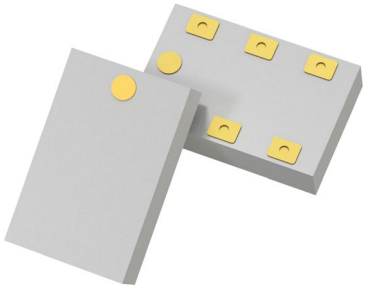
Xinger®

Hybrid Coupler
3 dB, 90°



Description:

The C2023J5003AHF is a low cost, low profile sub-miniature high performance 3 dB Hybrid coupler in an easy-to-use Xinger style surface mount package. C2023J5003AHF has a power rating of 4 Watts (AVG) at 85°C and 3 Watts (AVG) at 105°C, and a peak to average ratio of 12dB. It is designed for 1985-2350MHz applications including: 5G, LTE and ISM. The C2023J5003AHF is ideal for balanced power amplifiers, signal distribution and other applications where low insertion loss and tight amplitude and phase balance are required. C2023J5003AHF 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, RF-35, RO4350 and polyimide. Produced with 6 of 6 RoHS compliant ENIG finish. The C2023J5003AHF is available on tape and reel for pick and place high volume manufacturing.

Features:

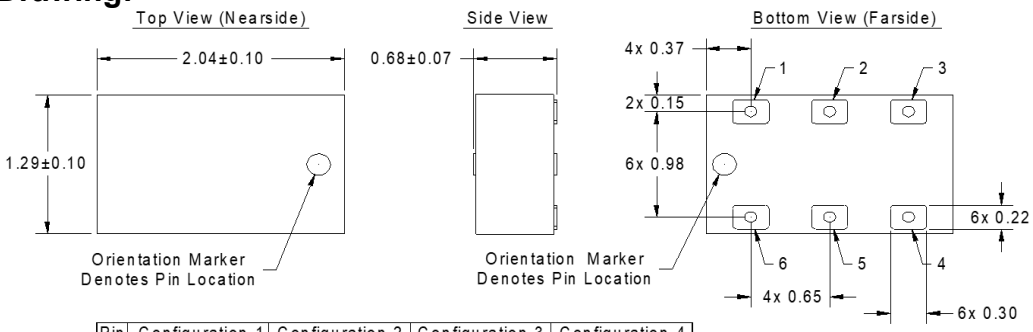
- **1985 – 2350 MHz**
- **0.68mm Height Profile**
- **5G, LTE, ISM applications**
- **AEC-Q200 qualified**
- **High Isolation (>21dB)**
- **Low Loss (<0.4dB)**
- **Surface Mountable**
- **Tape & Reel**
- **Non-conductive Surface**
- **RoHS Compliant**
- **Halogen-Free**
- **Made in the USA**

Electrical Specifications:

Parameter (at 25°C)	Min.	Typ.	Max	Unit
Frequency	1985		2350	MHz
Port Impedance		50		Ω
Return Loss	18	22		dB
Isolation	21	25		dB
Insertion Loss*		0.3	0.4	dB
Amplitude Balance		0.1	0.8	dB
Phase Balance (relative to 90°)		2	6	Degrees
Power Handling @ 85°C			4	Watts
Power Handling @ 105°C			3	Watts
Operating Temperature	-55		+140	ºC

* Specifications subject to change without notice.

Outline Drawing:

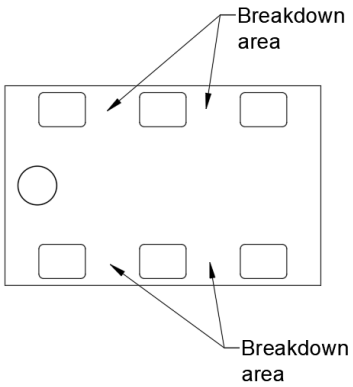


Pin	Configuration-1	Configuration-2	Configuration-3	Configuration-4
1	Input	Isolated	Direct	Coupled
2	GND	GND	GND	GND
3	Isolated	Input	Coupled	Direct
4	Direct	Coupled	Input	Isolated
5	GND	GND	GND	GND
6	Coupled	Direct	Isolated	Input

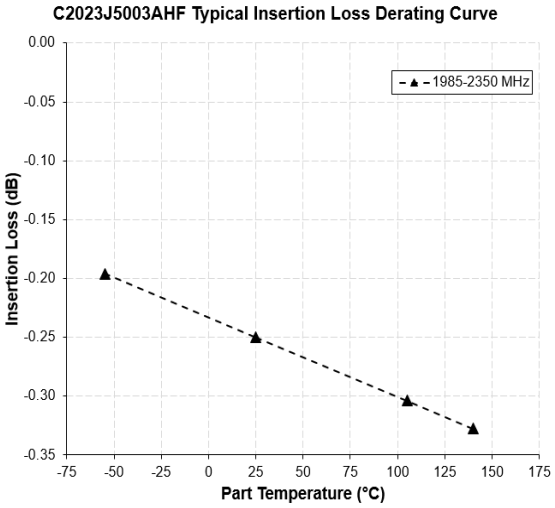
Mechanical Outline
-Dimensions are in Millimeters
-Tolerances are Non-Cumulative

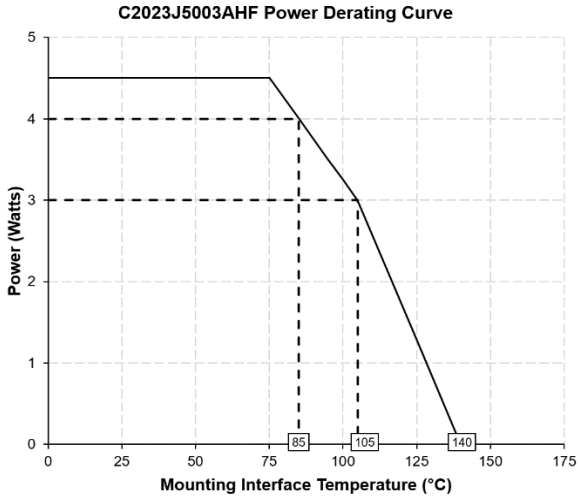
Peak Power Handling:

High-Pot testing of these couplers 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 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 to 140°C. A best-fit line for the measured data is computed and then plotted from -55°C to 140°C.

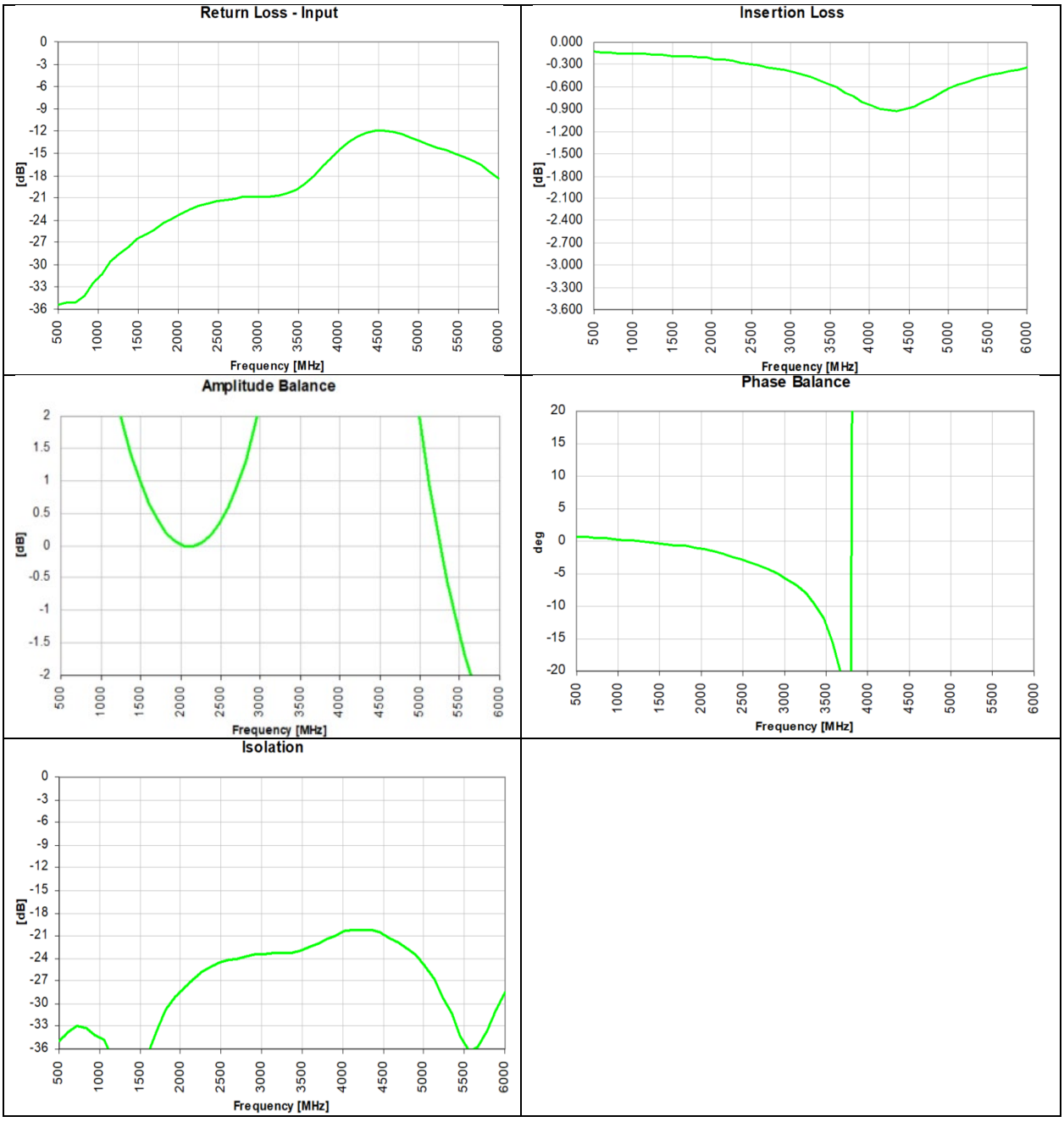
Power Derating:

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.

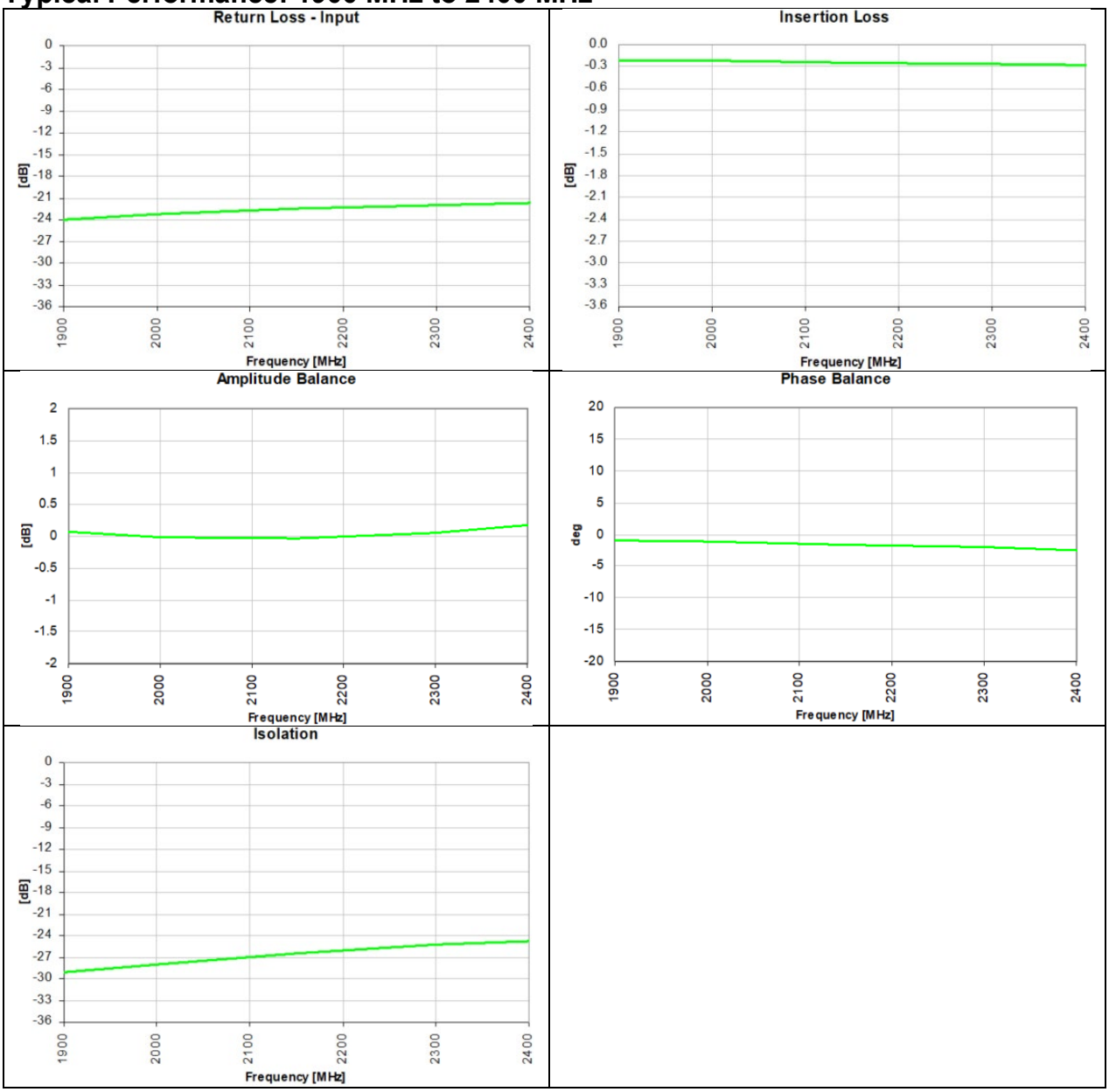
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

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

Broadband Performance: 500 MHz to 6000 MHz



Typical Performance: 1900 MHz to 2400 MHz



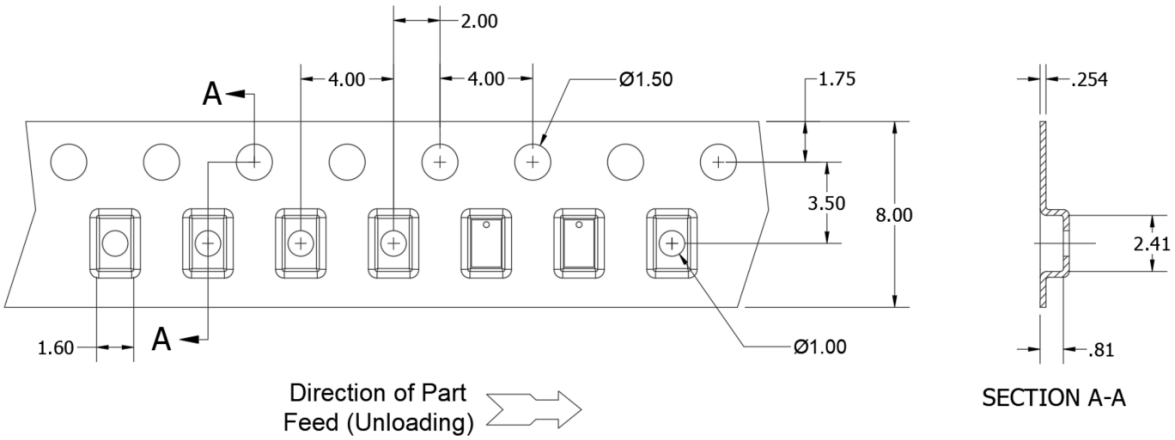
Definition of Measured Specifications:

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.	$Return\ Loss(dB) = 20log\ \frac{VSWR+1}{VSWR-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	$Insertion\ Loss(dB) = 10log\ \frac{P_{in}}{P_{cpl}+P_{direct}}$
Isolation	The input power divided by the power at the isolated port.	$Isolation(dB) = 10log\ \frac{P_{in}}{P_{iso}}$
Amplitude Balance	The power at each output divided by the average power of the two outputs.	$10\log \frac{P_{cpl}}{(P_{cpl}+P_{direct})/2}$ $10\log \frac{P_{direct}}{(P_{cpl}+P_{direct})/2}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at direct port
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)
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 pin configuration 1 (refer to page 1 for pin configuration).

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

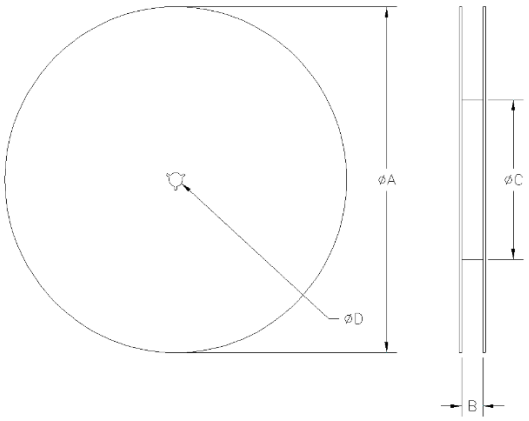


TABLE 1		
QUANTITY/REEL	REEL DIMENSIONS mm	
4000	øA	177.80
	B	8.00
	øC	50.80
	øD	13.00

Contact us:
rf&s_support@ttm.com