Directional Coupler
10dB

Features:

- **1.0 – 2.0 GHz**
- **L-Band (1-2GHz) COTS Mil-Aero applications**
- **Power 60 Watts (AVG)**
- **Peak to Average Ratio 12dB**
- **Low Loss (<0.35dB)**
- **High Directivity (<18dB)**
- **Surface Mountable**
- **Production Friendly**
- **Tape & Reel**
- **RoHS Compliant**
- **100% Tested**
- **ENIG Finish**
- **Convenient Package**

Description:

The XMC1020A1-10G is a low-profile, high performance 10dB directional coupler, with a power rating of 60 Watts (AVG) and a peak to average ratio of 12dB in an easy-to-use, Xinger style manufacturing friendly surface mount package. It is designed particularly for use on medium power L-Band (1-2GHz) COTS Mil-Aero applications. The component is ideal and designed particularly for high-power designs, power injection and frequency detection, as well as for VSWR monitoring, where tightly controlled coupling and low insertion loss is required.

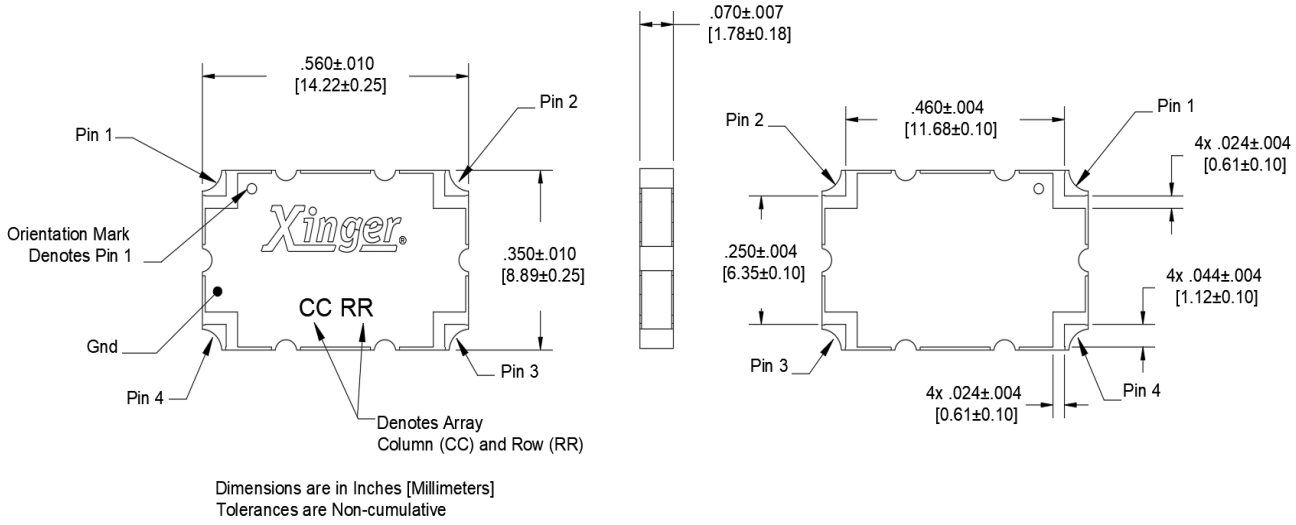
Parts have been subjected to rigorous Xinger qualification testing and are manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4003 and polyamide. Produced with 6 of 6 ENIG RoHS compliant finish.

Electrical Specifications*:

Frequency	Mean Coupling	Insertion Loss	VSWR
GHz	*dB*	*dB Max*	*Max: 1*
1.0 – 2.0	10.0 ± 0.8	0.35	1.22
Directivity	**Frequency Sensitivity**	**Power**	**Operating Temp.**
dB Min	*dB Max*	*AVG Watts at 85°C*	*°C*
18	±0.80	60	-55 to +130

**Specification based on performance of unit properly installed on microstrip printed circuit boards with 50 Ω nominal impedance. *Specifications subject to change without notice.

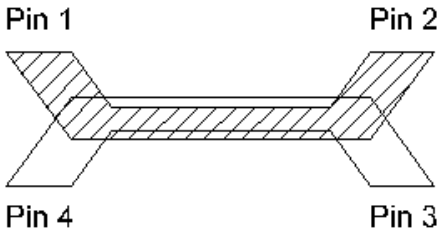
Outline Drawing:



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

Pin Configuration:

The component 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:



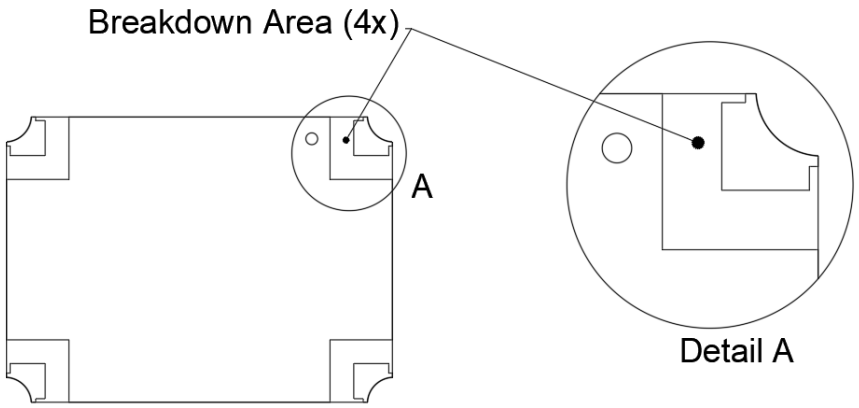
10dB Coupler Pin Configuration

	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

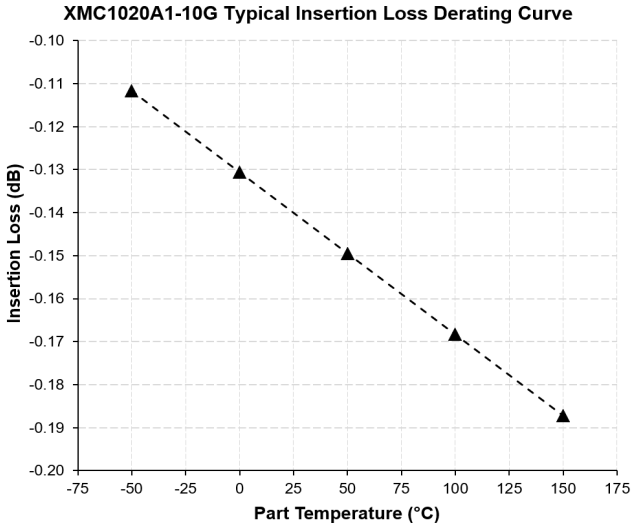
Note: The direct port has a DC connection to the input port and the coupled port has a DC connection to the isolated port. For optimum IL and power handling performance, use Pin 1 or Pin 2 as inputs.

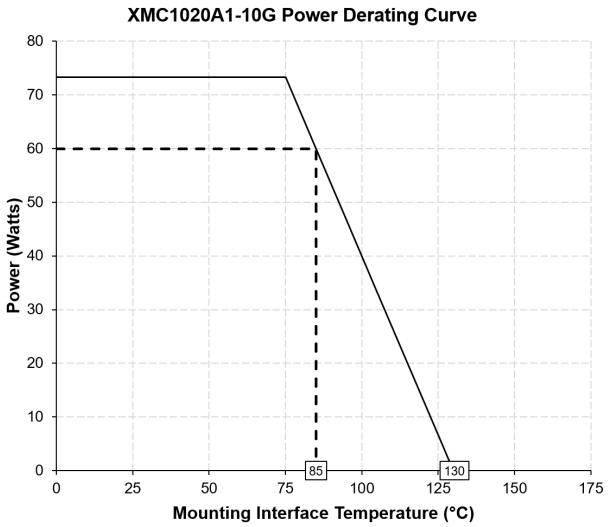
Peak Power Handling:

High-Pot testing of these components during the qualification procedure resulted in a minimum breakdown voltage of 1.40Kv (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 air interface at the component 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 the component 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, 85°C and 130°C. A best-fit line for the measured data is computed and then plotted from -55°C to 130°C.

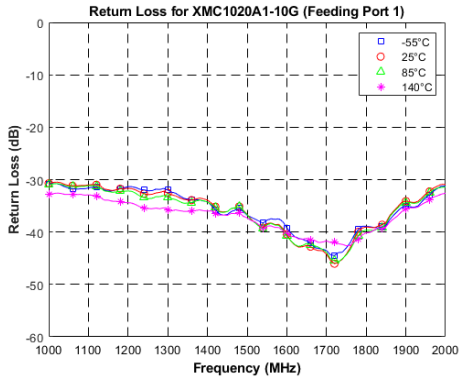
Power Derating:

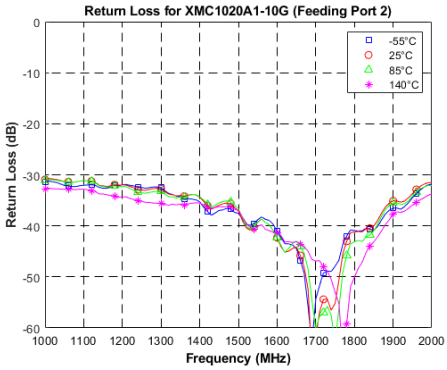
The power handling and corresponding power derating plots are a function of thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the component, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

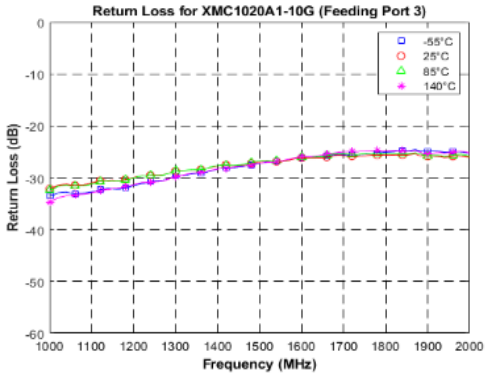
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

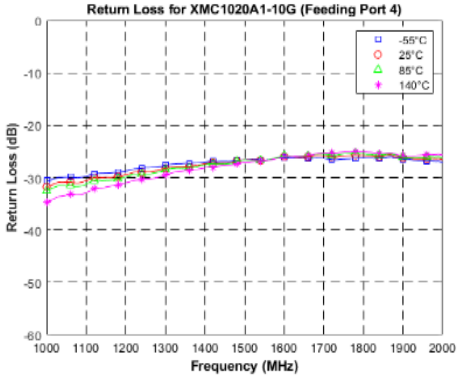
If mounting temperature is greater than 85°C, the component will perform reliably as long as the input power is derated to the curve above.

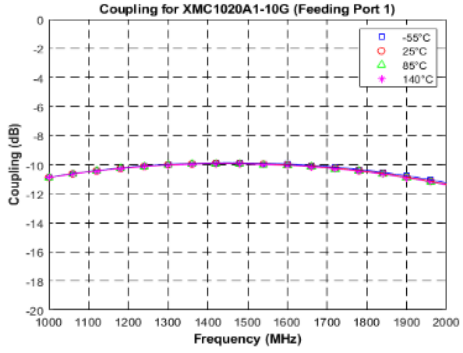
Typical Temperature Performance Plots:

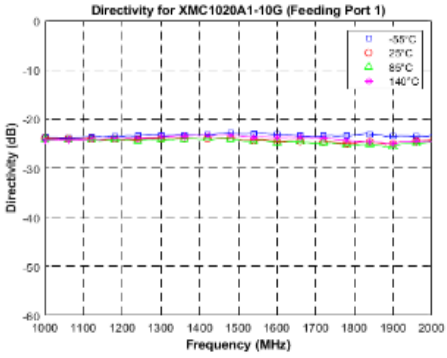


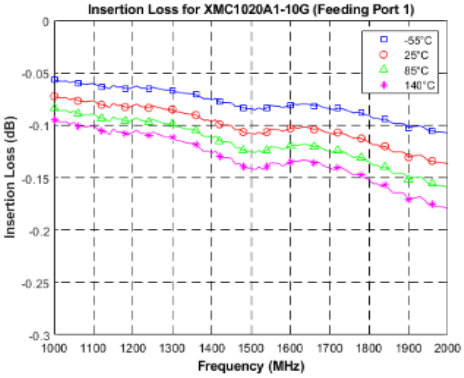


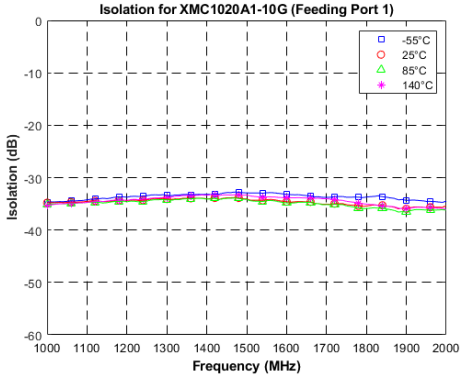










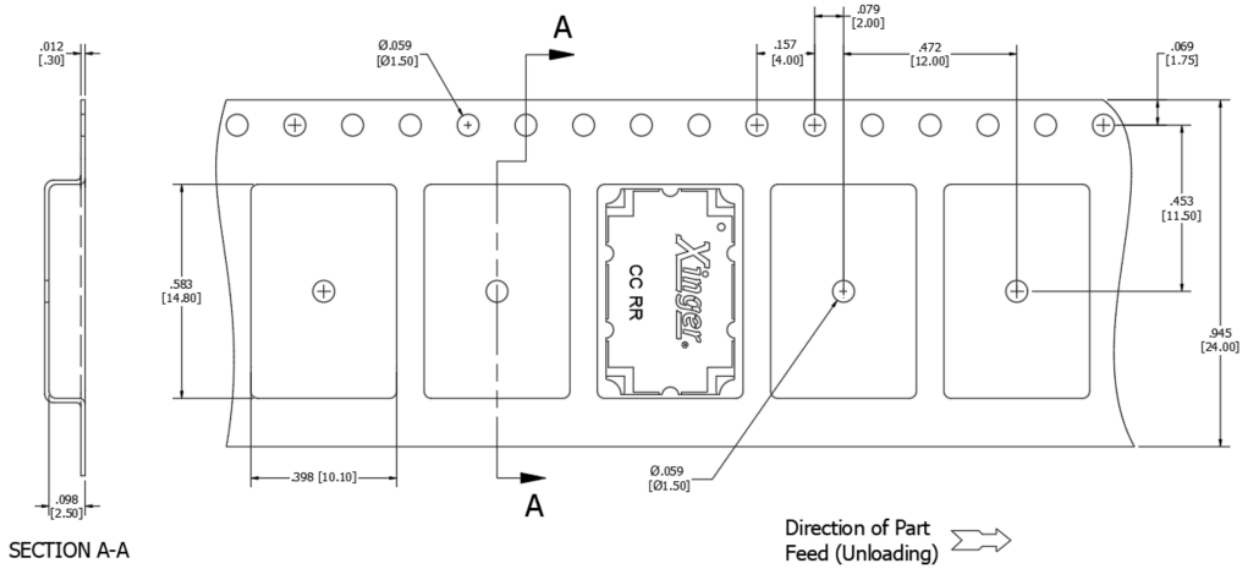


Definition of Measured Specifications:

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.	$Return\ Loss(dB) = 20log\ \frac{VSWR+1}{VSWR-1}$
Mean Coupling	At a given frequency (ω_n), coupling is the input power divided by the power at the coupled port. Mean coupling is the average value of the coupling values in the band. N is the number of frequencies in the band.	$Coupling(dB) = C(\omega_n) = 10log\ \frac{P_{in}(\omega_n)}{P_{cpl}(\omega_n)}$ $Mean\ Coupling(dB) = \frac{\sum_{n=1}^{N} C(\omega_n)}{N}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$Insertion\ Loss(dB) = 10log\ \frac{P_{in}}{P_{cpl}+P_{direct}}$
Transmission Loss	The input power divided by the power at the direct port.	$10log\ \frac{P_{in}}{P_{direct}}$
Directivity	The power at the coupled port divided by the power at the isolated port.	$10log\ \frac{P_{cpl}}{P_{iso}}$
Frequency Sensitivity	The decibel difference between the maximum in band coupling value and the mean coupling, and the decibel difference between the minimum in band coupling value and the mean coupling.	Max Coupling (dB) – Mean Coupling (dB) and Min Coupling (dB) – Mean Coupling (dB)

Packaging and Ordering Information:

Parts are available in reels. Packaging follows EIA 481 for reels. Parts are oriented in tape and reel as shown below. Tape and reel is available in 2000 pcs per reel.



Dimensions are in Inches [Millimeters]

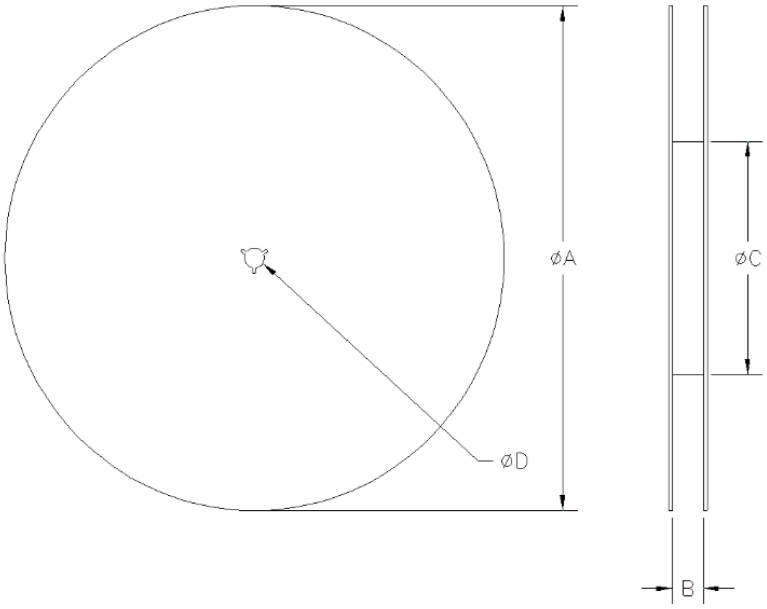


TABLE 1	
REEL DIMENSIONS (inches [mm])	
øA	13.0 [330.0]
B	.945 [24.0]
øC	4.017 [102.03]
øD	0.512 [13.0]

Contact us:
rf&s_support@ttm.com