XingerIV

Hybrid Coupler
3dB, 90°

Description:

The X4C09J1-03G is a low cost, low profile (0.70mm) sub-miniature (0805) 3 dB hybrid coupler, with a power rating of 5 Watts (AVG) and a peak to average ratio of 12dB, in a new easy to use, Xinger style manufacturing friendly surface mount package. It is designed particularly for 4G LTE, 5G, and Mil-Aero Radar applications. The X4C09J1-03G is designed particularly for power splitting and combining, where tightly controlled coupling and low insertion loss 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 ENIG finish.

Features:

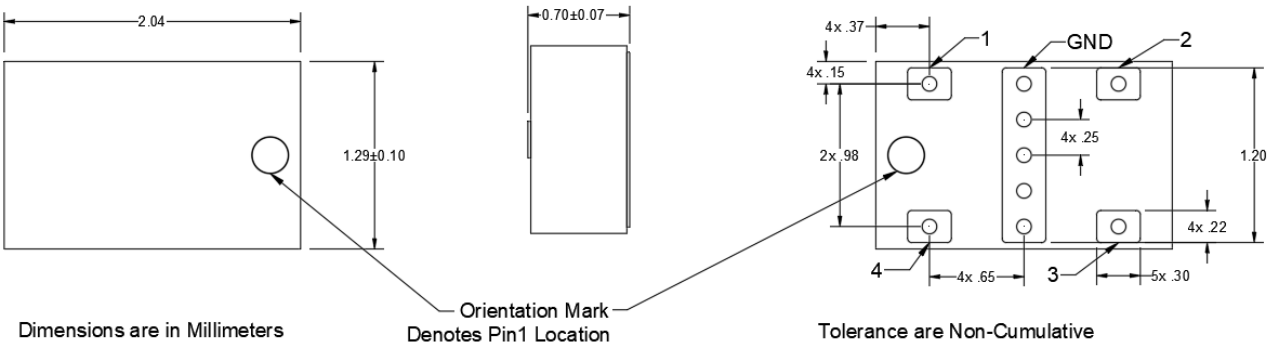
- **700 to 1000 MHz**
- **0.70mm Height Profile**
- **Power 5W (AVG)**
- **Peak to Average Ratio of 12dB**
- **4G LTE, 5G, and Mil-Aero Radar**
- **Very Low Loss (<0.6dB)**
- **High Isolation (>18dB)**
- **Production Friendly**
- **Tape and Reel**
- **Lead Free**

Electrical Specifications*:

Frequency	Isolation	Return Loss	Amplitude Balance	Insertion Loss
MHz	*dB Min*	*dB Min*	*dB Max*	*dB Max*
700-1000	18	18	±0.9	0.6
Phase	**Group Delay**	**Power**	**Operating Temp.**	
Degrees	*ns*	*Avg. Watts @85°C*	*°C*	
90 ±7	0.24±0.2	5	-55 to +140	

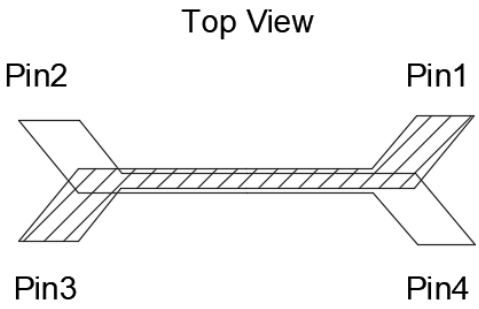
*Specifications subject to change without notice. Refer to parameter definitions for details. Specification based on performance of unit properly installed on TTM Technologies Test Board with small signal applied.

Outline Drawing:



Hybrid Coupler Pin Configuration:

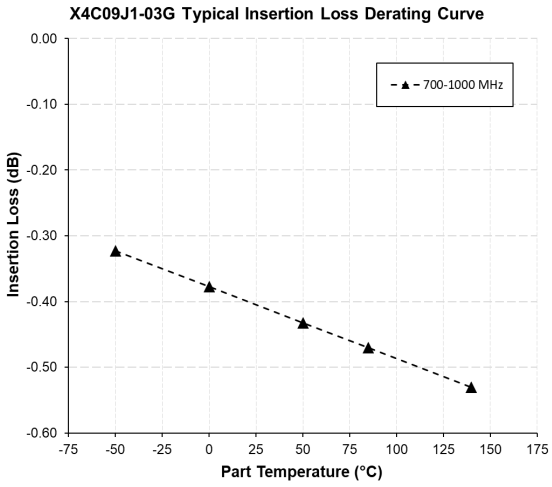
The X4C09J1-03G has an orientation marker to denote Pin 1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:

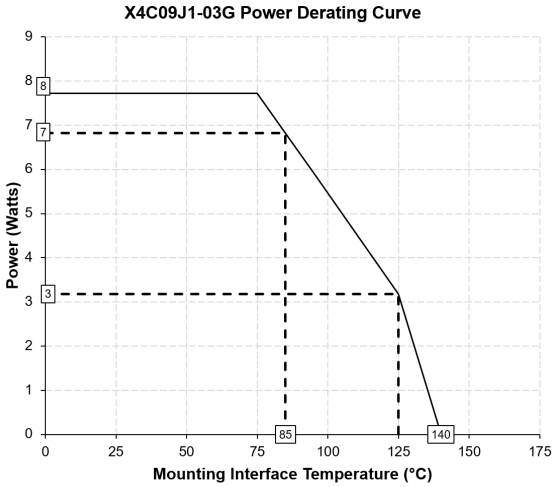


3dB Coupler Pin Configuration

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 $\angle\theta - 90$

Insertion Loss and Power Derating Curves:





Insertion Loss Derating:

The insertion loss, at a given frequency, of 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 -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.

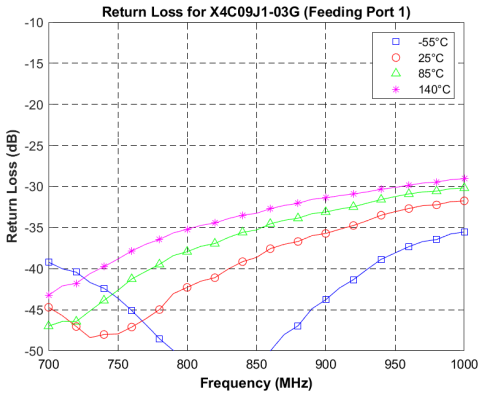
Power Derating:

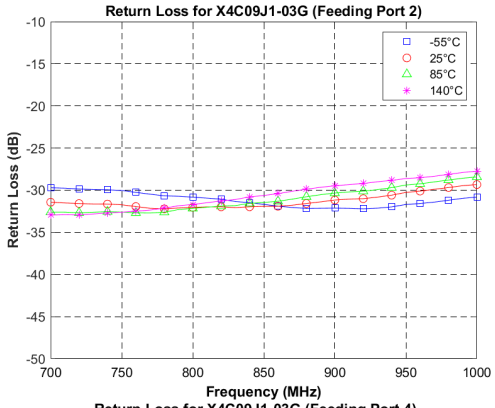
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

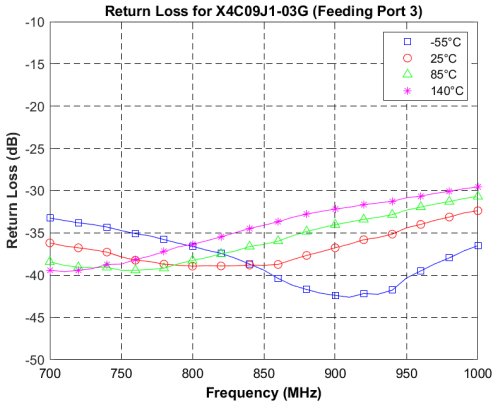
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

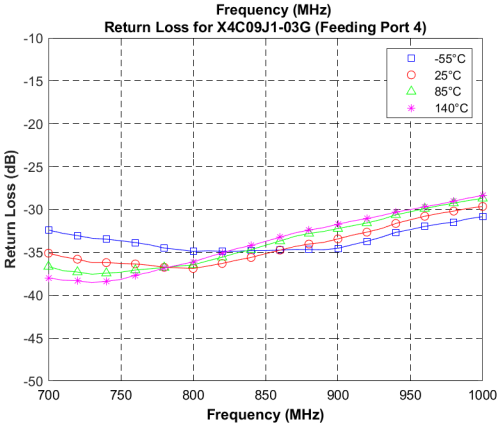
If the mounting temperature is greater than 85°C, the Xinger coupler will perform reliably if the input power is derated to the curve above.

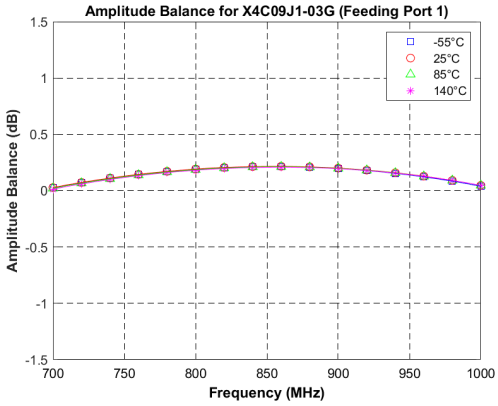
Typical Performance: 700 MHz to 1000 MHz

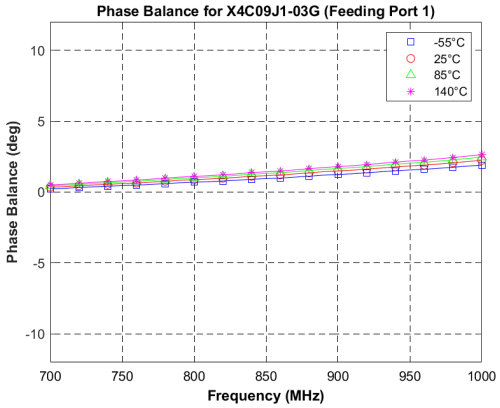


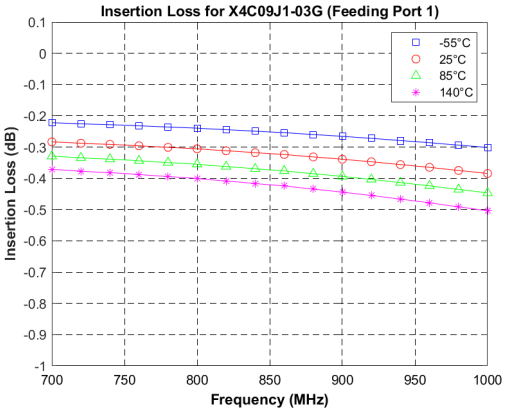


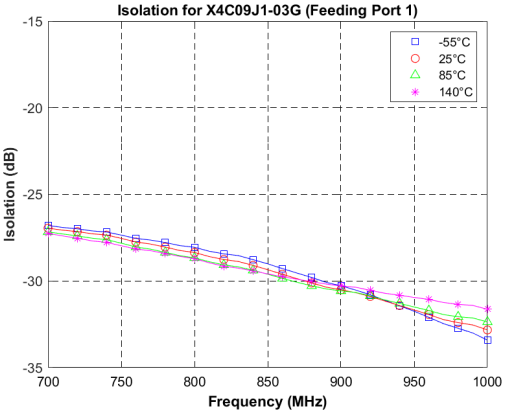












Definition of Measured Specification:

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.	$\text{VSWR} = \frac{V_{max}}{V_{min}}$ 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.	$\text{Return Loss(dB)} = 20\log\frac{\text{VSWR}+1}{\text{VSWR}-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$\text{Insertion Loss(dB)} = 10\log\frac{P_{in}}{P_{cpl}+P_{direct}}$
Isolation	The input power divided by the power at the isolated port.	$\text{Isolation(dB)} = 10\log\frac{P_{in}}{P_{iso}}$
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 $10\log\frac{P_{direct}}{(P_{cpl}+P_{direct})/2}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
Group Delay (GD-C)	Group delay is average of group delay's from input port to the coupled port	Average (GD-C)
Group Delay (GD-DC)	Group delay is average of group delay's from input port to the direct port	Average (GD-DC)

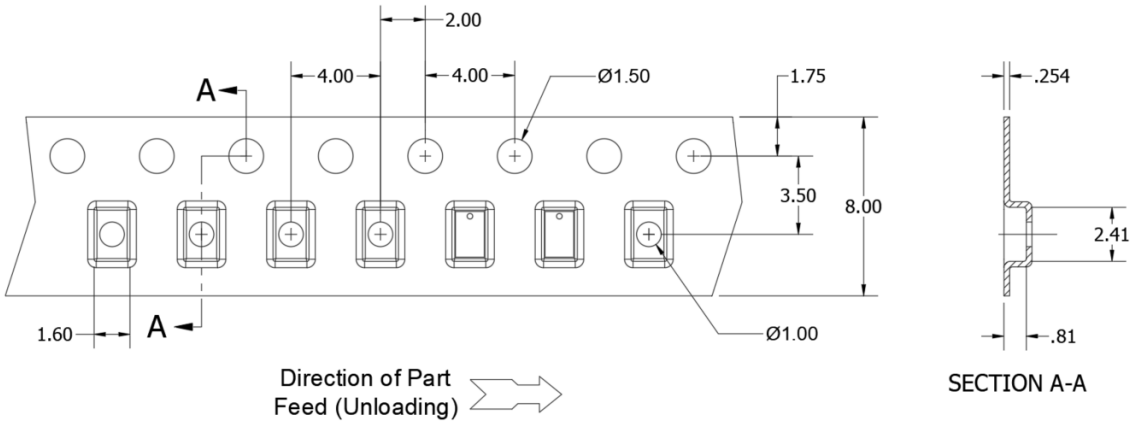
*100% RF test is performed per spec definition for every pin configuration. Refer to page 2 for pin assignment.

Peak Power Handling:

High-Pot testing of these components 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 peak 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).

Packaging and Ordering Information:

Parts are available in reel and are packaged per EIA 481. Parts are oriented in tape and reel as shown below. Minimum order quantities are 4000 per reel.



Dimensions are in Millimeters

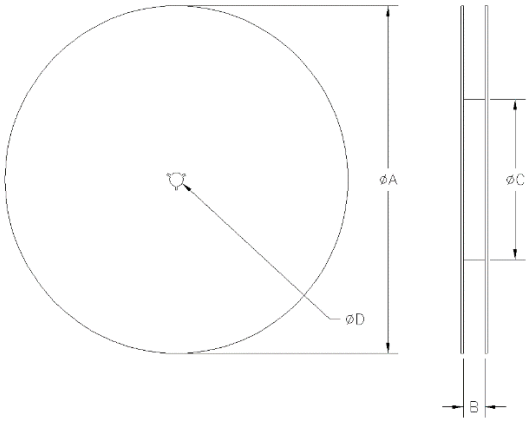


TABLE 1		
QUANTITY/REEL	REEL DIMENSIONS mm	
4000	øA	177.80
	B	8.00
	øC	50.80
	øD	13.00