

# Xinger<sup>®</sup> III



## Features:

- 700-1300 MHz
- LTE, 5G Telecom & Mil-Aero
- Power 225 Watts (AVG)
- Peak to Average Ratio 12dB
- Very Low Loss (<0.05dB)
- Tight Coupling (>0.60dB)
- High Directivity (<23dB)
- Production Friendly
- Tape and Reel
- Lead-Free

## Directional Coupler 20dB, 90°

### Description:

The X3C09E2-20S is a low profile, high performance 20dB directional coupler with a power rating of 225 Watts AVG and a peak to average ratio of 12dB in a new easy to use, manufacturing friendly Xinger style surface mount package. It is designed for LTE, 5G Telecom & Mil-Aero applications. The component is designed particularly for power and frequency detection, as well as for VSWR monitoring, where tightly controlled coupling and low insertion loss is required.

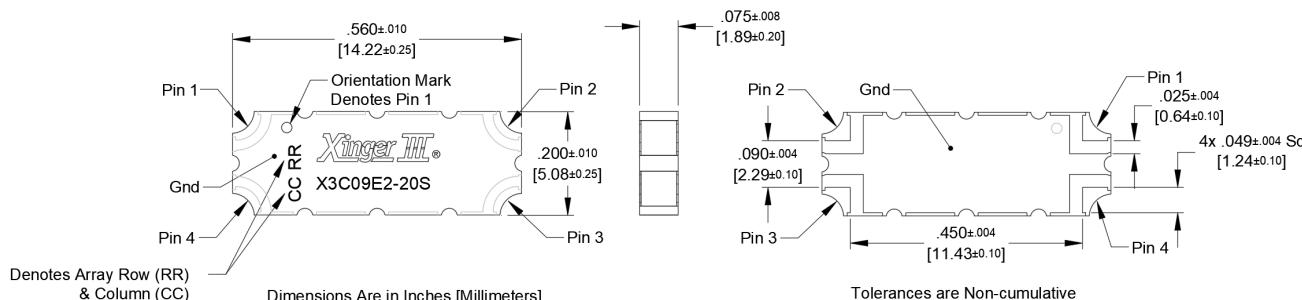
Parts have been subjected to rigorous Xinger qualification testing and they are manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4003 and polyimide. Produced with 6 of 6 RoHS compliant tin immersion finish.

### Electrical Specifications\*:

Frequency MHz	Mean Coupling dB	Insertion Loss dB Max	VSWR
800-1000	20.0 ± 1.00	0.075	Max: 1
700 – 800	20.0 ± 0.75	0.05	1.22
869 – 894	20.0 ± 0.60	0.05	1.22
925 -960	20.0 ± 0.60	0.05	1.22
900 – 1300	20.0 ± 1.50	0.075	1.22
Directivity dB Min	Frequency Sensitivity dB Max	Power AVG Watts at 95°C	Operating Temp. °C
20	±0.35	225	-55 to +150
20	±0.30	225	-55 to +150
23	±0.05	225	-55 to +150
23	±0.05	225	-55 to +150
15	±1.80	225	-55 to +150

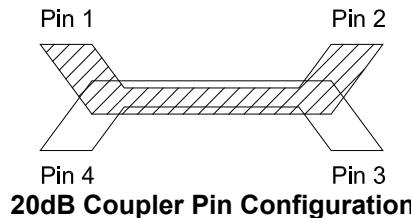
\*Specification based on performance of unit properly installed on TTM Technologies Test Board with small signal applied. Specifications subject to change without notice. Refer to parameter definitions for details.

### Outline Drawing:



## Directional Coupler Pin Configuration:

The X3C09E2-20S 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:

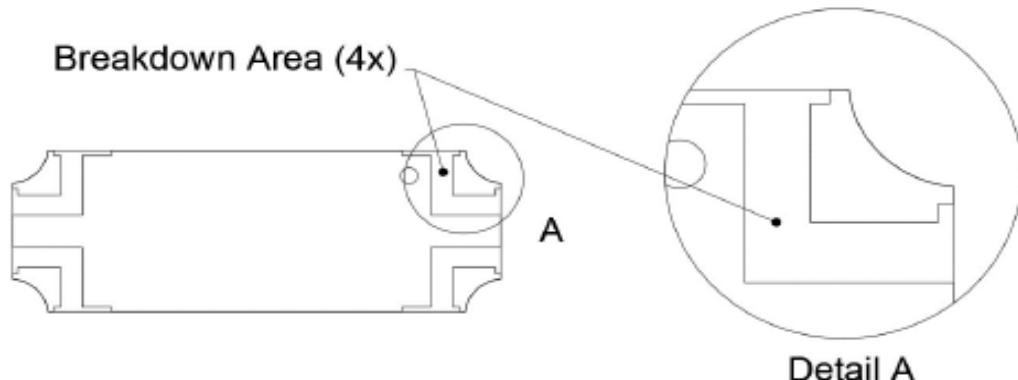


Pin 1	Pin 2	Pin 3	Pin 4
Input	Direct	Isolated	Coupled
Direct	Input	Coupled	Isolated

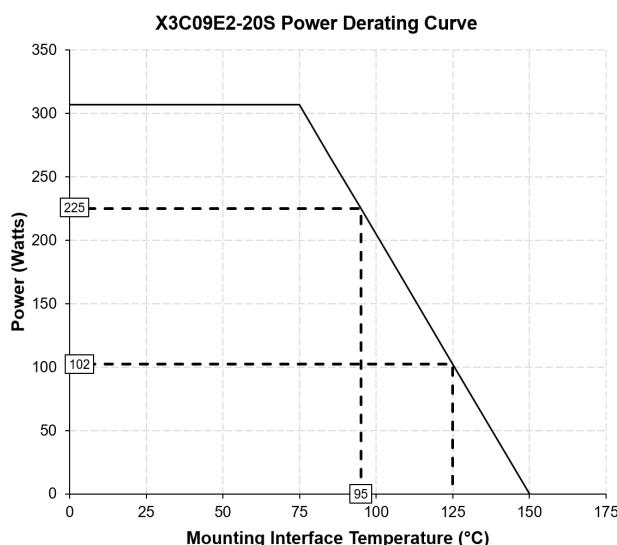
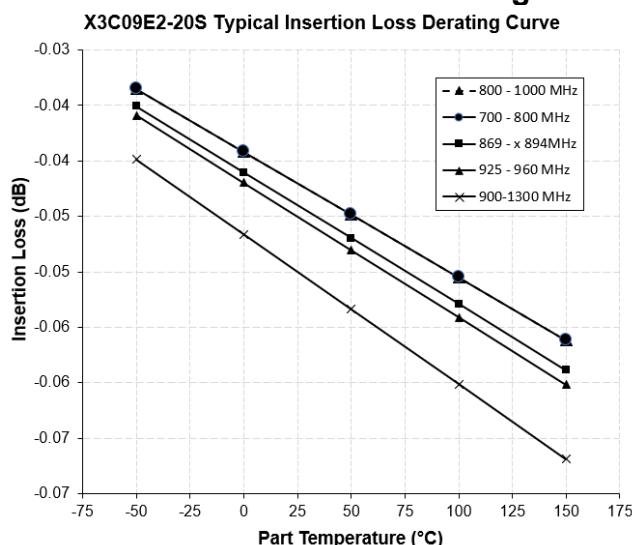
Note: The direct port has a DC connection to the input port and the coupled port has a DC connection to the isolated port. For optimum IL and power handling performance, use Pin 1 or Pin 2 as inputs.

## Peak Power Handling:

High-Pot testing of these couplers during the qualification procedure resulted in a minimum breakdown voltage of 1.50 Kv (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 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:

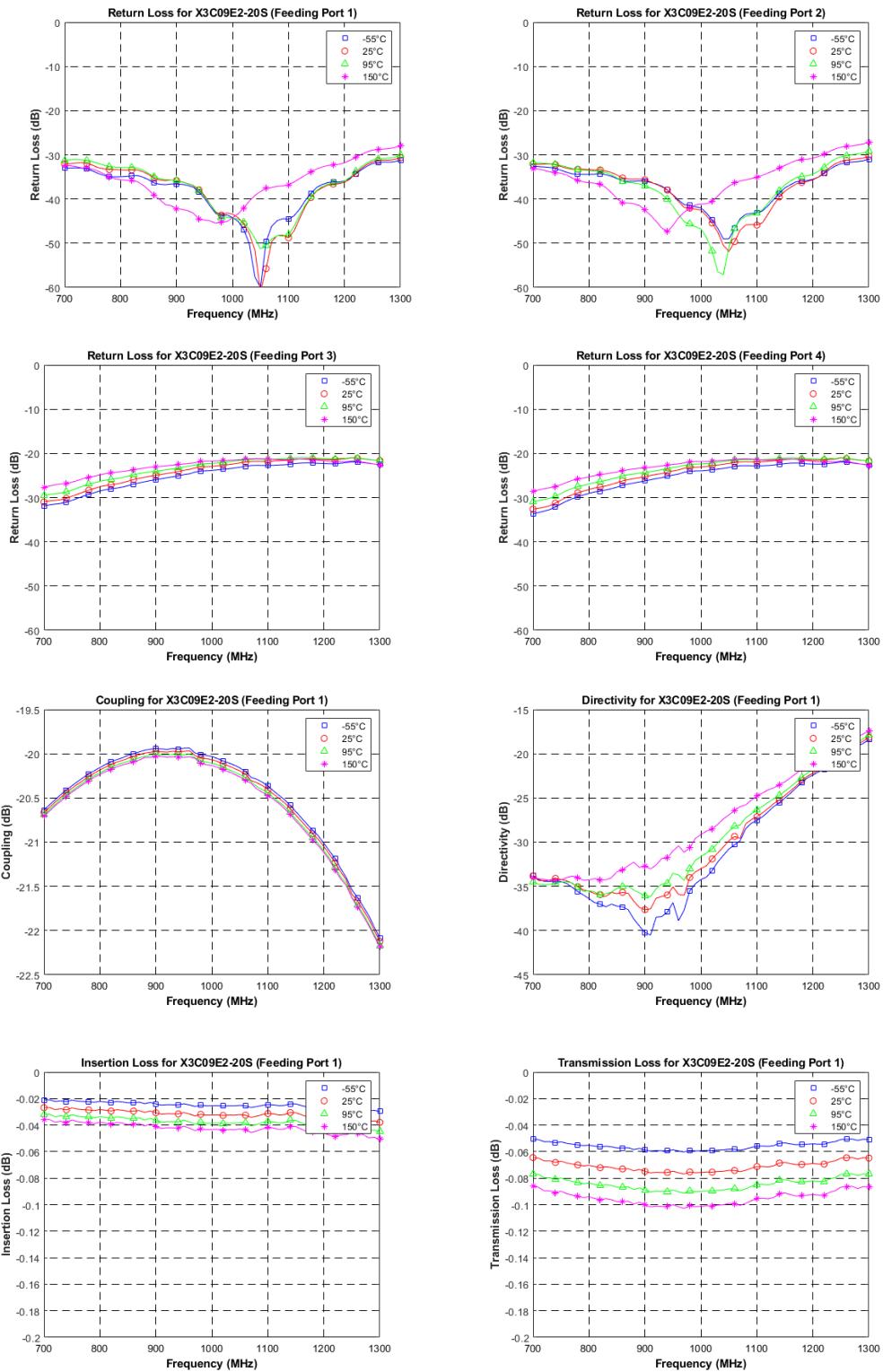
The insertion loss, at a given frequency, of the coupler is measured at 25°C and then averaged. The measurements are performed under small signal conditions (i.e. using a Vector Network Analyzer). The process is repeated at -55°C, 95°C and 150°C. A best-fit line for the measured data is computed and 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 95°C, the Xinger coupler will perform reliably as long as the input power is derated to the curve above.

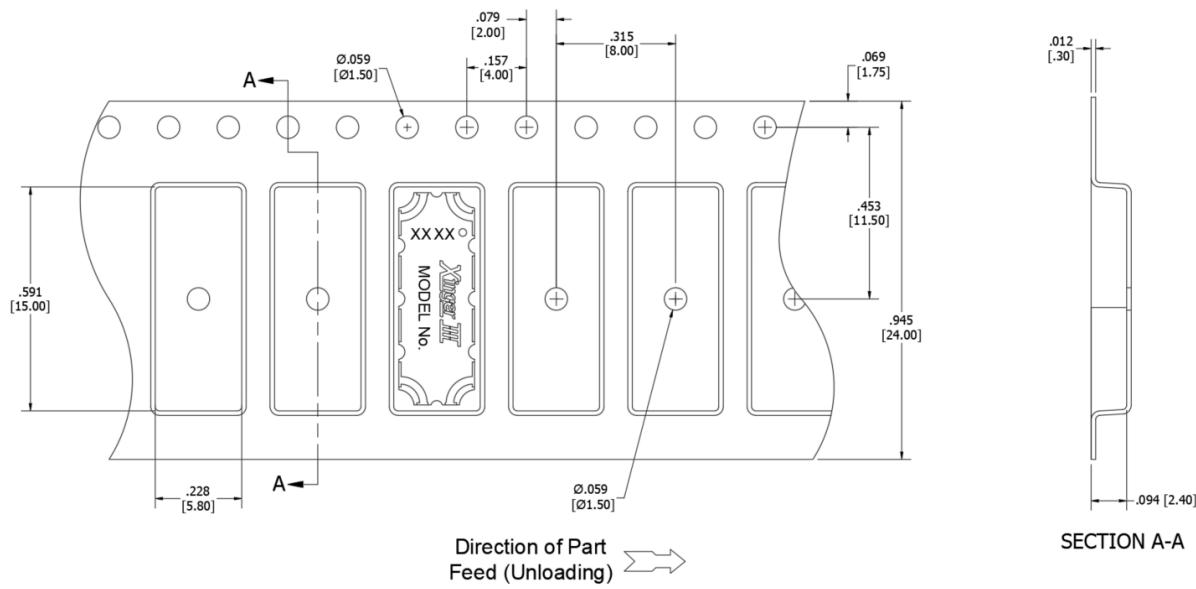
**Typical Performance: 700-1300 MHz:**


## Definition of Measured Specifications:

Parameter	Definition	Mathematical Representation
<b>VSWR (Voltage Standing Wave Ratio)</b>	The impedance match of the coupler to a $50\Omega$ 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
<b>Return Loss</b>	The impedance match of the coupler to a $50\Omega$ system. Return Loss is an alternate means to express VSWR.	$Return\ Loss(dB) = 20\log \frac{VSWR + 1}{VSWR - 1}$
<b>Mean Coupling</b>	At a given frequency ( $\omega_n$ ), 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.	$Coupling(dB) = C(\omega_n) = 10\log \frac{P_{in}(\omega_n)}{P_{cpl}(\omega_n)}$ $Mean\ Coupling(dB) = \frac{\sum_{n=1}^N C(\omega_n)}{N}$
<b>Insertion Loss</b>	The input power divided by the sum of the power at the two output ports.	$Insertion\ Loss(dB) = 10\log \frac{P_{in}}{P_{cpl} + P_{direct}}$
<b>Transmission Loss</b>	The input power divided by the power at the direct port.	$10\log \frac{P_{in}}{P_{direct}}$
<b>Directivity</b>	The power at the coupled port divided by the power at the isolated port.	$10\log \frac{P_{cpl}}{P_{iso}}$
<b>Frequency Sensitivity</b>	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]

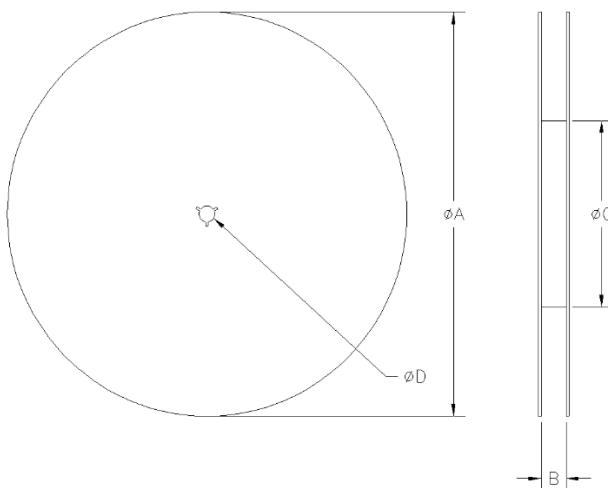


TABLE 1

**TABLE 1**  
**BEEF DIMENSIONS (inches [mm])**

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](mailto:rf&s_support@ttm.com)