

Directional Couplers 5 dB

Xinger®



Description

The JA1305-5 is a low profile 5dB directional coupler in an easy to use surface mount package covering WCDMA and other 3G applications. The JA1305-5 is ideal for 3 way inline splitting and combining amplifiers and for power injection. The coupler can be used in most high power designs. 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 such as FR4, G-10 and polyamide.

Features:

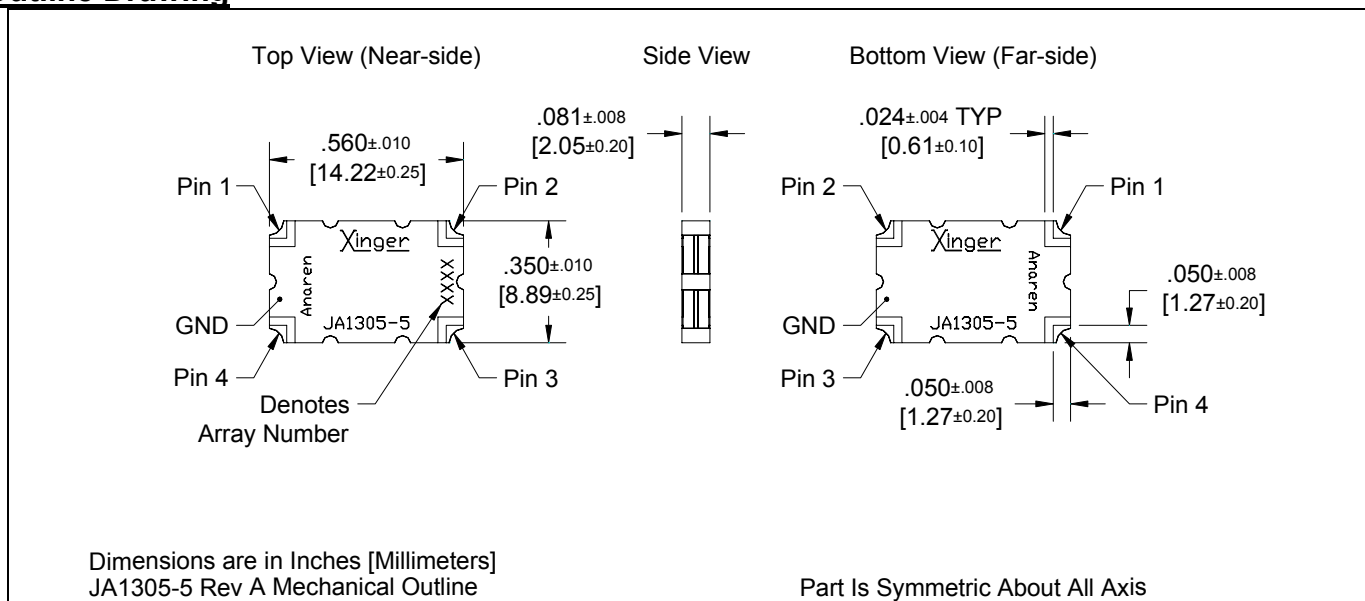
- 2.0 - 2.3 GHz
- Optimized for 3G
- Low Insertion loss
- High Directivity
- Surface Mountable
- Tape And Reel
- Convenient Package
- 100% Tested

ELECTRICAL SPECIFICATIONS**

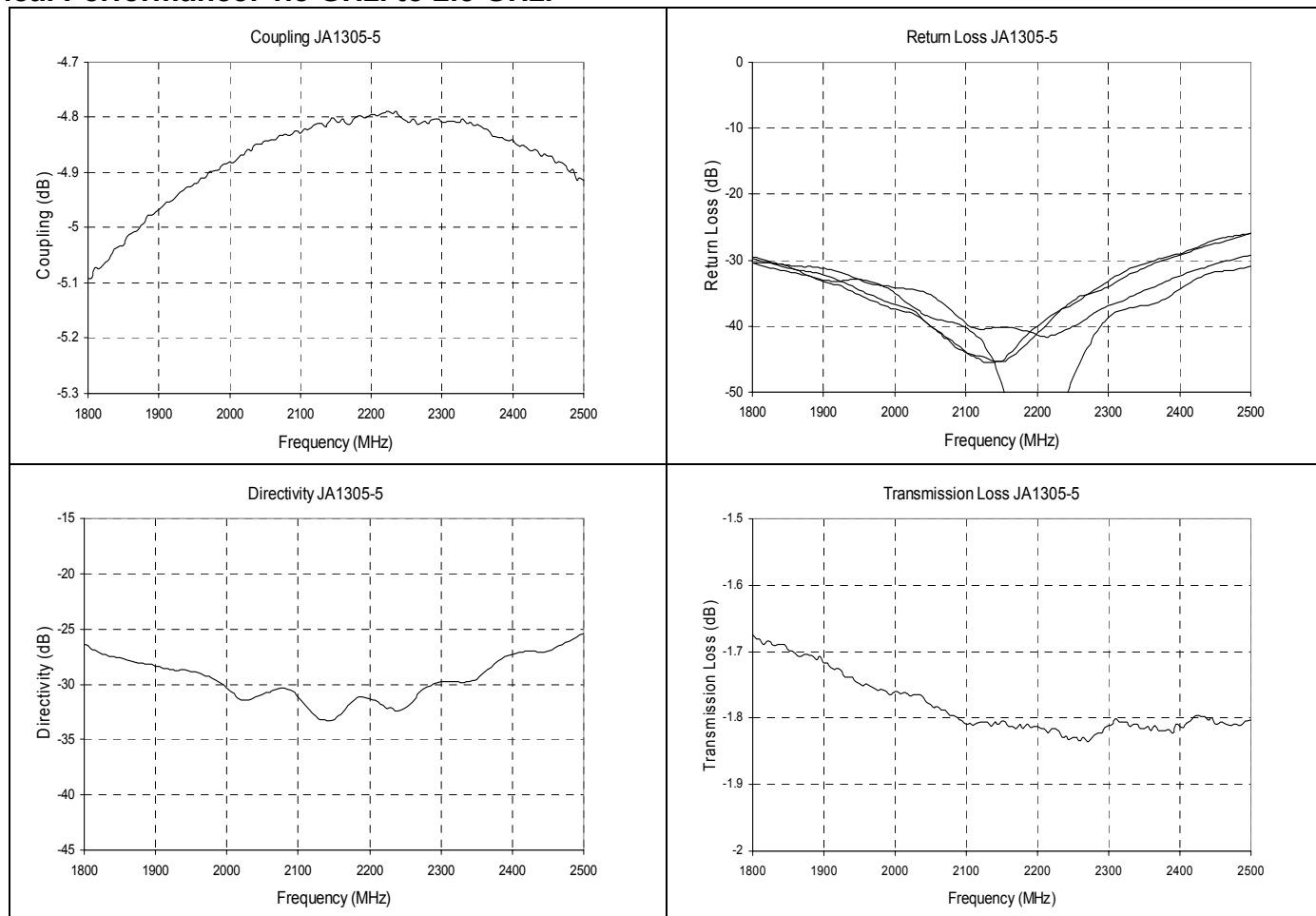
Frequency	Mean Coupling	Insertion Loss	VSWR	Freq. Sensitivity
GHz	dB	dB Max	Max:1	dB Max
2.11 – 2.17	5.0 ± 0.25	0.23	1.20	±0.10
2.0 – 2.3	5.1 ± 0.4	0.25	1.25	±0.20
Deviation from Linear Phase (50 MHz. Band)	Directivity	Power Handling	⊙JC	Operating Temp.
Deg. Max	dB Min	Watts	°C / Watt	°C
NA	20	55	15.35	-55 to +85
±0.10	18	50	15.35	-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.

Outline Drawing



Typical Performance: 1.8 GHz. to 2.5 GHz.



COUPLING

Choice of a coupling value in an application normally depends on the power level of the main (sampled) line. For example, if the coupler is being used to monitor main line power, the coupling value is selected to provide sufficient power to the monitoring device and yet minimize system loss. Note that any coupler reduces power flowing in the main line by the amount coupled off; a 6dB coupler reduces main line power by 1.25 dB (25%) where a 20dB coupler reduces it by only 0.044dB (1%).

Anaren uses mean coupling and frequency sensitivity with the coupling specification. The mean coupling value is arrived at by periodically sampling the coupling value over the specified band and averaging the readings. Frequency sensitivity is the peak to peak variation in coupling over the specified band.

VSWR & DIRECTIVITY

In directional couplers, directivity is specified in lieu of isolation. Directivity is a measure of how well the coupled power is isolated from reflections at the main line output port. For example, open or short circuiting the output port of a coupler with 20dB directivity would only affect the coupled output power by 1% and only 0.1% for 30dB directivity. High directivity is especially important if the coupler is being used to measure the VSWR of a device at its output port. In this application, accurate measurements of forward and reverse power are required.

In theory, VSWR and directivity characteristics of a coupler are perfect; the input and output ports are perfectly matched and no power is coupled to the isolated port. In practice, factors associated with the

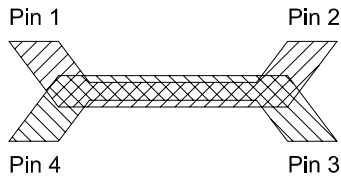


design and manufacturing processes limit VSWR and directivity. The internal meandering of the coupled line and limitations of building perfect 50Ω transitions at the input and output ports of the device are the most significant factors against perfect VSWR and directivity. Typically, VSWR and directivity of 1.15 :1 and 23 dB respectively are achieved in practice.

INSERTION LOSS

Coupler insertion loss is defined as the log of the input power divided by the sum of the power at the two output ports. In practice, typical loss is approximately 0.15 dB. Specification limits are somewhat higher due to imperfect test conditions; surface mount couplers must be tested in test fixtures which negatively affect results.

PIN CONFIGURATION



Directional Coupler Pin Configuration				
	Pin 1	Pin 2	Pin 3	Pin 4
Configuration #1	Input	Output	Isolated	Coupled
Configuration #2	Output	Input	Coupled	Isolated
Configuration #3	Isolated	Coupled	Input	Output
Configuration #4	Coupled	Isolated	Output	Input

Most of the surface mount directional couplers have pin orientations which are symmetrical. When a port is chosen as the input port, automatically the output, coupled and isolated ports are known. For example, if the input port for a device was selected to be Pin 1, Pin 2 automatically becomes the output port, Pin 4 becomes the coupled port, and Pin 3 is the isolated port. Similarly, if Pin 3 was to be selected as the input port, the adjacent port on the long side (Pin 4) is the output port, the adjacent port on the short side (Pin 2) is the coupled port, and the opposite port (Pin 1) is the isolated port. Any port can be selected as the input port, as shown in the table below, which shows every pin configuration possible.

MOUNTING

For optimal performance of the surface mount couplers, there must be 50Ω transmission lines leading to and from

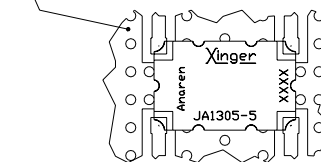
all of the RF ports. Also, there must be a very good ground plane under the part to ensure proper electrical performance. If either of these two conditions are not satisfied, insertion loss, coupling, VSWR and directivity may not meet published specifications.

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 as well as power handling. Performance can also be improved when grounded coplanar waveguide is used as the transmission medium and a low loss dielectric is used. All of the Xinger couplers are constructed from ceramic filled PTFE composites which possess excellent electrical and mechanical stability having X and Y thermal coefficient of expansion (CTE) of 17 ppm/°C.

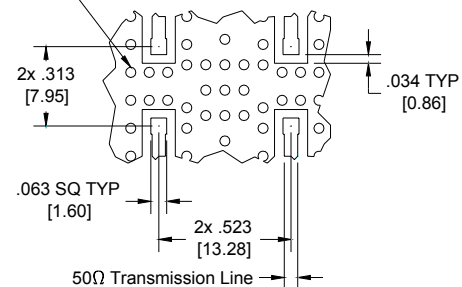
When a surface mount directional coupler is mounted to a printed circuit board, the primary concerns are; insuring the RF pads of the device are in contact with the circuit trace of the PCB and insuring the ground plane of neither the component nor the PCB is in contact with the RF signal. As long as 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 varying thickness as well as adjustments for pick and place equipment tolerances.

SUGGESTED FOOTPRINT

To insure proper electrical and thermal performance there must be a ground plane under the part



Multiple plated thru holes to ground plane



Dimensions are in Inches [Millimeters]
JA1305-5 Rev A Mounting Footprint

