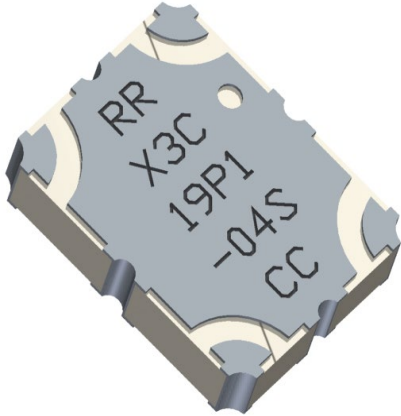




**4dB Directional Coupler**



**Description:**

The X3C19P1-04S is a low profile, high performance 4dB directional coupler in a new easy to use, manufacturing friendly surface mount package. It is designed for DC, WCDMA, LTE and PCS applications. The X3C19P1-04S is designed particularly for non-binary split and combine in high power amplifiers, e.g. used along with a 3dB to get a 3-way, plus other signal distribution applications where low insertion loss is required. It can be used in high power applications up to 70 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.

**Electrical Specifications\*\***

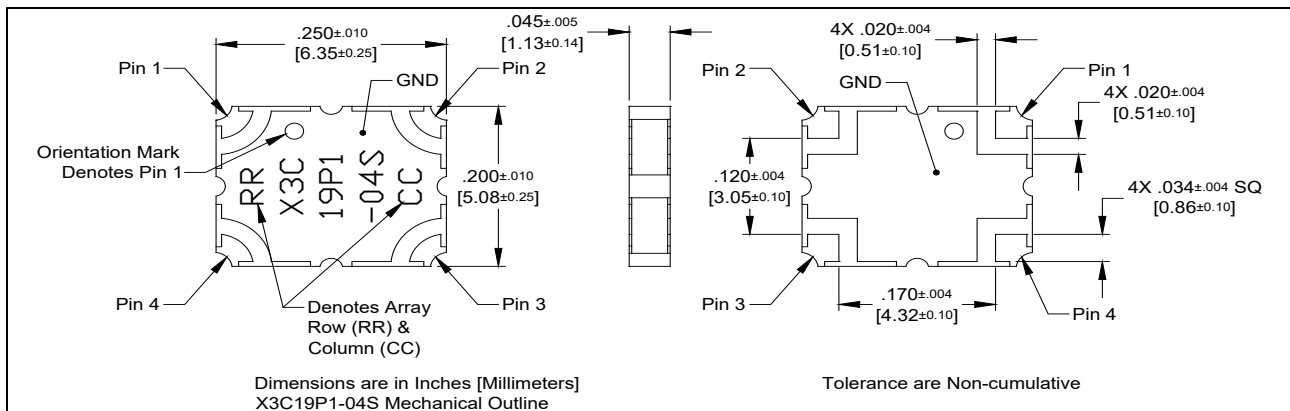
**Features:**

- 1500-2000MHz
- DCS, PCS, WCDMA and LTE
- High Power
- Very Low Loss
- Tight Coupling
- High Directivity
- Production Friendly
- Tape and Reel
- Lead Free

Frequency MHz	Mean Coupling dB	Insertion Loss dB Max	VSWR Max : 1	Phase Balance Degrees
1500-1700	4.0 ± 0.3	0.15	1.22	90±4.0
1700-2000	4.0 ± 0.3	0.15	1.22	90±4.0
1805-1880	4.0 ± 0.2	0.13	1.15	90±3.0
1930-1990	4.0 ± 0.2	0.14	1.15	90±3.0
	Directivity dB Min	Frequency Sensitivity dB Max	Power Avg. CW Watts @95°C	Operating Temp. °C
	20	± 0.25	70	-55 to +150
	20	± 0.25	70	-55 to +150
	23	± 0.05	70	-55 to +150
	23	± 0.05	70	-55 to +150

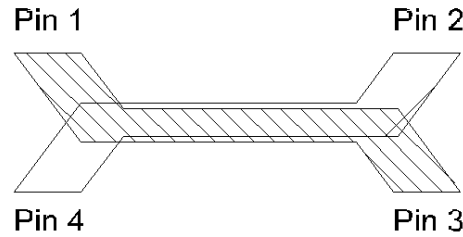
\*\*Specification based on performance of unit properly installed on a TTM test board. Refer to Specifications subject to change without notice. Refer to parameter definitions for details

**Mechanical Outline:**



## Directional Coupler Pin Configuration

The X3C19P1-04S 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:

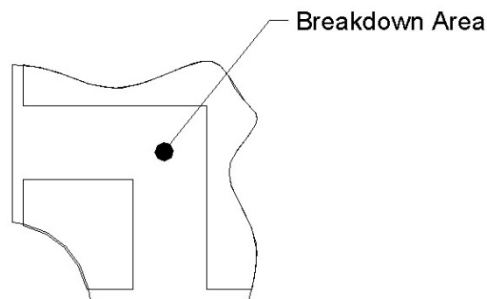


Pin 1	Pin 2	Pin 3	Pin 4
Input	Isolated	Direct	Coupled
Isolated	Input	Coupled	Direct
Direct	Coupled	Input	Isolated
Coupled	Direct	Isolated	Input

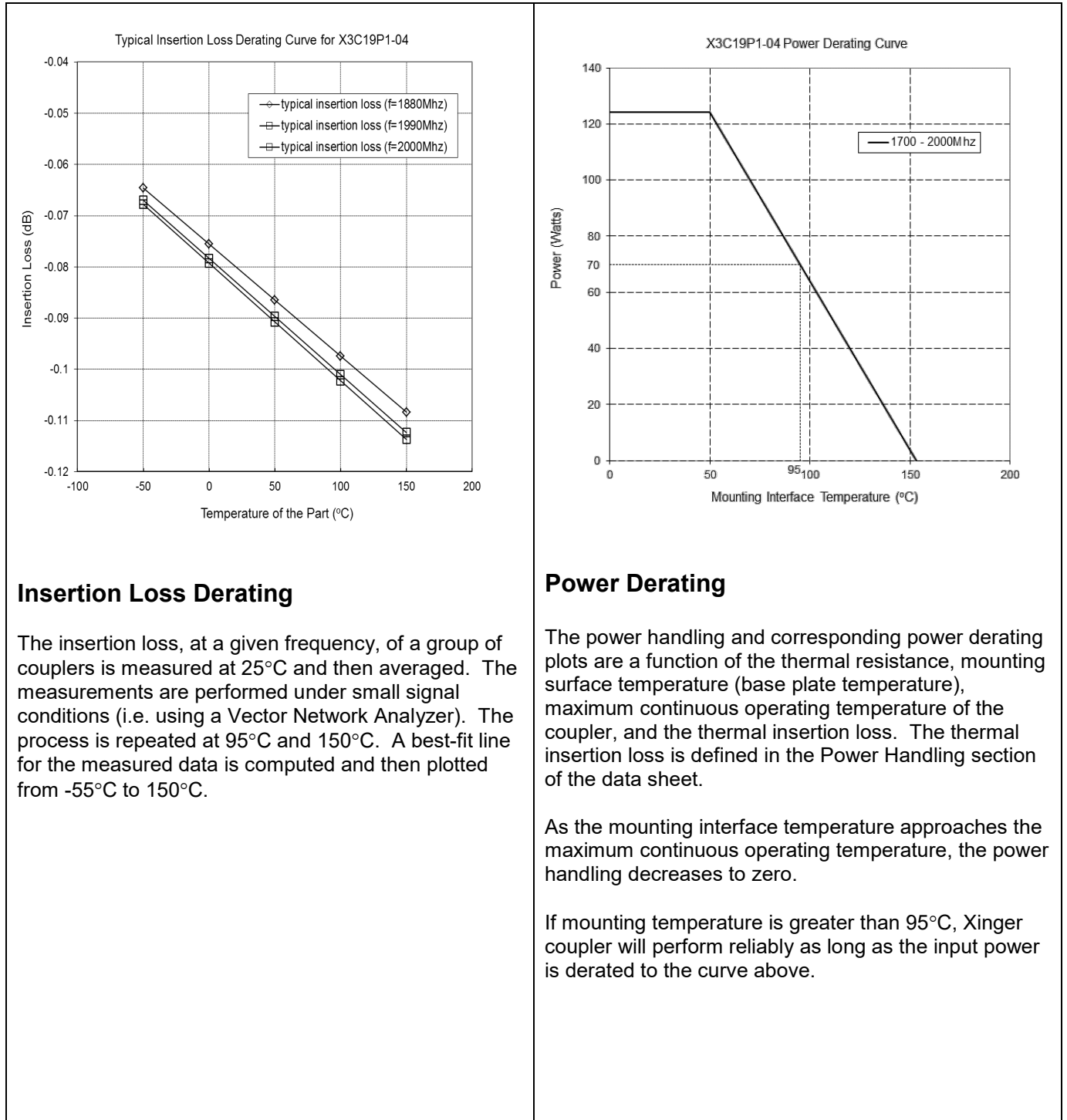
Note: The direct port has a DC connection to the input port and the coupled port has a DC connection to the isolated port.

## Peak Power Handling

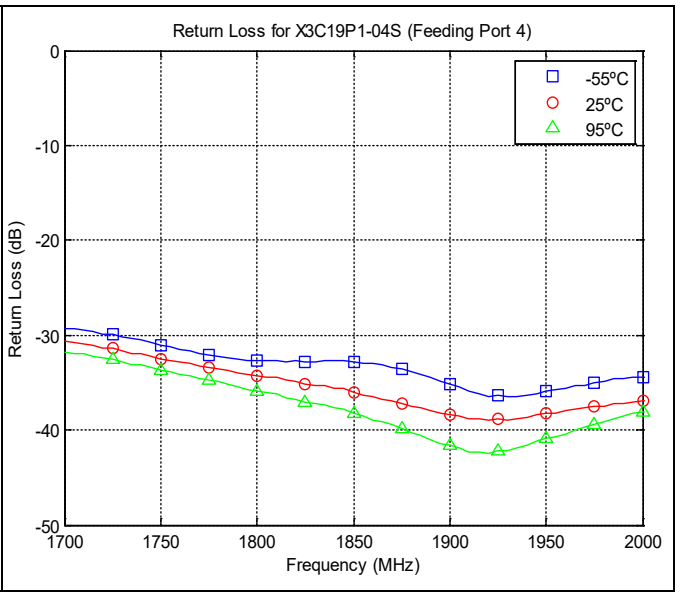
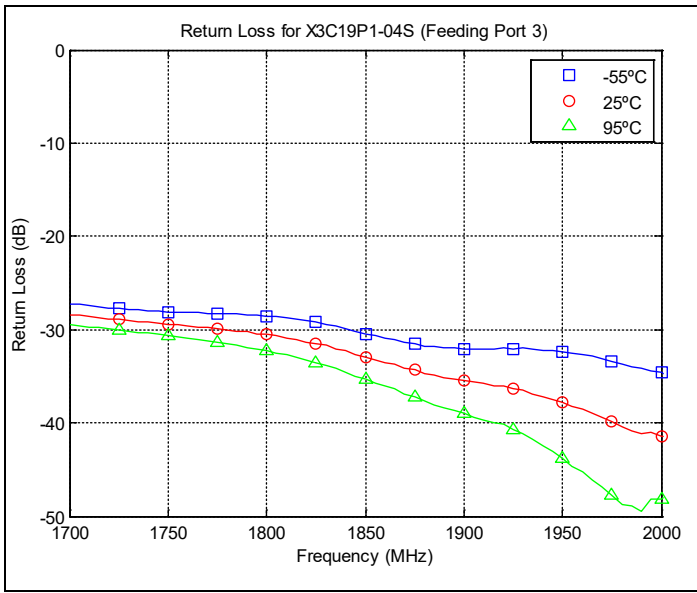
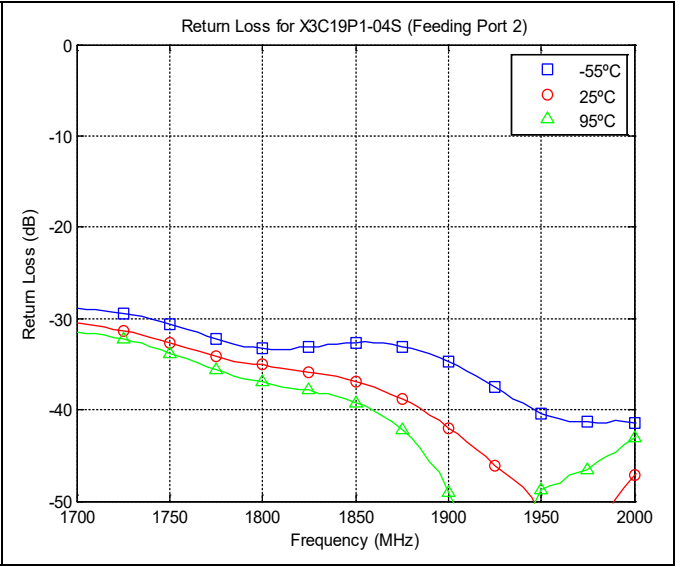
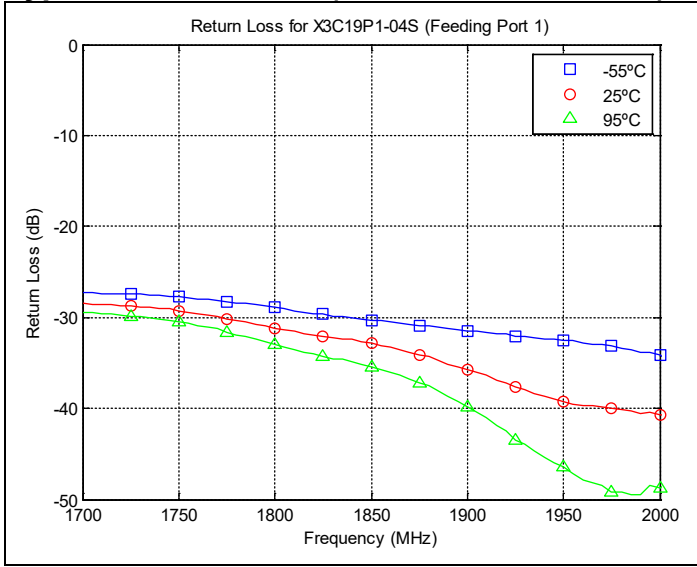
High-Pot testing of these couplers during the qualification procedure resulted in a minimum breakdown voltage of 0.56Kv (minimum recorded value). This voltage level corresponds to a breakdown resistance capable of handling at least 12dB peaks over average power levels, for very short durations. The breakdown 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).

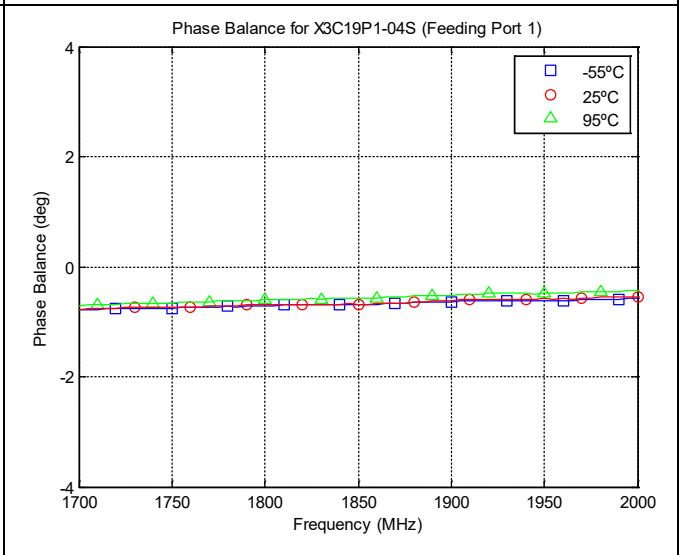
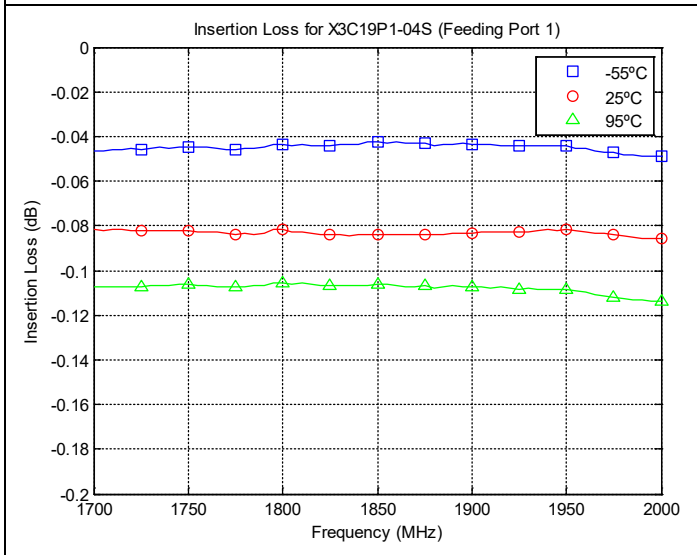
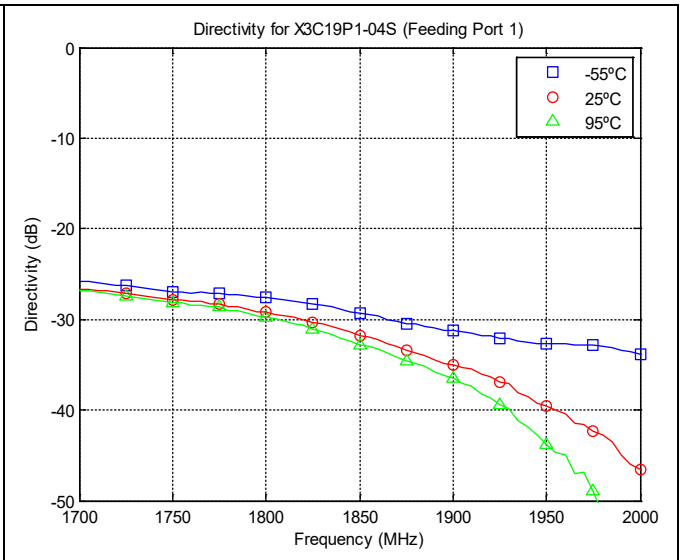
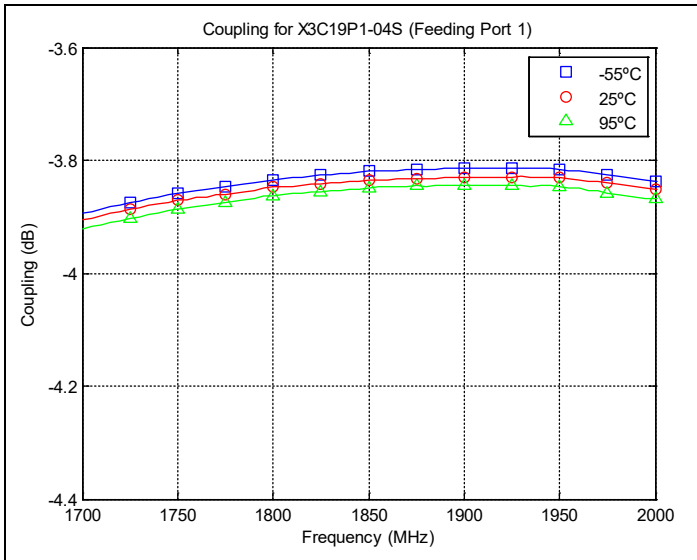


## Insertion Loss and Power Derating Curves



**Typical Performance (-55°C, 25°C and 95°C): 1700-2000 MHz**





## Definition of Measured Specification

Parameter	Definition	Mathematical Representation
<b>VSWR (Voltage Standing Wave Ratio)</b>	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
<b>Return Loss</b>	The impedance match of the coupler to a 50Ω 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>Directivity</b>	The power at the coupled port divided by the power at the isolated port.	$10\log \frac{P_{cpl}}{P_{iso}}$
<b>Phase Balance</b>	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
<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)