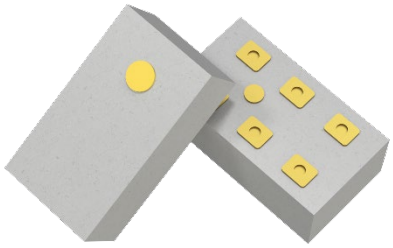
X4C40L1-30G
Rev A

Directional Coupler 30dB



Description:

The X4C40L1-30G is a low-profile sub-miniature (0603) high performance 20 dB directional 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 5G (N104), 6G and S&C-Band applications in all end markets including telecom and COTS Mil-Aero. The X4C40L1-30G 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. X4C40L1-30G is qualified in accordance with AEC-Q200, and it is suitable for all applications where AECQ qualification is required.

Parts have been subjected to rigorous Xinger qualification testing including AEC-Q200 qualification, 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 ENIG finish.

Features:

- **3200-5000 MHz**
- **0.67mm Height**
- **5G (N104), 6G, S&C-Band COTS Mil-Aero**
- **AEC-Q200 Qualified**
- **Power 7 Watts (AVG)**
- **Peak to Average Ratio 12dB**
- **Very Low Loss (<0.10dB)**
- **Tight Coupling (±1.5dB)**
- **High Directivity (>14dB)**
- **Production Friendly**
- **Tape and Reel**

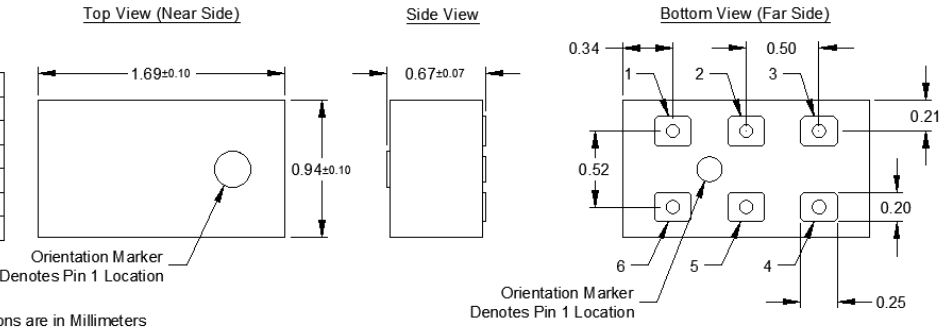
Electrical Specifications:

Frequency *MHz*	Mean Coupling *dB*	Insertion Loss *dB Max*	Return Loss *dB Min*
3200-4200	30.0 ±1.5	0.1	20
3300-3800	30.0 ±1.5	0.1	20
4400-5000	30.0 ±1.5	0.1	20
Frequency Sensitivity *dB Max*	**Directivity** *dB Min*	**Power** *Avg. Watts at 105°C*	**Operating Temp.** *°C*
± 0.5	18	7	-55 to +140
± 0.35	18	7	-55 to +140
± 0.25	14	7	-55 to +140

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

Outline Drawing:

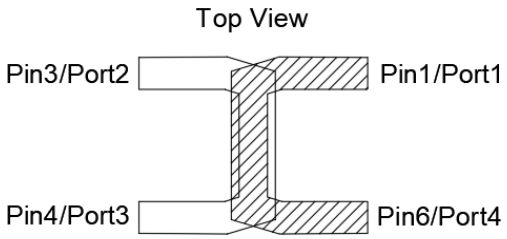
PIN	DESIGNATION
1	INPUT
2	GROUND
3	COUPLED
4	ISOLATION
5	GROUND
6	DIRECT



-Dimensions are in Millimeters
-Tolerances are Non-Cumulative

Directional Coupler Pin Configuration:

The X4C40L1-30G 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:



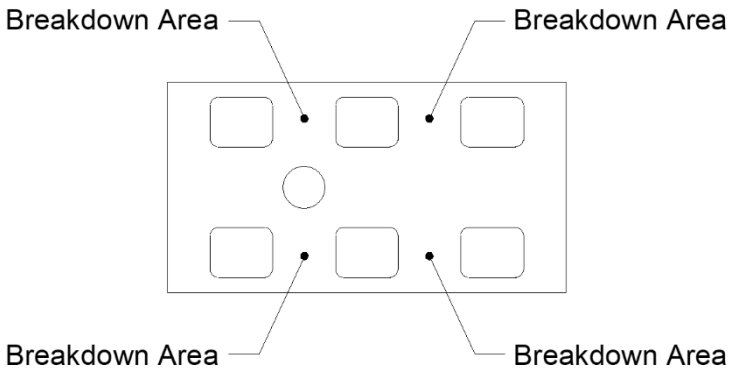
30dB Coupler Pin Configuration

Configuration	Pin 1/Port 1	Pin 2	Pin 3/Port 2	Pin 4/Port 3	Pin 5	Pin 6/Port 4
Conf.-1	Input	Gnd	Coupled	Isolated	Gnd	Direct
Conf.-2	Direct	Gnd	Isolated	Coupled	Gnd	Input

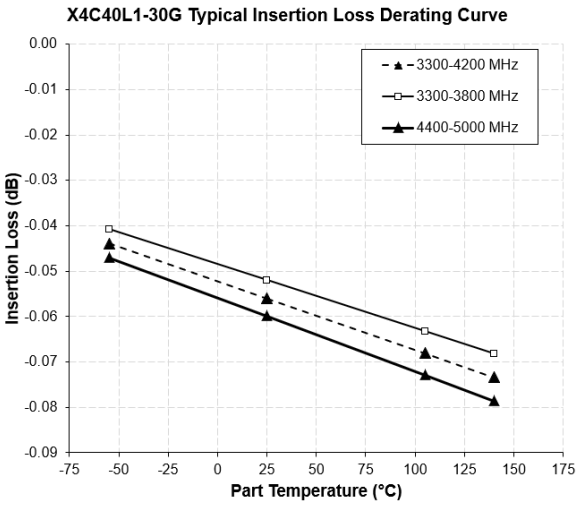
Note: The direct port has a DC connection to the input port and the coupled port has a DC connection to the isolated port. For optimum IL and power handling performance, use Pin 1 or Pin 2 as inputs.

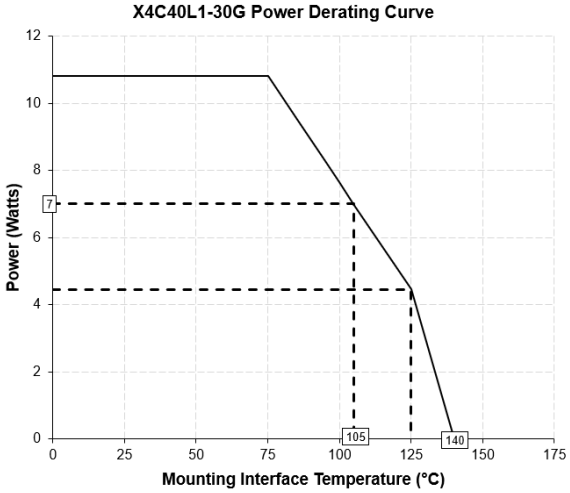
Peak Power Handling:

High-Pot testing of these components during the qualification procedure resulted in a minimum breakdown voltage of 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 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 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.

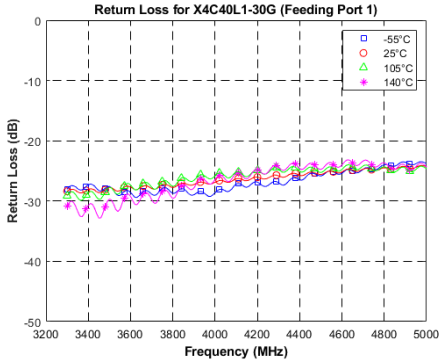
Power Derating:

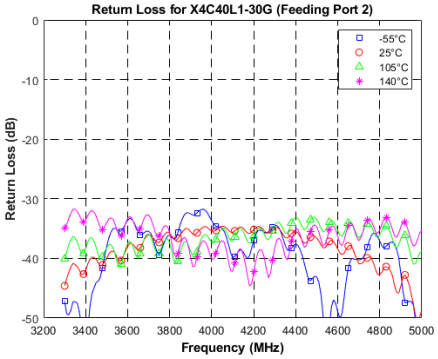
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the component, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

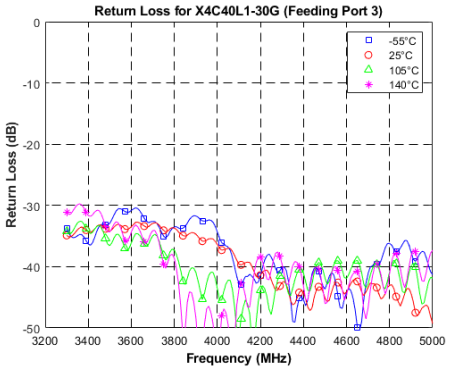
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

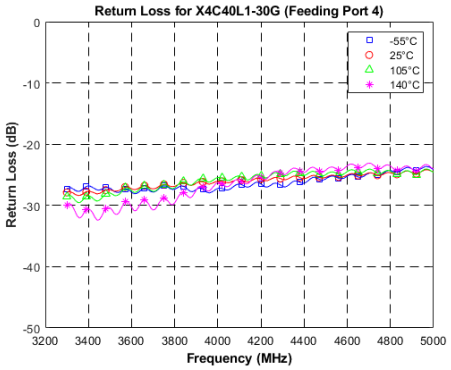
If the mounting temperature is greater than 105°C, the Xinger component will perform reliably if the input power is derated to the curve above.

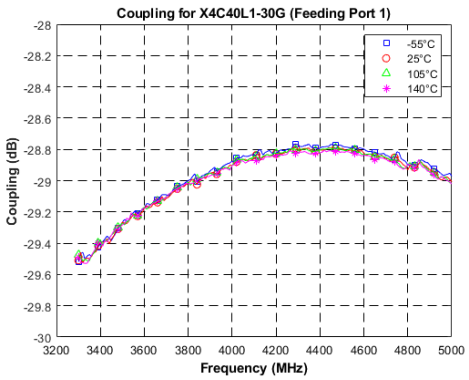
Typical Performance:

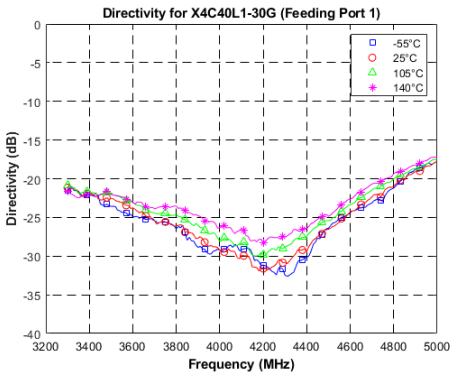


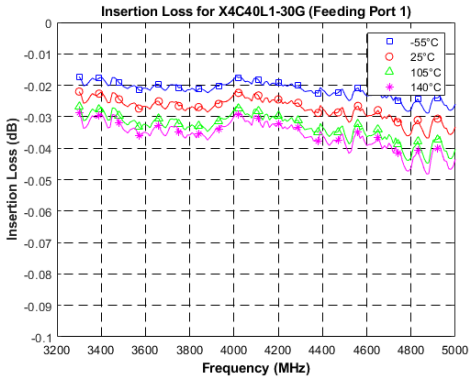


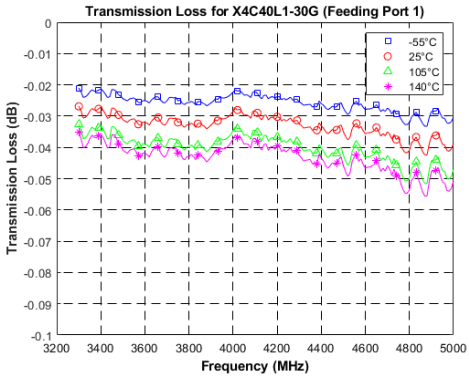










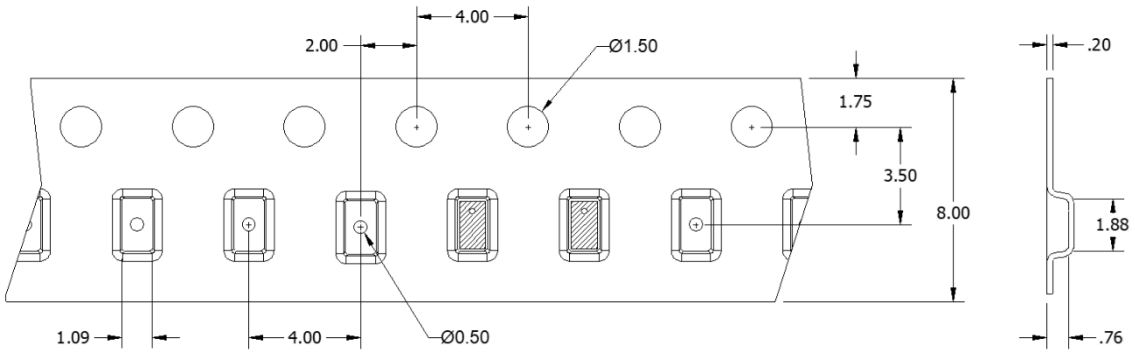


Definition of Measured Specification:

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.	$VSWR = \frac{V_{max}}{V_{min}}$ 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:

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



Dimensions are in Millimeters

Direction of Part Feed (Unloading)

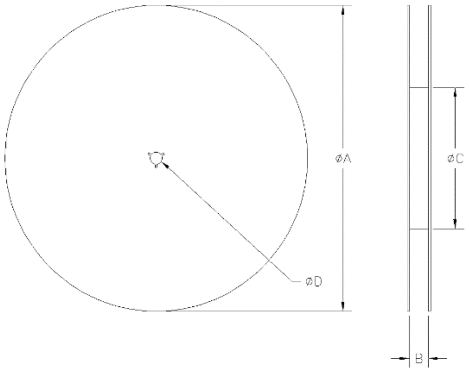


TABLE 1		
QUANTITY/REEL	REEL DIMENSIONS mm	
4000	ØA	177.80
	B	8.00
	ØC	50.80
	ØD	13.00

X4C 40 L 1 – 30 G

Function & Family	Frequency	Package Size	Power Handling	Coupling	Finish
X4C = Xinger 4 Coupler	40 = mid freq 4.0 GHz	L = 0.060" x 0.030"	1 = Low Power	30 = 30dB	G = ENIG

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