TGS4302

High Power Ka-Band VPIN SPDT Switch

Product Description

Qorvo's TGS4302 is a GaAs Single Pole, Double Throw (SPDT) PIN monolithic switch designed to operate over the Ka-Band frequency range.

This switch maintains a low insertion loss with high power handling of 33 dBm or greater input P1dB at V_C = 7.5V.

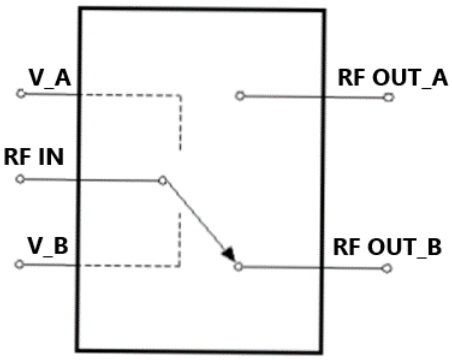
These advantages, along with small size of the chip, make the TGS4302 ideal for use in communication and transmit/receive applications.

Product Features

- Frequency Range: 27 - 46 GHz
- Insertion Loss: < 0.9 dB Typical
- Input P_{1dB}: >33 dBm @ V_C = 7.5V
- Switching Speed: < 4ns
- On-Chip Biasing Resistors
- DC Blocked at RF ports
- VPIN Technology
- Die Dimensions: 1.10 x 1.10 x 0.10 mm

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Block Diagram



Applications

- Ka-Band Transmit / Receive
- Point-to-Point Radio
- Point-to-Multipoint Radio

Ordering Information

Part No.	Description
TGS4302	27 - 46 GHz High Power Switch

Absolute Maximum Ratings

Parameter	Value
Control Voltage	-5 to +25 V
Control Current	22.5 mA
RF Input Power (1), CW, 50 Ω, T = 25ºC	37 dBm
Mounting Temperature (30 sec)	320 °C
Storage Temperature	-65 to 150

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Notes: (1) Operation above 30 dBm requires control voltage above +5V.

Recommended Operating Conditions

Parameter	Min	Typ.	Max	Units
Frequency	27		46	GHz
Control Voltage (V_A/V_B)		+5/-5		V
Control Current (I_A/I_B)		0/20		mA

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

DC Probe Test

Test conditions unless otherwise noted: Temp= +25 °C

Symbol	Min	Max	Units
R_{FWD}	3.5	6	Ω
V_{REV}	-60	-30	V

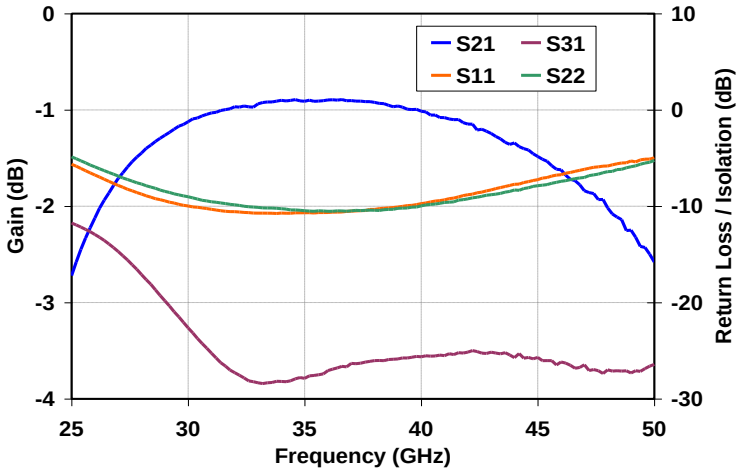
Electrical Specifications

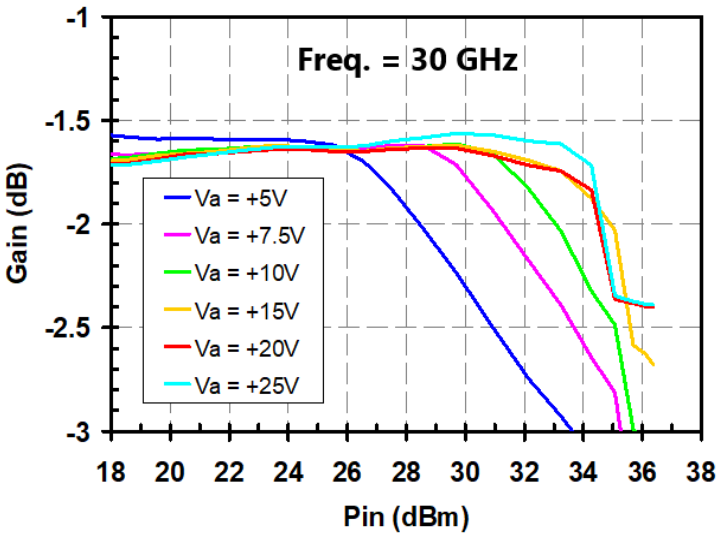
Test conditions unless otherwise noted: Temp= +25 °C, Bias Conditions: V_A = 5 V, I_A = 0 mA, V_B = -5 V, I_B = 20 mA

Parameter	Conditions	Min	Typical	Max	Units
Operational Frequency Range		27		46	GHz
Insertion Loss	Freq. = 27 to 30 GHz		1.3		dB
	Freq. = 30 to 40 GHz		0.9		
	Freq. = 40 to 46 GHz		1.3		
Return Loss – Common Port RL	Freq. = 27 to 46 GHz		10		dB
Output Power @ P_{1dB} (Freq. = 30 GHz)	V_C = +5 V		31		dBm
	V_C = +7.5 V		33		
	V_C = +10 V		35		
	V_C = +15 V		36		

Performance Plots –

Test conditions unless otherwise noted: Temp= +25 °C, Bias Conditions: V_A = 5 V, I_A = 0 mA, V_B = -5 V, I_B = 20 mA





Assembly Drawing

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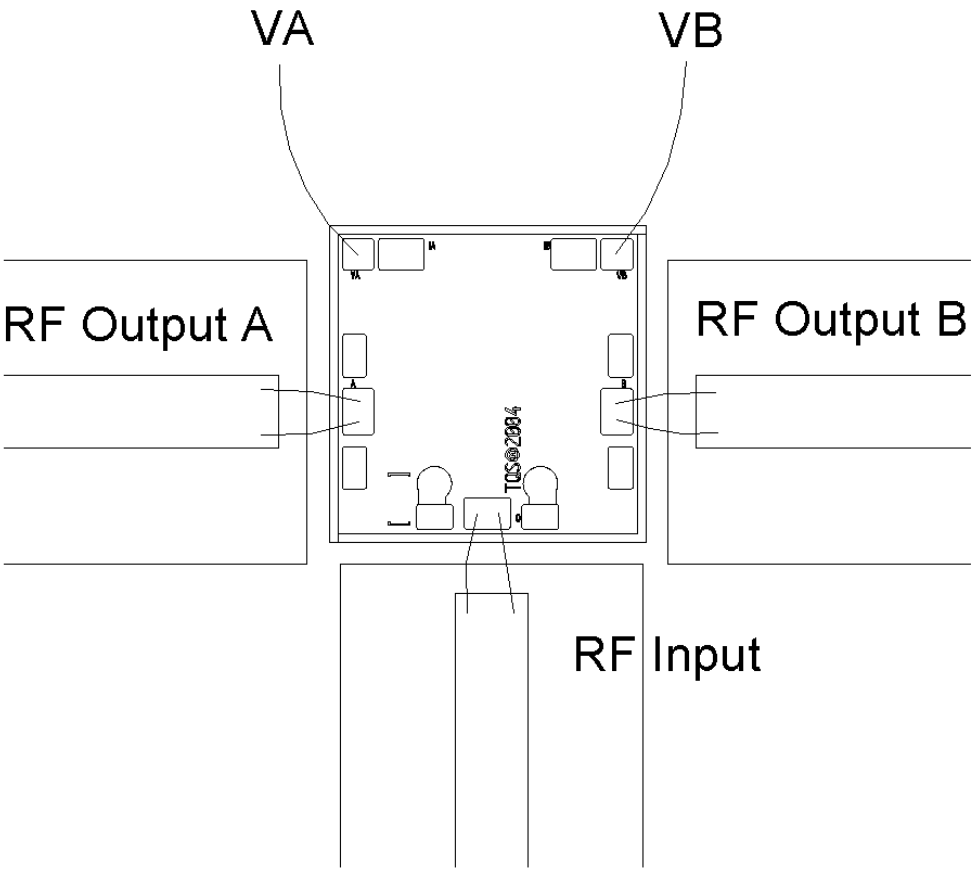

True Table

State	V_A	V_B
RF Out A	≥ +5 V @ ~0 mA	-5 V @ 20 mA
RF Out B	-5 V @ 20 mA	≥ +5 V @ ~0 mA

Operation at RF power levels >30 dBm requires increasing the positive voltage level to put a larger reverse bias on the diodes while the negative voltage level remains at -5 V with a current of approximately 20mA.

Bond pads IA and IB bypass (Alternate Assembly on next page) the on-chip series resistors to allow adjustment of the current to the diodes in their forward biased state.

Alternate Assembly Drawing

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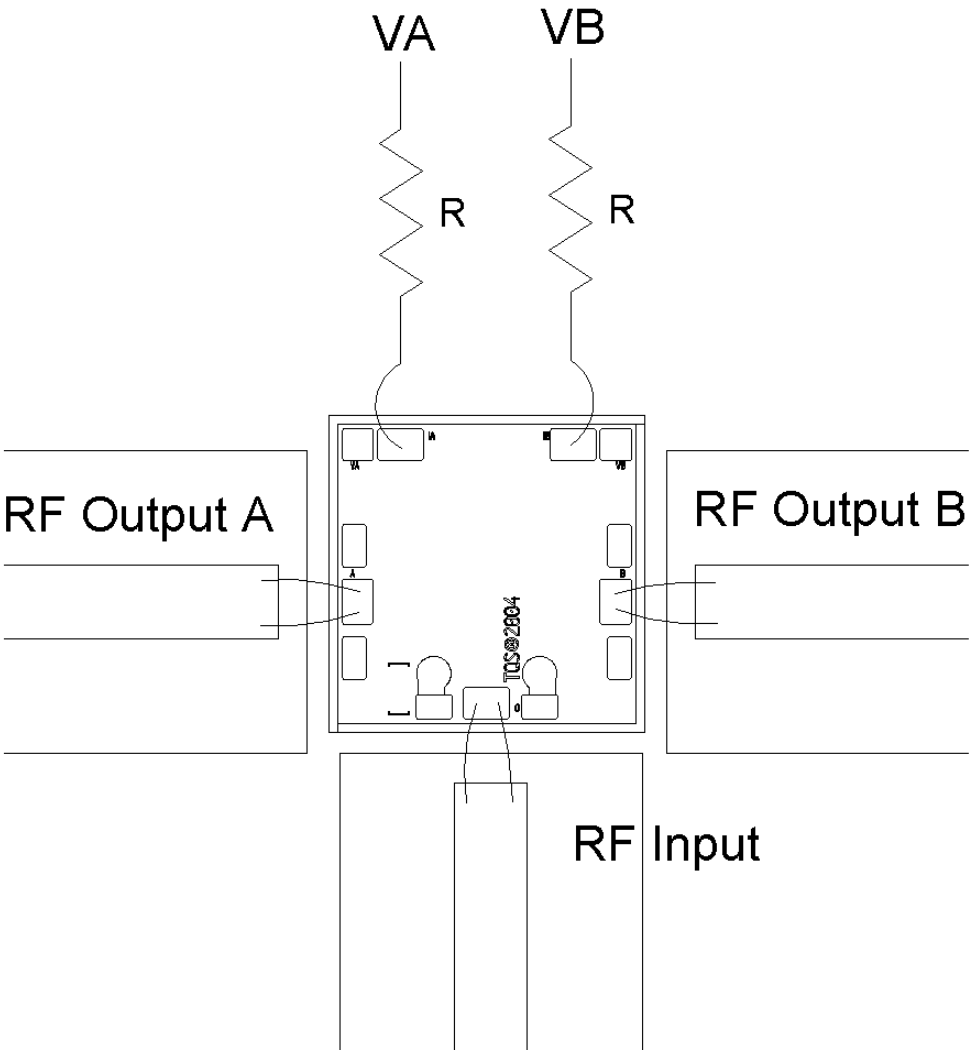
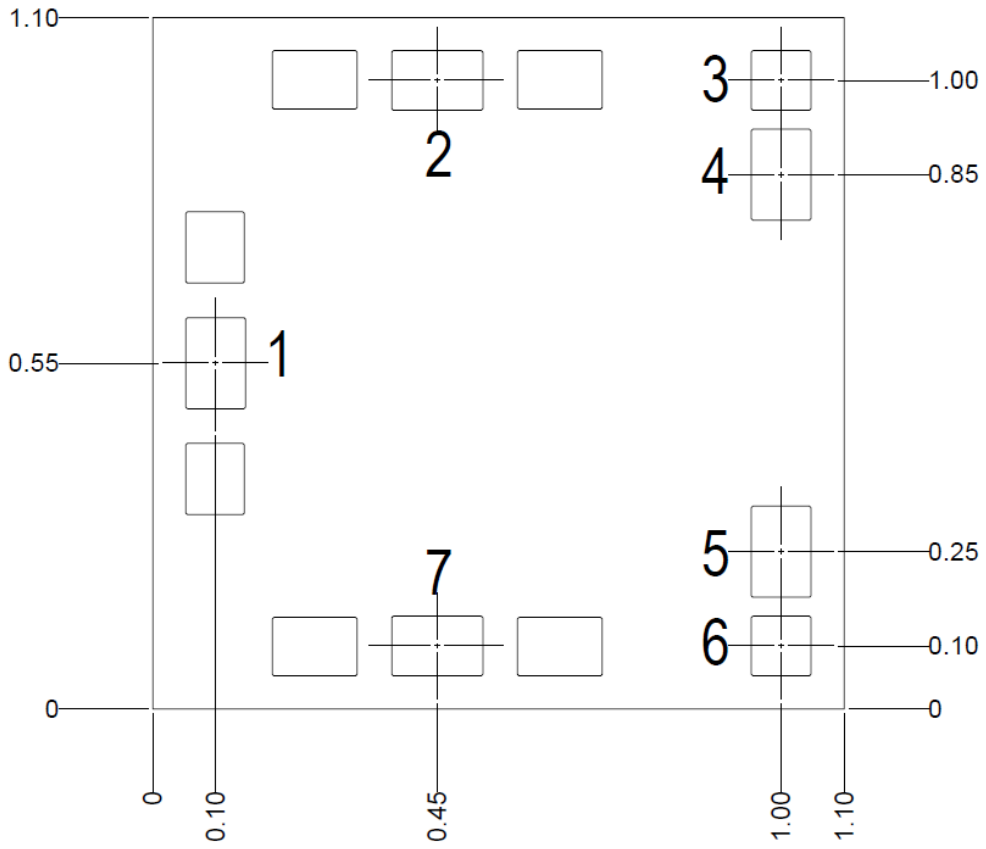


Notes: Refer to Bias Resistor Values Table for values of R vs. Control Voltage.

Bias Resistor Values

Maximum Negative Bias Voltage	R
-5 V	190 Ω
-7.5 V	315 Ω
-10 V	440 Ω
-15 V	690 Ω
-20 V	940 Ω

Mechanical Drawing and Bond Pad Description



Pin No.	Symbol	Description	Pad Size (mm)
1	RF In	Input, RF common port; matched to 50 Ω; DC blocked.	0.095 x 0.145
2	RF Out A	Output A, RF switched port A; matched to 50 Ω; DC blocked.	0.145 x 0.095
3	VA	Control voltage A.	0.095 x 0.095
4	IA	Control current A.	0.095 x 0.145
5	IB	Control current B.	0.095 x 0.145
6	VB	Control voltage A.	0.095 x 0.095
7	RF Out B	Output B, RF switched port B; matched to 50 Ω; DC blocked.	0.145 x 0.095

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e., conductive epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3 – 4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonic are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1A	ESDA / JEDEC JS-001

Caution!
ESD-Sensitive Device

Solderability

Use only AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3-4 minutes, maximum.

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU. This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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