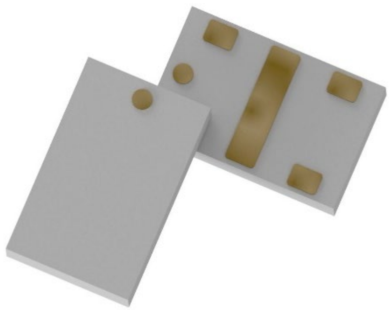
TTM Technologies
Time-To-Market Interconnect Solutions

X4C25J1-04G
Rev C

Xinger®

Ultra Low Profile 0805
4dB Directional Coupler



Description:

The X4C25J1-04G is a is a low cost, low profile sub-miniature high performance 4 dB directional coupler in a new easy to use, manufacturing friendly surface mount package. It is designed for 2200 – 2800MHz applications including: 5G applications. The X4C25J1-04G is designed particularly for power and frequency detection, as well as for return loss monitoring, where tightly controlled coupling and low insertion loss is required. It can be used in high power applications up to 5 Watts.

Parts have been subjected to rigorous qualification testing and 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:

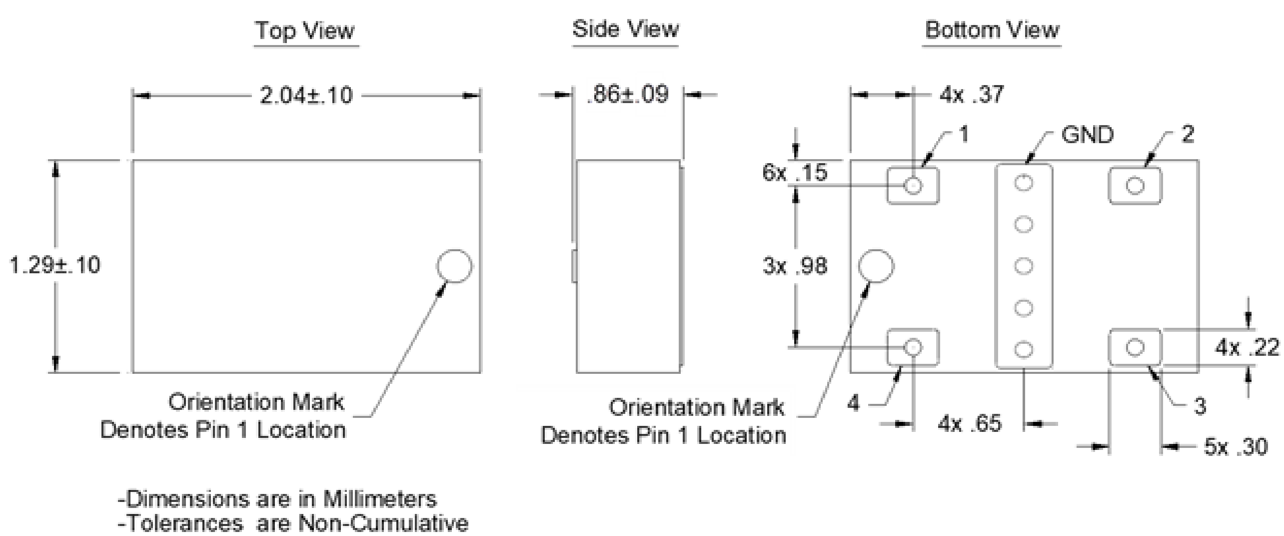
- **2200-2800 MHz**
- **5G Applications**
- **High Power**
- **Very Low Loss**
- **Tight Amplitude Balance**
- **High Isolation**
- **Production Friendly**
- **Tape and Reel**
- **RoHS Compliant**
- **Halogen Free**

Electrical Specifications**

Frequency	Coupling	Insertion Loss	Return Loss
MHz	*dB*	*dB Max*	*dB Min*
2200-2800	4 ± 0.5	0.5	20
Isolation	**Phase Balance**	**Power**	**Operating Temp.**
dB Min	*degree*	*Avg. CW Watts @105°C*	*ºC*
24	± 4	5	-55 to +140

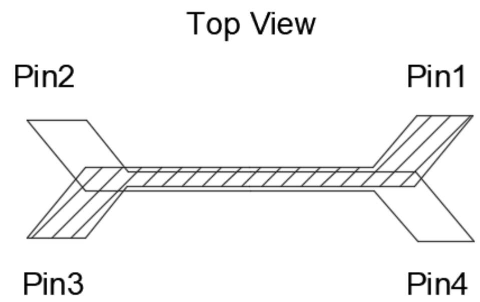
**Specification based on performance of unit properly installed on TTM Test Board with small signal applied.
*Specifications subject to change without notice. Refer to parameter definitions for details.

Mechanical Outline:



Directional Coupler Pin Configuration

The X4C25J1-04G 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:

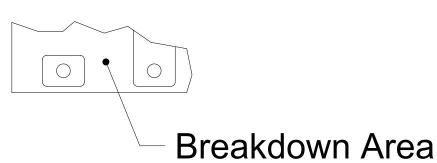


Pin 1	Pin 2	Pin 3	Pin 4
Input	Isolated	Direct	Coupled
Isolated	Input	Coupled	Direct
Direct	Coupled	Input	Isolated
Coupled	Direct	Isolated	Input

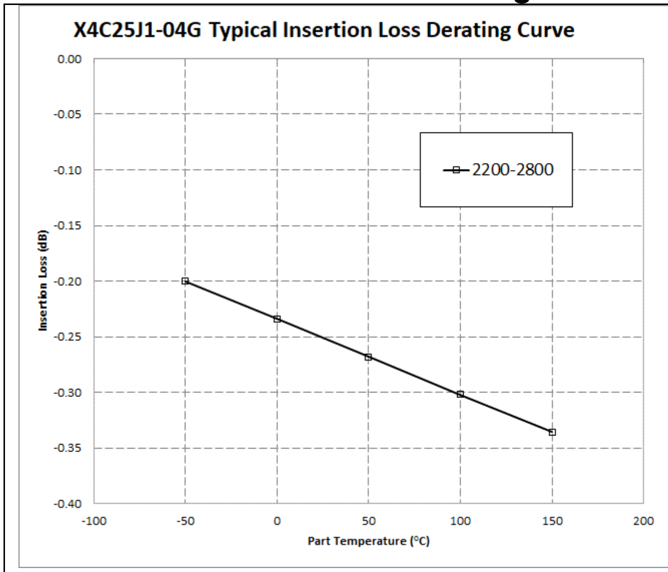
Note: The direct port has a DC connection to the input port and the coupled port has a DC connection to the isolated port.

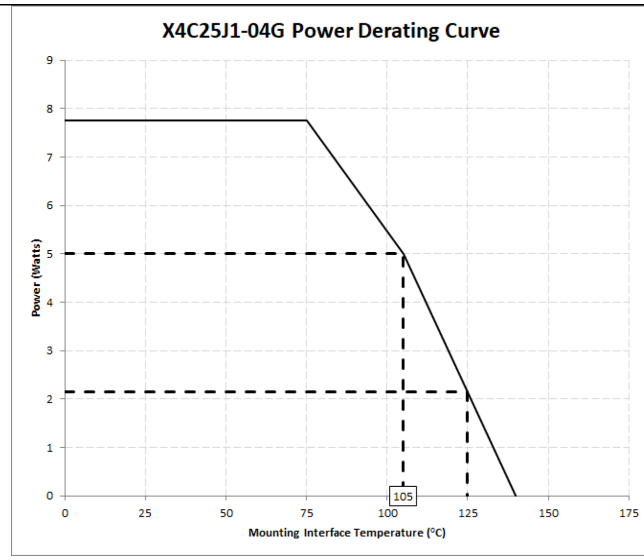
Peak Power Handling

High-Pot testing of these couplers 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 bar (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 -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.

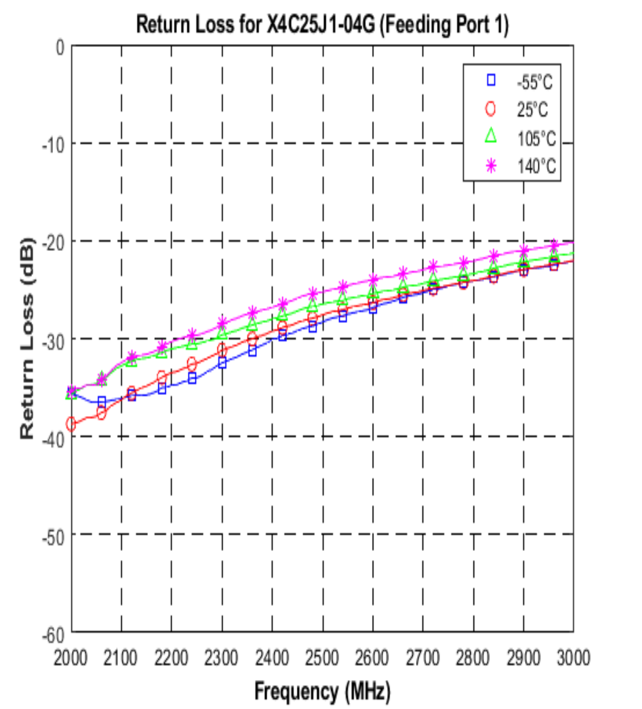
Power Derating

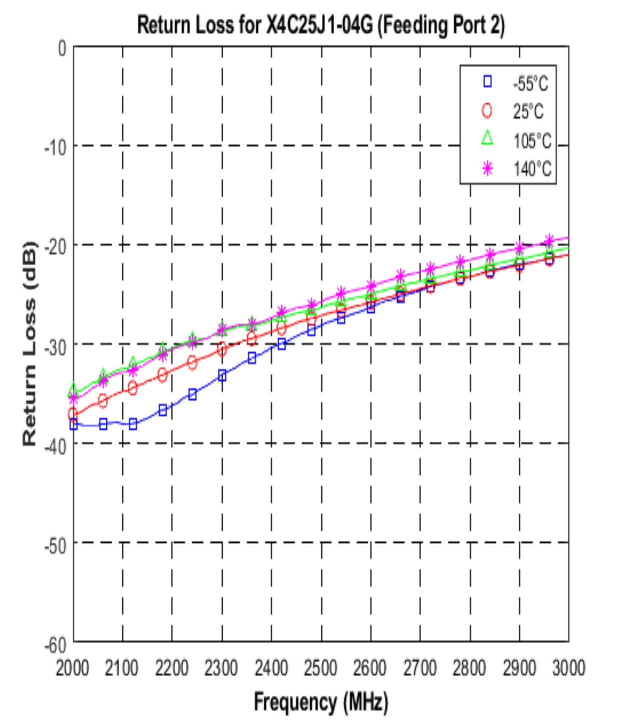
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

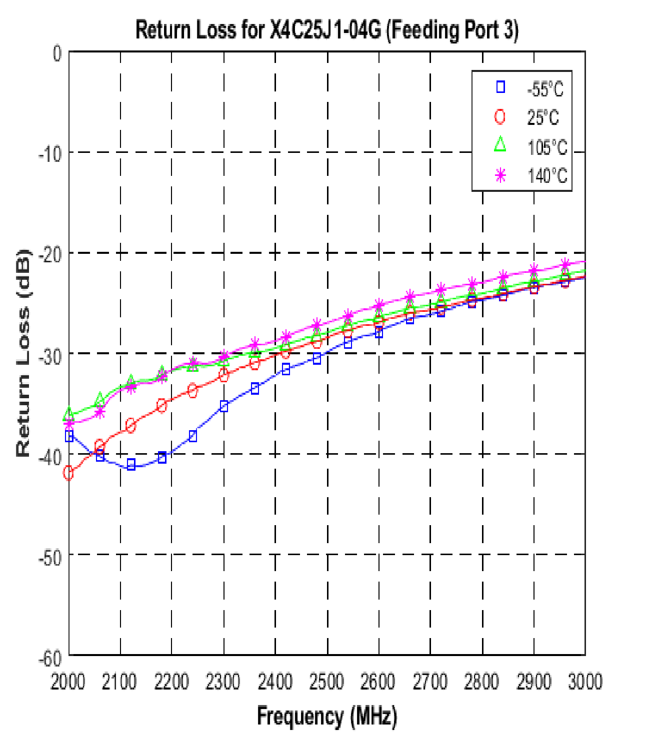
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

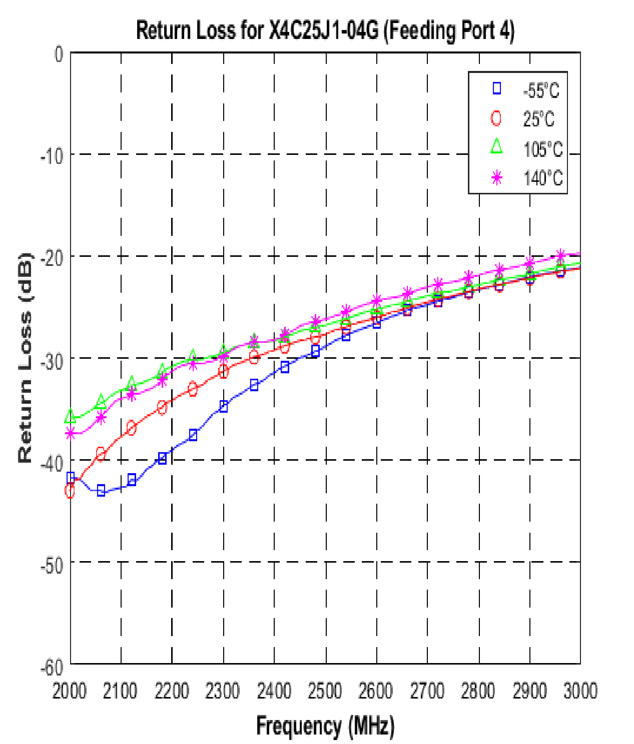
If mounting temperature is greater than 105°C, Xinger coupler will perform reliably as long as the input power is derated to the curve above.

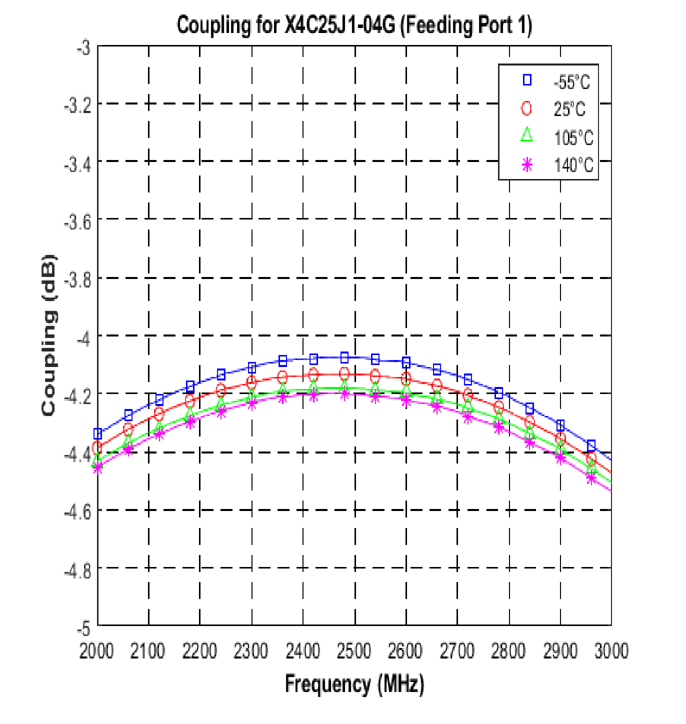
Typical Performance: 2000-3000 MHz

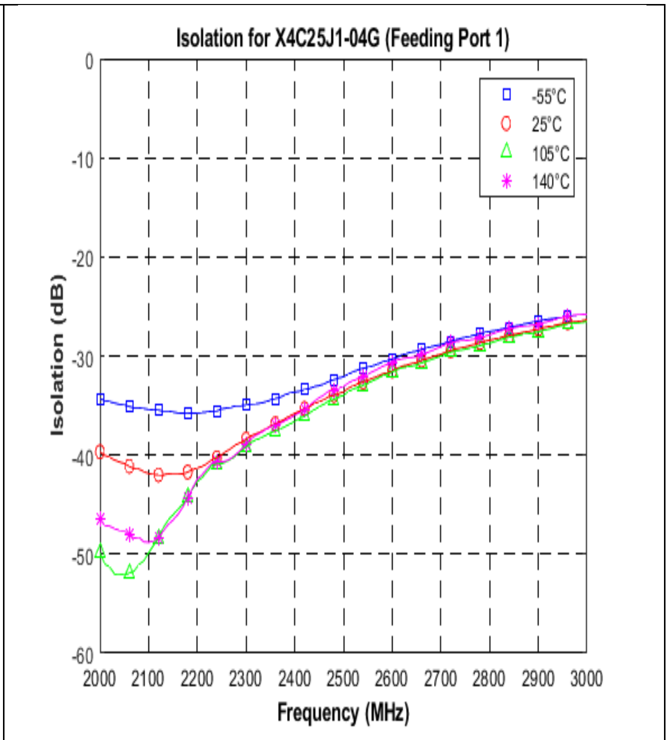


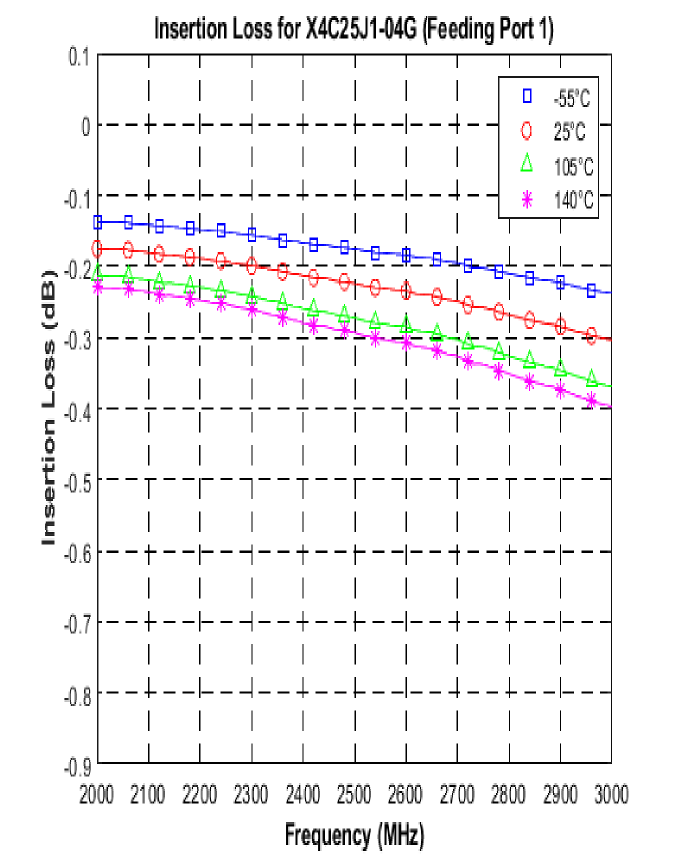


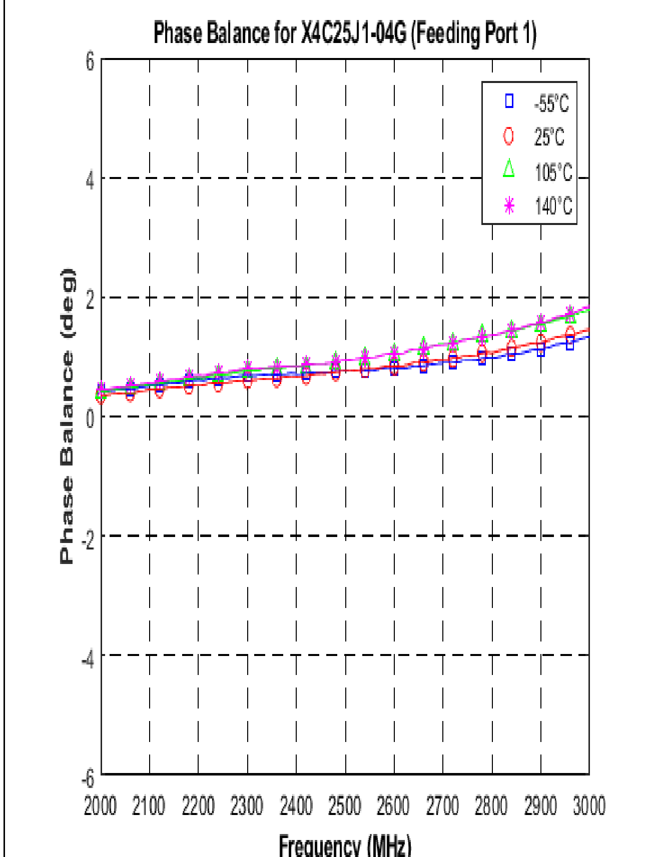





Coupling for X4C25J1-04G (Feeding Port 1)
-55°C
25°C
105°C
140°C
Coupling (dB)
Frequency (MHz)


Isolation for X4C25J1-04G (Feeding Port 1)
-55°C
25°C
105°C
140°C
Isolation (dB)
Frequency (MHz)


Insertion Loss for X4C25J1-04G (Feeding Port 1)
-55°C
25°C
105°C
140°C
Insertion Loss (dB)
Frequency (MHz)


Phase Balance for X4C25J1-04G (Feeding Port 1)
-55°C
25°C
105°C
140°C
Phase Balance (deg)
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.	$\mathrm{VSWR} = \frac{V_{max}}{V_{min}}$ 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.	$\mathrm{Return\ Loss(dB)} = 20\log\frac{\mathrm{VSWR}+1}{\mathrm{VSWR}-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$\mathrm{Insertion\ Loss(dB)} = 10\log\frac{P_{in}}{P_{cpl}+P_{direct}}$
Isolation	The input power divided by the power at the isolated port.	$\mathrm{Isolation(dB)} = 10\log\frac{P_{in}}{P_{iso}}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
Coupling	At a given frequency (ω_n), coupling is the input power divided by the power at the coupled port.	$\mathrm{Coupling(dB)} = C(\omega_n) = 10\log\frac{P_{in}(\omega_n)}{P_{cpl}(\omega_n)}$
Group Delay	Group delay is average of group delay's from input port to the coupled port	Average (GD-C)