

GC9952-6LP
Datasheet
Schottky—Surface Mount Limiting Diode Driver RoHS
Compliant

Preliminary
December 2017

Contents

1	Revision History	1
1.1	Revision 1.0	1
2	Product Overview	2
2.1	Applications	2
2.2	Benefits	2
2.3	Key Features	2
3	Electrical Specifications	3
3.1	Absolute Maximum Ratings	3
3.2	Device Electrical Parameters	3
4	Small Signal Characteristics	4
5	Transfer Characteristics	5
5.1	CW Multi-Stage Transfer Characteristics	5
5.2	Pulsed Multi-Stage Transfer Characteristics	7
6	Application Schematic	9
7	Package Specifications	10
7.1	Package Dimensions	10
7.2	Package Outline	10
8	Evaluation Board Assembly	11
9	Tape-and-Reel Format	12
10	Ordering Information	13

1 **Revision History**

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 published in December 2017. It was the first publication of this document.

2 Product Overview

This SMT limiting diode driver element consists of a specially processed Schottky 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 drive current, this device is designed for use in active limiters at frequencies through X-band.

This surface mount limiter meets RoHS requirements per EU Directive 2011/65/EC and 2002/95 EC.

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 (for example, through a circulator or a hybrid coupler).

The QFN limiting diode elements may be used in microstrip, co-planar microstrip, or other media. Single or cascaded devices may be used, depending on power levels.

2.2 Benefits

The GC9952-6LP device provides the following application benefits:

- Receiver protection circuits
- Amplifier protection

2.3 Key Features

The following are key features of the GC9952-6LP device:

- Small 1.6 mm × 1.6 mm QFN
- GC9952-6LP: Schottky driver
- Low loss: 0.2 dB at 6 GHz
- Multistage designs
 - GC4212-6LP: Input PIN diode
 - GC4701-6LP: Output PIN diode
- Suitable for applications to 15 GHz
- RoHS compliant

3 Electrical Specifications

This section describes the electrical specifications of the GC9952-6LP device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the GC9952-6LP device.

Table 1 • Absolute Maximum Ratings

Rating	Symbol	Value	Unit
Operating temperature	T _{OP}	–55 to 150	°C
Storage temperature	T _{STG}	–65 to 150	°C
ESD sensitivity (HBM)		Class 0	
Moisture sensitivity level		MSL 1	

3.2 Device Electrical Parameters

The following table shows the GC9952-6LP device electrical parameters at 25 °C.

Table 2 • Device Electrical Parameters

Parameter	Units	Condition	Min	Typ	Max
V _B	V	I _R = 10 μA	2	3	
CT	pF	V _R = 0 V, f = 1 MHz		0.4	0.5
R _d	Ω	I _F = 10 mA		12	15
Carrier lifetime	ps	I _F = 5 mA			100
Thermal resistance	°C/W	I heat = 0.5 A			500

4 Small Signal Characteristics

The following graphs show the small signal characteristic curves of the GC9952-6LP device.

Figure 1 • GC9952-6LP Insertion Loss

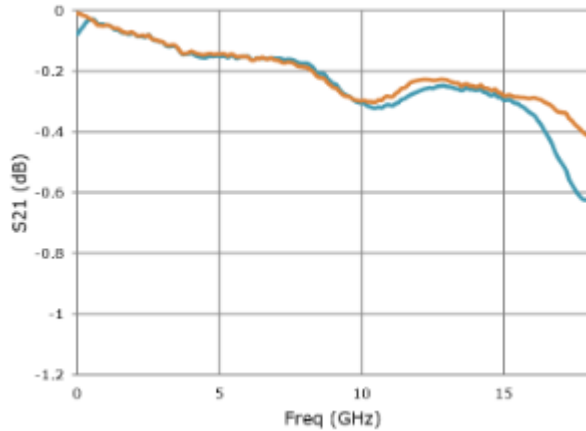


Figure 2 • GC9952-6LP Input Return Loss

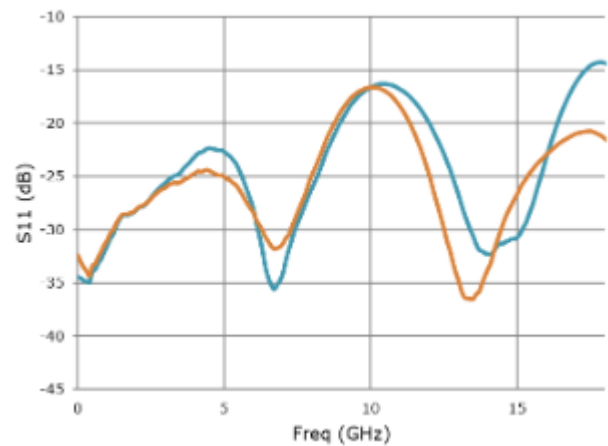


Figure 3 • GC4212-6LP/GC9952-6LP Insertion Loss

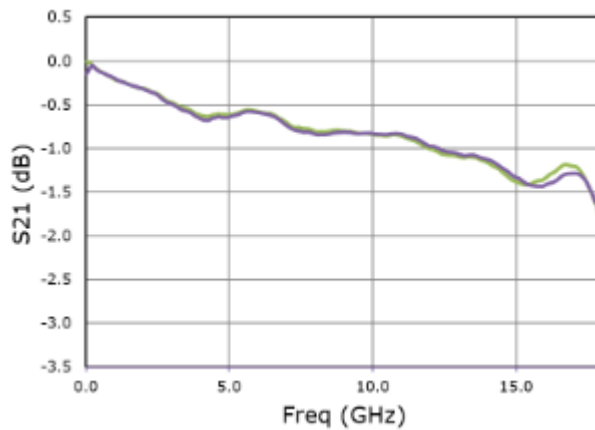


Figure 4 • GC4212-6LP/GC9952-6LP Input Return Loss

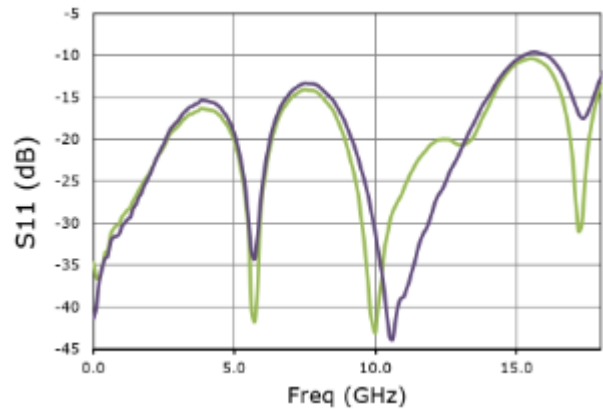


Figure 5 • GC4212-6LP/GC4701-6LP/GC9952-6LP Insertion Loss

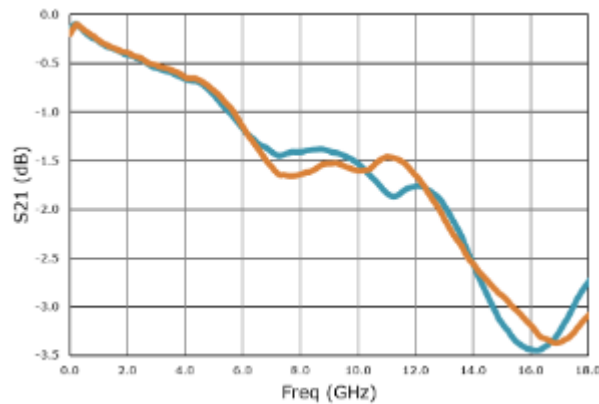
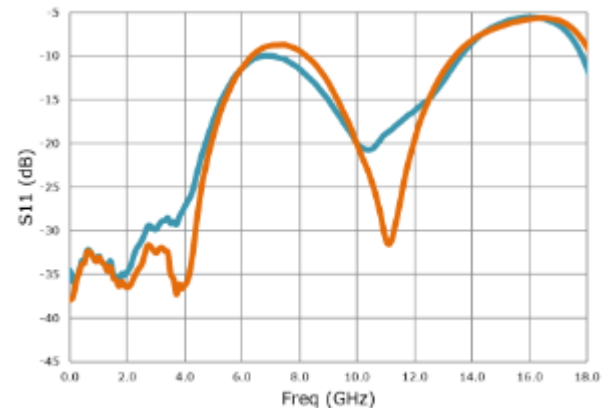


Figure 6 • GC4212-6LP/GC4701-6LP/GC9952-6LP Input Return Loss



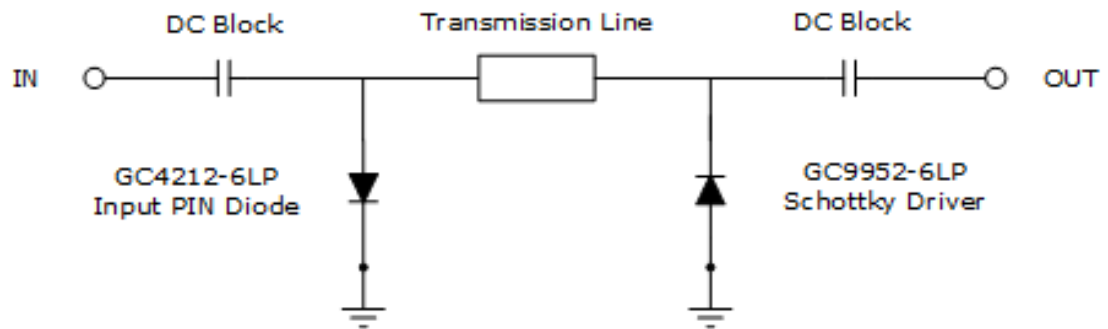
5 Transfer Characteristics

The following sections describe the transfer characteristics of the GC9952-6LP device.

5.1 CW Multi-Stage Transfer Characteristics

The following illustration shows the CW multi-stage transfer characteristics for the GC4212-6LP and GC9952-6LP devices.

Figure 7 • GC4212-6LP and GC9952-6LP Application Schematic



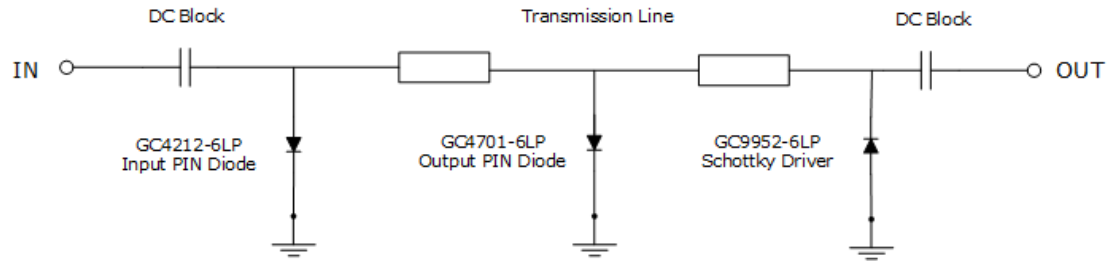
The following graph shows the CW multi-stage transfer characteristics of the GC4212-6LP and GC9952-6LP devices.

Figure 8 • GC4212-6LP and GC9952-6LP CW Multi-Stage Transfer Characteristics



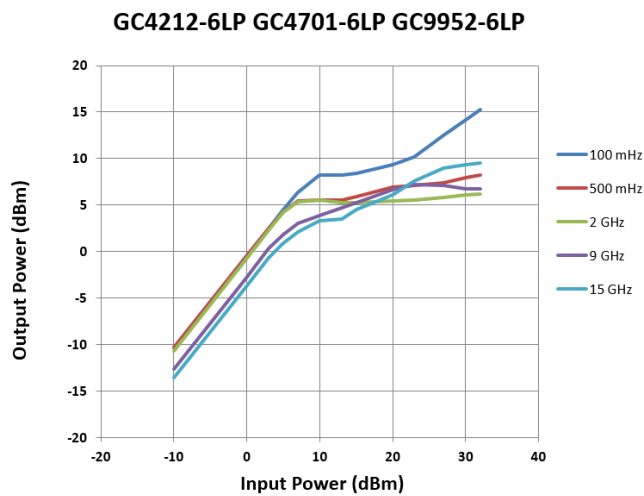
The following illustration shows the CW multi-stage transfer characteristics for GC4212-6LP, GC4701-6LP, and the GC9952-6LP devices.

Figure 9 • GC4212-6LP, GC4701-6LP, and GC9952-6LP Application Schematic



The following graph shows the CW multi-stage transfer characteristics of the GC4212-6LP, GC4701-6LP, and the GC9952-6LP devices.

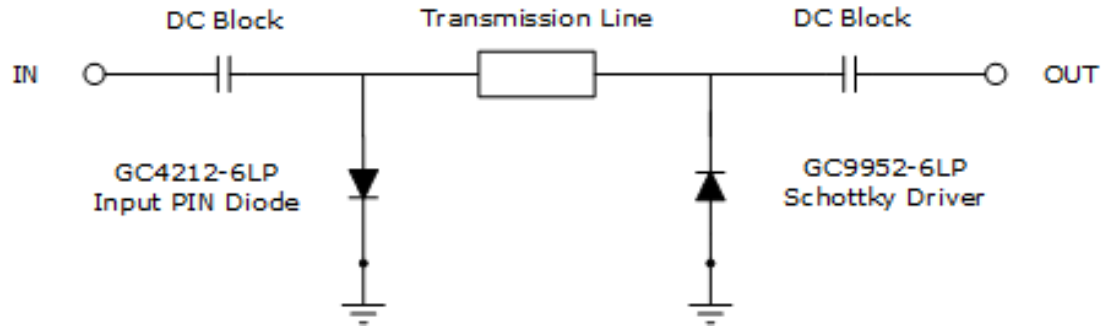
Figure 10 • GC4212-6LP, GC4701-6LP, and GC9952-6LP CW Multi-Stage Transfer Characteristics



5.2 Pulsed Multi-Stage Transfer Characteristics

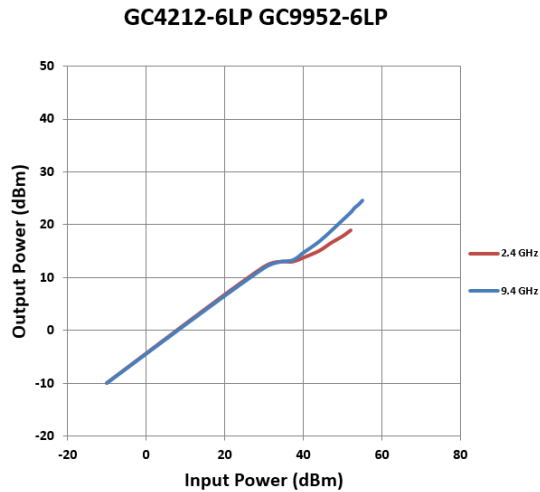
The following illustration shows the application schematic for GC4212-6LP and GC9952-6LP devices (at 1 μ s pulse width, 0.1% duty cycle).

Figure 11 • GC4212-6LP and GC9952-6LP Application Schematic



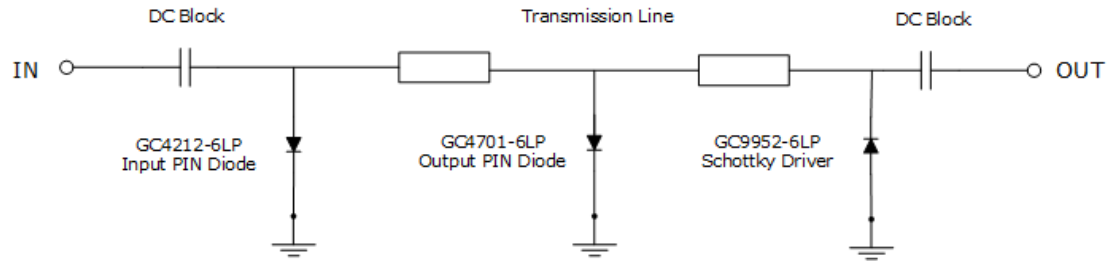
The following graph shows the pulsed multi-stage transfer characteristics of the GC4212-6LP and GC9952-6LP devices.

Figure 12 • GC4212-6LP and GC9952-6LP Pulsed Multi-Stage Transfer Characteristics



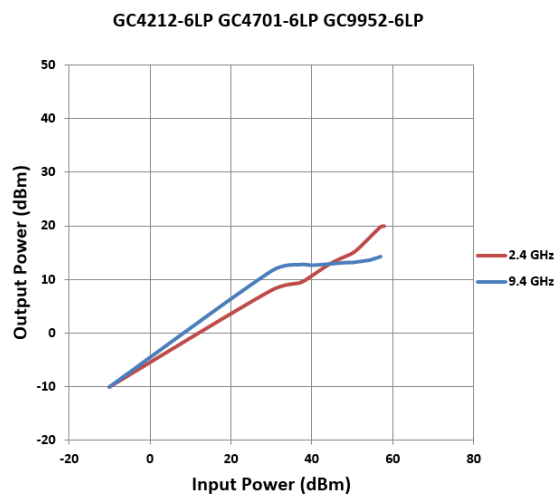
The following illustration shows the application schematic for GC4212-6LP, GC4701-6LP, and the GC9952-6LP devices.

Figure 13 • GC4212-6LP, GC4701-6LP, and GC9952-6LP Application Schematic



The following graph shows the pulsed multi-stage transfer characteristics of the GC4212-6LP, GC4701-6LP, and the GC9952-6LP devices.

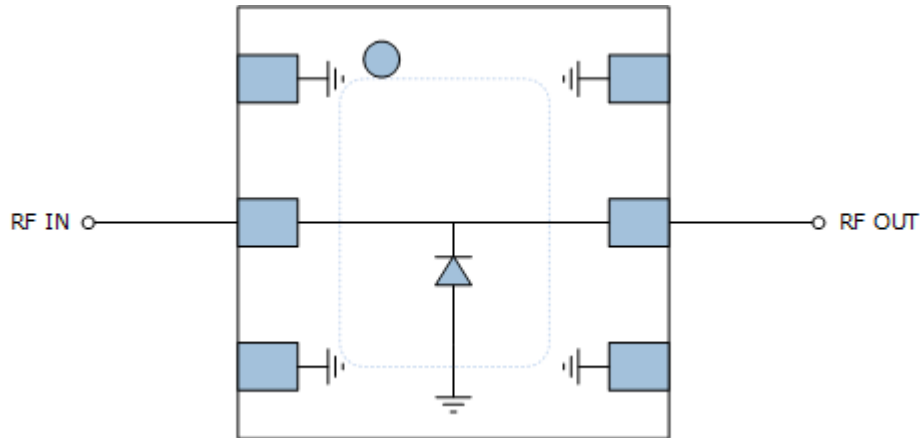
Figure 14 • GC4212-6LP GC4701-6LP GC9952-6LP Graph



6 Application Schematic

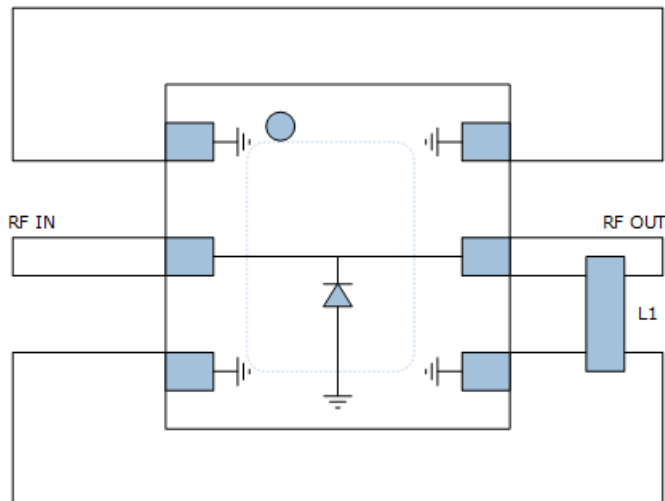
The following illustration shows the application schematic for the GC9952-6LP device.

Figure 15 • Application Schematic



The following illustration shows the recommended board layout for the GC9952-6LP device.

Figure 16 • Recommended Board Layout



The following table lists the recommended inductor values for given frequency ranges.

Table 3 • Inductor Values

Band Width (GHz)	L1 (nH)
1–2	40–50
2–4	20–25
4–8	10–20
8–15	8–12
1–12	40–50

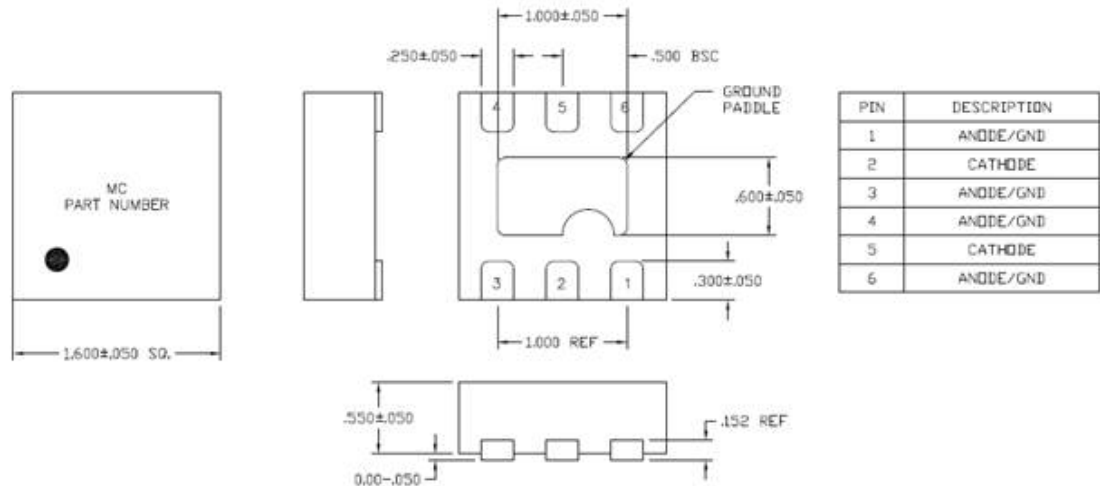
7 Package Specifications

This section details the package specifications of the GC9952-6LP device.

7.1 Package Dimensions

The following illustration shows the package outline of the GC9952-6LP device. Dimensions are in millimeters [inches].

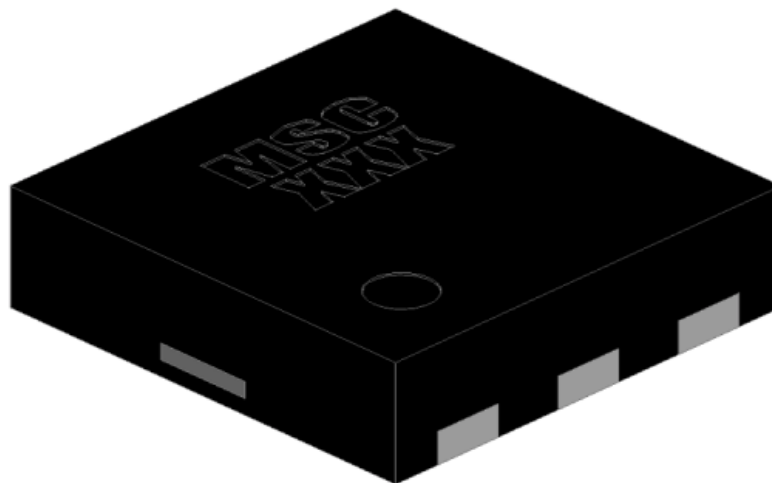
Figure 17 • Package Dimensions



7.2 Package Outline

The following illustration shows the package outline of the GC9952-6LP device. For additional packaging information, contact your Microsemi sales representative.

Figure 18 • Package Outline



8 Evaluation Board Assembly

The following illustrations show the evaluation board assembly of the GC9952-6LP device. 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.

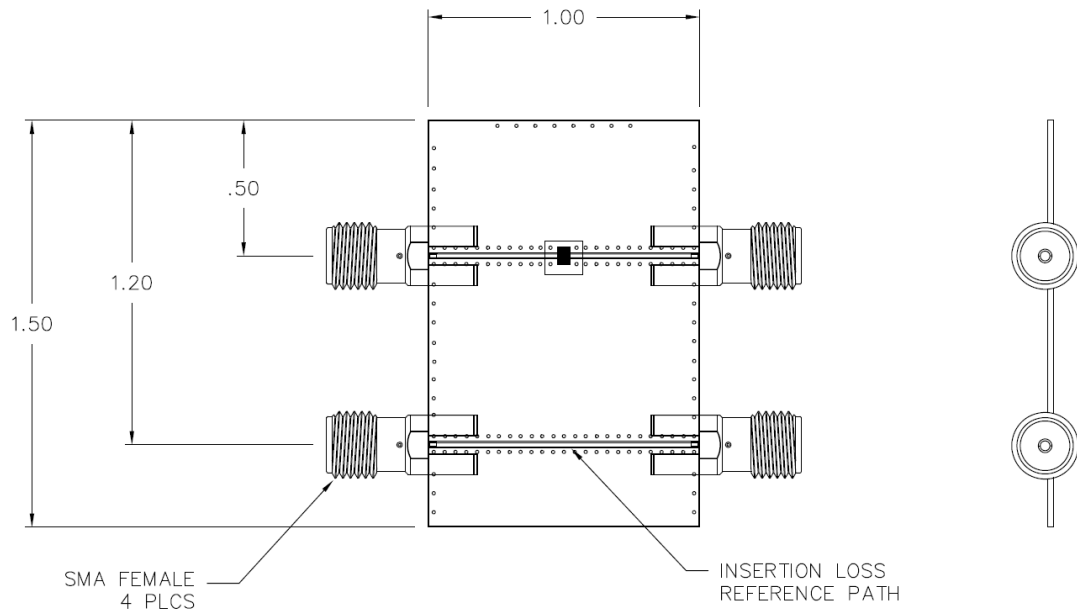
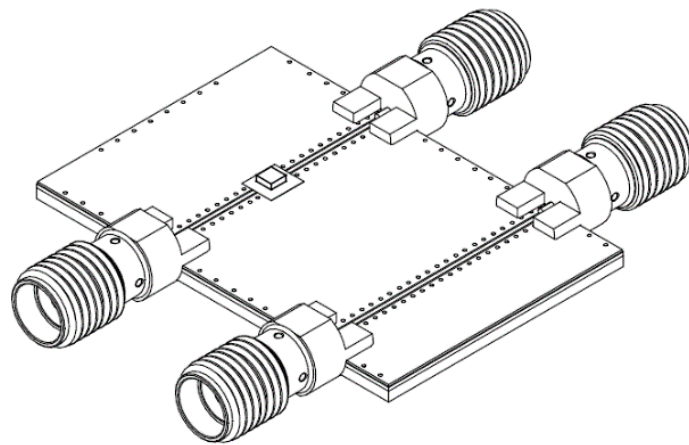


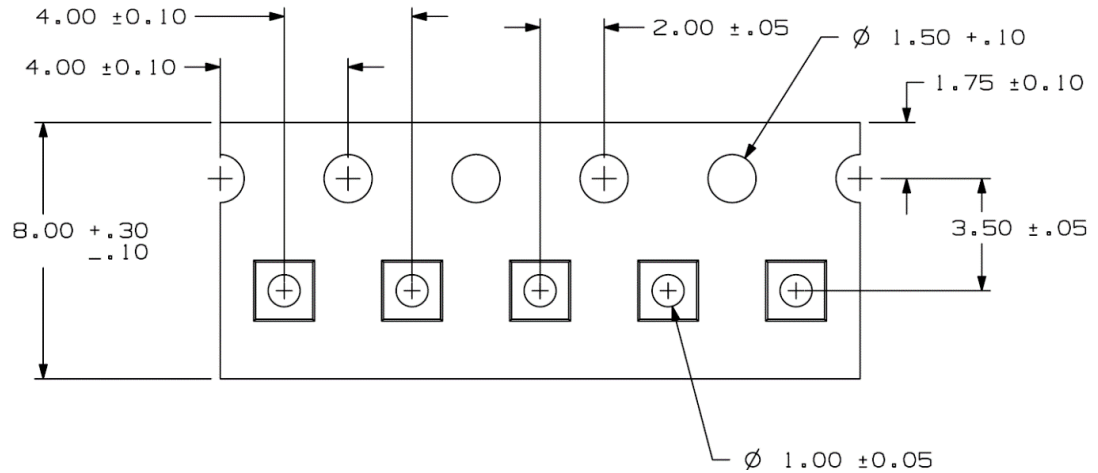
Figure 19 • Evaluation Board Assembly



9 Tape-and-Reel Format

The following illustration shows the tape-and-reel format of the GC9952-6LP device.

Figure 20 • Tape-and-Reel Format



10 Ordering Information

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

Table 4 • Ordering Information

Part Number	Package
GC9952	6LP 1.6 × 1.6 QFN

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