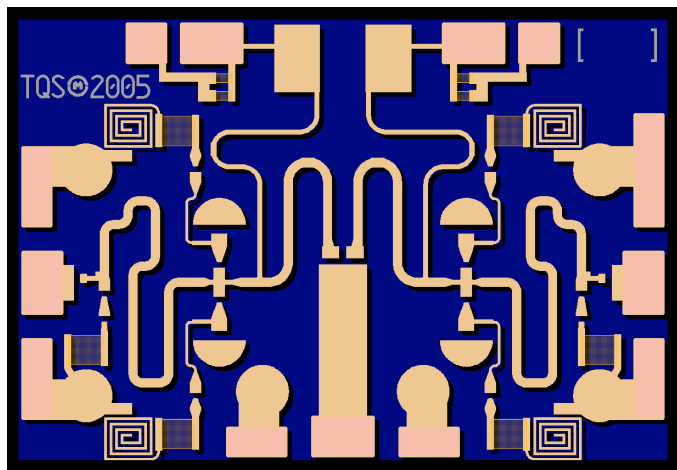


High Power Ka-Band Absorptive SPDT Switch TGS4304



Key Features and Performance

- 32 - 40 GHz Frequency Range
- > 33 dBm Input P1dB @ $V_C = +10V$
- On Chip Biasing Resistors
- On Chip DC Blocks
- < 1.0 dB Midband Insertion Loss
- < 4ns Switching Speed
- VPIN Technology
- Chip Dimensions:
1.58 x 1.10 x 0.10 mm
(0.043 x 0.062 x 0.004 inches)

Description

The TriQuint TGS4304 is a GaAs absorptive 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 33dBm or greater input P1dB at $V_C = +10V$. These advantages, along with the small size of the chip, make the TGS4304 ideal for use in communication and transmit/receive applications.

The TGS4304 is 100% DC & RF tested on-wafer to ensure performance compliance.

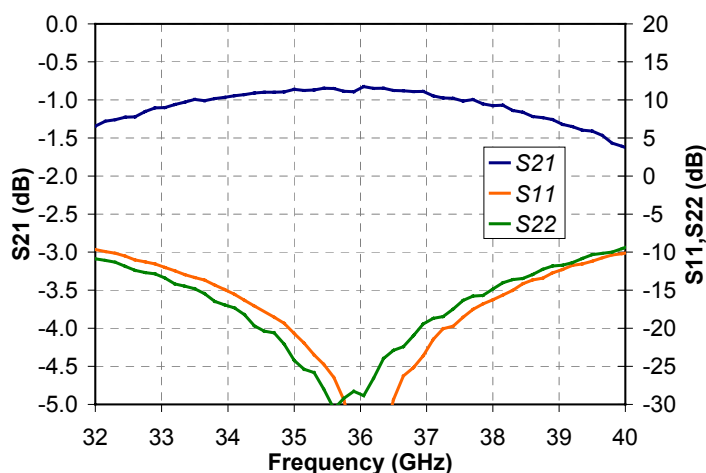
Lead free and RoHS compliant.

Primary Applications

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

Measured Data

$V_A = +5V$, $I_A \approx 0mA$, $V_B = -4V$, $I_B = 30mA$



Note: This device is early in the characterization process prior to finalizing all electrical test specifications. Specifications are subject to change without notice.

TABLE I
MAXIMUM RATINGS

Symbol	Parameter 1/	Value	Notes
V_C	Control Voltage	-5V to +25V	2/
I_C	Control Current	34 mA	<u>2/</u>
P_{IN}	Input Continuous Wave Power	38 dBm	
T_M	Mounting Temperature (30 Seconds)	320 °C	
T_{STG}	Storage Temperature	-65 to 150 °C	

1/ These ratings represent the maximum operable values for this device.

2/ V_C and I_C are per bias pad.

3/ Operation above 30dBm requires control voltages above +7.5V.

TABLE II
RF CHARACTERIZATION TABLE
($T_A = 25^\circ\text{C}$, Nominal)
($V_A = +5\text{V}$, $I_A = 0\text{mA}$, $V_B = -4\text{V}$, $I_B = 30\text{mA}$)

Symbol	Parameter	Test Conditions	Typ	Units	Notes
IL	Insertion Loss	F = 32 – 34 GHz F = 34 – 37 GHz F = 37 – 40 GHz	1.3 0.9 1.3	dB	
RL	Return Loss	F = 32 – 40 GHz	10	dB	
P1dB	Output Power @ 1dB Gain Compression	$V_C = +5\text{V}$ $V_C = +7.5\text{V}$ $V_C = +10\text{V}$	30.5 32 33	dBm	<u>1/</u> <u>2/</u>

Note: Table II Lists the RF Characteristics of typical devices as determined by fixtured measurements.

1/ Frequency = 35GHz

2/ Extrapolated from the data

TABLE III
TRUTH TABLE

Selected RF Output	V _A	V _B
RF Out A	≥ +5V @ ~0mA	-4V @ 30mA
RF Out B	-4V @ 30mA	≥ +5V @ ~0mA

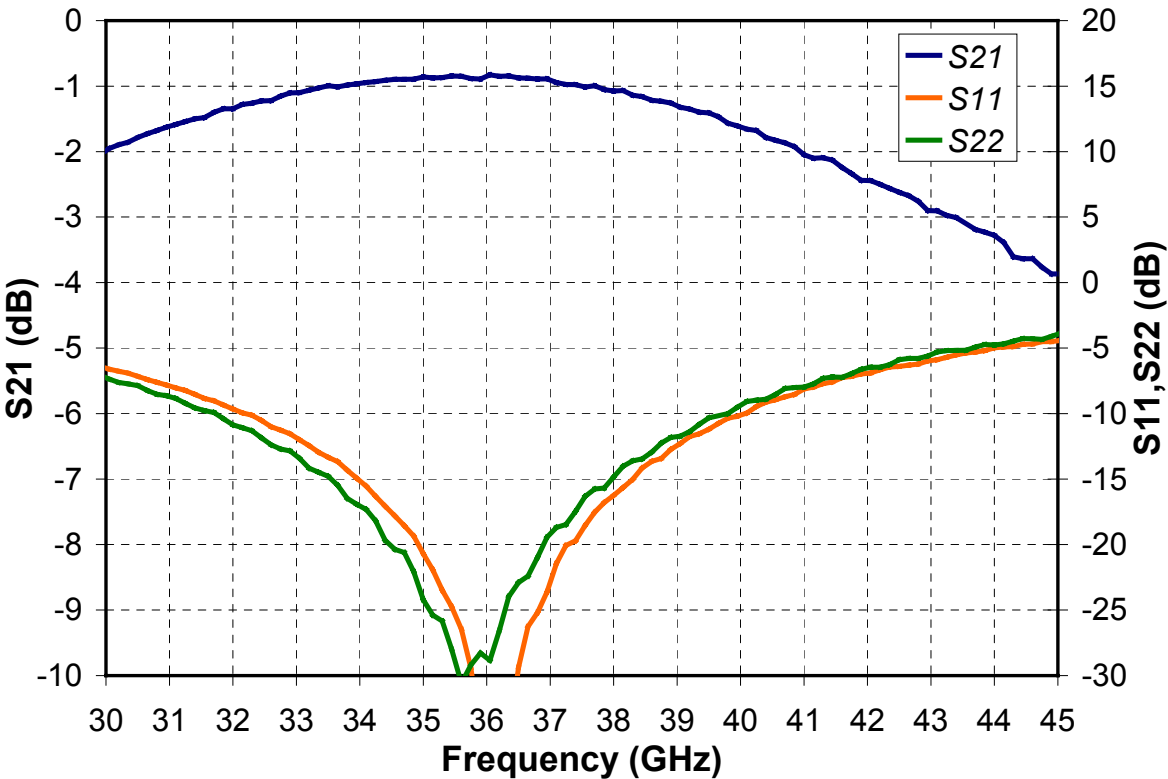
Selected RF Output	I _A	I _B
RF Out A	≥ +5V @ ~0mA	30mA
RF Out B	30mA	≥ +5V @ ~0mA

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 -4V with a current of approximately 30mA. If you are using -5V, use alternate assembly with off chip resistors.

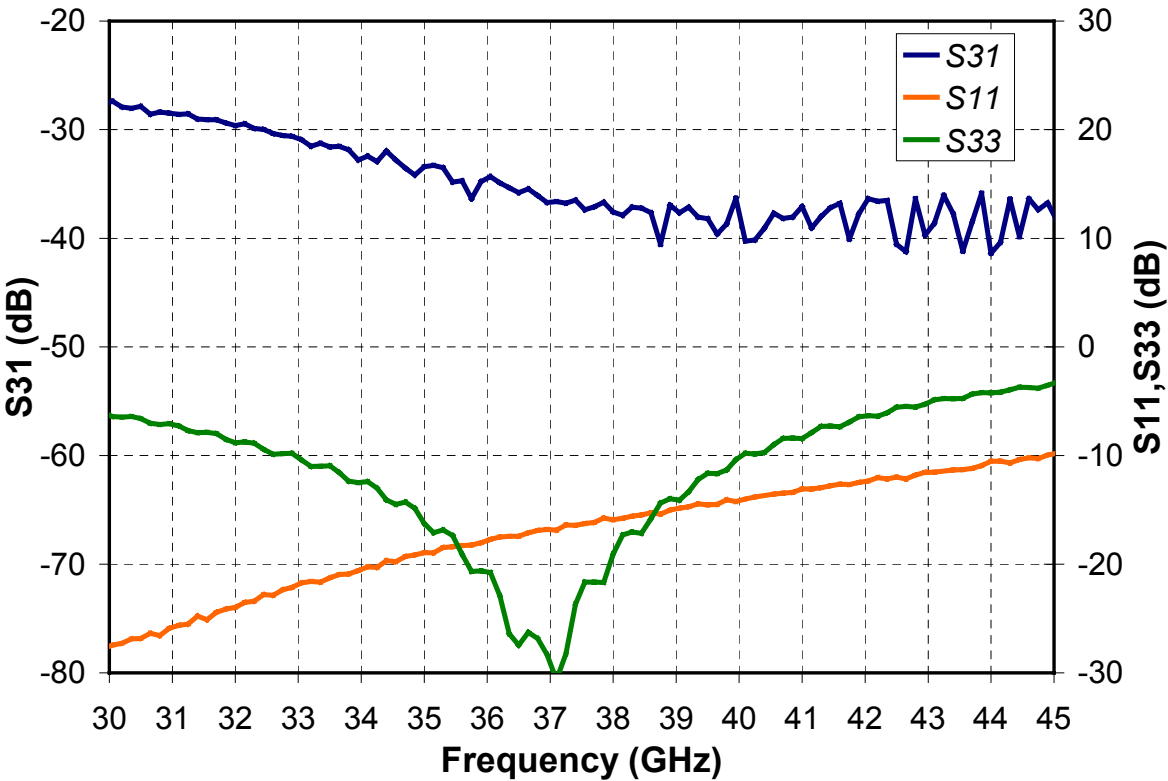
Bond pads IA and IB bypass the on-chip series resistors to allow adjustment of the current to the diodes in their forward biased state.

Measured Performance
On State

TGS4304

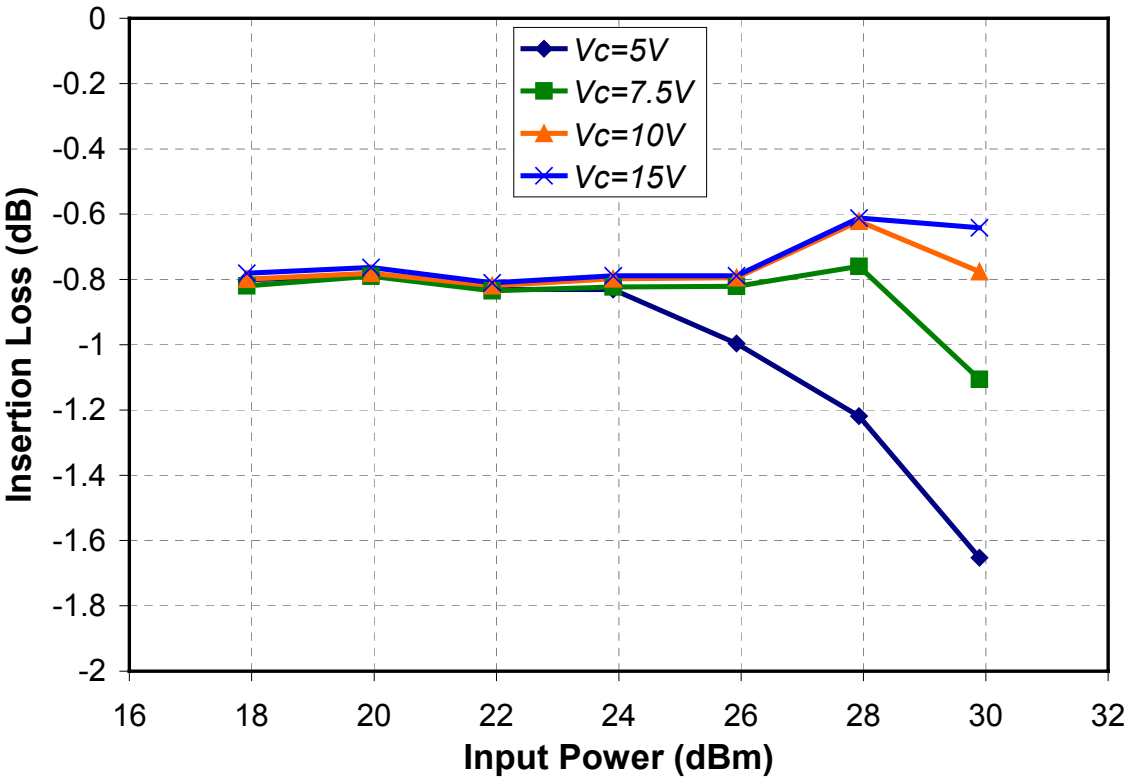


Off State

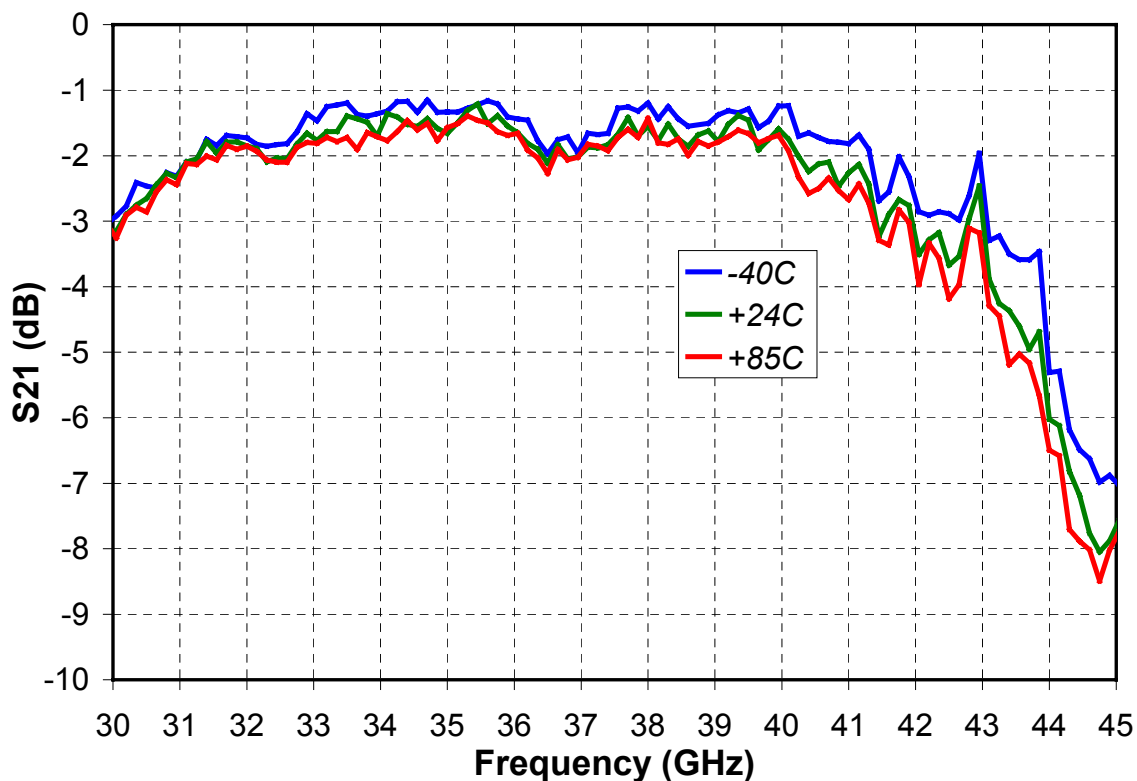


Measured Performance
35 GHz

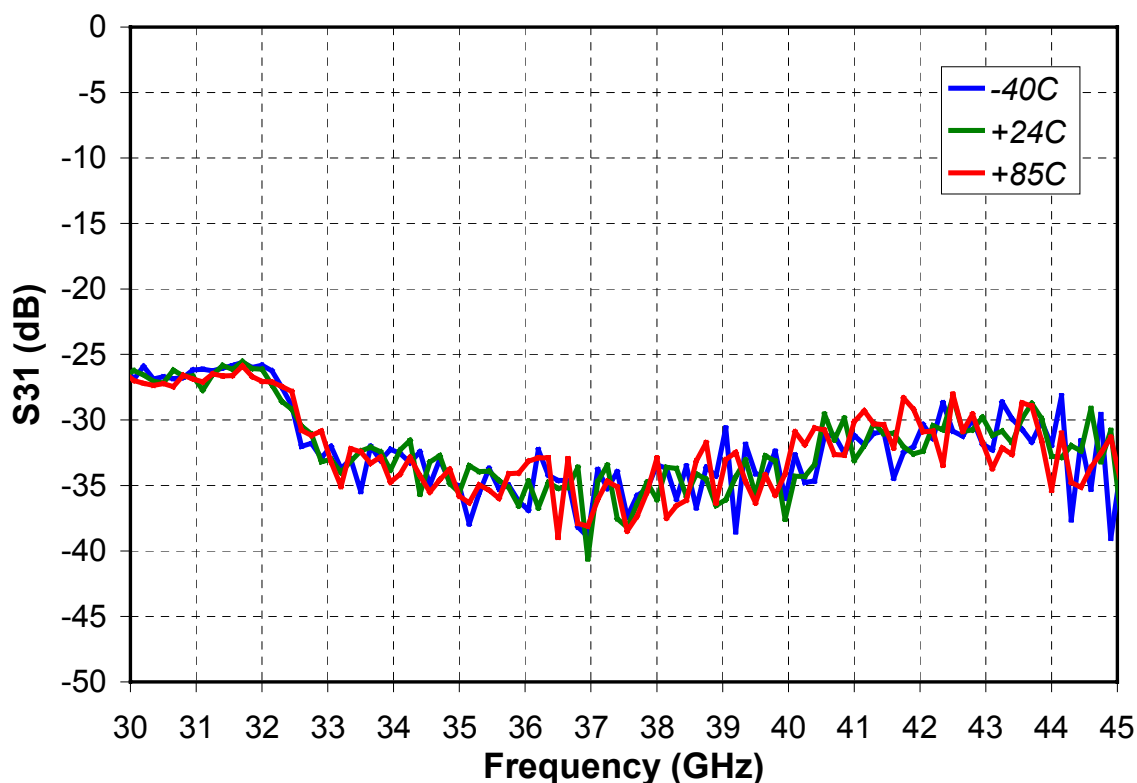
TGS4304



Measured Performance
On State

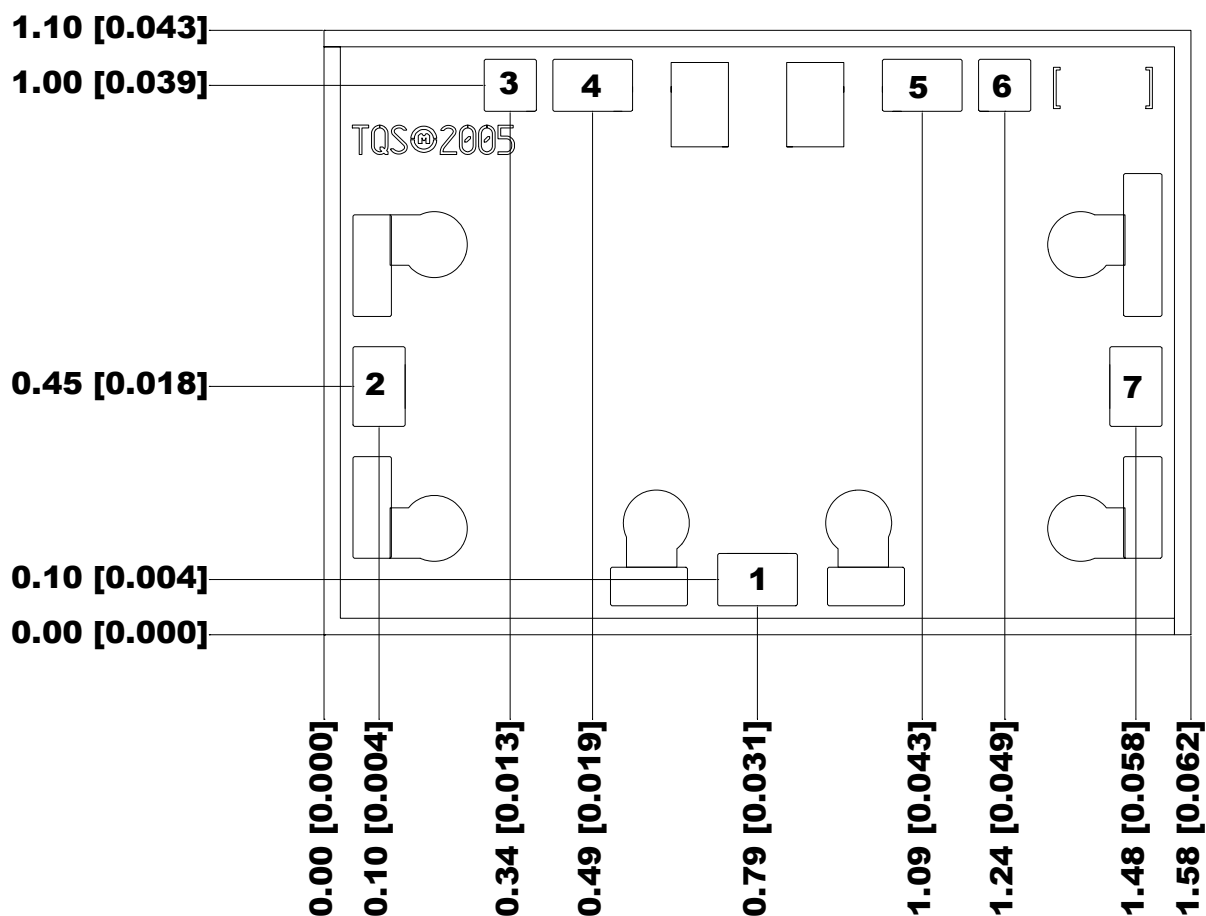


Off State



Mechanical Drawing

TGS4304



Units: millimeters (inches)

Thickness: 0.100 (0.004)

Chip edge to bond pad dimensions are shown to center of bond pad

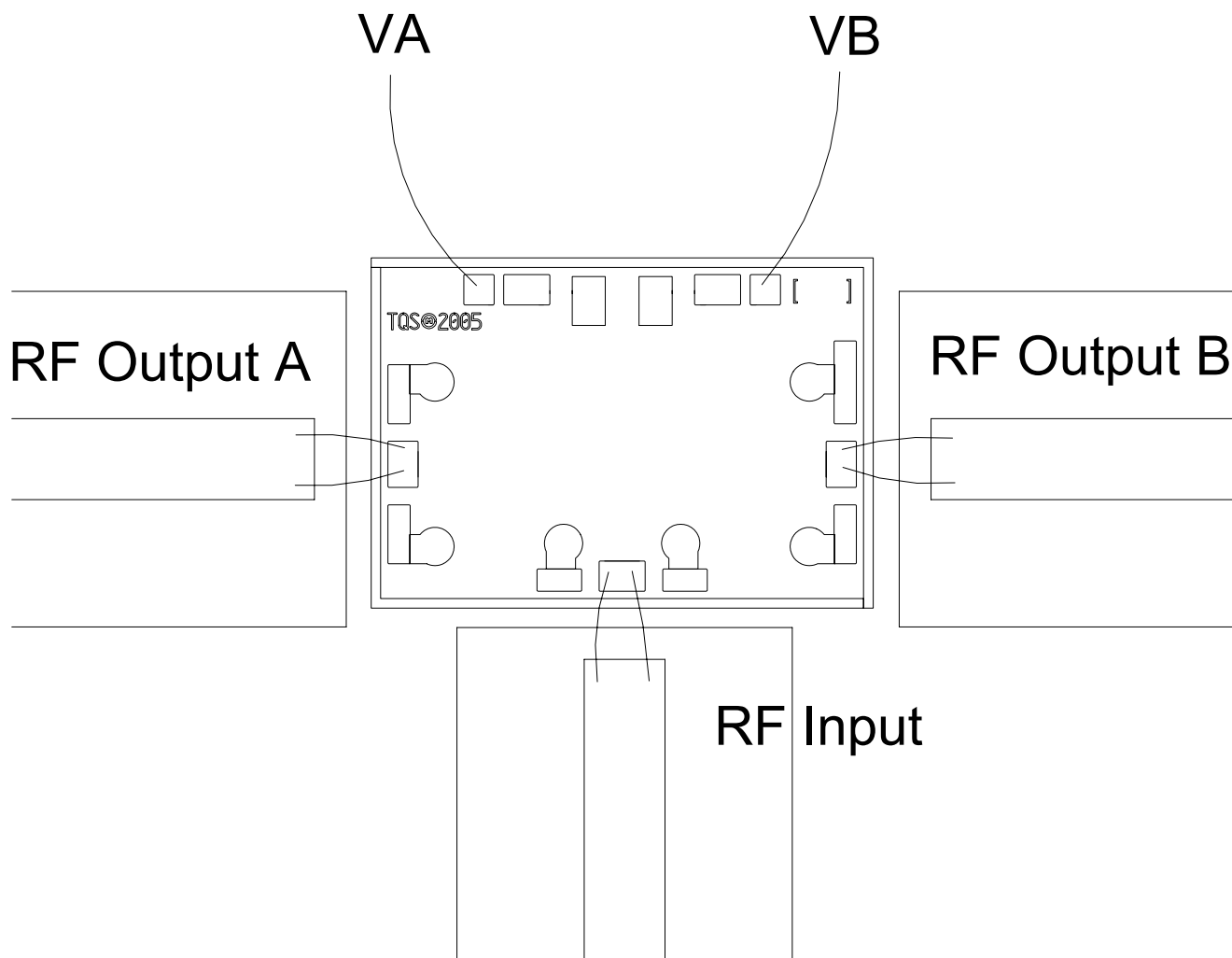
Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

Bond Pad #1	(RF In)	0.15 x 0.10 (0.006 x 0.004)
Bond Pad #2	(RF Out A)	0.10 x 0.15 (0.004 x 0.006)
Bond Pad #3	(VA)	0.10 x 0.10 (0.004 x 0.004)
Bond Pad #4	(IA)	0.15 x 0.10 (0.006 x 0.004)
Bond Pad #5	(IB)	0.15 x 0.10 (0.006 x 0.004)
Bond Pad #6	(VB)	0.10 x 0.10 (0.004 x 0.004)
Bond Pad #7	(RF Out B)	0.10 x 0.15 (0.004 x 0.006)

Chip Assembly & Bonding Diagram

TGS4304



GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

Alternate Chip Assembly & Bonding Diagram TGS4304

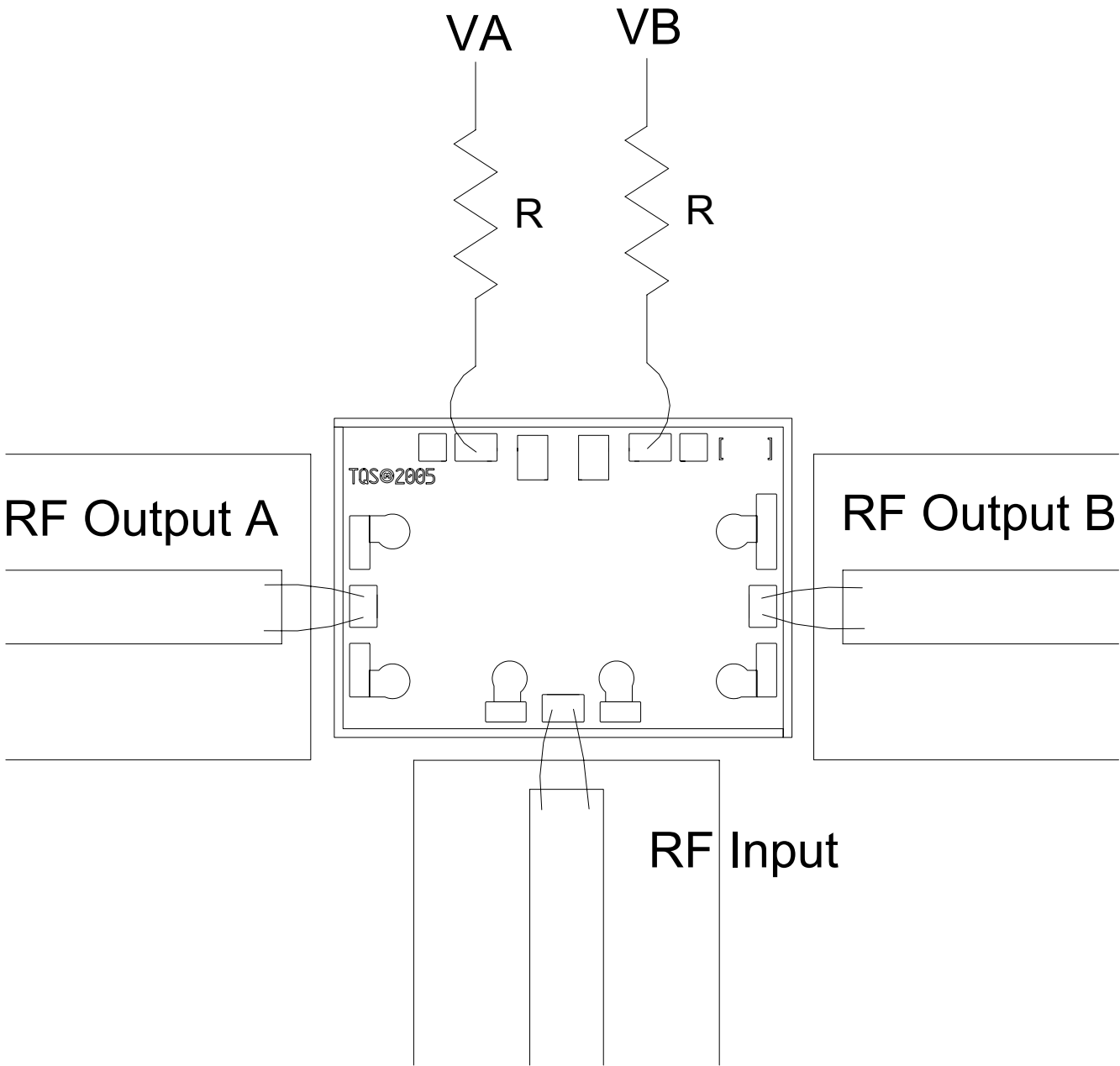


TABLE IV
BIAS RESISTOR VALUES

Maximum Negative Bias Voltage	R
-5V	33 Ohms
-7.5V	117 Ohms
-10V	200 Ohms
-15V	367 Ohms
-20V	533 Ohms

Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C. (30 seconds maximum)
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- No fluxes should be utilized.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

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 can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.
- Microwave or radiant curing should not be used because of differential heating.
- Coefficient of thermal expansion matching is critical.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Maximum stage temperature is 200°C.

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.