Uneven Split Quadrature Coupler
2 dB, 90°

Description:

The X3C21P1-02S is a low profile, high performance 2dB quadrature (90 degree) coupler with a high power rating of 80 W (CW) in a new easy to use, Xinger style manufacturing friendly surface mount package. It is designed particularly for 5G and S-Band (2-4 GHz) applications in all end markets including telecom and Mil-Aero. The X3C21P1-02S can be used as power splitters in Doherty power amplifiers, where low insertion loss, tight power splitting ratio control and phase balance control are required.

Parts have been subjected to rigorous Xinger qualification testing and they are manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, RF-35, RO4350 and polyimide. Produced with 6 of 6 RoHS compliant tin immersion finish.

Features:

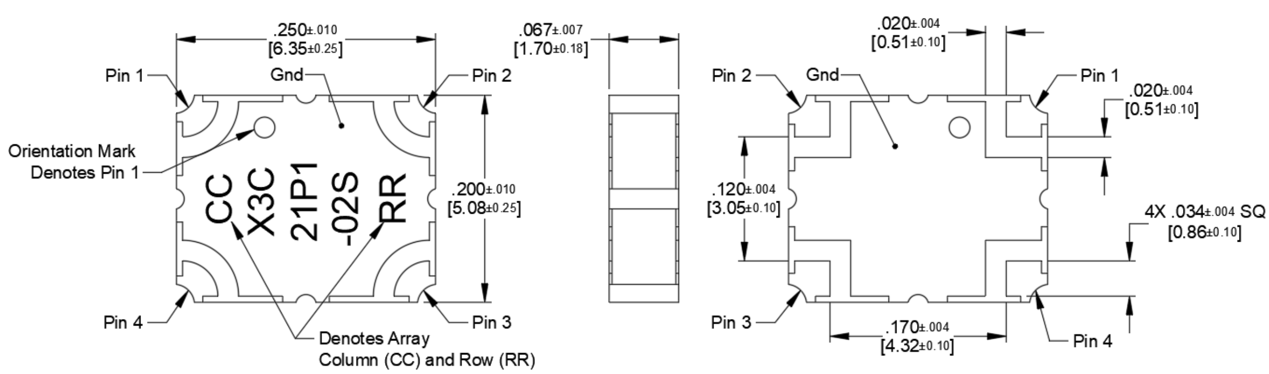
- **2000-2300 MHz**
- **5G, S Band & Mil-Aero**
- **High Power 80W (CW)**
- **Very Low Loss**
- **Tight Amplitude Balance**
- **High Isolation**
- **Production Friendly**
- **Tape and Reel**
- **Lead-Free**

Electrical Specifications*:

Frequency	Insertion Loss	VSWR	Coupling
MHz	*dB Max*	*dB Min dB*	*dB*
2000-2300	0.25	1.22	1.95±0.25
Isolation	**Phase**	**Power**	**Operating Temp.**
dB Min	*Degrees*	*Avg. CW Watts @125ºC*	*ºC*
20	90±5.0	80	-55 to +150

*Specification based on performance of unit properly installed on TTM Technologies Test Board with small signal applied. Specifications subject to change without notice. Refer to parameter definitions for details.

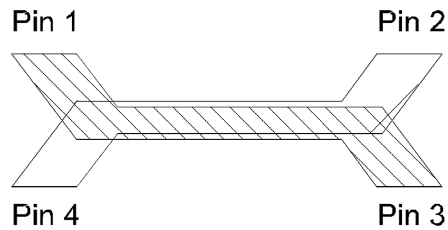
Outline Drawing:



Dimensions are in Inches [Millimeters]
Tolerances are Non-cumulative

Coupler Pin Configuration:

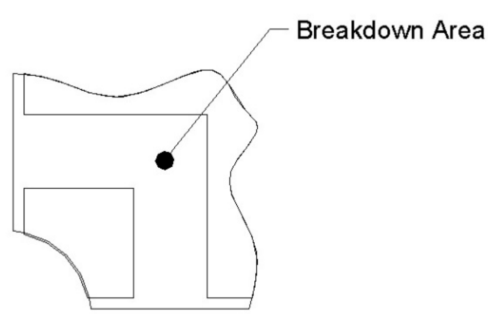
The **X3C21P1-02S** has an orientation marker to denote Pin 1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:



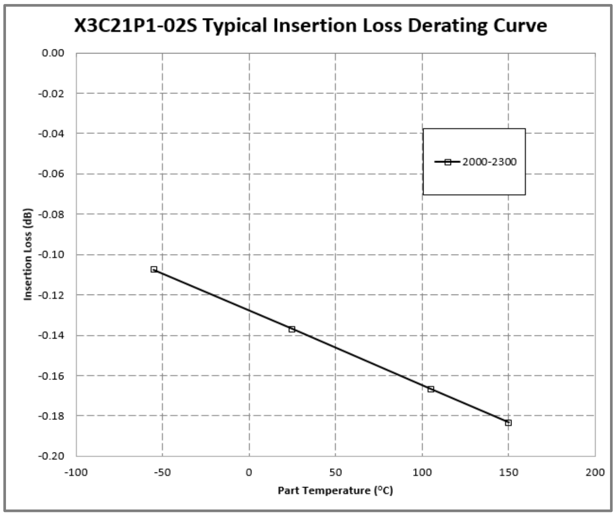
Configuration	Pin 1	Pin 2	Pin 3	Pin 4
Splitter	Input	Isolated	-5dB < Θ -90	-2dB < Θ
Splitter	Isolated	Input	-2dB < Θ	-5dB < Θ -90
Splitter	-5dB < Θ -90	-2dB < Θ	Input	Isolated
Splitter	-2dB < Θ	-5dB < Θ -90	Isolated	Input

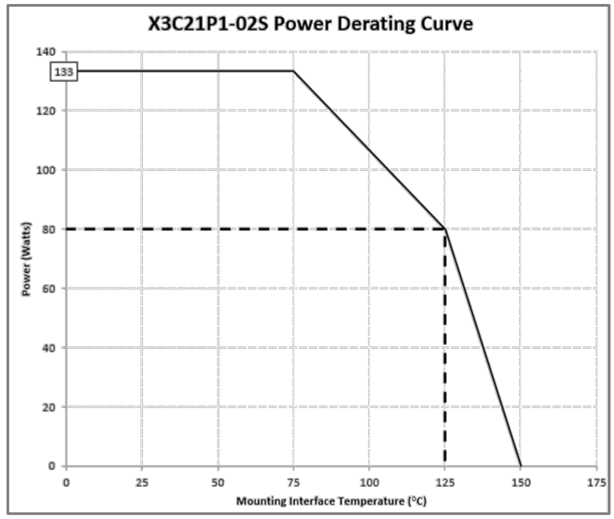
Peak Power Handling:

High-Pot testing of these couplers during the qualification procedure resulted in a minimum breakdown voltage of 1.73 Kv (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 air interface at the coupler contact 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).



Insertion Loss and Power Derating Curves:





Insertion Loss Derating:

The insertion loss, at a given frequency, the coupler 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 125°C and 150°C. A best-fit line for the measured data is computed and then plotted from -55°C to 150°C.

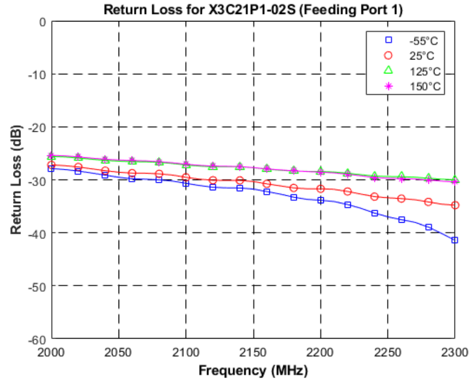
Power Derating:

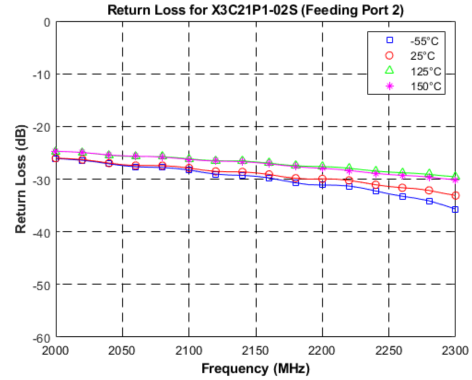
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

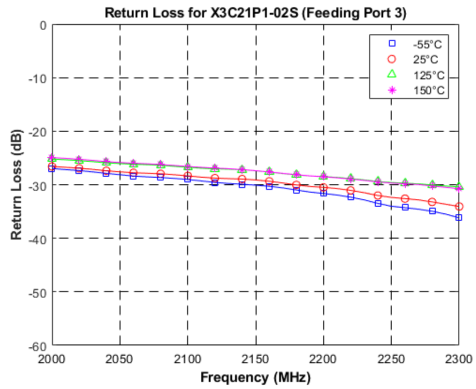
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

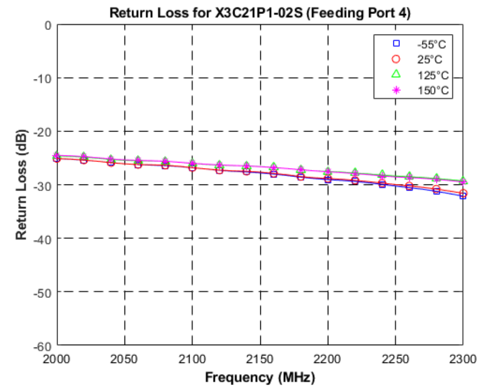
If mounting temperature is greater than 125°C, the Xinger coupler will perform reliably as long as the input power is derated to the curve above.

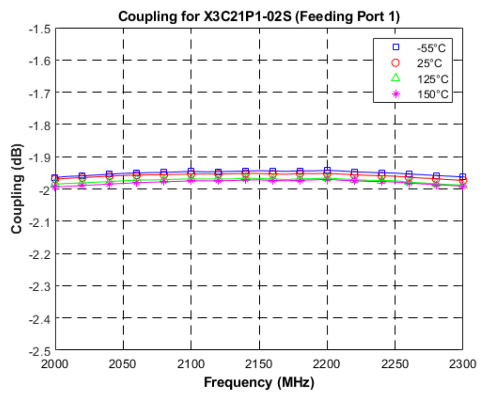
Typical Performance: 2000 to 2300 MHz

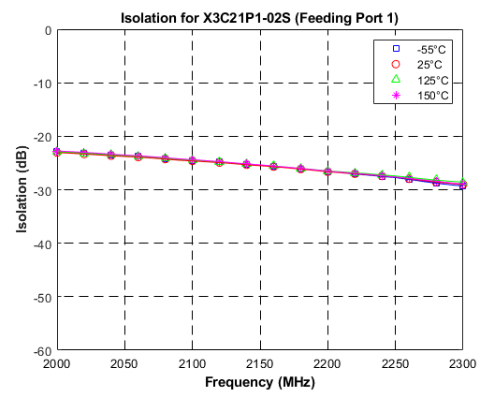


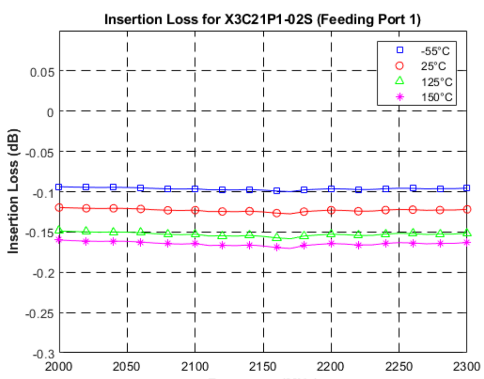


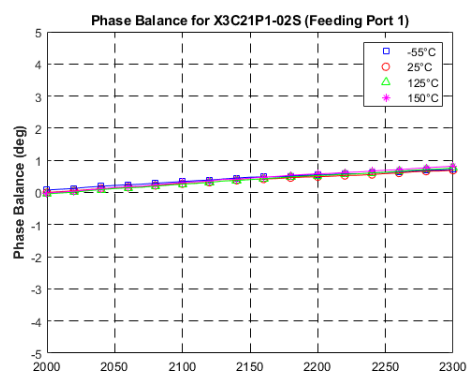










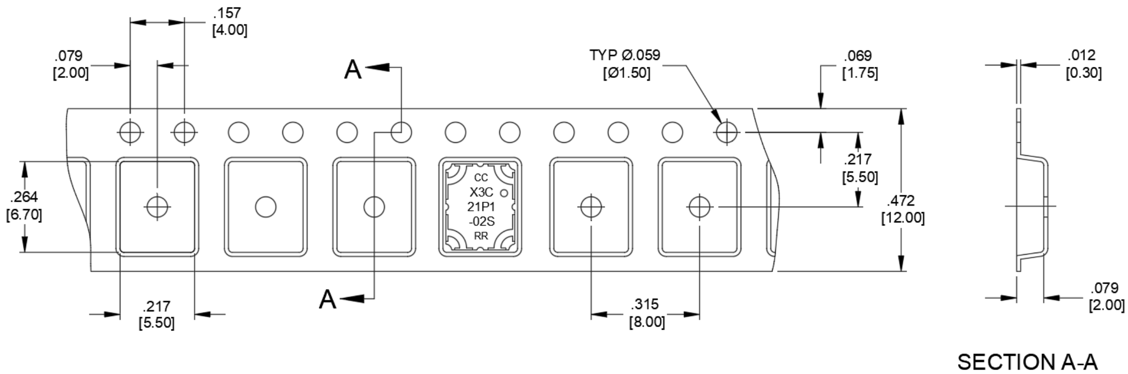


Definition of Measured Specifications:

Parameter	Definition	Mathematical Representation
VSWR (Voltage Standing Wave Ratio)	The impedance match of the coupler to a 50Ω system. A VSWR of 1:1 is optimal.	$\mathrm{VSWR} = \frac{V_{max}}{V_{min}}$ Vmax = voltage maxima of a standing wave Vmin = voltage minima of a standing wave
Return Loss	The impedance match of the coupler to a 50Ω system. Return Loss is an alternate means to express VSWR.	$\text{Return Loss(dB)} = 20\log\frac{\mathrm{VSWR}+1}{\mathrm{VSWR}-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$\text{Insertion Loss(dB)} = 10\log\frac{P_{in}}{P_{cpl}+P_{direct}}$
Directivity	The power at the coupled port divided by the power at the isolated port.	$10\log\frac{P_{cpl}}{P_{iso}}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
Coupling	At a given frequency (ω_n), coupling is the input power divided by the power at the coupled port.	$\text{Coupling(dB)} = C(\omega_n) = 10\log\frac{P_{in}(\omega_n)}{P_{cpl}(\omega_n)}$
Group Delay	Group delay is average of group delay's from input port to the coupled port	Average (GD-C)

Packaging and Ordering Information:

Parts are available in a reel. Packaging follows EIA 481 for reels. Parts are oriented in tape and reel as shown below. Minimum order quantities are 2000 per reel.



Dimensions are in Inches [Millimeters]

Direction of Part Feed (Unloading)

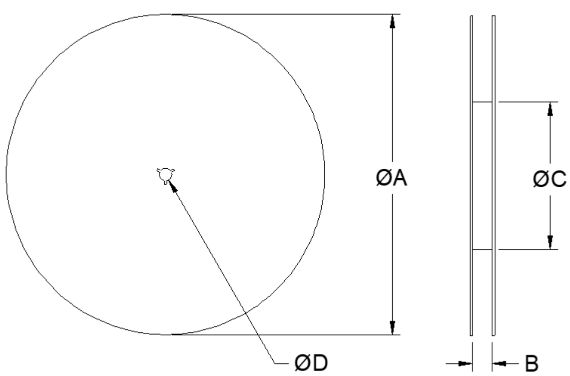


TABLE 1	
REEL DIMENSIONS (Inches[mm])	
ØA	13.0 [330.0]
B	.472 [12.0]
ØC	4.017 [102.03]
ØD	.512 [13.0]

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