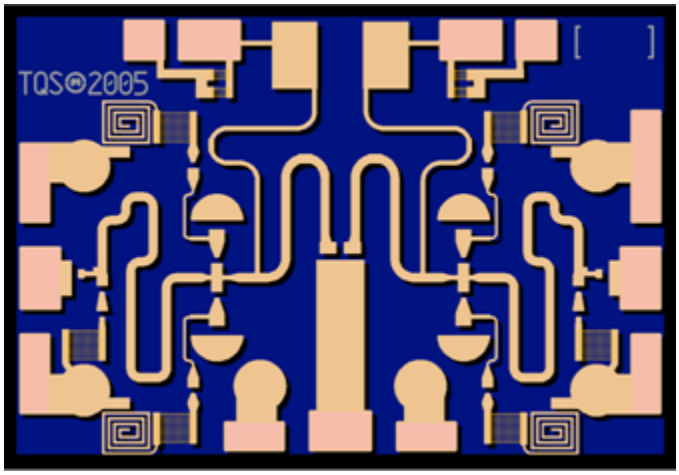
TriQuint SEMICONDUCTOR

May 2, 2008

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.

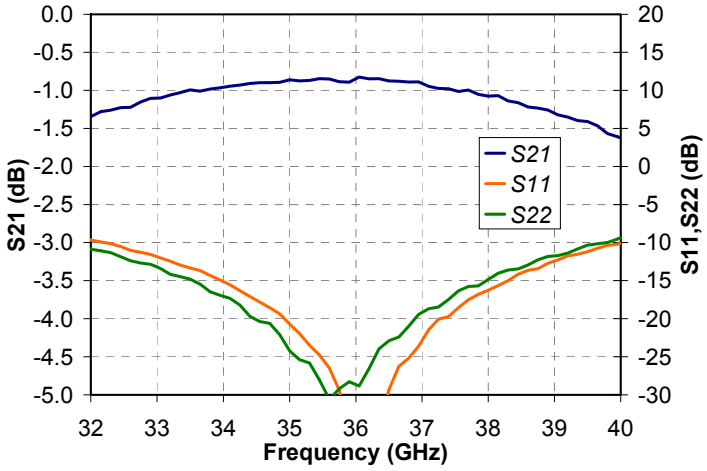
Lead free and RoHS compliant.

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.

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TABLE I
MAXIMUM RATINGS

Symbol	Parameter 1/	Value	Notes
V_C	Control Voltage	-5V to +25V	2/
I_C	Control Current	34 mA	2/
P_{IN}	Input Continuous Wave Power	35 dBm	
T_M	Mounting Temperature (30 Seconds)	320 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}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°C, Nominal)
(V_A = +5V, I_A = 0mA, V_B = -4V, I_B = 30mA)

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 V V_C = +7.5 V Vc = +10 V V_C = +20 V	31 33 34 34.5	dBm	1/

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

1/ Frequency = 30GHz

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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

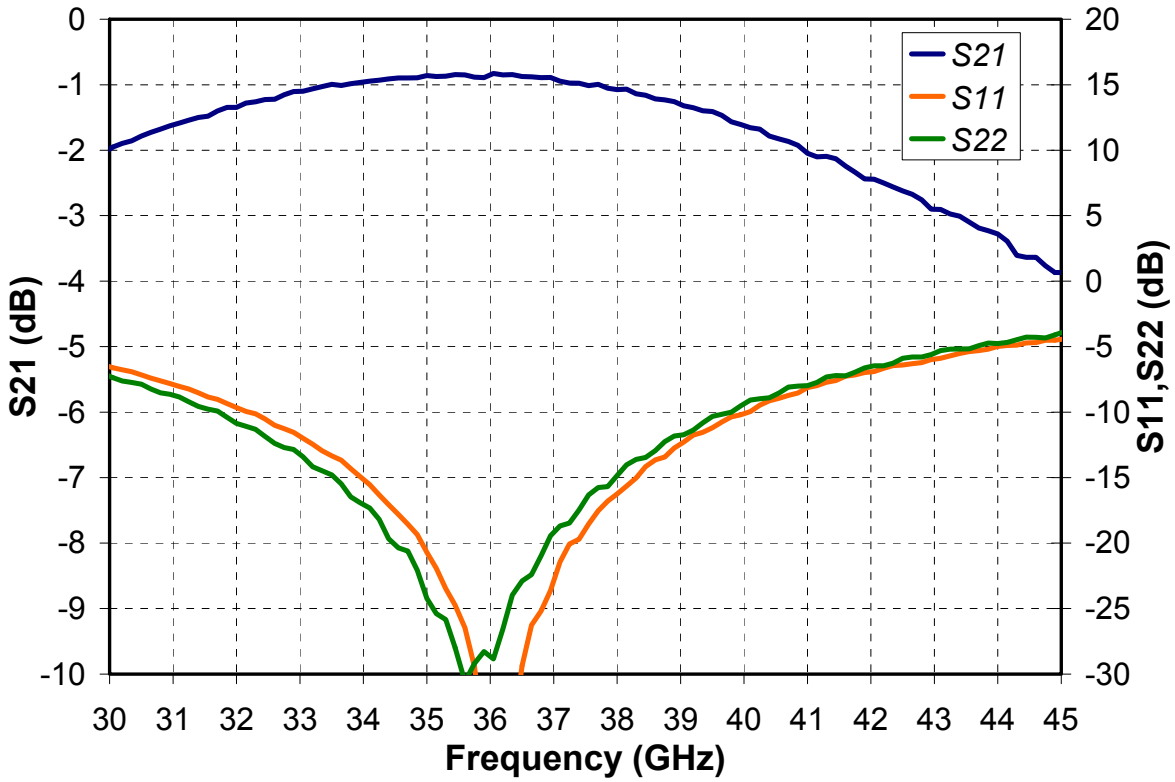
Selected RF Output	I_A	I_B
RF Out A	≥ +5V @ ~0mA	30mA
RF Out B	30mA	≥ +5V @ ~0mA

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.

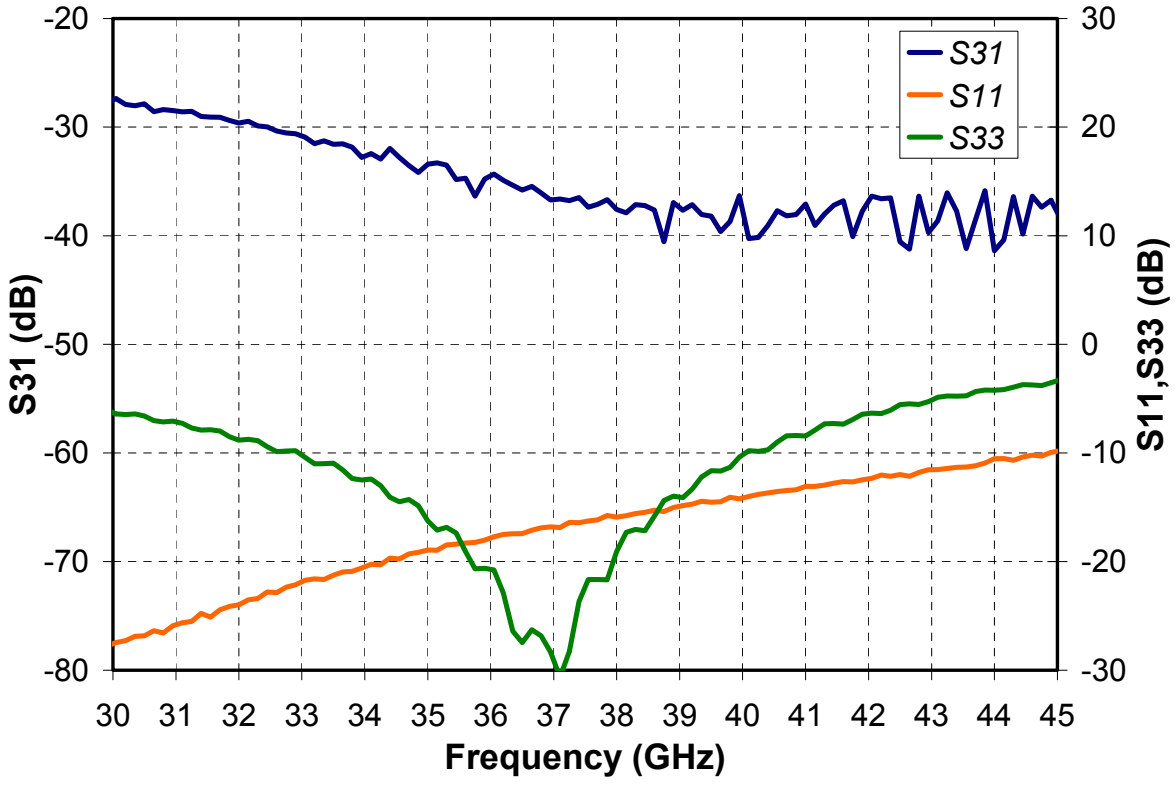
Bond pads IA and IB bypass the on-chip series resistors to allow adjustment of the current to the diodes in their forward biased state.

Measured Performance

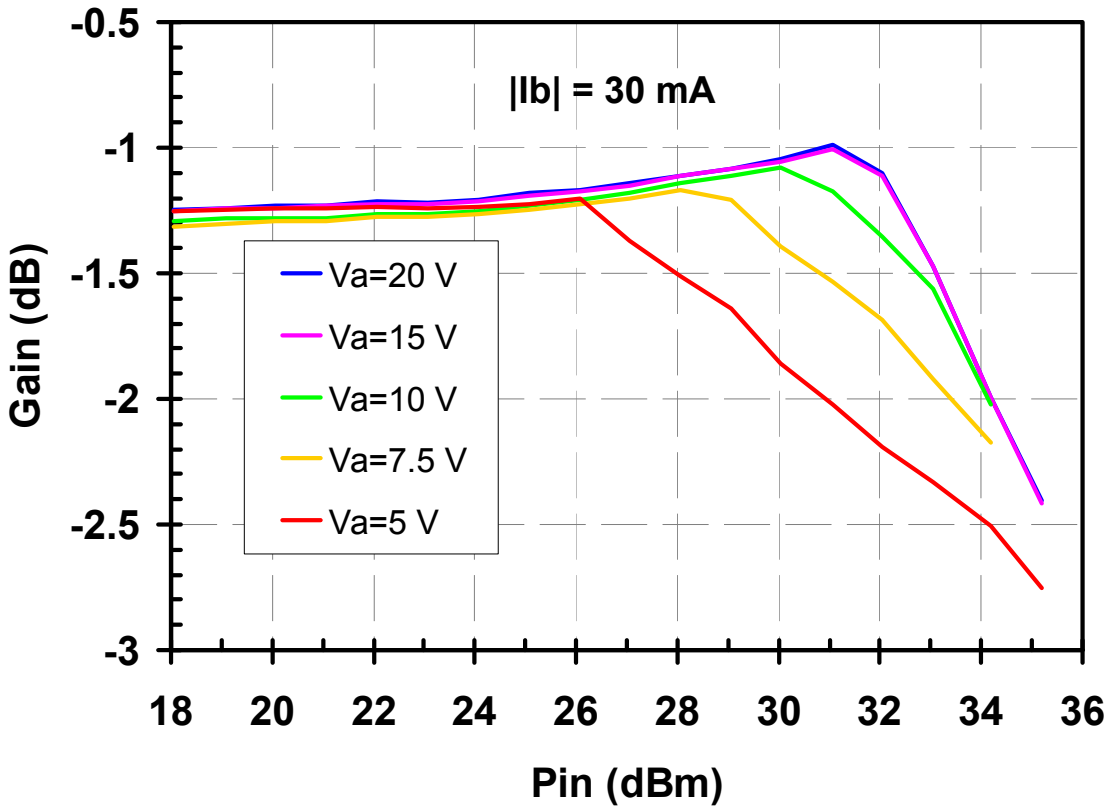
On State



Off State



Measured Performance
30 GHz



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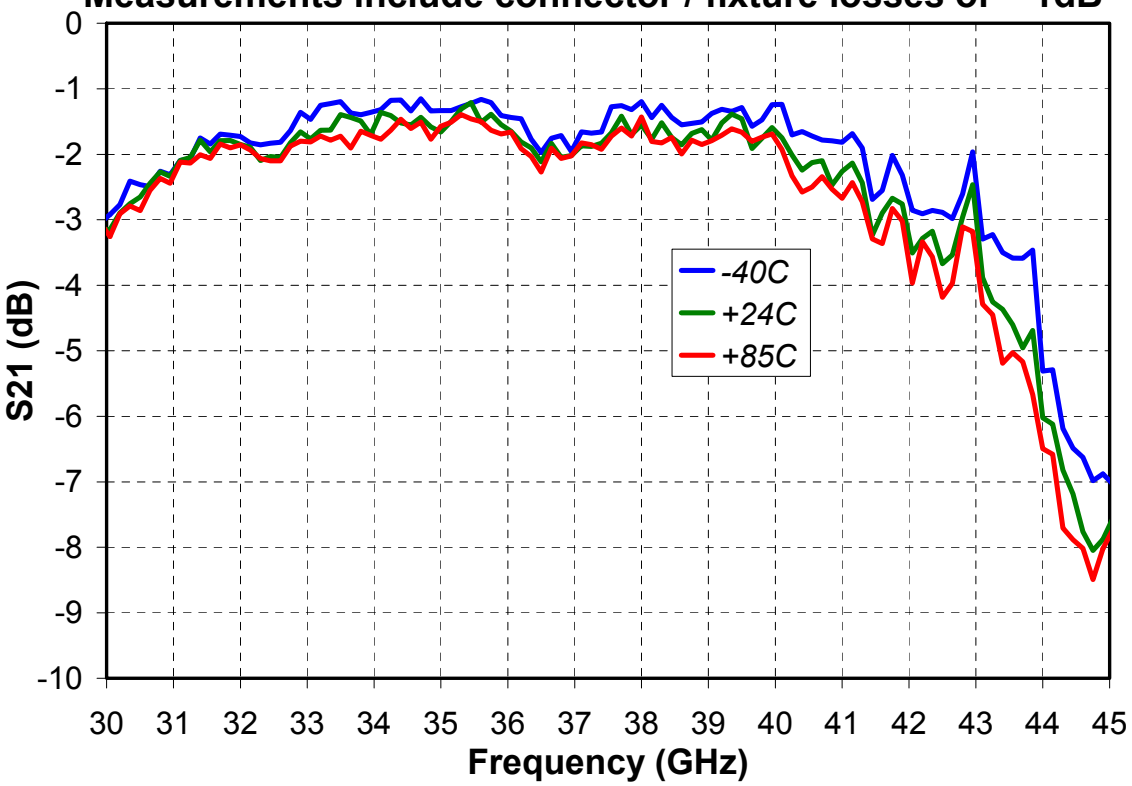
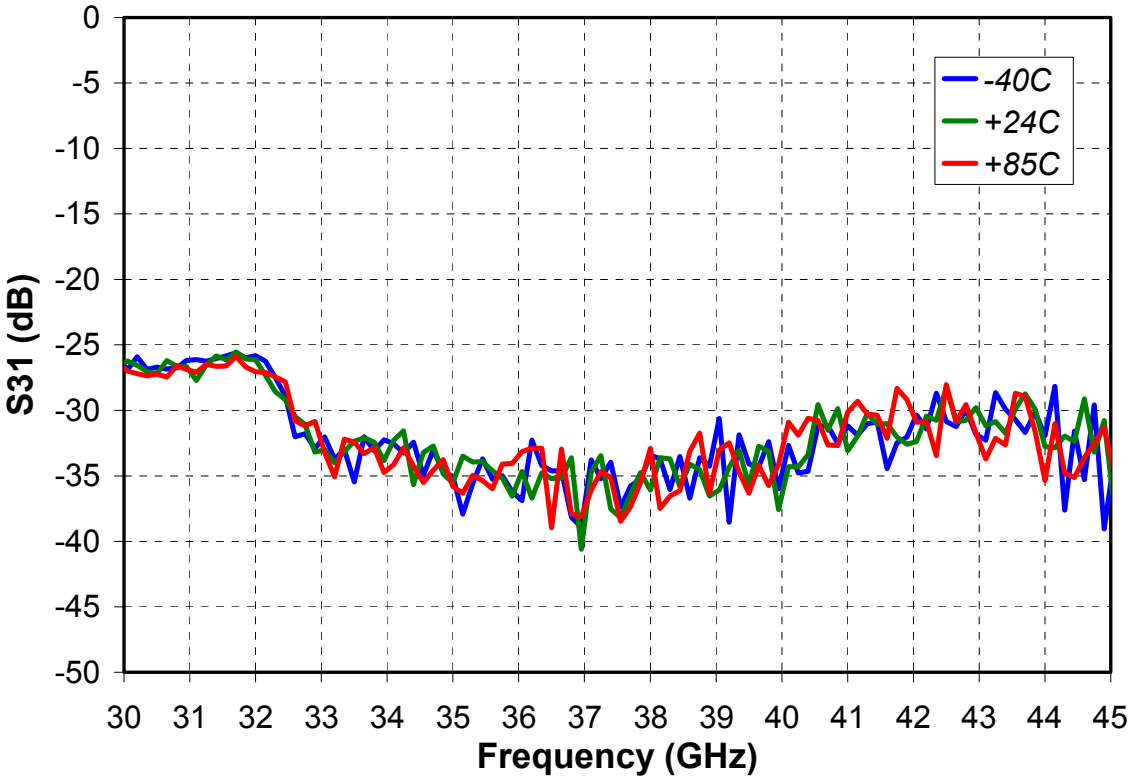
Measured Performance

On State

Measurements include connector / fixture losses of ~ 1dB



Off State



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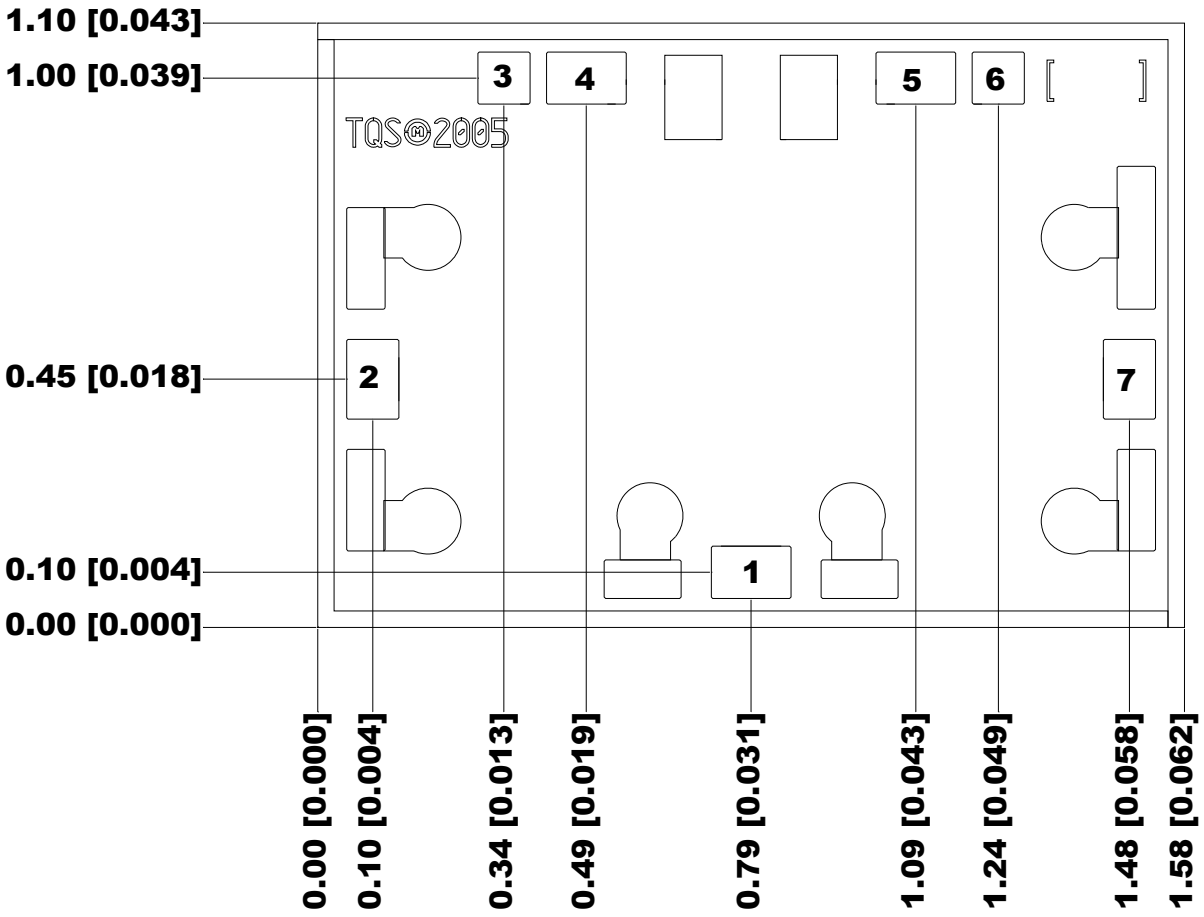
Mechanical Drawing



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)**

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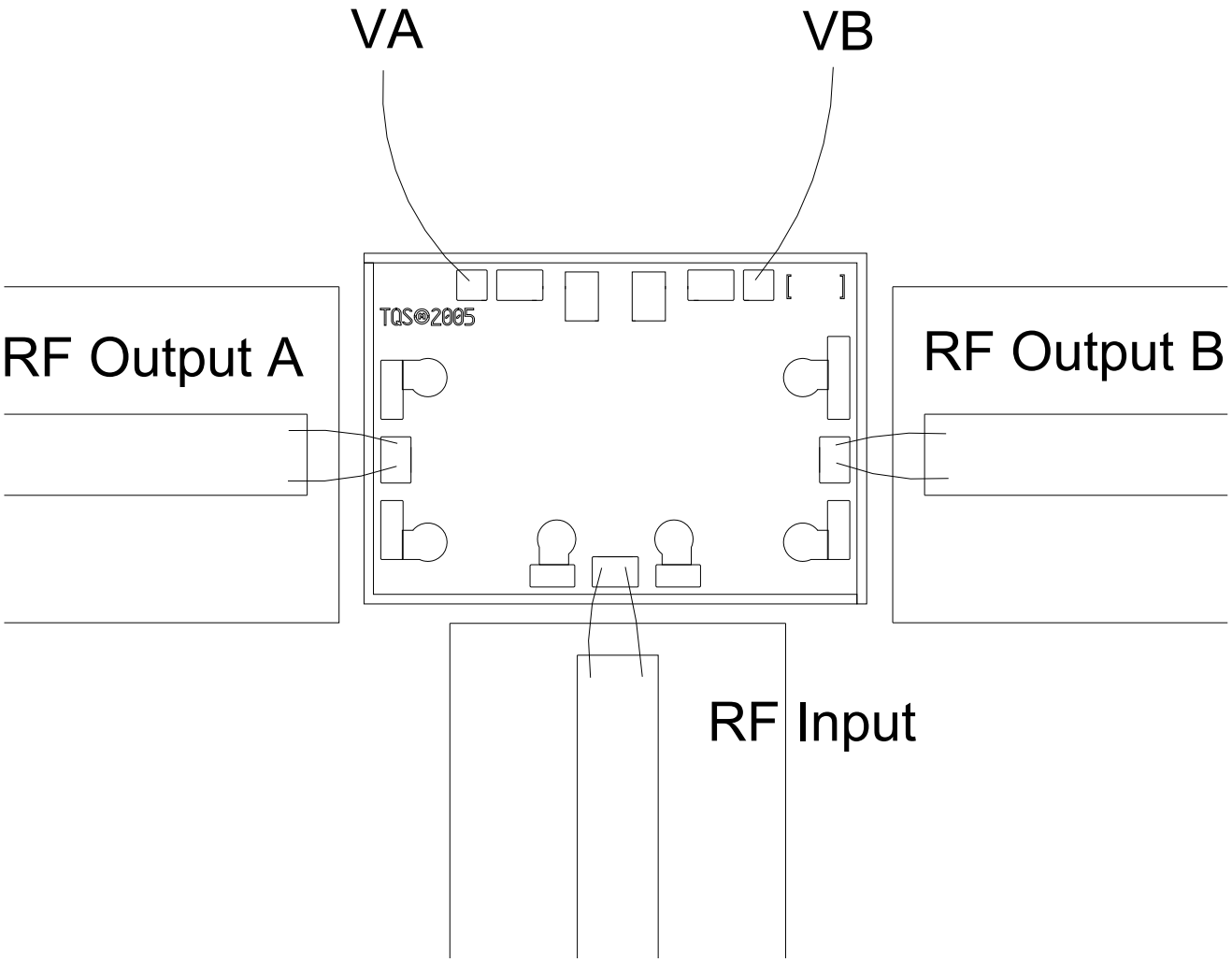
Chip Assembly & Bonding Diagram



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

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Alternate Chip Assembly & Bonding Diagram

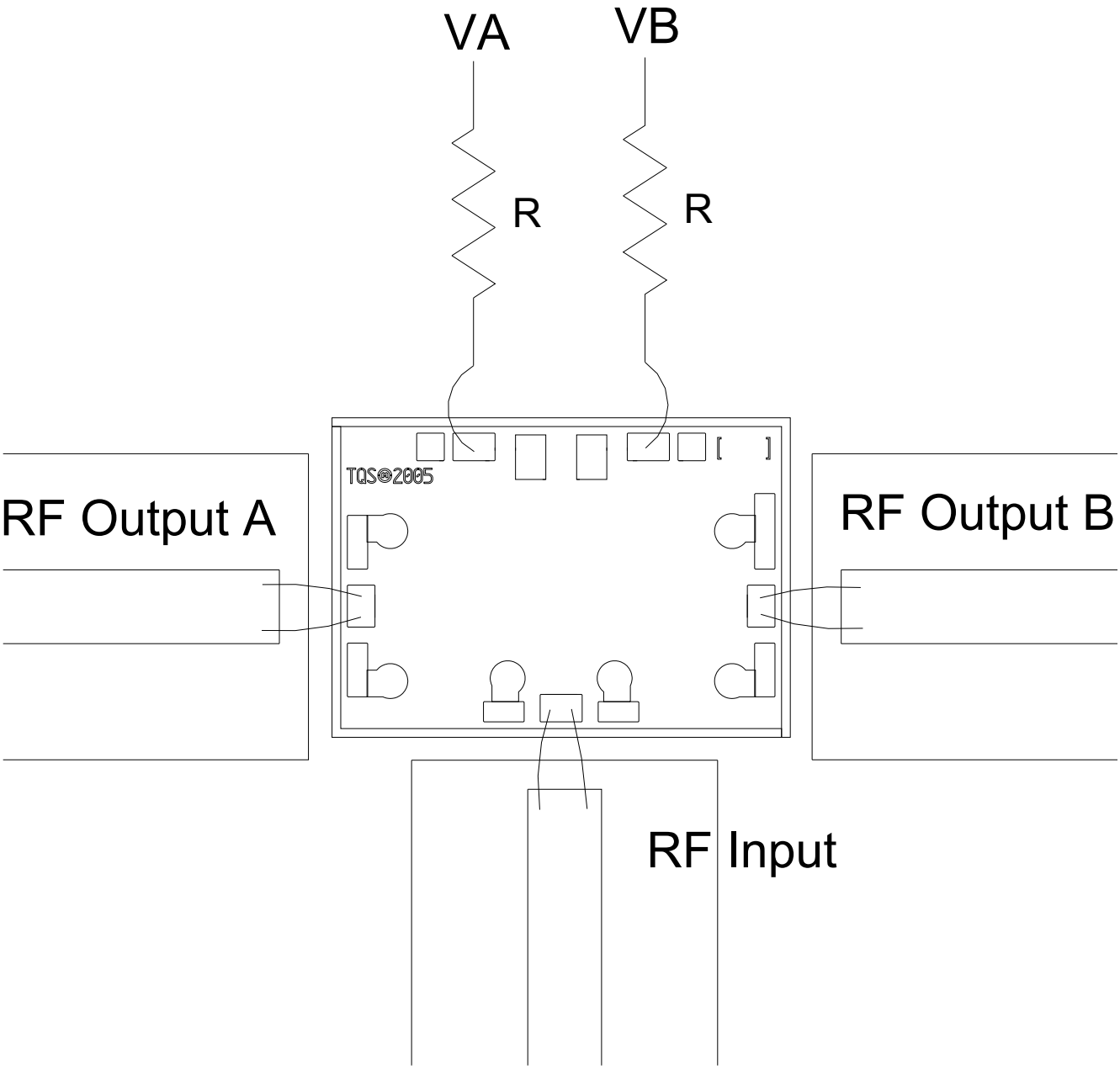

TABLE IV
BIAS RESISTOR VALUES

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

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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.

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