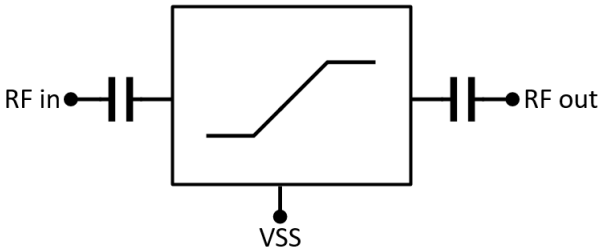
Product Overview

The ASX5001 is a high power GaAs pHEMT reflective Limiter which operates from 3.5 to 6.5 GHz. The ASX5001 features low insertion loss of below 1.4 dB, high OIP3 of >+39 dBm, a typical 1 dB compression point of 11 dBm and 34 dBm CW input power handling. Its high power handling capability besides having high linearity features, makes it ideal for protecting sensitive components and for applications requiring high linearity. This high power limiter is ideal for hybrid and MCM assemblies due to its compact size, consistent output power and DC blocked RF I/O's. All data is measured with the chip in a 50 Ohm test fixture connected via two 0.025 mm (1 mil) diameter bond wires of minimal length 0.51 mm (20 mil).

Functional Block Diagram



Key Features

1. Fully integrated high power reflective limiter
2. Integrated DC blocking at RF input/output
3. Bandwidth: 3.5 GHz to 6.5 GHz
4. Insertion loss <1.4 dB
5. Typical P1dB of +11 dBm
6. Power Handling: 34 dBm (CW), 37 dBm (Pulsed)
7. Below +19 dB leakage power @ 34 dBm CW
8. Reflection of about 75% of input power
9. Fast Recovery Time: <50 ns
10. 50 Ohm Matched Input/output
11. Die Size: 1.24 x 1.12 x 0.1 mm

Applications

1. RF transceivers
2. PIN diode replacement
3. Point-to-point communication

Absolute Maximum Rating

Pulse RF conditions: duty cycle=50%

Gate Bias Voltage (VSS)	-3.5 Vdc
RF Input Power (CW) @ 65°C	34 dBm
RF Input Power (Pulsed) @ 65°C	37 dBm
Channel Temperature	175 °C
Thermal Resistance (channel to ground pad)	55 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +65 °C

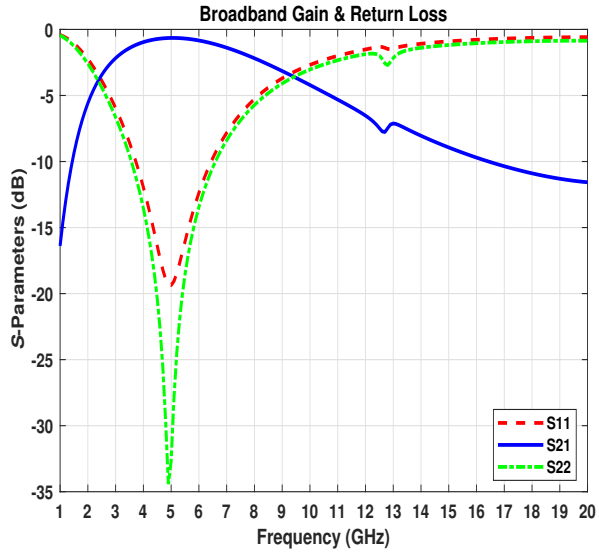

ELECTROSTATIC SENSITIVE DEVICE OBSERVE HANDLING PRECAUTIONS

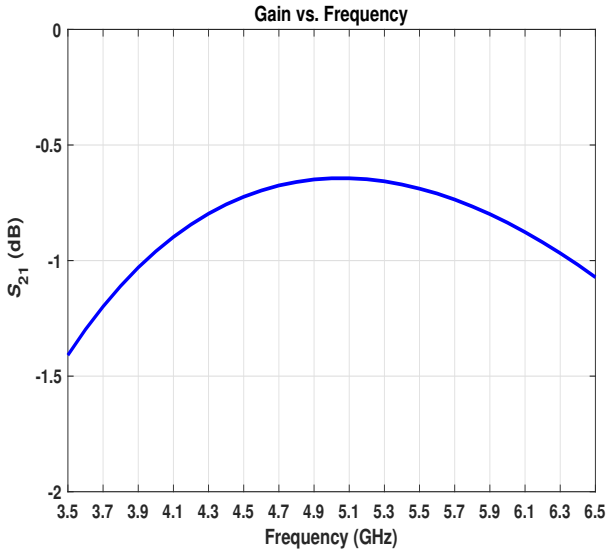
Electrical Specifications

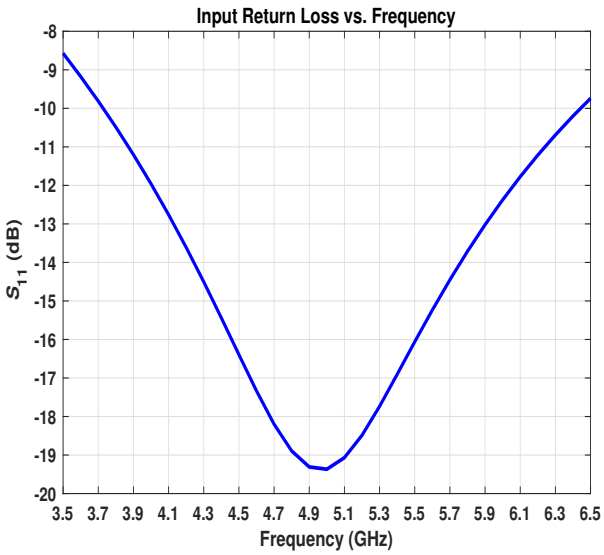
Parameter	Min.	Typ.	Max.	Units
Frequency Range	3.5	-	6.5	GHz
Insertion Loss	-	0.7	1.4	dB
Input Return Loss	-	15	-	dB
Output Return Loss	-	15	-	dB
Output Power for 1 dB Compression (P1dB)	10.7	-	12.5	dBm
Leakage Power @ 34 dBm CW	15	-	19	dBm
Output Third Order Intercept Point (IP3)	39	-	41.5	dBm
Supply Current	-	200	-	µA

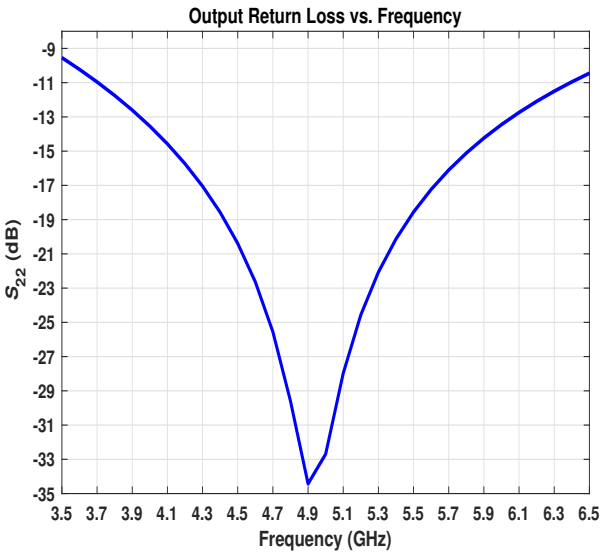
Test conditions unless otherwise noted:TA=+25 °C, VSS=-2.5 V, Iss=200 µA, Z0=50 Ω

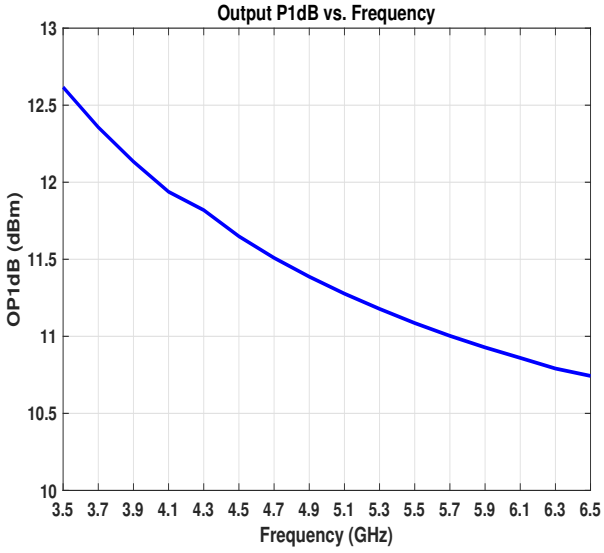
Typical Performance Curves

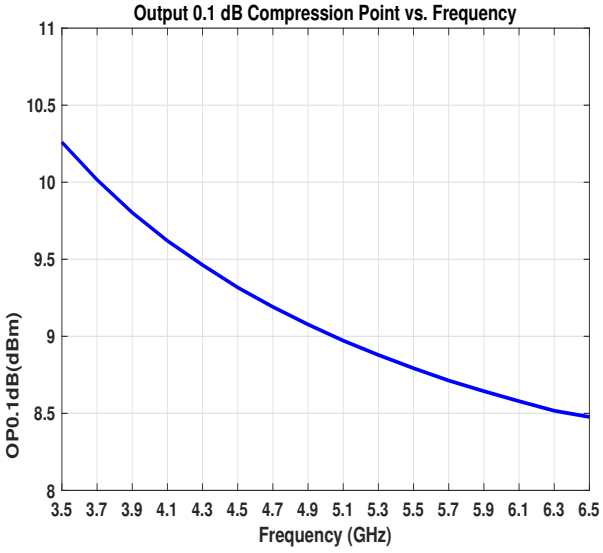












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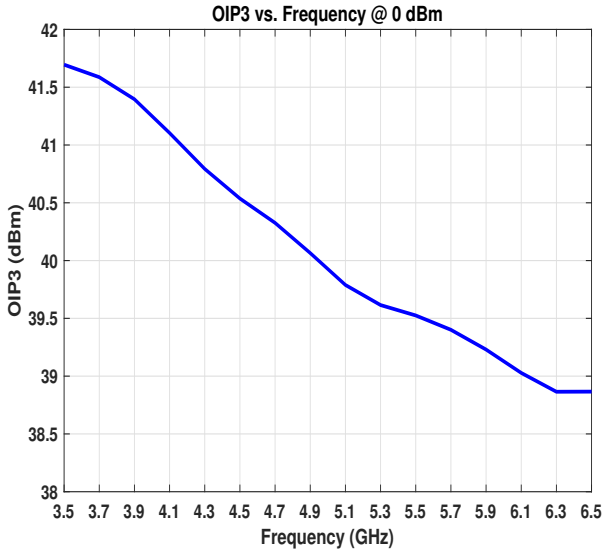
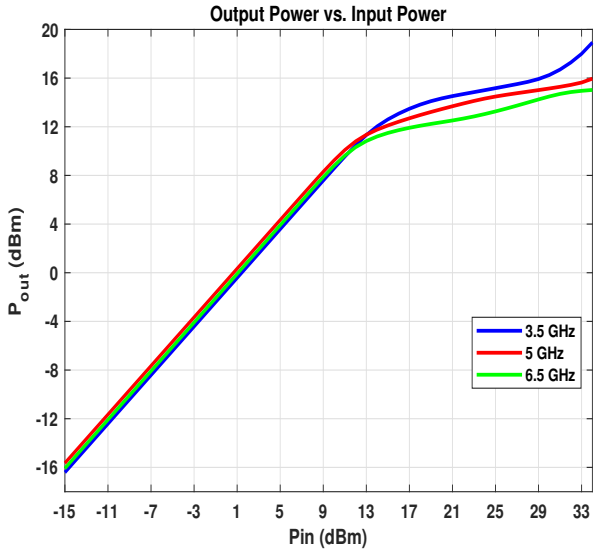
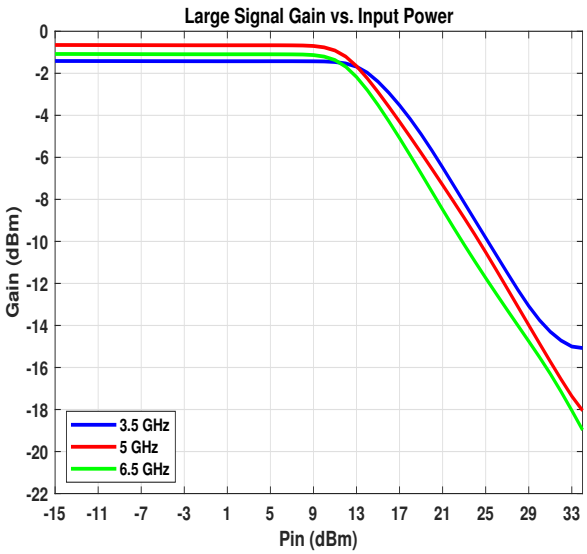
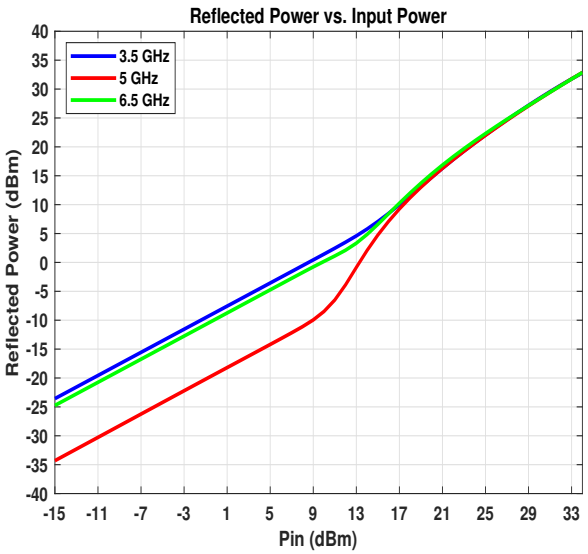
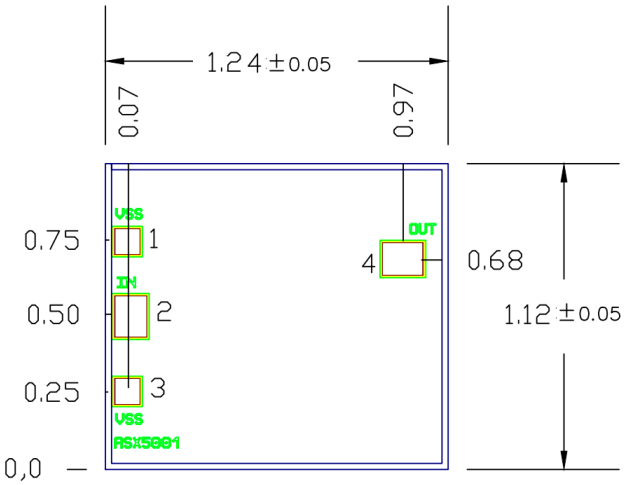








Mechanical Information



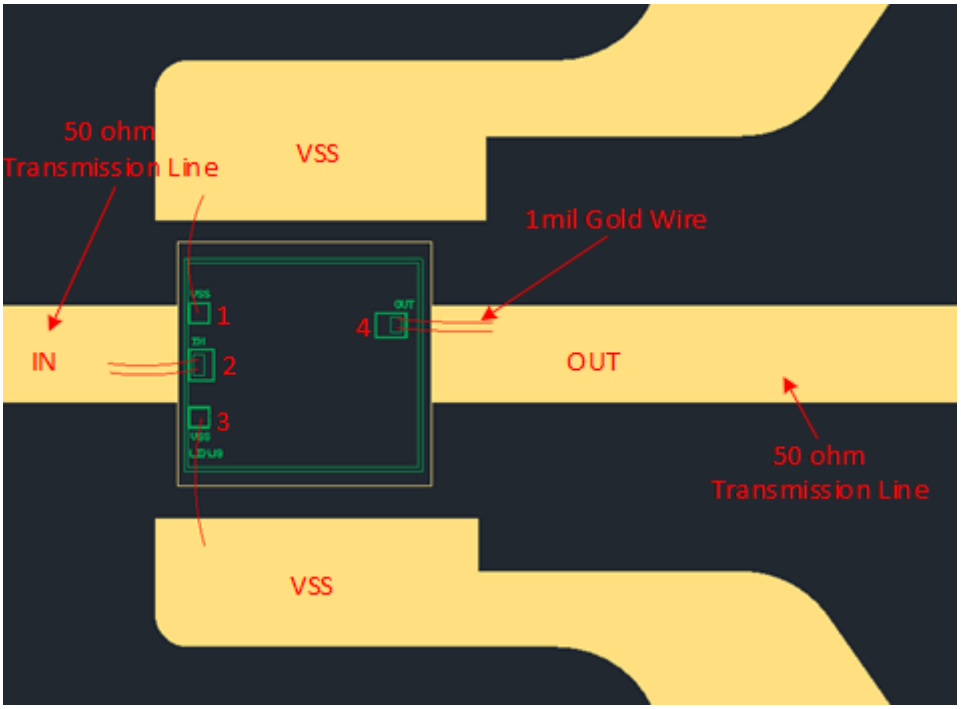
NOTES:

1. ALL DIMENSIONS IN MILLIMETERS
2. DIE THICKNESS IS 100 µm
3. TYPICAL BOND PAD IS 0.01 mm2
4. BACKSIDE METALLIZATION: GOLD
5. BACKSIDE METAL IS GROUND
6. BOND PAD METALLIZATION: GOLD
7. NO CONNECTION REQUIRED FOR UNLABELED BOND PADS
8. Die Size: OVERALL DIE SIZE ±50 µm

Bond Pad Description

2	RF-IN	This pad is AC coupled and matched to 50 Ohms.
4	RF-OUT	This pad is AC coupled and matched to 50 Ohms.
Die bottom	GND	The die bottom is RF/DC ground. The die bottom must be connected to the RF/DC ground.
1,3	VSS	Negative Supply Voltage for the limiter. At least one of the pads must be bonded.

Assembly Diagram



Mounting and Bonding Techniques for Millimeter wave GaAs MMICs

The die should be attached directly to the ground plane eutectically or with conductive epoxy. 50 Ohm Microstrip transmission lines on 0.127mm (5 mil) thick alumina thin film substrates are recommended for bringing RF to and from the chip (Figure 1). If 0.254mm (10 mil) thick alumina thin film substrates must be used, the die should be raised 0.150mm (6 mils) so that the surface of the die is coplanar with the surface of the substrate. One way to accomplish this is to attach the 0.102mm (4 mil) thick die to a 0.150mm (6 mil) thick molybdenum heat spreader (moly-tab) which is then attached to the ground plane (Figure 2). Microstrip substrates should be brought as close to the die as possible in order to minimize bond wire length. Typical die-to-substrate spacing is 0.076mm (3 mils)

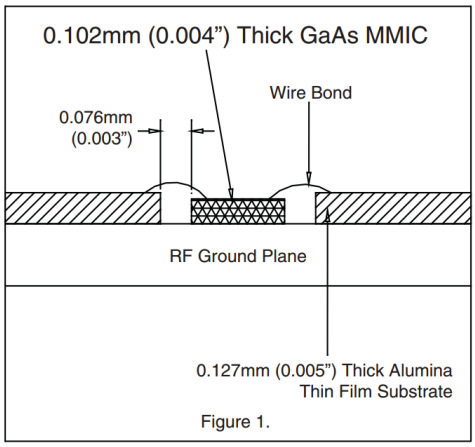


Figure 1.

Handling Precautions

Follow these precautions to avoid permanent damage.
Storage: All bare dies are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.
Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems. Static Sensitivity: Follow ESD precautions to protect against >± 250V ESD strikes.
Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.
General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers.

The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

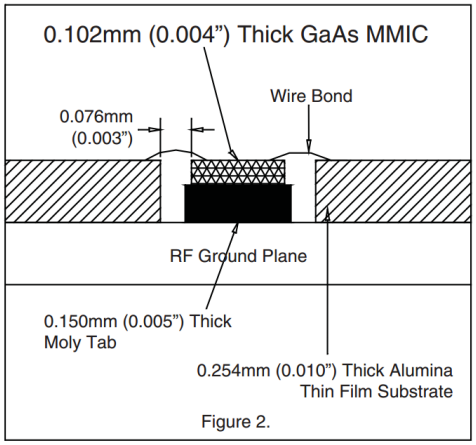


Figure 2.

Mounting

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.
Eutectic Die Attach:A 80/20 gold tin preform is recommended with a work surface temperature of 255 °C and a tool temperature of 265 °C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 °C. DO NOT expose the chip to a temperature greater than 320 °C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.
Epoxy Die Attach: Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

Wire Bonding

Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire is recommended. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.5 mm (20 mils).

Contact Information

For the latest specifications, additional product information:
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