Pico Xinger
10dB Directional Coupler

Description

The 1P610S Pico Xinger is a low profile, miniature 10dB directional coupler in an easy to use surface mount package designed for MMDS and WLAN applications. The 1P610 is for power and frequency detection as well as power injection. The 1P610 is an ideal solution for the ever-increasing demands of the wireless industry for smaller printed circuit boards and high performance. Parts have been subjected to rigorous qualification testing and units are 100% tested. They are manufactured using materials with x and y thermal expansion coefficients compatible with common substrates. Produced with 6 of 6 RoHS compliant tin immersion. Available in 6 of 6 RoHS compliant tin immersion (1P610S).

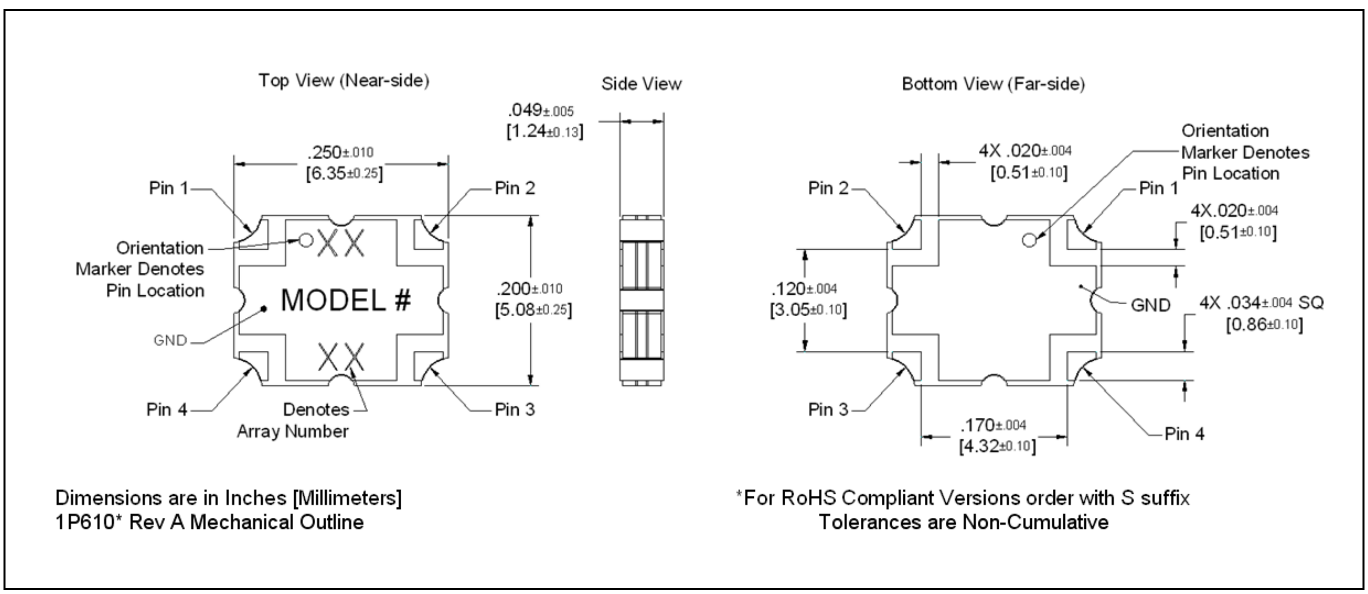
Features:

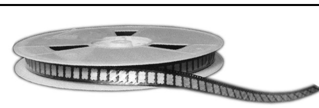
- **2300-2700 MHz**
- **MMDS and WLAN**
- **Very Low Loss**
- **High Directivity**
- **Surface Mountable**
- **Tape and Reel**
- **Lead Free**

ELECTRICAL SPECIFICATIONS**

Frequency	Mean Coupling	Insertion Loss	VSWR
MHz	*dB*	*dB Max*	*Max : 1*
2300-2700	10 ± 0.75	0.25	1.22
Directivity	**Freq. Sensitivity**	**Power Handling**	**Operating Temp.**
dB Min	*dB Max*	*Avg CW Watts @85°C*	*ºC*
20	± 0.2	20	-55 to +150

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





Available on Tape and Reel For Pick and Place Manufacturing.

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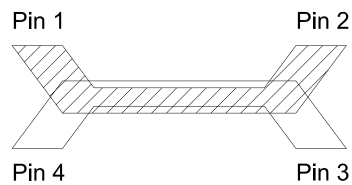
Directional Coupler Pin Configuration

The 1P610S 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:

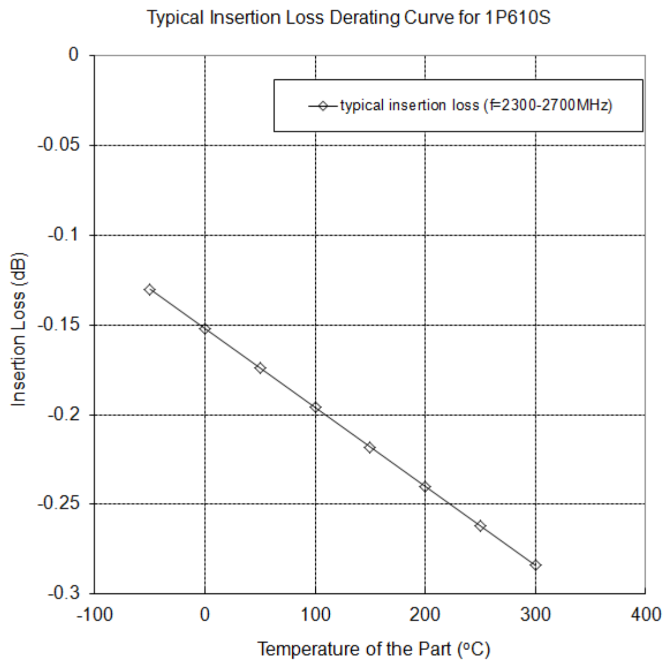


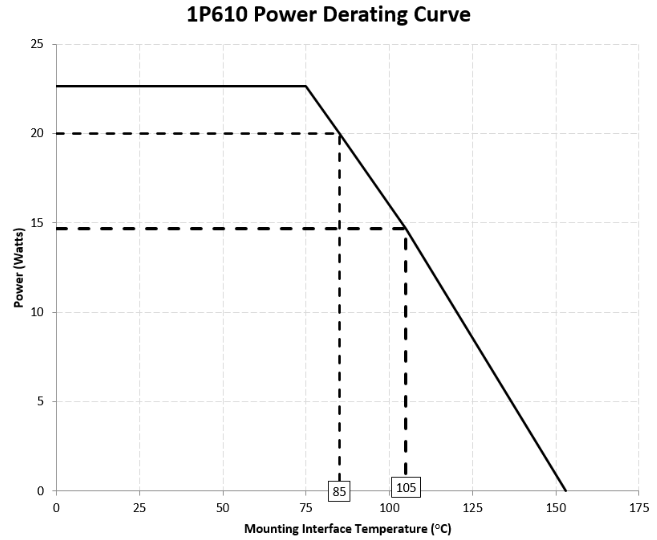
10dB Coupler Pin Configuration

Pin 1	Pin 2	Pin 3	Pin 4
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 performance use Pin 1 or Pin 2 as inputs.

Insertion Loss and Power Derating Curves





Insertion Loss Derating:

The insertion loss, at a given frequency, of a group of couplers 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 and 85°C. Based on copper as well as dielectric losses, the insertion loss is computed from -55°C to 300°C.

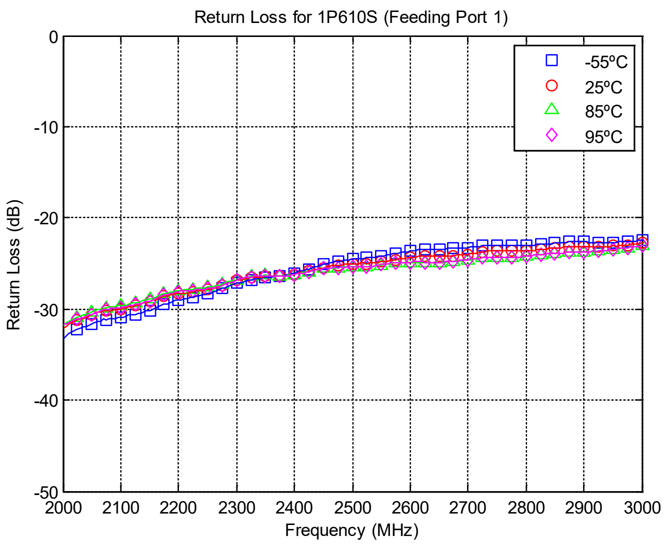
Power Derating:

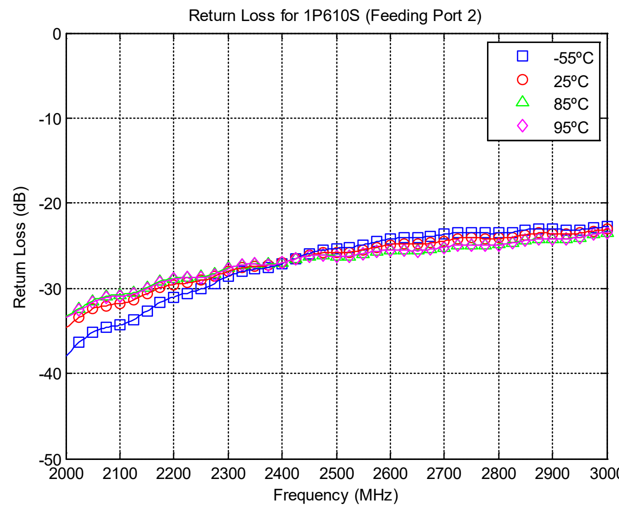
The power handling and corresponding power derating plots are a function of the thermal resistance, mounting surface temperature (base plate temperature), maximum continuous operating temperature of the coupler, and the thermal insertion loss. The thermal insertion loss is defined in the Power Handling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

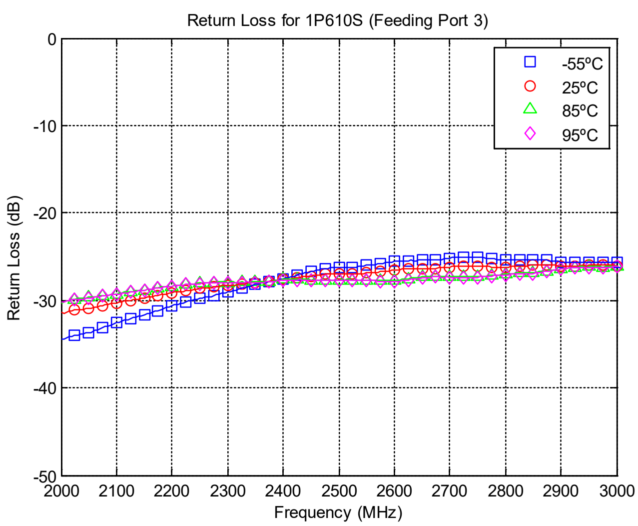
As the mounting interface temperature approaches the maximum continuous operating temperature, the power handling decreases to zero.

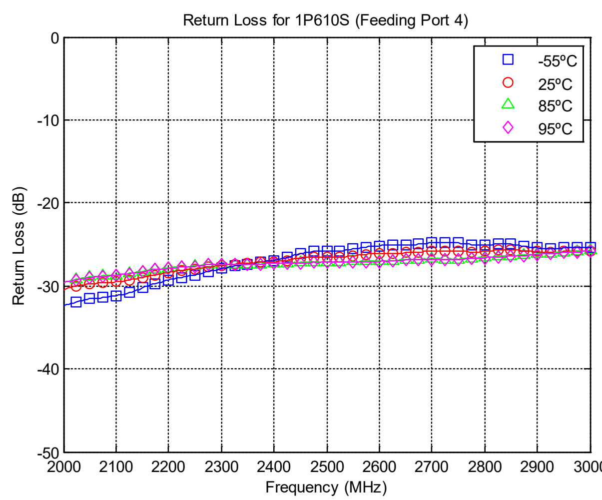
If mounting temperature is greater than 85°C, Xinger coupler will perform reliably as long as the input power Is derated to the curve above.

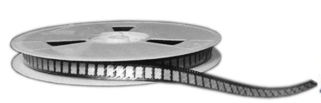
Typical Performance (-55°C, 25°C. 85°C and 95°C): 2000-3000 MHz



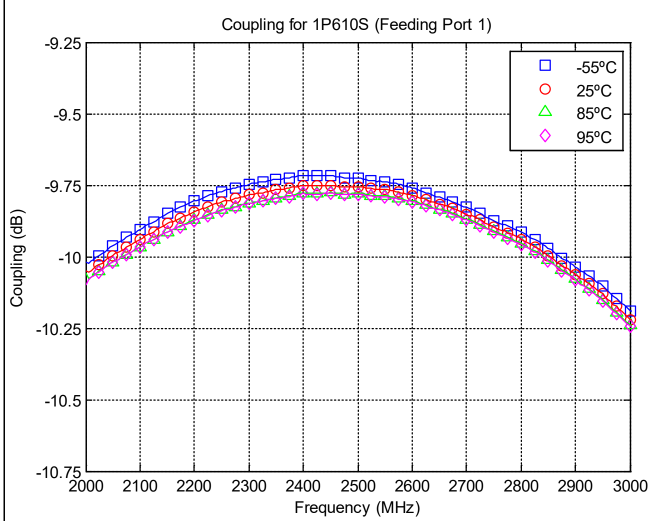


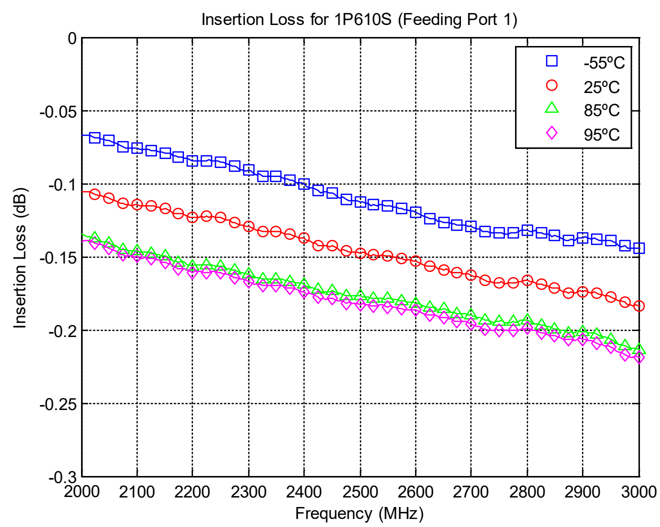


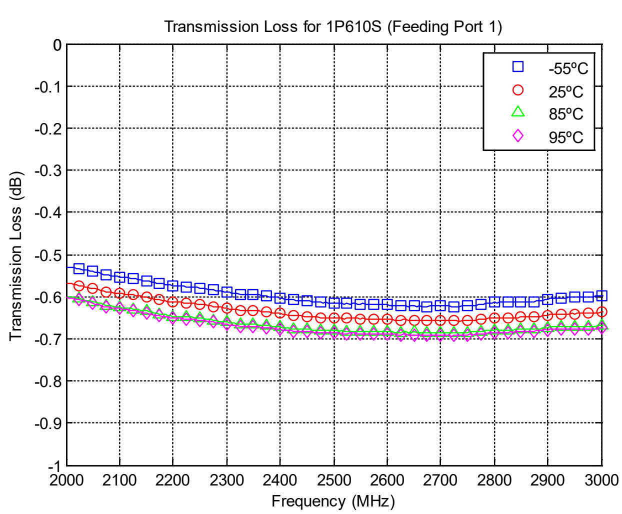


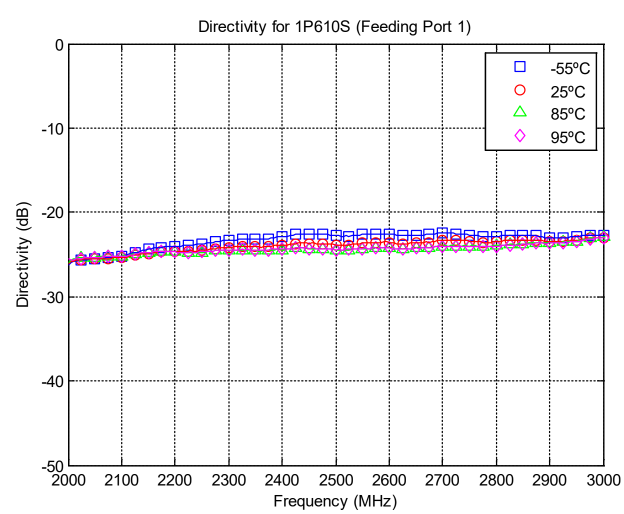


Typical Performance (-55°C, 25°C , 85°C and 95°C): 2000-3000 MHz









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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) = $C(\omega_n) = 10\log\left(\frac{P_{in}(\omega_n)}{P_{cpl}(\omega_n)}\right)$ 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.	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)

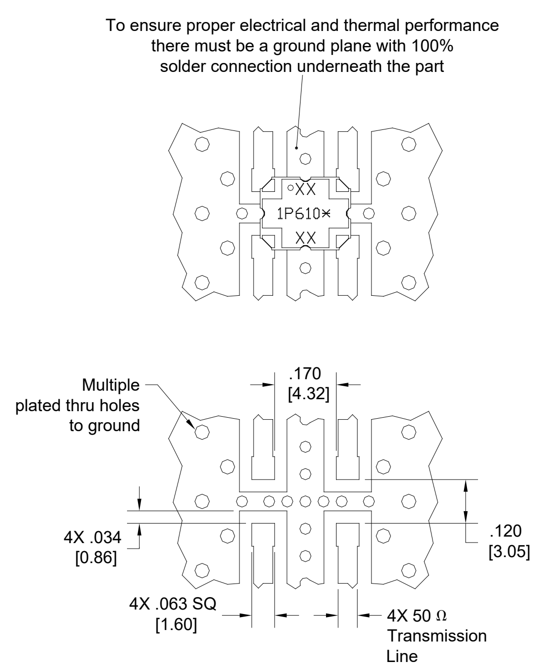
Mounting

In order for Xinger surface mount couplers to work optimally, there must be 50Ω transmission lines leading to and from all of the RF ports. Also, there must be a very good ground plane underneath the part to ensure proper electrical performance. If either of these two conditions is not satisfied, insertion loss, coupling, VSWR and isolation may not meet published specifications.

Overall ground is improved if a dense population of plated through holes connect the top and bottom ground layers of the PCB. This minimizes ground inductance and improves ground continuity. All of the Xinger hybrid and directional couplers are constructed from ceramic filled PTFE composites which possess excellent electrical and mechanical stability.

When a surface mount hybrid coupler is mounted to a printed circuit board, the primary concerns are; ensuring the RF pads of the device are in contact with the circuit trace of the PCB and insuring the ground plane of neither the component nor the PCB is in contact with the RF signal.

Mounting Footprint



Dimensions are in Inches [Millimeters]
1P610* Rev A Mounting Footprint

Coupler Mounting Process

The process for assembling this component is a conventional surface mount process as shown in Figure 1. This process is conducive to both low and high volume usage.

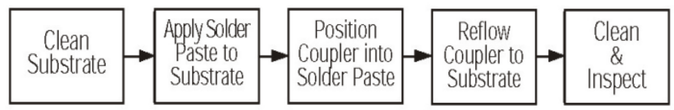
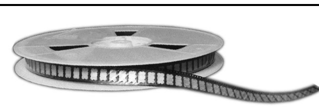


Figure 1: Surface Mounting Process Steps

Storage of Components: The Xinger II products are available in an immersion tin finish. Commonly used storage procedures used to control oxidation should be followed for these surface mount components. The storage temperatures should be held between 15°C and 60°C.

Substrate: Depending upon the particular component, the circuit material has a coefficient of thermal expansion (CTE) similar to commonly used board substrates such as RF35, RO4003, FR4, polyimide and G-10 materials. The similarity in CTE minimizes solder joint stresses due to similar expansion rates between component and board. Mounting to "hard" substrates (alumina etc.) is possible depending upon operational temperature requirements. The solder surfaces of the coupler are all copper plated with an immersion tin finish.

Solder Paste: All conventional solder paste formulations will work well with Anaren's Xinger II surface mount components. Solder paste can be applied with stencils or syringe dispensers. An example of a stenciled solder paste deposit is shown in Figure 2. As shown in the figure solder paste is applied to the four RF pads and the entire ground plane underneath the body of the part.



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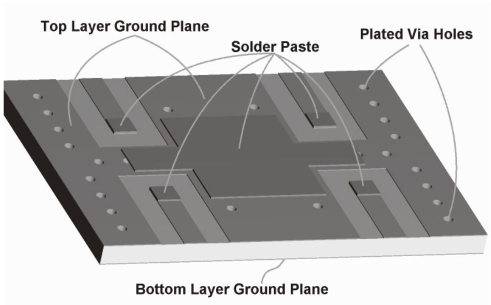


Figure 2: Solder Paste Application

Coupler Positioning: The surface mount coupler can be placed manually or with automatic pick and place mechanisms. Couplers should be placed (see Figure 3 and 4) onto wet paste with common surface mount techniques and parameters. Pick and place systems must supply adequate vacuum to hold a 0.50-0.55 gram coupler.

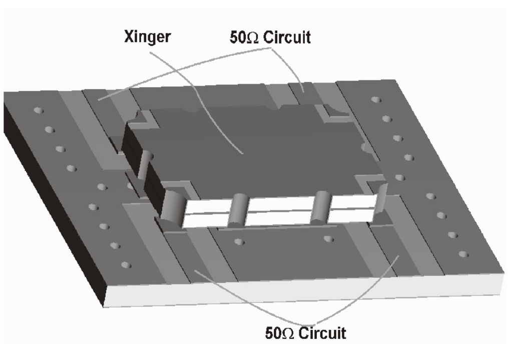


Figure 3: Component Placement

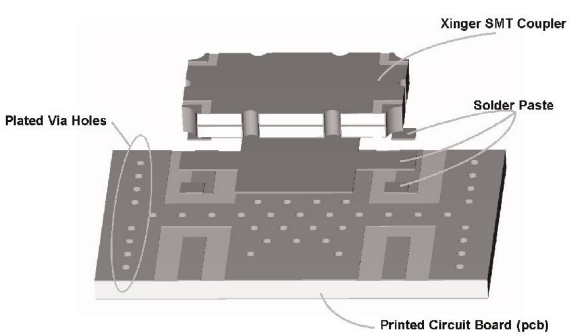


Figure 4: Mounting Features Example

Reflow: The surface mount coupler is conducive to most of today's conventional reflow methods. A low and high temperature thermal reflow profile are shown in Figures 5 and 6, respectively. Manual soldering of these components can be done with conventional surface mount non-contact hot air soldering tools. Board pre-heating is highly recommended for these selective hot air soldering methods. Manual soldering with conventional irons should be avoided.

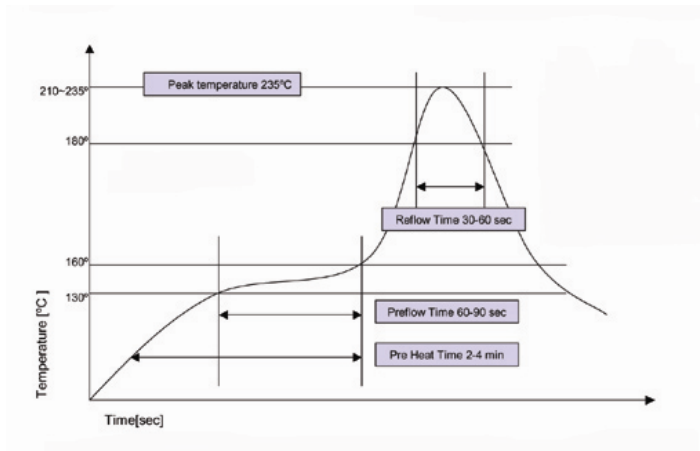


Figure 5 – Low Temperature Solder Reflow Thermal Profile

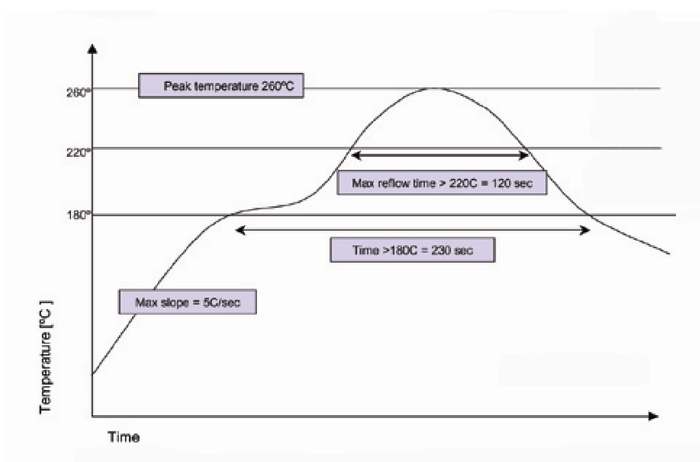
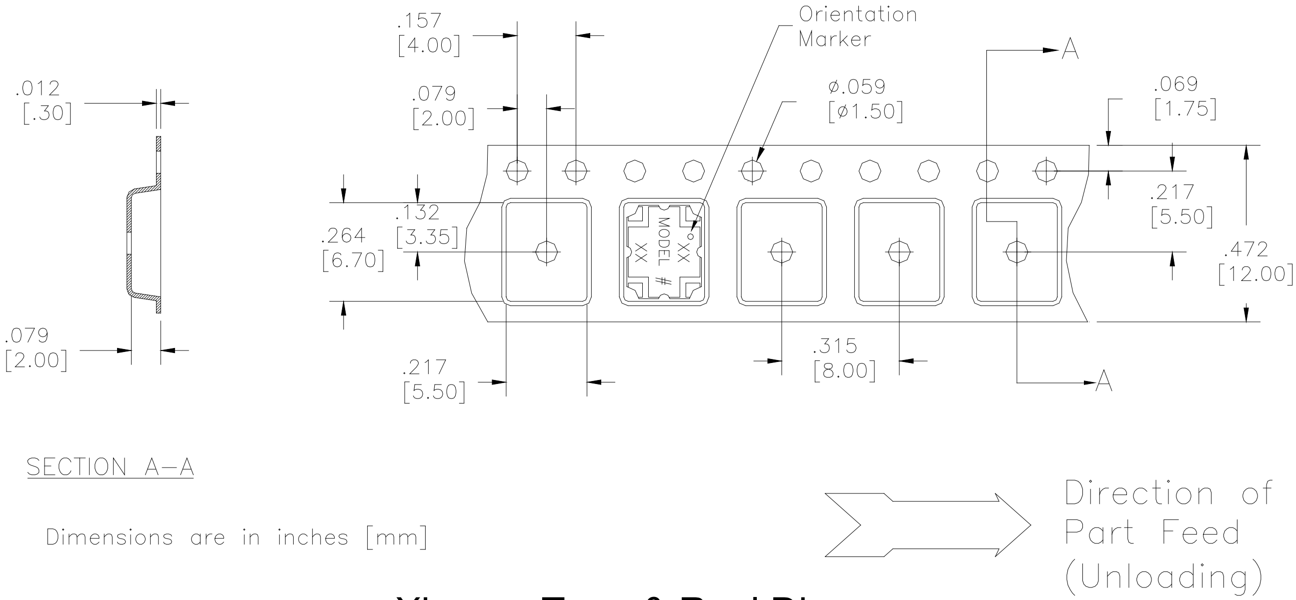


Figure 6 – High Temperature Solder Reflow Thermal Profile

PACKAGING

Packaging follows EIA-481-2. Parts are oriented in tape as shown below. Minimum order quantities are 2000 per reel .



Xinger® Tape & Reel Diagram

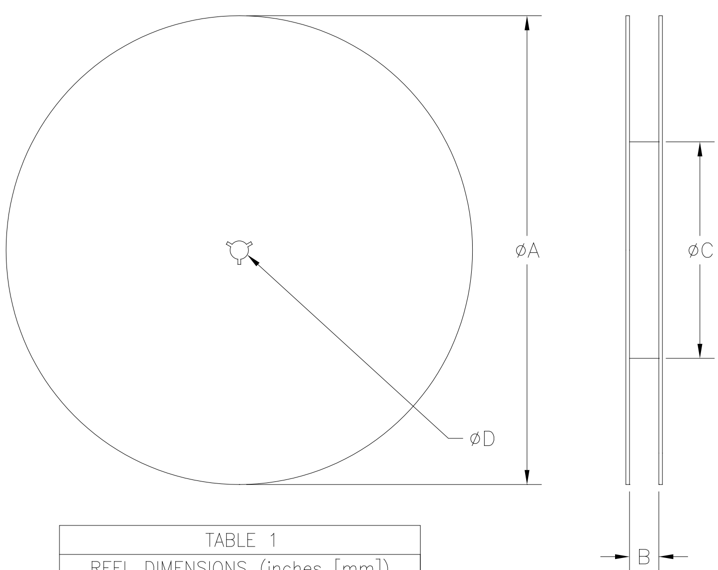
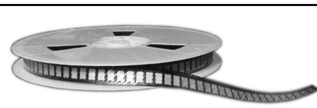


TABLE 1	
REEL DIMENSIONS (inches [mm])	
øA	13.3 [333.0]
B	0.472 [12.0]
øC	4.017 [102.03]
øD	0.512 [13.0]



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