ω nominal impedance. Specifications subject to change without notice.

Mechanical Outline



Dimensions are in Inches [Millimeters]
JP503S Mechanical Outline

Part is Symmetric About All Axis
Tolerances are Non-Cumulative



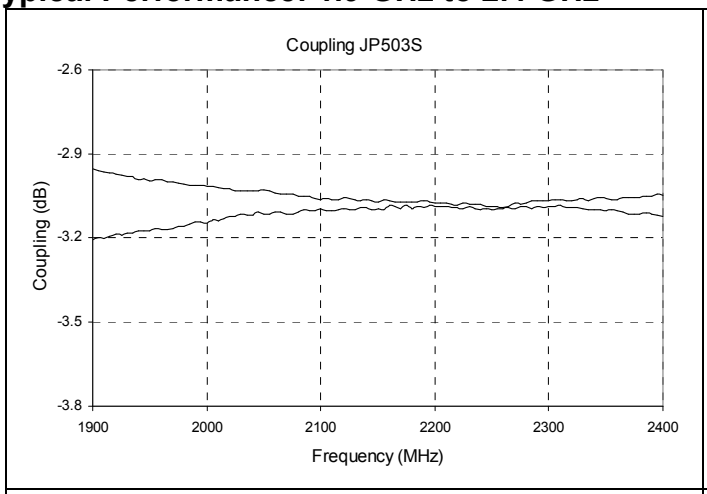
Available on Tape and Reel For Pick and Place Manufacturing.

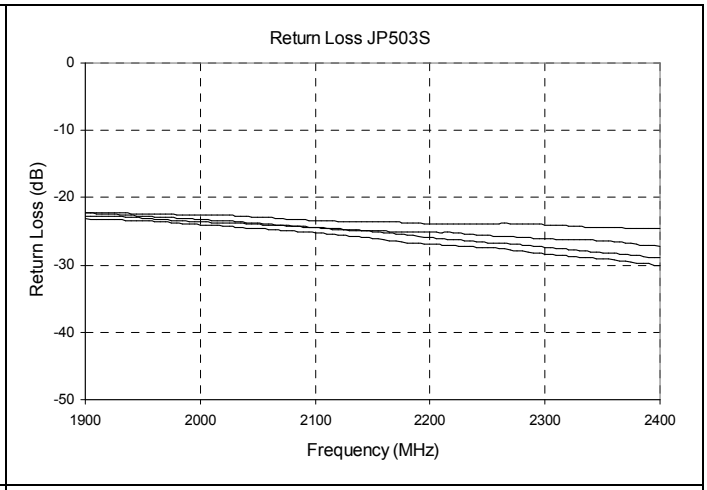
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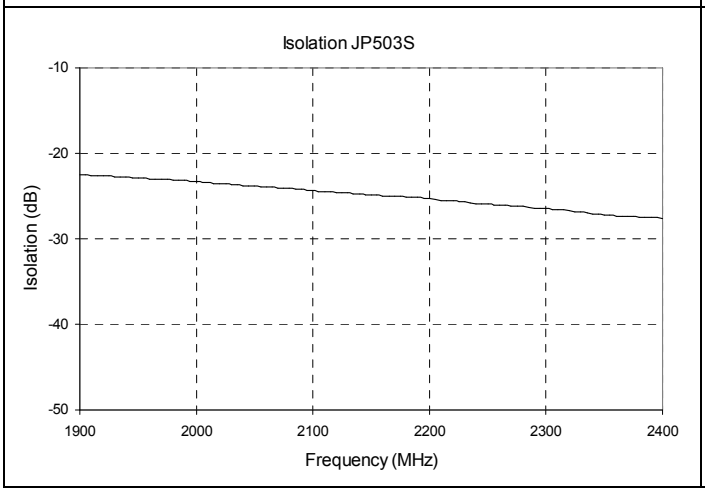
Model JP503S

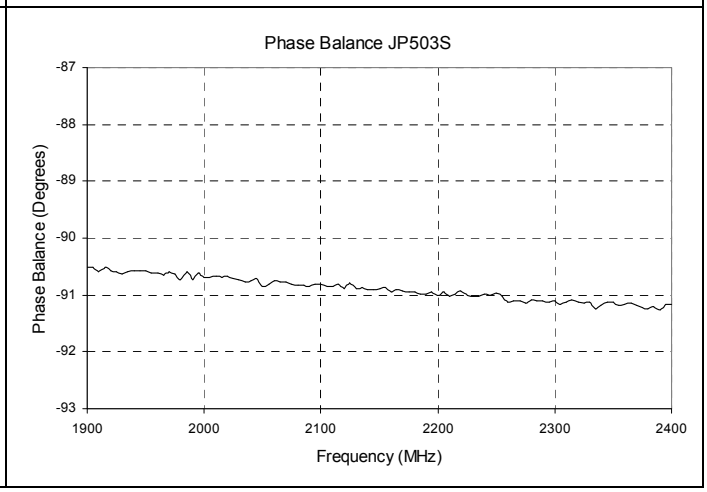
Rev. E

Typical Performance: 1.9 GHz to 2.4 GHz









AMPLITUDE BALANCE

3dB hybrids are a type of backward wave coupler. In the design of these couplers, the even mode impedance was chosen to 'critically couple' or slightly 'over couple' at mid band to maximize performance and bandwidth. The amplitude balance specification is defined as the difference (in dB) of the signals at the COUPLED port output and the DC port output, when compared to the average output level.

PHASE BALANCE

In theory, output ports of a backward wave hybrid coupler remain in perfect phase quadrature independent of frequency. In practice, factors associated with the manufacturing processes slightly degrade performance. The specification is typical two to three degrees maximum although in practice, phase balance is statistically better than specified ($<1^{o}$).

VSWR & ISOLATION

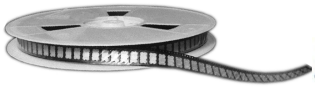
Similar to phase balance, the VSWR and isolation of a coupler are theoretically perfect; where the input and output ports are perfectly matched and no power is coupled to the isolated port. In practice, factors associated with the design and manufacturing processes limit VSWR and isolation. The significant limitations are associated with limitations of building perfect 50Ω transitions at the input and output ports of the device.

INSERTION LOSS

Coupler insertion loss is defined as the difference of the input power from the sum of the output power. In practice, loss is typically 0.20 dB. Specification limits are somewhat higher due to imperfect test conditions; as the couplers must be tested in fixtures which negatively affect results.

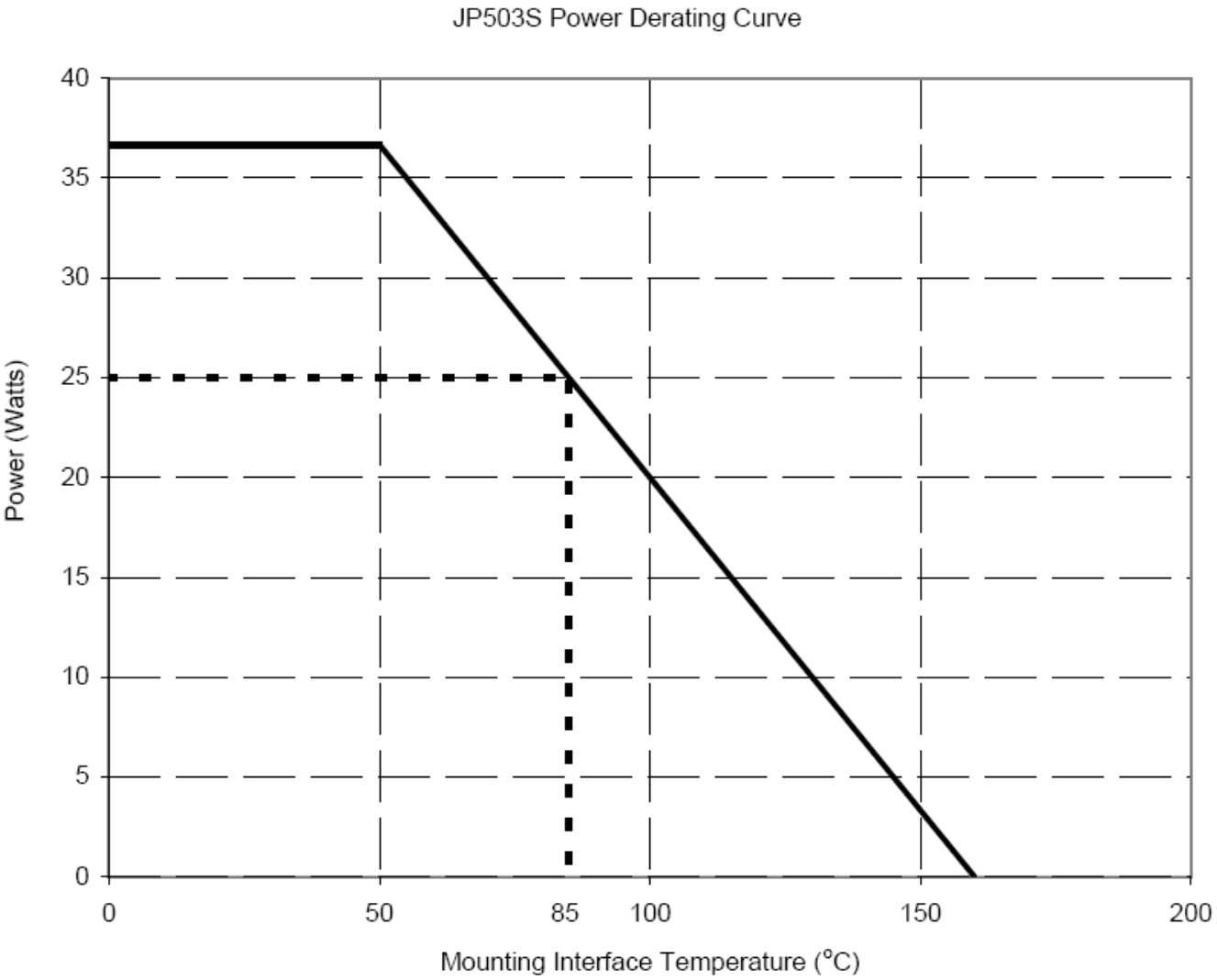
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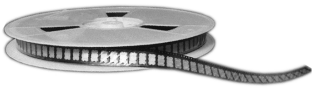
Power Derating Curve



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.

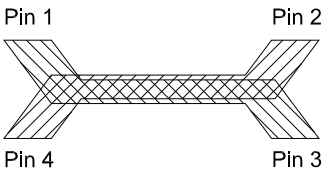
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.



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PIN CONFIGURATION



Hybrid Coupler Pin Configruation				
	Pin 1	Pin 2	Pin 3	Pin 4
Configuration #1	Input	Isolated	-3dB, -90°	-3dB, 0°
Configuration #2	Isolated	Input	-3dB, 0°	-3dB, -90°
Configuration #3	-3dB, -90°	-3dB, 0°	Input	Isolated
Configuration #4	-3dB, 0°	-3dB, -90°	Isolated	Input

All of the standard surface mount 3dB hybrid couplers have pin orientations that are symmetrical. When a port is designated as the input, automatically the two output and isolated ports are defined. For example, if the input port for a device was selected to be Pin 1, Pin 2 is automatically the isolated port, Pin 4 is the 0 degree reference output port, and Pin 3 is the output port which "lags" behind the reference output port by 90 degrees. Similarly, if Pin 3 was to be selected as the input port, the adjacent port on the long side (Pin 4) is the isolated port, the adjacent port on the short side (Pin 2) is the 0 degree output port, and the opposite port (Pin 1) is the -90 degree output port. Below is a table of all possible orientations.

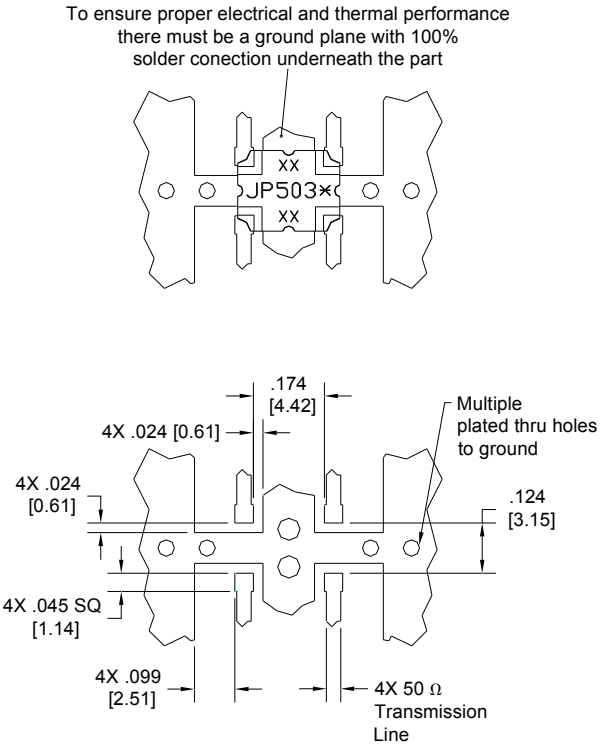
MOUNTING

In order for Xinger surface mount couplers 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 under the part to ensure proper electrical performance. If either of these two conditions are not satisfied, insertion loss, coupling, VSWR and isolation 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 hybrid and directional couplers are constructed from ceramic filled PTFE composites that possess excellent electrical and mechanical stability having X and Y thermal coefficient of expansion (CTE) of 17 ppm/^{o}C

When a surface mount hybrid coupler is mounted to a printed circuit board, the primary concerns are; insuring 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. As long as the geometry of the unit fits onto the layout of the circuit trace on the PCB, and the conditions of the previous paragraph are followed, the coupler's performance is ensured. An example of how the PCB footprint could look is shown below. In specific designs, the 50Ω lines need to be adjusted to the unique dielectric coefficients and thicknesses as well as varying pick and place equipment tolerances.

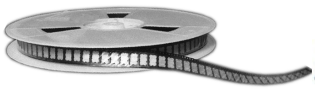
SUGGESTED FOOTPRINT



Dimensions are in Inches [Millimeters]
JP503* Mounting Footprint

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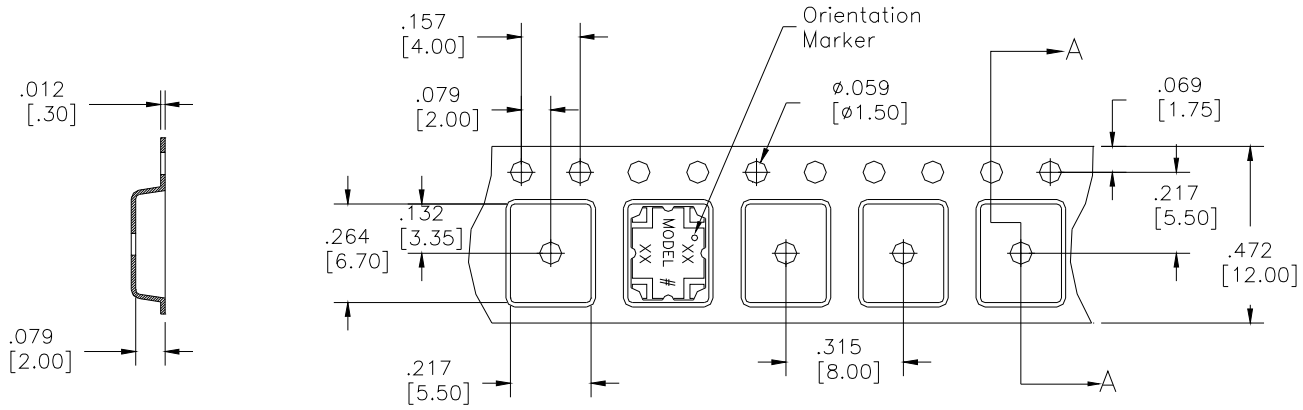
Available on Tape and Reel For Pick and Place Manufacturing.



Xinger®

PACKAGING

Packaging follows EIA-481-2. Parts are oriented in tape as shown below. Minimum order quantities are 2000 per reel and 77 per tube.



Xinger® Tape & Reel Diagram

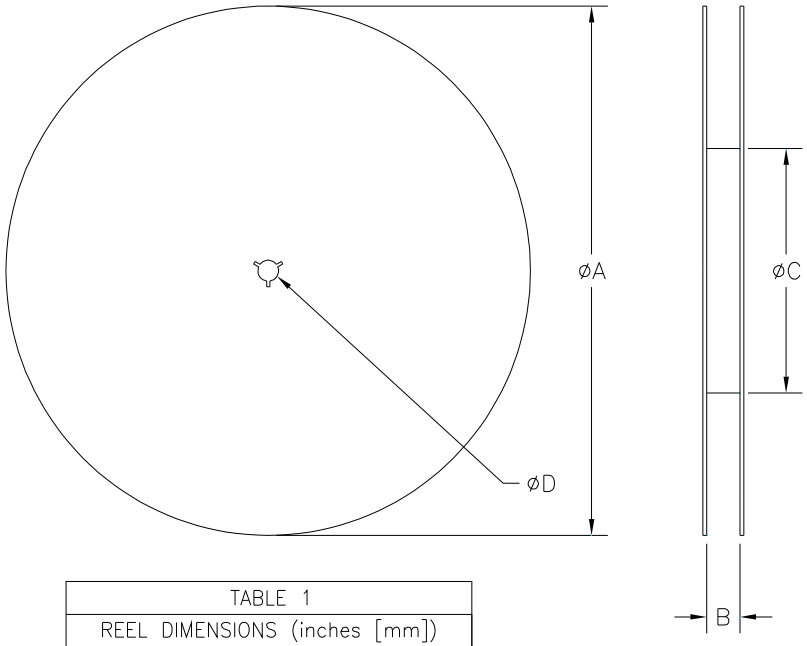
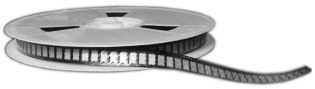


TABLE 1	
REEL DIMENSIONS (inches [mm])	
øA	13.3 [333.0]
B	0.472 [12.0]
øC	4.017 [102.03]
øD	0.512 [13.0]



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