

**GC4701-6LP Datasheet**  
**RoHS-Compliant Control Devices**  
**DC–15 GHz Surface Mount Limiter PIN Diode**



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# 1 Revision History

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The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1 Revision 1.0

Revision 1.0 was the first publication of this document.

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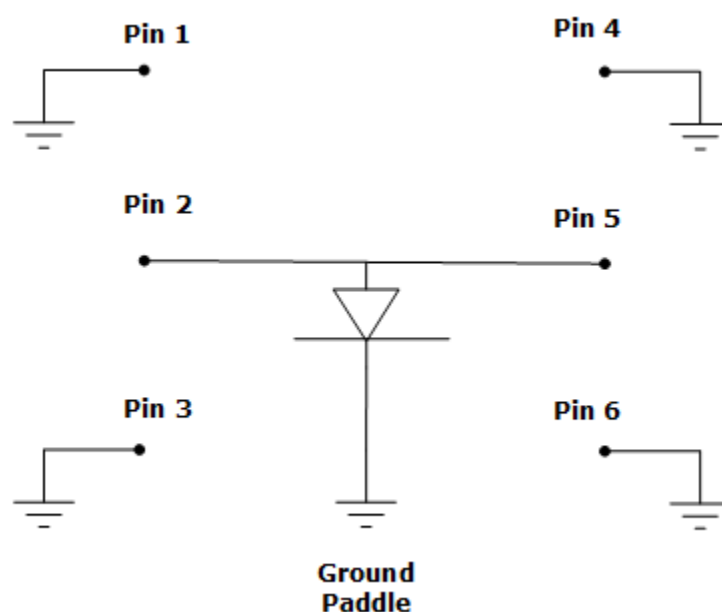
## 2 Product Overview

The GC4701-6LP SMT PIN limiter element is a specially processed PIN diode packaged in a convenient, low-cost plastic outline suitable for standard or co-planar microstrip circuits. Featuring low-loss, low turn-on, and high self-biased isolation, this device is designed for use in passive or active limiters at frequencies through X-band.

This surface mount limiter meets RoHS requirements according to EU directives 2011/65/EC and 2002/95 EC.

The following illustration shows the primary functional blocks of the GC4701-6LP device.

**Figure 1 Functional Block Diagram**



### 2.1 Applications

A diode limiter is a power-sensitive variable attenuator that uses the non-linear properties of the diode to provide an impedance mismatch when sufficient amounts of RF power are incident on the device. The output power is reduced to a level that will not overdrive a receiver, burn out a mixer, or otherwise compromise the device. For varying input power levels in excess of the diode's threshold level, the limiter's output power tends to remain constant.

A passive limiter is one in which the limiter diodes are turned on by the RF signal itself. An active limiter is one in which the limiter diodes are turned on primarily by an external bias current typically supplied by a Schottky detector diode that senses the incident signal.

Since limiter diodes are not designed to dissipate large amounts of power, the limiter must reflect or divert the excess incident power back to the source or to another load (through a circulator or a hybrid coupler, for example).

Limiter diodes may be used in wave guides, coax, microstrip, stripline, or other media. Single or cascaded devices may be used, depending on power levels.

### 2.1.1 Benefits

The GC4701-6LP device provides the following application benefits:

- Receiver protection circuits
- Amplifier protection

## 2.2 Key Features

The following are key features of the GC4701-6LP device:

- Low insertion loss: 0.1 dB
- Designed for applications to 15 GHz
- 50 dBm peak and 34.8 dBm CW power
- Excellent flat leakage: 22 dBm
- Low-P1dB compression point: 10 dBm
- Gold-doped for fast turn-on
- Lead-free 1.6mm × 1.6 mm 6-lead plastic QFN package
- RoHS compliant



## 3 Electrical Specifications

### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings at 25 °C unless otherwise specified.

**Table 1 Absolute Maximum Ratings**

Rating	Symbol	Value	Unit
Maximum leakage current (at 80% of minimum-rated $V_B$ )	$I_R$	0.5	$\mu\text{A}$
Forward voltage drop	$V_F$	1.2 at $I_F = 10 \text{ mA}$	V
Operating temperature	$T_{OP}$	–55 to 150	°C
Storage temperature	$T_{STG}$	–65 to 150	°C
ESD sensitivity (HBM)		Class 1A	
Moisture sensitivity level		MSL 1	

### 3.2 Device Electrical Parameters

The following table shows the device electrical parameters at 25 °C where the pulse length is 1  $\mu\text{s}$ .

**Table 2 Device Electrical Parameters**

Model Number	$V_b$  $I_R = 10 \mu\text{A}$ (Min)	$C_{t0}$  at 0 V (Typ)	$C_{t-6}$  at 6 V (Max)	$R_s$  at 10 mA (Typ)	$T_L$  (Typ)	$\theta P^1$  Thermal Resistance (Typ)	$\theta P$  Thermal Resistance (Max)
GC4701-6LP	20 V	0.35 pF	0.25 pF	1.5 $\Omega$	10 ns	20 °C/W	50 °C/W

1. Pulse length is 1  $\mu\text{s}$

### 3.3 Typical RF Performance

The following table shows the typical RF performance at 25 °C.

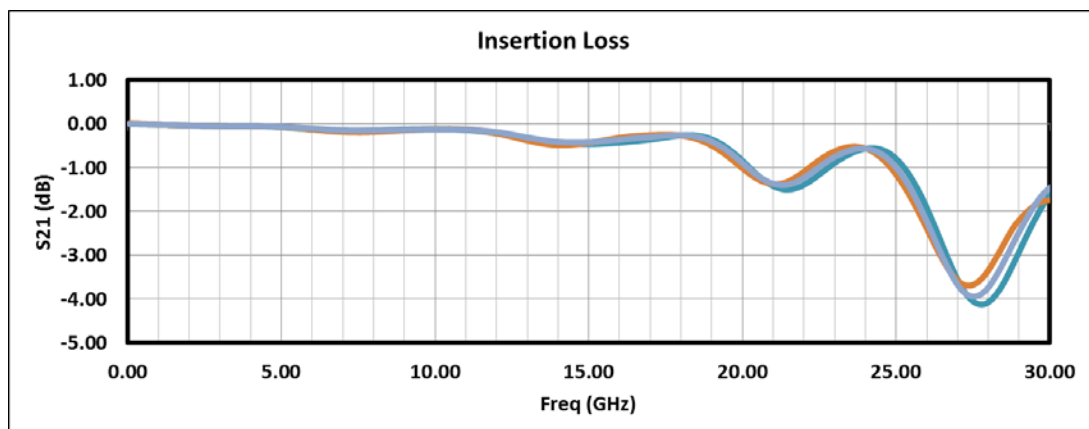
**Table 3 Typical RF Performance**

Model Number	$V_b$ (Min)	Peak Power $P_{IN}$ at 1 $\mu\text{s}$ Duty cycle 0.1%	Typical Leakage $P_{OUT}$	Typical Threshold $P_{1dB}$	Typical INS. Loss $I_L$	Maximum CW Power
GC4701	20	50 dBm	22 dBm	10 dBm	0.1 dB	3 W

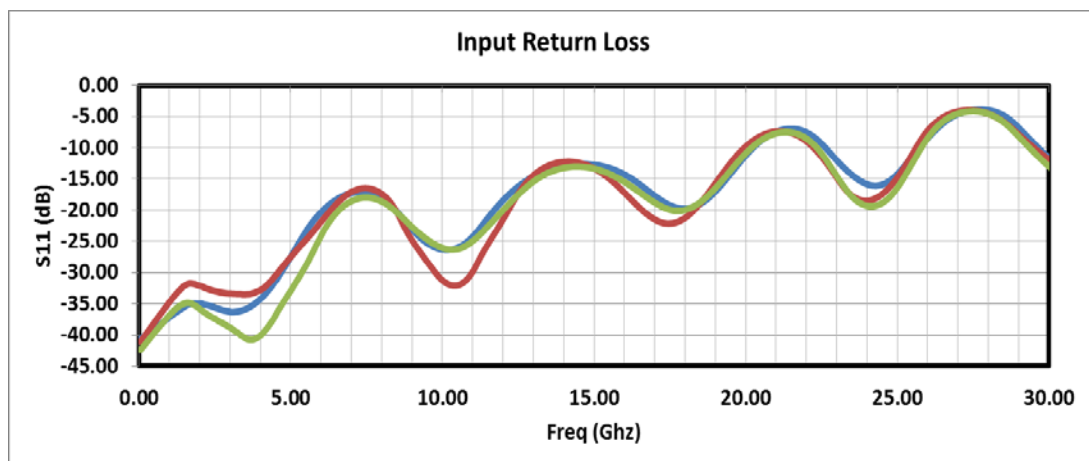
## 4 Small Signal Measurements

The following graphs show the small signal measurement curves of the GC4701-6LP device.

**Figure 2** Insertion Loss



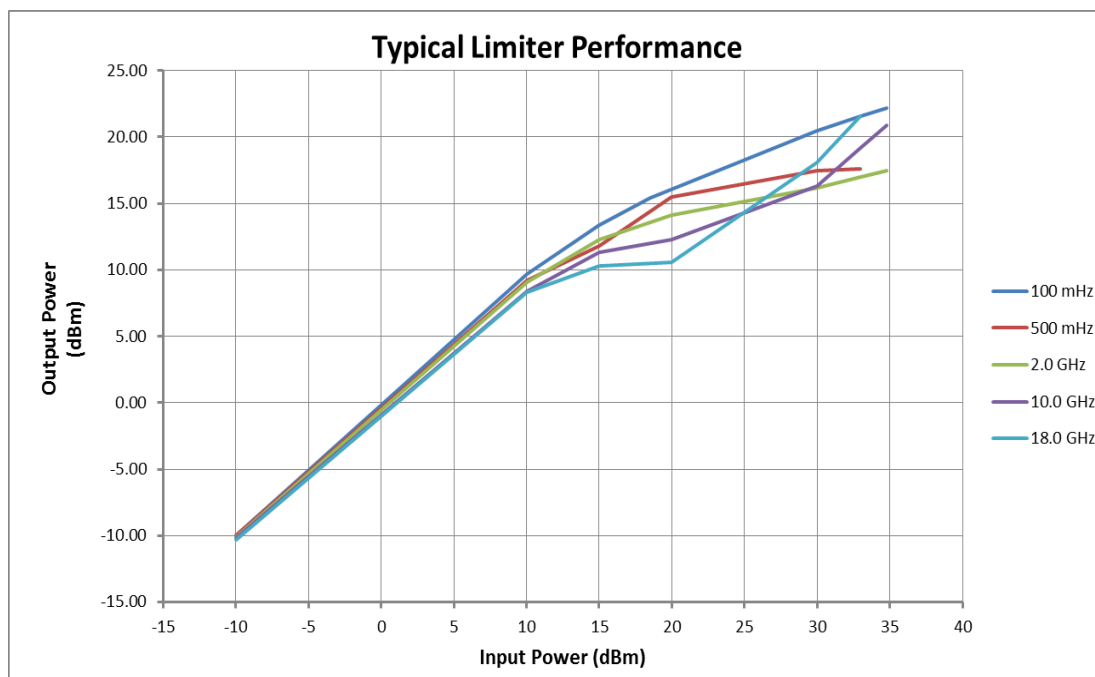
**Figure 3** Input Return Loss



## 5 Transfer Characteristics

The following graph shows the transfer characteristics of the GC4701-6LP device.

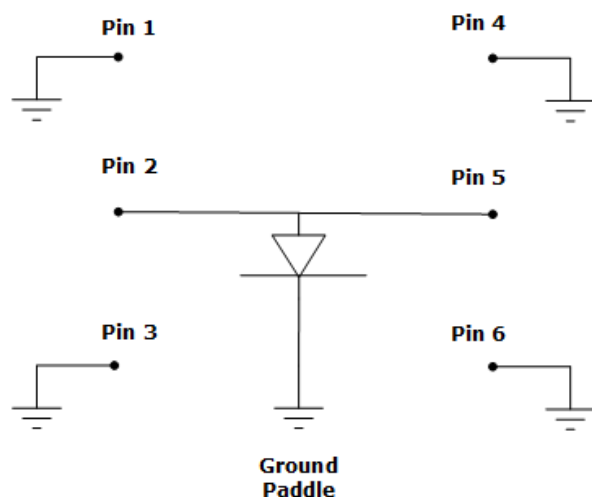
**Figure 4 Typical Limiter Performance**



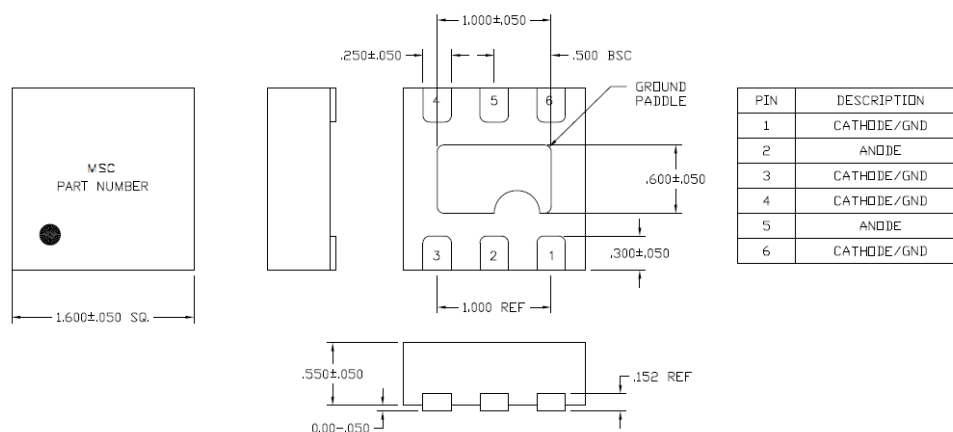
## 6 Package Outline

The following illustration shows the package outline of the GC4701-6LP device. Units are in millimeters.

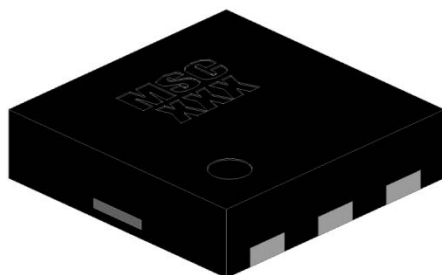
**Figure 5 Functional Block Diagram**



**Figure 6 Package Dimensions**



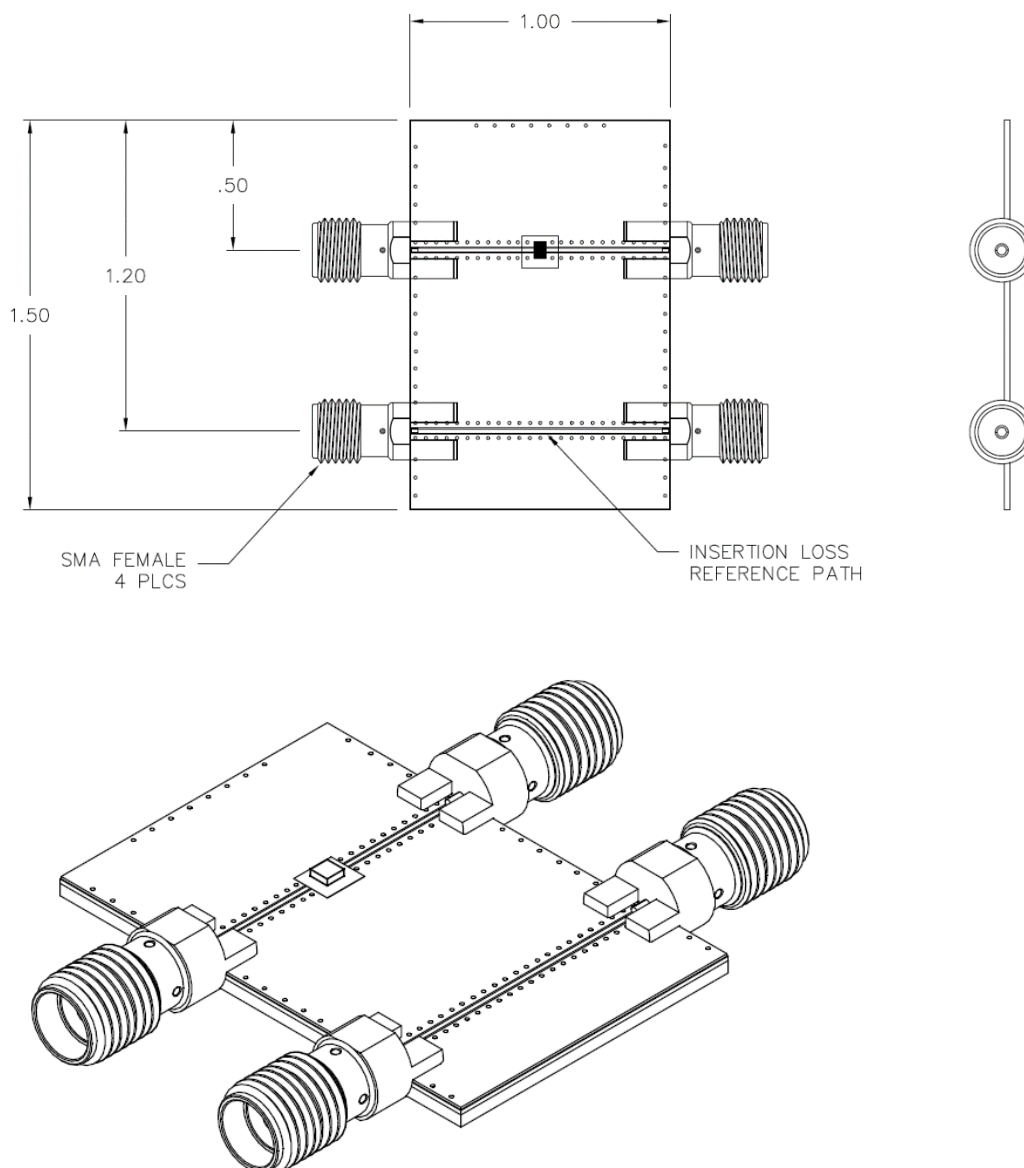
**Figure 7 Package Outline**



## 7 Evaluation Board Assembly

The following illustrations show the evaluation board assembly of the GC4701-6LP device (ordering part number: MSTF0012). The board material is 0.016 Rogers 4003, 0.5 oz. copper cladding on both sides (starting thickness). It has a full-metal backside and an electroless nickel immersion gold (ENIG) finish on both sides. Solder mask is applied to the topside only. Units are in inches.

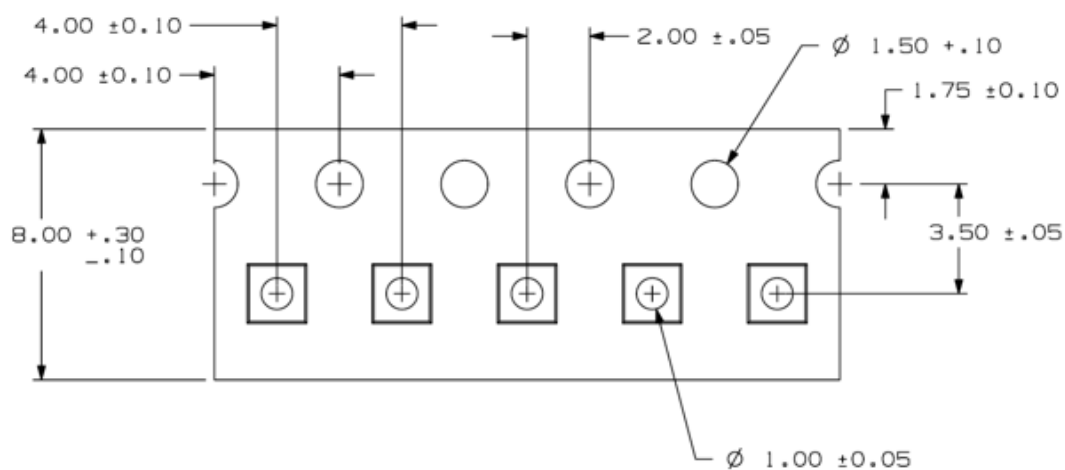
**Figure 8 Evaluation Board Assembly**



## 8 Tape-and-Reel Format

The following illustration shows the tape-and-reel format of the GC4701-6LP device.

**Figure 9** Tape-and-Reel Format



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## 9 Ordering Information

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The following table shows the ordering information for the GC4701-6LP device.

**Table 4 Ordering Information**

Part Number	Package
GC4701-6LP	Plastic QFN
MSTF0012	Evaluation board assembly

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