18–40 GHz GaAs MMIC
High Isolation SPST Reflective PIN Switch

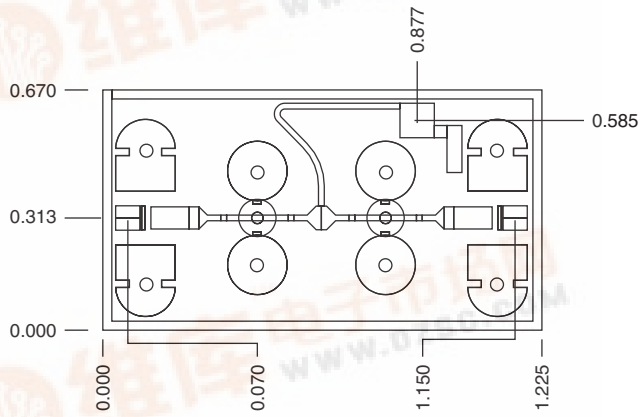
Alpha

AP640R1-00

Features

- Broad Bandwidth
- Low Loss, < 1.3 dB
- High Isolation, > 37 dB
- Excellent Return Loss, < -13 dB
- Fast Switching Speed, 4 ns
- High Power Handling, 37 dBm Peak, 33 dBm CW

Chip Outline



Dimensions indicated in mm.
All pads are ≥ 0.07 mm wide.
Chip thickness = 0.1 mm.

Description

Alpha's high isolation, single pole, single throw PIN diode switch is a robust, high performance switch. It is ideal for low loss, high isolation applications, particularly where broad bandwidths and high power handling is required. The chip uses Alpha's proven PIN diode technology, and is based upon MBE layers for the highest uniformity and repeatability. The diodes employ surface passivation to ensure a rugged, reliable part with through-substrate via holes and gold-based backside metallization to facilitate an epoxy die attach process. The GaAs MMIC employs two shunt PIN diodes and an on-chip bias network. Chips are measured on a 100% basis at 24, 28, 31 and 35 GHz for insertion loss, isolation, input and output return losses, and also at DC for diode breakdown voltage and turn on voltage.

Absolute Maximum Ratings

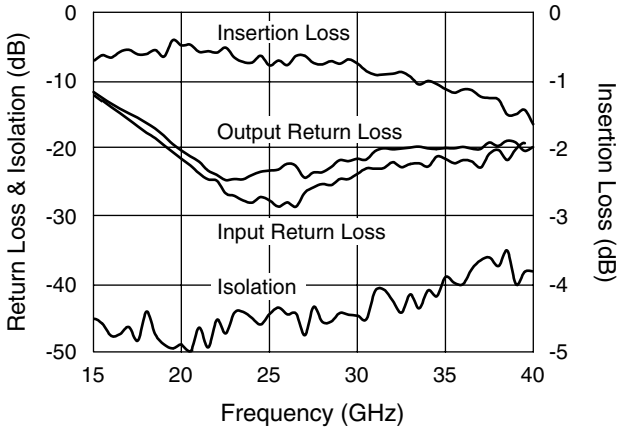
Characteristic	Value
Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C
DC Reverse Bias	-70 V (-20 mA)
DC Forward Bias	+1.3 V (100 mA)
P_{IN}	10 W

Electrical Specifications at 25°C

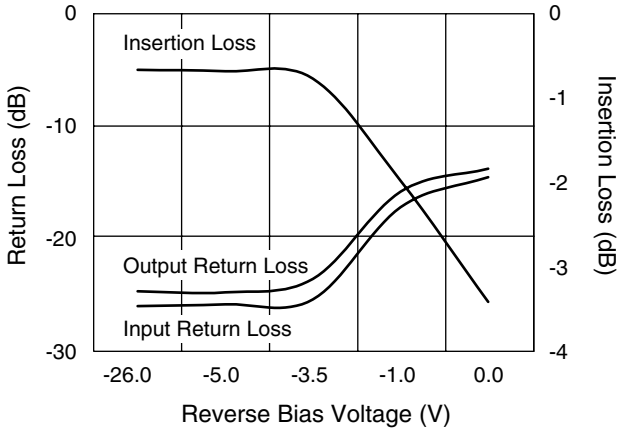
Parameter	Symbol	Condition	Min.	Typ.[2]	Max.	Unit
Insertion Loss	IL	F = 18, 21, 24, 28, 31, 35 GHz		1.0	1.3	dB
		F = 38, 40 GHz		1.3	1.9	dB
Isolation	ISO	F = 18, 21, 24, 28, 31, 35 GHz	37	42		dB
		F = 38, 40 GHz	33	36		dB
Input Return Loss (Insertion State)	RL_I	F = 18, 21 GHz		14	12	dB
		F = 24, 28, 31, 35, 38, 40 GHz		24	15	dB
Output Return Loss (Insertion State)	RL_O	F = 18, 21 GHz		14	12	dB
		F = 24, 28, 31, 35, 38, 40 GHz		22	13	dB
Leakage Current	I_{DD}	V = -50 V		2	20	µA
Switching Speed[1]				4		ns
Output Power at 1 dB Compression[1]	$P_{1\ dB}$	F = 35 GHz		33		dBm

1. Not measured on a 100% basis.
2. Typical represents the median parameter value across the specified frequency range for the median chip.

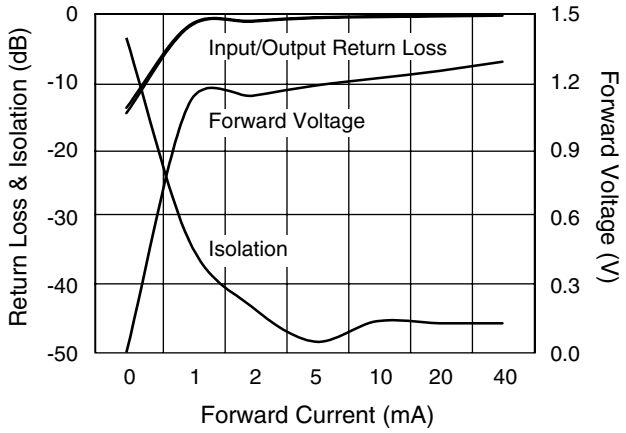
Typical Performance Data



Performance vs. Frequency
Bias Conditions: I_F = 20 mA, V_R = -3.5 V



Performance vs. DC Bias
F = 28 GHz

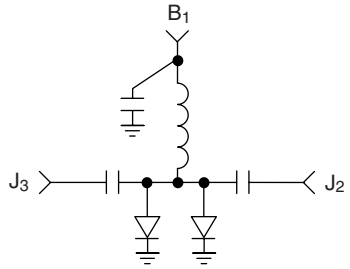


Performance vs. DC Bias
F = 28 GHz

Truth Table

B_1	J_1–J_2
+20 mA	Isolation
-5 V	Insertion Loss

Circuit Schematic



Bias Arrangement