MPS4101-6LP Datasheet

50 MHz–25 GHz RoHS-Compliant Control Device
QFN SPST PIN

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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 the first publication of this document.

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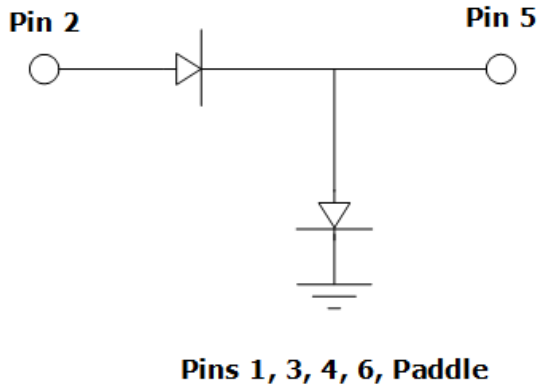
2 Product Overview

The MPS4101-6LP is a QFN-packaged series/shunt element. The parasitic inductance is minimized in this design resulting in wide-band, low-loss, high-isolation performance.

This product meets RoHS requirements according to EU directives 2011/65/EC and 2002/95 EC. The standard terminal finish is matte tin unless otherwise specified. Contact your Microsemi representative if you have special requirements.

The following illustration shows the primary functional blocks of the MPS4101-6LP device.

Figure 1 Functional Block Diagram



2.1 Applications

This shunt/series QFN-packaged switching element provides optimum insertion loss and isolation characteristics up to 25 GHz. It replaces the conventional shunt-mounted chip and series-mounted beam lead pin diode normally used in the manufacture of broadband microwave switches.

The QFN package facilitates ease of installation and high production yield with little danger of device degradation at assembly as a result of bonding trauma. It is compatible with automatic insertion equipment. Additionally, the device's power-handling ability is enhanced by the superior heat conduction path inherent in the series portion of this monolithically fabricated switching element.

2.1.1 Benefits

The MPS4101-6LP device provides the following application benefits:

- 0.05 GHz–25 GHz switching
- Improved power handling
- High reliability

2.2 Key Features

The following are key features of the MPS4101-6LP device:

- QFN SPST PIN switch element
- Wide band operation: 0.05 GHz–25 GHz

- Low insertion loss
  - <1.1 dB at 20 GHz
  - <1.5 dB at 25 GHz
- High isolation
  - >30 dB at 20 GHz
  - >25 dB at 25 GHz
- Power handling: 2 W CW
- Rugged silicon monolithic design
- Fast switching: 5 ns typical
- Series capacitance: 0.12 pF typical
- Shunt capacitance: 0.20 pF typical
- 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
Minimum-rated breakdown voltage	V_B	80	V
Storage temperature	T_{ST}	–65 to 200	°C
Operating temperature	T_{OP}	–55 to 150	°C
CW RF operating power	P_{CW}	2	W
Forward DC current	I_F	100	mA
Reverse DC voltage	V_R	100	V
ESD sensitivity (HBM)		Class 1B (500 V)	
Moisture sensitivity level		MSL 1	

3.2 Device Electrical Parameters

The following tables show the device electrical parameters at 25 °C.

Table 2 Device Electrical Parameters

Element	V_b I_R = 10 µA (Min)	C_T at 50 V (Typ)	R_s I_F = 100 mA F = 1.0 GHz (Max)	T_L (Typ)	V_F I_F = 10 mA (Typ)	θ_P Thermal Resistance (Typ)
Series element	80 V	0.12 pF	2.5 Ω	40 ns	1.05 V	100 °C/W
Shunt element	80 V	0.20 pF	0.8 Ω	60 ns	0.85 V	50 °C/W

Table 3 Device Electrical Specifications

Parameter	Conditions	Specification
Insertion loss	50 MHz–5 GHz	0.6 dB max
	50 MHz–10 GHz	0.8 dB max
	50 MHz–20 GHz	1.1 dB max
	50 MHz–25 GHz	1.5 dB max
Return loss	50 MHz–5 GHz	20 dB max
	50 MHz–10 GHz	18 dB max
	50 MHz–20 GHz	16 dB max
	50 MHz–25 GHz	10 dB max
Isolation	50 MHz–5 GHz	45 dB min
	50 MHz–10 GHz	36 dB min
	50 MHz–20 GHz	30 dB min
	50 MHz–25 GHz	28 dB min
1.0 dB compression point	50 MHz–25 GHz	33 dB min
Rise time	10%–90% RF	20 ns max
Fall time	90%–10% RF	5 ns max
IOP3		62 dBm min
IOP2		83 dBm min

Table 4 Bias Table

Bias	Condition
Pin 2 to pin 5: 20 mA	On-state (low loss)
Pin 5 to ground: –10 V	
Pin 2 to pin 5: –10 V	Off-state (isolation)
Pin 5 to ground: 20 mA	

4 Small Signal Measurements

The following graphs show the small signal measurement curves of the MPS4101-6LP device.

Figure 2 Insertion Loss

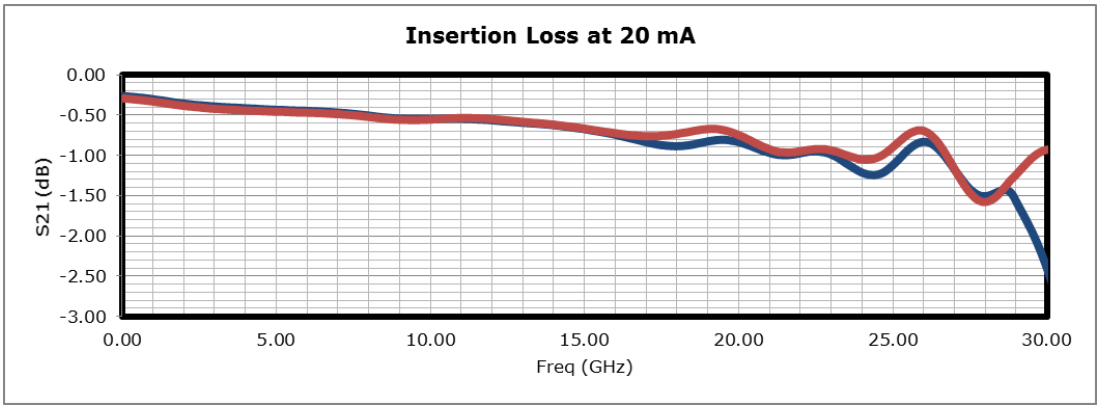


Figure 3 Input Return Loss

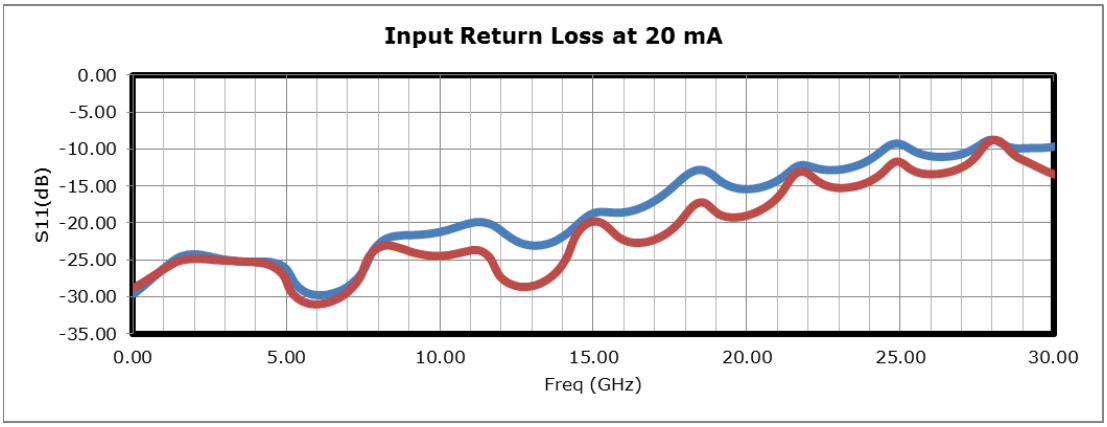
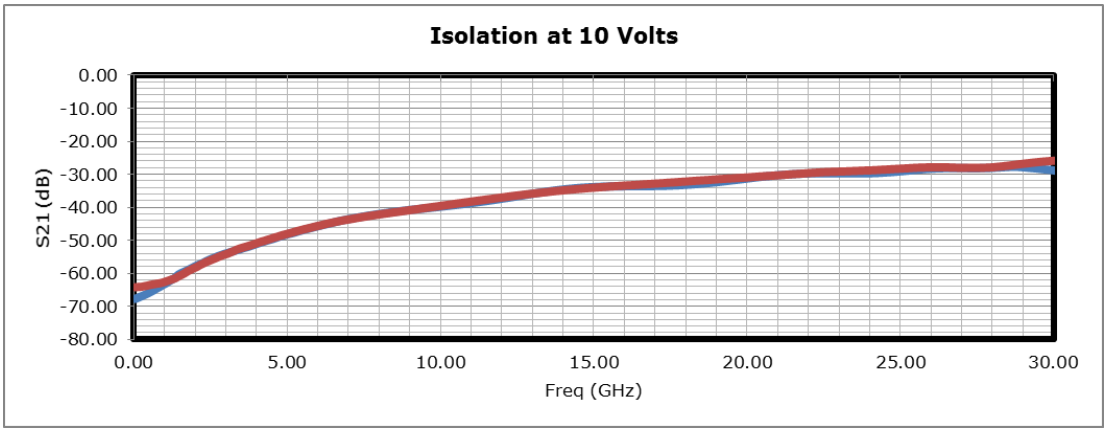


Figure 4 Isolation



5 Package Outline

The following illustration shows the package outline of the MPS4101-6LP device. Units are in millimeters.

Figure 5 Functional Block Diagram

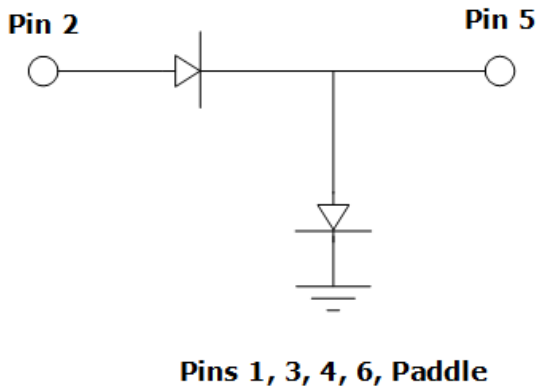
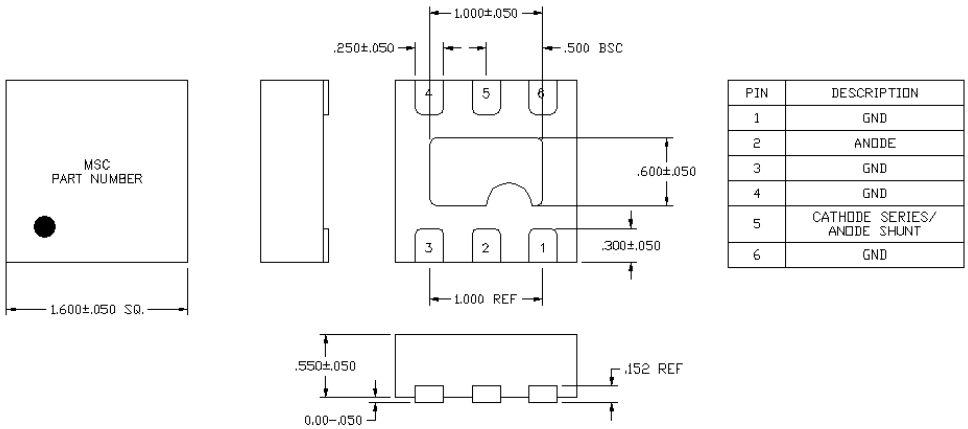
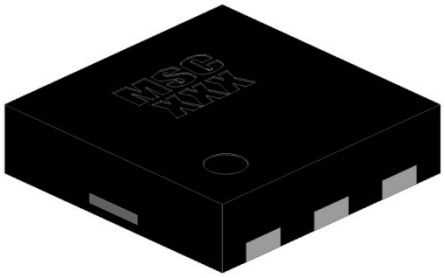


Figure 6 Package Dimensions



PIN	DESCRIPTION
1	GND
2	ANODE
3	GND
4	GND
5	CATHODE SERIES/ ANODE SHUNT
6	GND

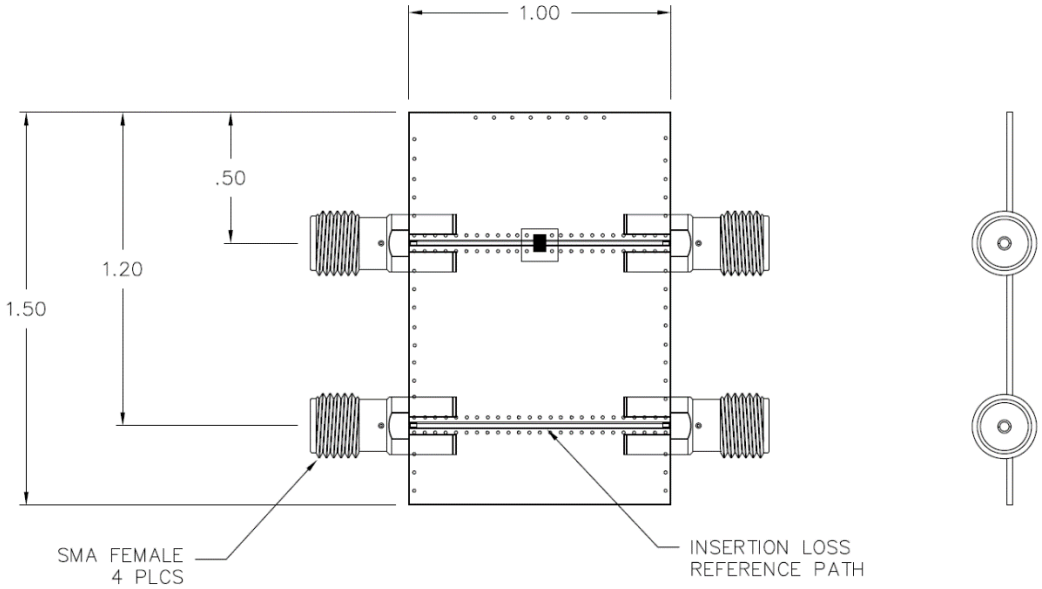
Figure 7 Package Outline

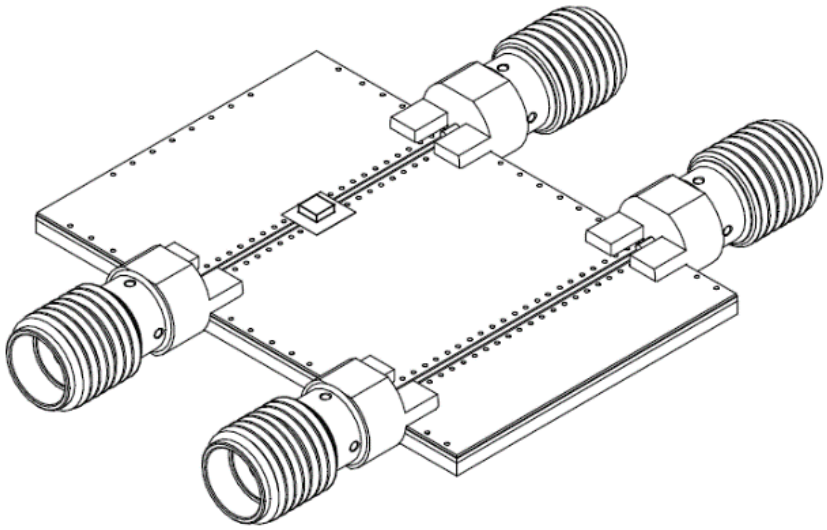


6 Evaluation Board Assembly

The following illustrations show the evaluation board assembly of the MPS4101-6LP 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

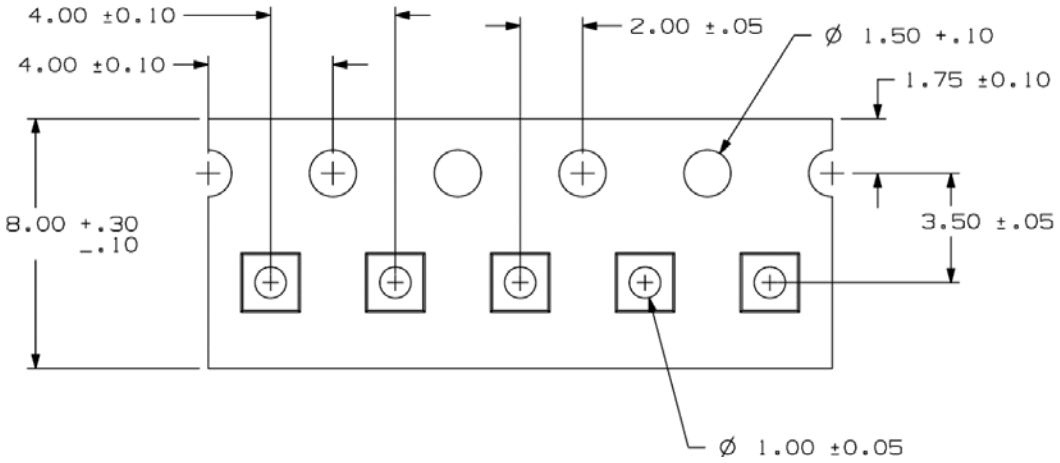




7 Tape-and-Reel Format

The following illustration shows the tape-and-reel format of the MPS4101-6LP device.

Figure 9 Tape-and-Reel Format



8 Ordering Information

The following table shows the ordering information for the MPS4101-6LP device.

Table 5 Ordering Information

Part Number	Package
MPS4101-6LP	Plastic QFN
MSTF0012	Evaluation board assembly