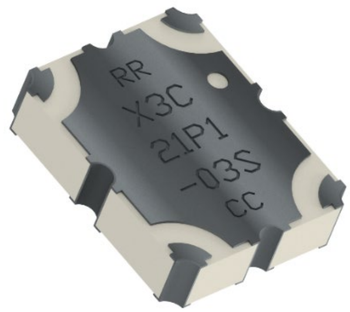
Hybrid Coupler
3 dB, 90°



Description:

The X3C21P1-03S is a low profile, high performance 3dB hybri coupler in a new easy to use, manufacturing friendly surface mou package. It is designed for LTE and WIMAX band applications. Th X3C21P1-03S is designed particularly for balanced power and lo noise amplifiers, plus signal distribution and other applications wher low insertion loss and tight amplitude and phase balance is required. can be used in high power applications up to 110 watts.

Parts have been subjected to rigorous qualification testing anc they are manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4003 and polyimide. Produced with 6 of 6 RoHS compliant tin immersion finish.

Features:

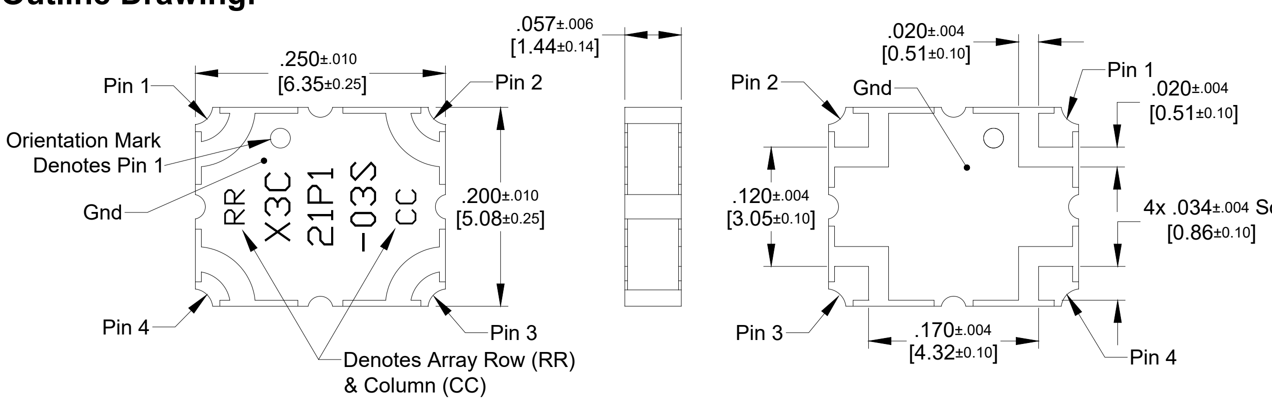
- **1800-2400 MHz**
- **LTE, WIMAX**
- **High Power**
- **Very Low Loss**
- **Tight Amplitude Balance**
- **High Isolation**
- **Production Friendly**
- **Tape and Reel**
- **Lead-Free**

Detailed Electrical Specifications:

Frequency	Insertion Loss	VSWR	Amplitude Balance
MHz	*dB Max*	*Max : 1*	*dB Max*
2000-2300	0.22	1.15	±0.22
2110-2170	0.12	1.12	±0.10
2300-2400	0.25	1.33	±0.40
1800-2200	0.17	1.17	±0.22
Phase	**Isolation**	**Power**	**Operating Temp.**
Degrees	*dB Min*	*Avg. CW Watts @ 95 ºC*	*ºC*
90 ±4.0	23	90	-55 to +150
90 ±2.0	25	110	-55 to +150
90 ±4.0	18	90	-55 to +150
90 ±3.0	23	90	-55 to +150

**Specification based on performance of unit properly installed on TTM Technologies Test Board 54147-0001 with small signal applied *Specifications subject to change without notice. Refer to parameter definitions for details.

Outline Drawing:

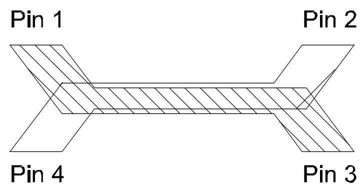


Dimensions are in Inches [Millimeters]
X3C21P1-03SS Mechanical Outline

Tolerances are Non-Cumulative

Hybrid Coupler Pin Configuration

The X3C21P1-03S 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:



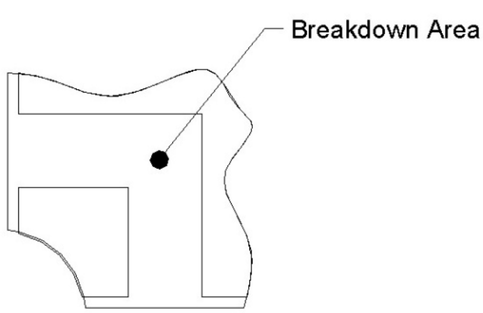
Configuration	Pin 1	Pin 2	Pin 3	Pin 4
Splitter	Input	Isolated	-3dB $\angle\theta - 90$	-3dB $\angle\theta$
Splitter	Isolated	Input	-3dB $\angle\theta$	-3dB $\angle\theta - 90$
Splitter	-3dB $\angle\theta - 90$	-3dB $\angle\theta$	Input	Isolated
Splitter	-3dB $\angle\theta$	-3dB $\angle\theta - 90$	Isolated	Input
***Combiner**	A $\angle\theta - 90$	A$\angle\theta$	Isolated	Output
***Combiner**	A $\angle\theta$	A $\angle\theta - 90$	Output	Isolated
***Combiner**	Isolated	Output	A $\angle\theta - 90$	A $\angle\theta$
***Combiner**	Output	Isolated	A $\angle\theta$	A $\angle\theta - 90$

*Notes: “A” is the amplitude of the applied signals. When two quadrature signals with equal amplitudes are applied to the coupler as described in the table, they will combine at the output port. If the amplitudes are not equal, some of the applied energy will be directed to the isolated port.

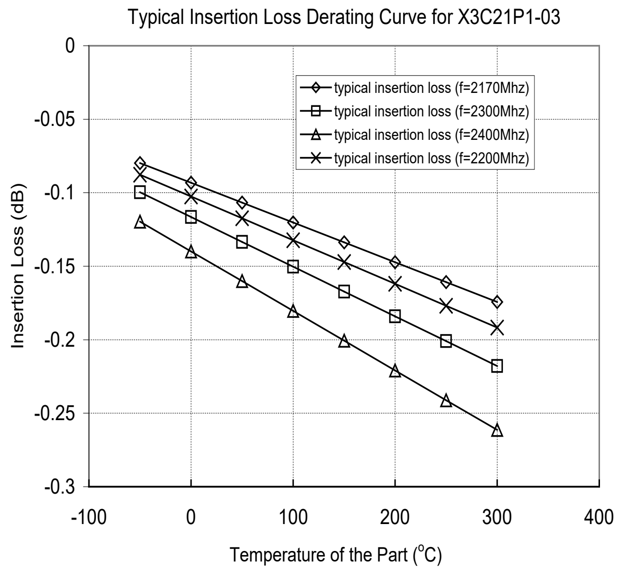
The actual phase, $\angle\theta$, or amplitude at a given frequency for all ports, can be seen in our de-embedded s-parameters, that can be downloaded at www.ttm.com.

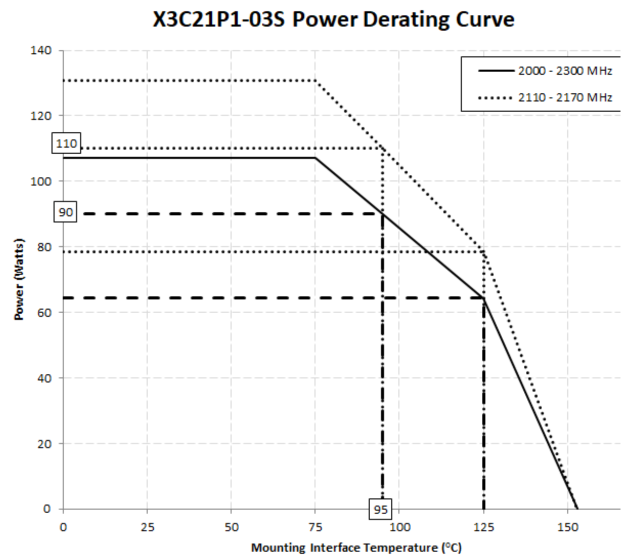
Peak Power Handling

High-Pot testing of these couplers during the qualification procedure resulted in a minimum breakdown voltage of 1.31Kv (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, of a group of couplers 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 85°C, 150°C, and 200°C. A best-fit line for the measured data is computed and then plotted from -55°C to 300°C.

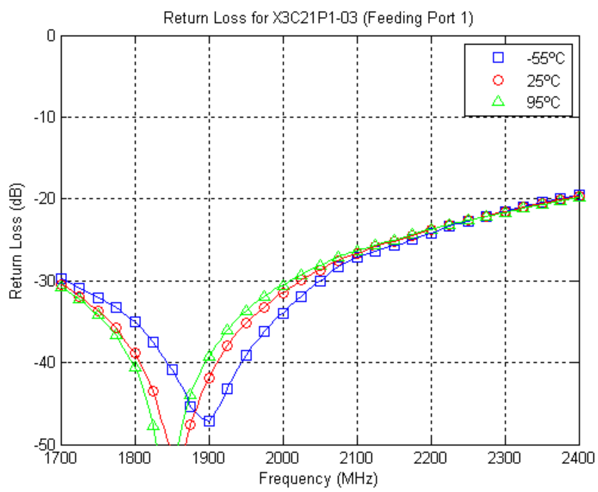
Power Derating:

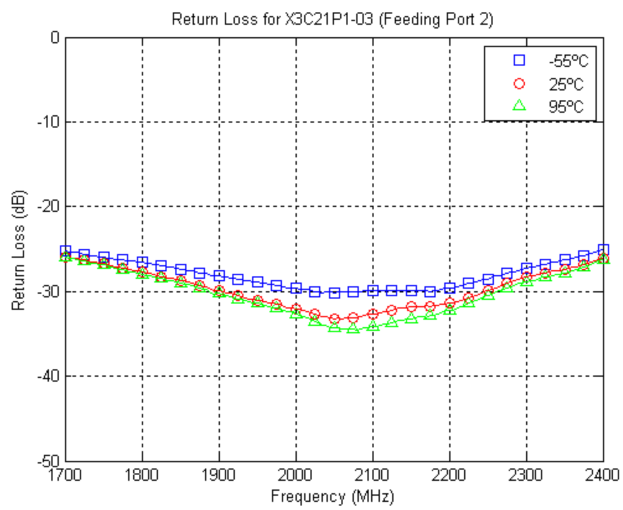
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

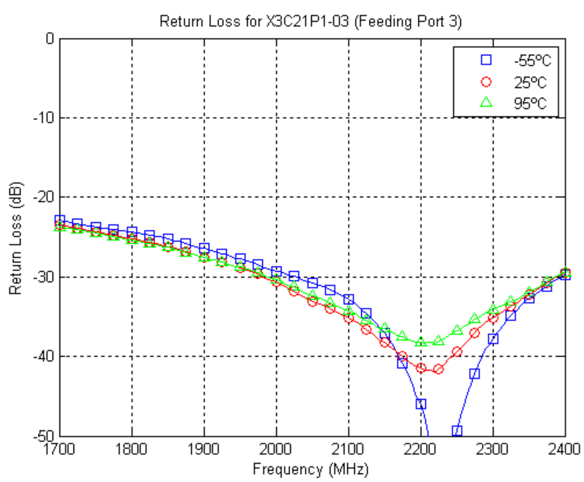
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

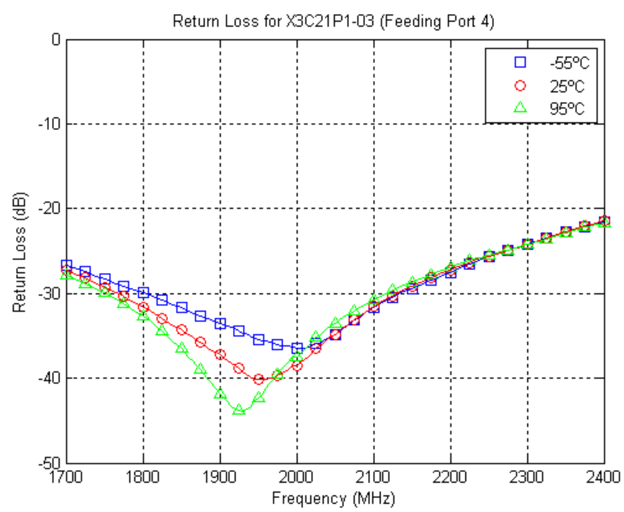
If mounting temperature is greater than 95°C, Xinger coupler will perform reliably as long as the input power is derated to the curve above.

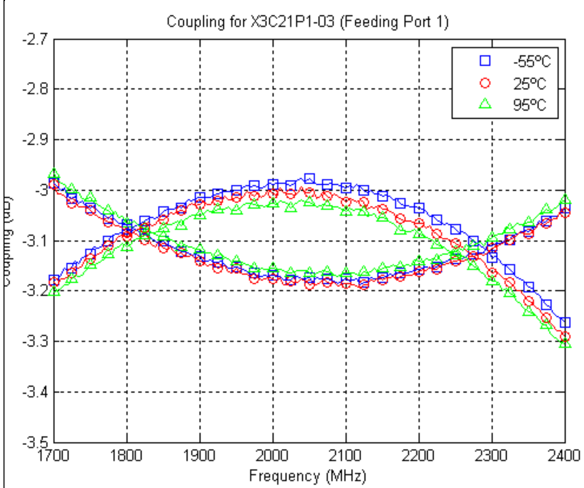
Typical Performance (-55°C, 25°C & 95°C): 1700-2400 MHz

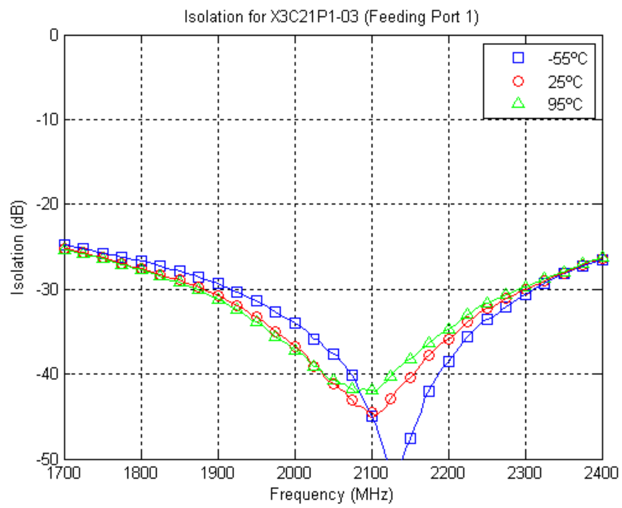


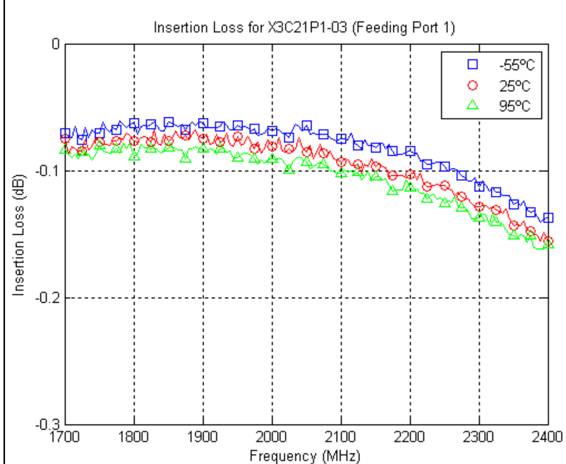


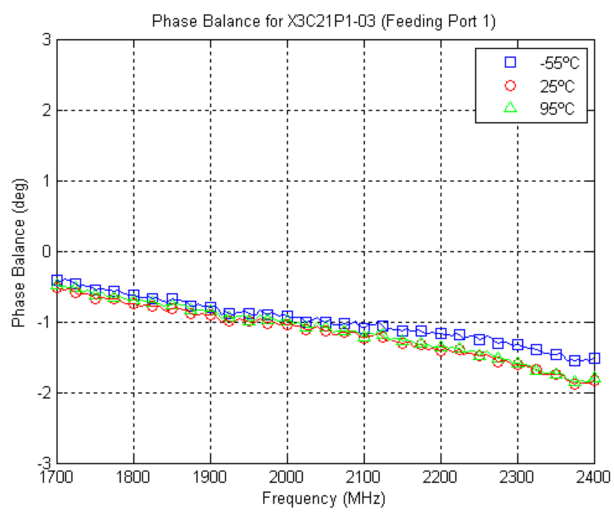





Coupling for X3C21P1-03 (Feeding Port 1)
-55ºC
25ºC
95ºC
-2.7
-2.8
-2.9
-3
-3.1
-3.2
-3.3
-3.4
-3.5
1700
1800
1900
2000
2100
2200
2300
2400
Frequency (MHz)


Isolation for X3C21P1-03 (Feeding Port 1)
-55ºC
25ºC
95ºC
Isolation (dB)
0
-10
-20
-30
-40
-50
1700
1800
1900
2000
2100
2200
2300
2400
Frequency (MHz)


Insertion Loss for X3C21P1-03 (Feeding Port 1)
-55ºC
25ºC
95ºC
Insertion Loss (dB)
0
-0.1
-0.2
-0.3
1700
1800
1900
2000
2100
2200
2300
2400
Frequency (MHz)

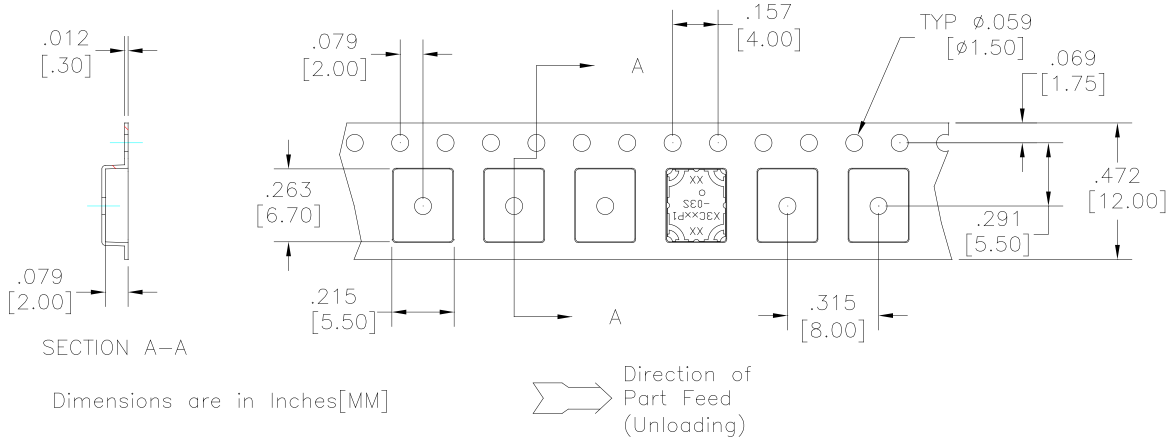

Phase Balance for X3C21P1-03 (Feeding Port 1)
-55ºC
25ºC
95ºC
Phase Balance (deg)
3
2
1
0
-1
-2
-3
1700
1800
1900
2000
2100
2200
2300
2400
Frequency (MHz)

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.	$VSWR = \frac{V_{max}}{V_{min}}$ 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.	$Return\ Loss(dB) = 20log\frac{VSWR+1}{VSWR-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$Insertion\ Loss(dB) = 10log\frac{P_{in}}{P_{cpl}+P_{direct}}$
Isolation	The input power divided by the power at the isolated port.	$Isolation(dB) = 10log\frac{P_{in}}{P_{iso}}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
Amplitude Balance	The power at each output divided by the average power of the two outputs.	$10\log\frac{P_{cpl}}{(P_{cpl}+P_{direct})/2}$ and $10\log\frac{P_{direct}}{(P_{cpl}+P_{direct})/2}$

Packaging and Ordering Information

Parts are available in a reel and as loose parts in a bag. Packaging follows EIA 481-2 for reels . Parts are oriented in tape and reel as shown below. Minimum order quantities are 2000 per reel and 100 for loose parts.. See Model Numbers below for further ordering information



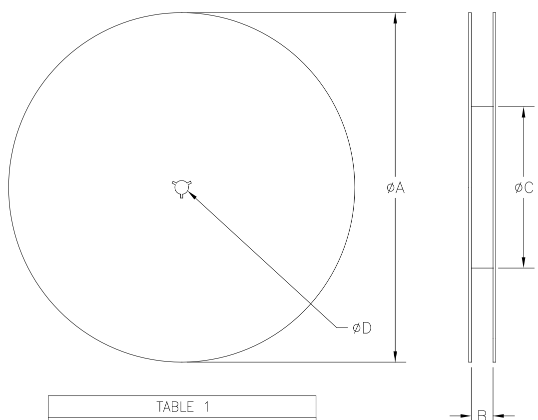


TABLE 1	
REEL DIMENSIONS (inches [mm])	
⌀A	13.3 [333.0]
B	0.472 [12.0]
⌀C	4.017 [102.03]
⌀D	0.512 [13.0]

Contact us:
rf&s_support@ttm.com