TriQuint SEMICONDUCTOR

Advance Product Information
November 11, 2005

Ka-Band Packaged 1W PA

TGA4509-SM

Key Features

- Frequency Range: 28-31 GHz
- 30 dBm Nominal P1dB
- 19 dB Nominal Gain
- Bias Conditions: Vd = 6 V, Idq_tot = 420 mA (Id = 800mA under RF drive)
- Compact 4 x 4 QFN with 20 leads
- Package Dimensions: 4.0 x 4.0 x 0.9 mm

Primary Applications

- Ka-Band VSAT Ground Terminal
- Point-to-Point Radio
- Point-to-Multipoint Communications

Product Description

The TriQuint TGA4509-SM is a Ka-Band Packaged 1W Power Amplifier. The TGA4509-SM operates from 28-31 GHz and is designed using TriQuint's proven standard 0.25 um power pHEMT production process.

The TGA4509-SM typically provides 30 dBm of output power at 1 dB gain compression with small signal gain of 19 dB.

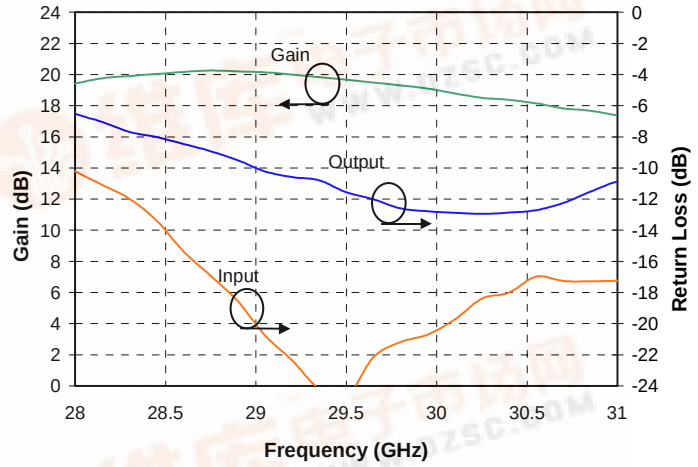
The TGA4509-SM is available in a low-cost, surface mount 4x4 QFN style package and is ideally suited for Ka-band VSAT Ground Terminal, Point-to-Point Radio and Point-to-Multipoint applications.

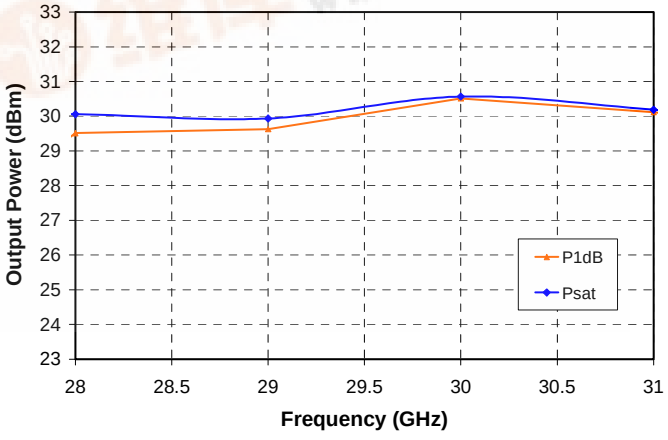
Evaluation Boards are available upon request.

Lead-free and RoHS compliant.

Measured Performance

Bias Conditions: Vd = 6V, Idq = 420mA





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

TABLE I
MAXIMUM RATINGS

Symbol	Parameter 1/	Value	Notes
V^+	Positive Supply Voltage	7 V	2/
V^-	Negative Supply Voltage Range	-5V to 0V	
I^+	Positive Supply Current	984 mA	2/
$\| I_G \|$	Gate Supply Current	35 mA	
P_{IN}	Input Continuous Wave Power	22 dBm	2/
P_D	Power Dissipation	See Note 3	2/ 3/
T_{CH}	Operating Channel Temperature	150 °C	4/ 5/
T_M	Mounting Temperature (30 Seconds)	260 °C	
T_{STG}	Storage Temperature	-65 to 150 °C	

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

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.

3/ For a median life time of 1E+6 hrs, Power dissipation is limited to:
$P_{D(max)} = (150\ °C - T_{BASE}\ °C) / 22.4\ (°C/W)$

4/ These ratings apply to each individual FET.

5/ Junction operating temperature will directly affect the device median time to failure (T_M). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

TABLE II
RF CHARACTERIZATION TABLE
(T_A = 25°C, Nominal)
Bias Conditions: Vd = 6V, Idq = 420mA

SYMBOL	PARAMETER	TEST CONDITION	NOMINAL	UNITS
Gain	Small Signal Gain	f = 28-31 GHz	19	dB
IRL	Input Return Loss	f = 28-31 GHz	16	dB
ORL	Output Return Loss	f = 28-31 GHz	10	dB
Psat	Saturated Output Power	f = 28-31 GHz	30.5	dBm
P1dB	Output Power @ 1dB Compression	f = 28-31 GHz	30	dBm

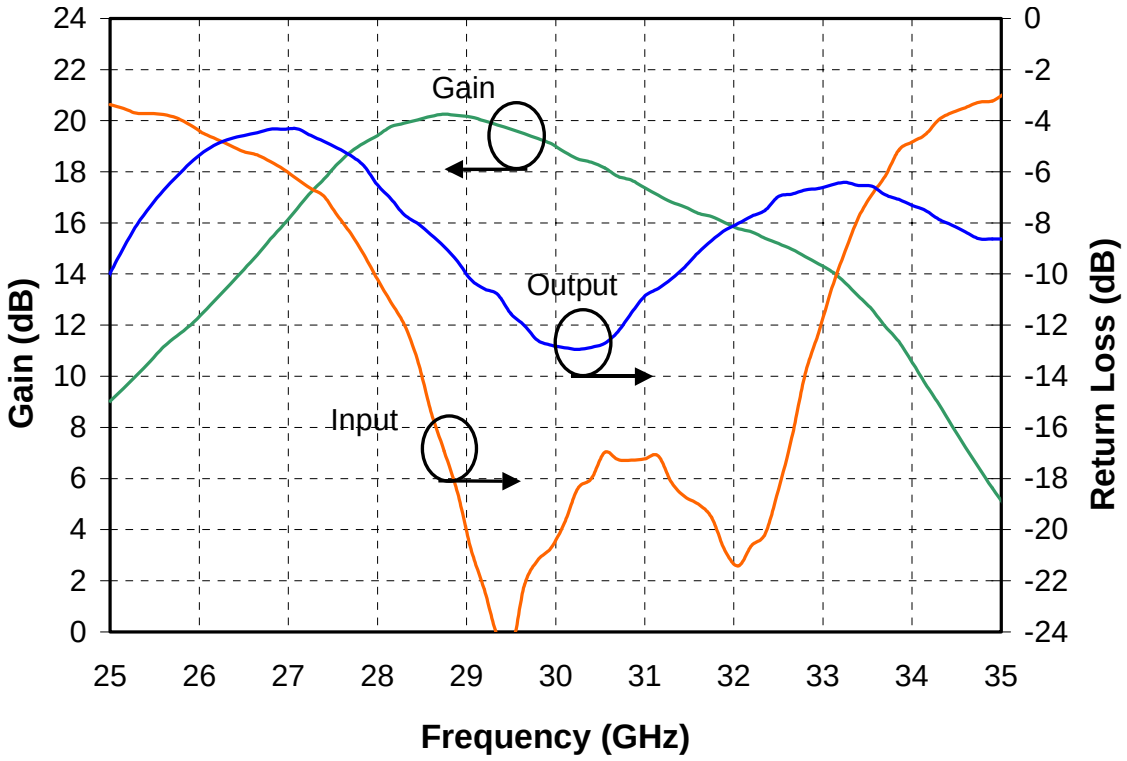
TABLE III
THERMAL INFORMATION

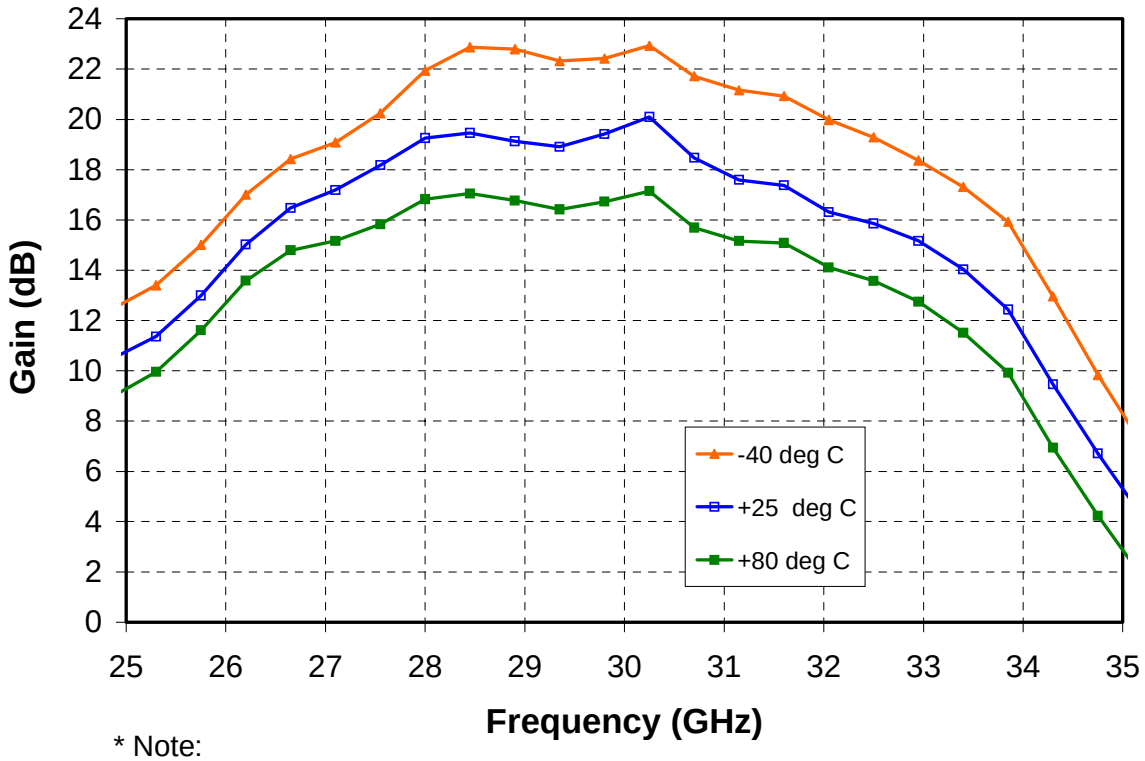
PARAMETER	TEST CONDITION	T_{CH} (°C)	$R_{\theta jc}$ (°C/W)	MTTF (HRS)
$R_{\theta jc}$ Thermal Resistance (Channel to package)	V_D = 6V I_{Dq} = 420mA P_{Diss} = 2.52 W	141	22.4	2.2 E+6

Note: Backside of package is at 85 °C baseplate temperature. Worst case is at saturated output power when DC power consumption rises to 4.8 W with 1 W RF power delivered to load. Power dissipated is 3.8 W and the temperature rise in the channel is 85 °C. Baseplate temperature must be reduced to 65 °C to remain below the 150 °C maximum channel temperature.

Measured Performance

Bias Conditions: Vd = 6 V, Idq = 420 mA

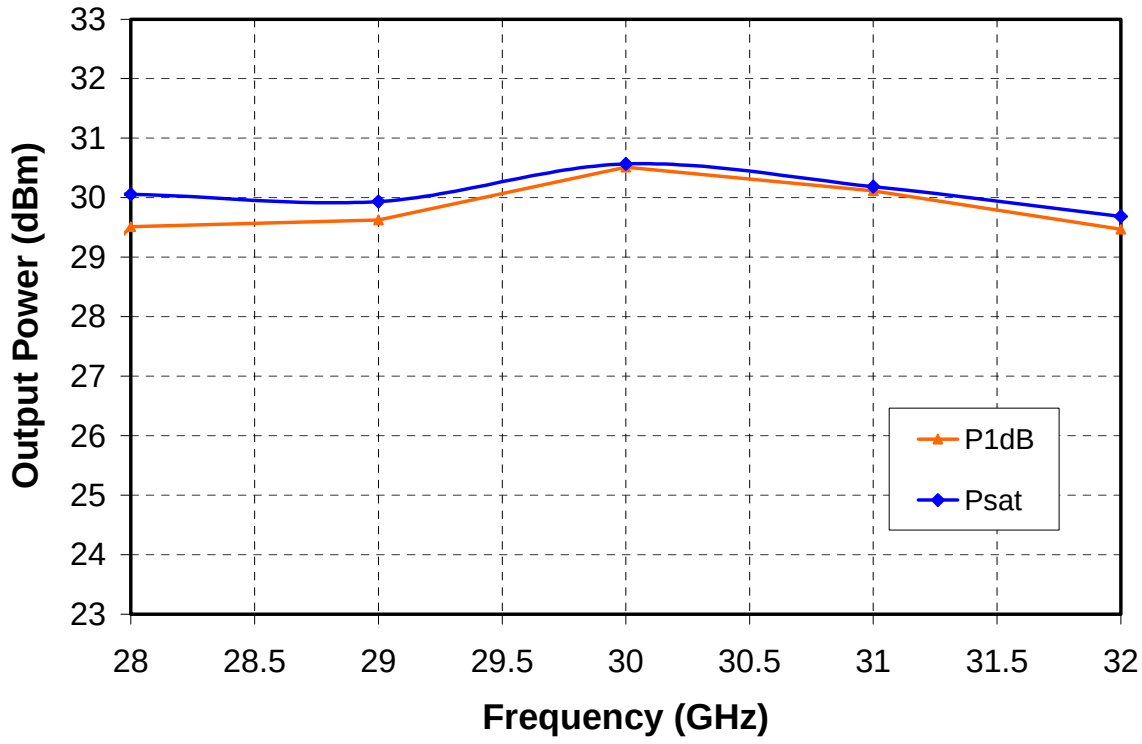


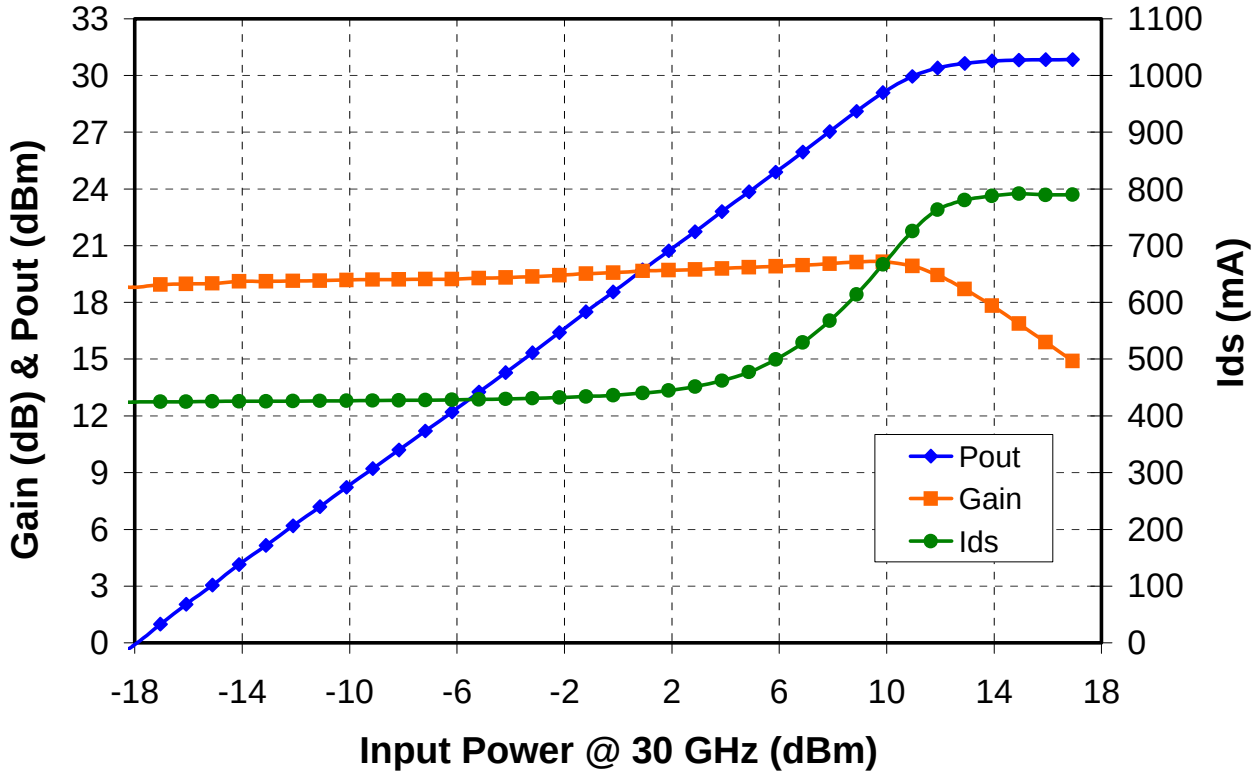


* Note:
Temperature data is taken using connectorized evaluation boards. The reference plane is at RF connectors, and hence connector and board loss has not been de-embedded.

Measured Performance

Bias Conditions: Vd = 6 V, Idq = 420 mA





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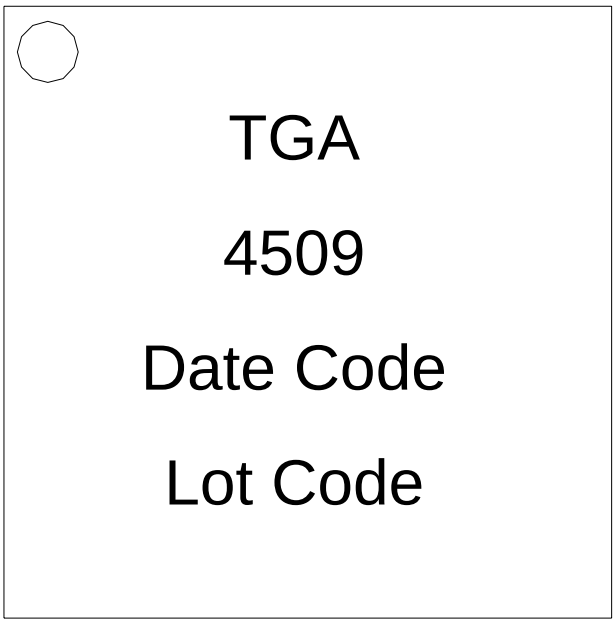
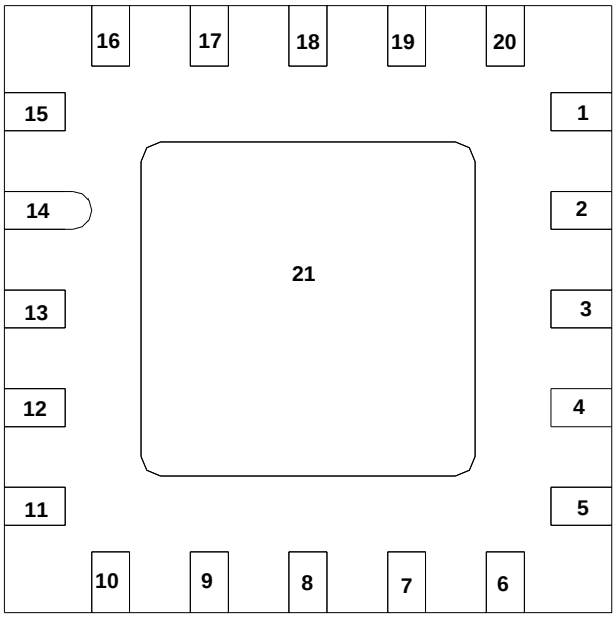
Package Pinout Diagram



Top View

Dot indicates Pin 1

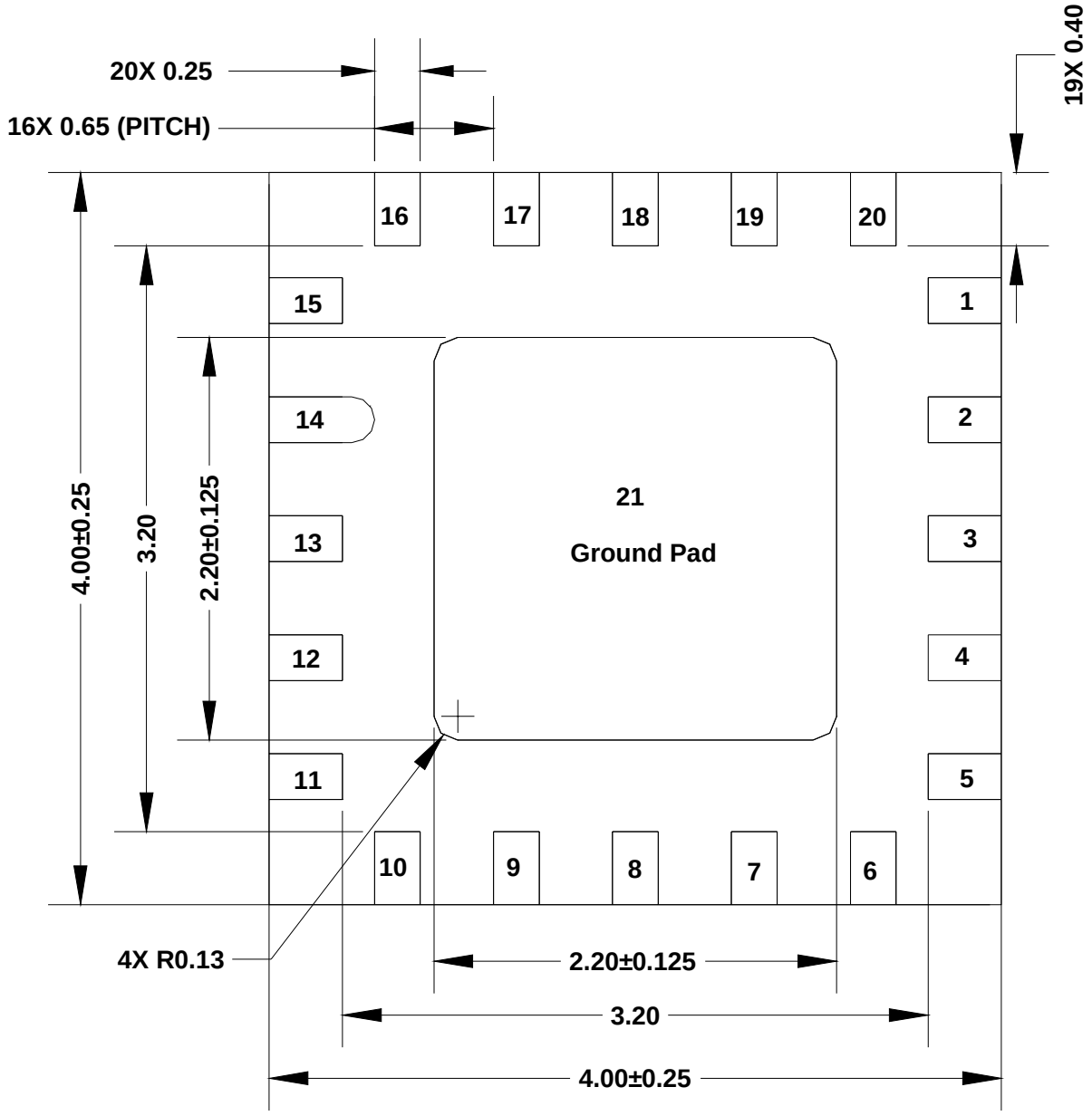


Bottom View

Pin	Description
1, 5, 6, 10, 11, 15, 16, 20, 21	GND
2, 4, 8, 12, 14, 17, 18, 19	NC
3	RF Input
7 and/or 19	Vg
9 and/or 17	Vd
13	RF Output

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

Mechanical Drawing

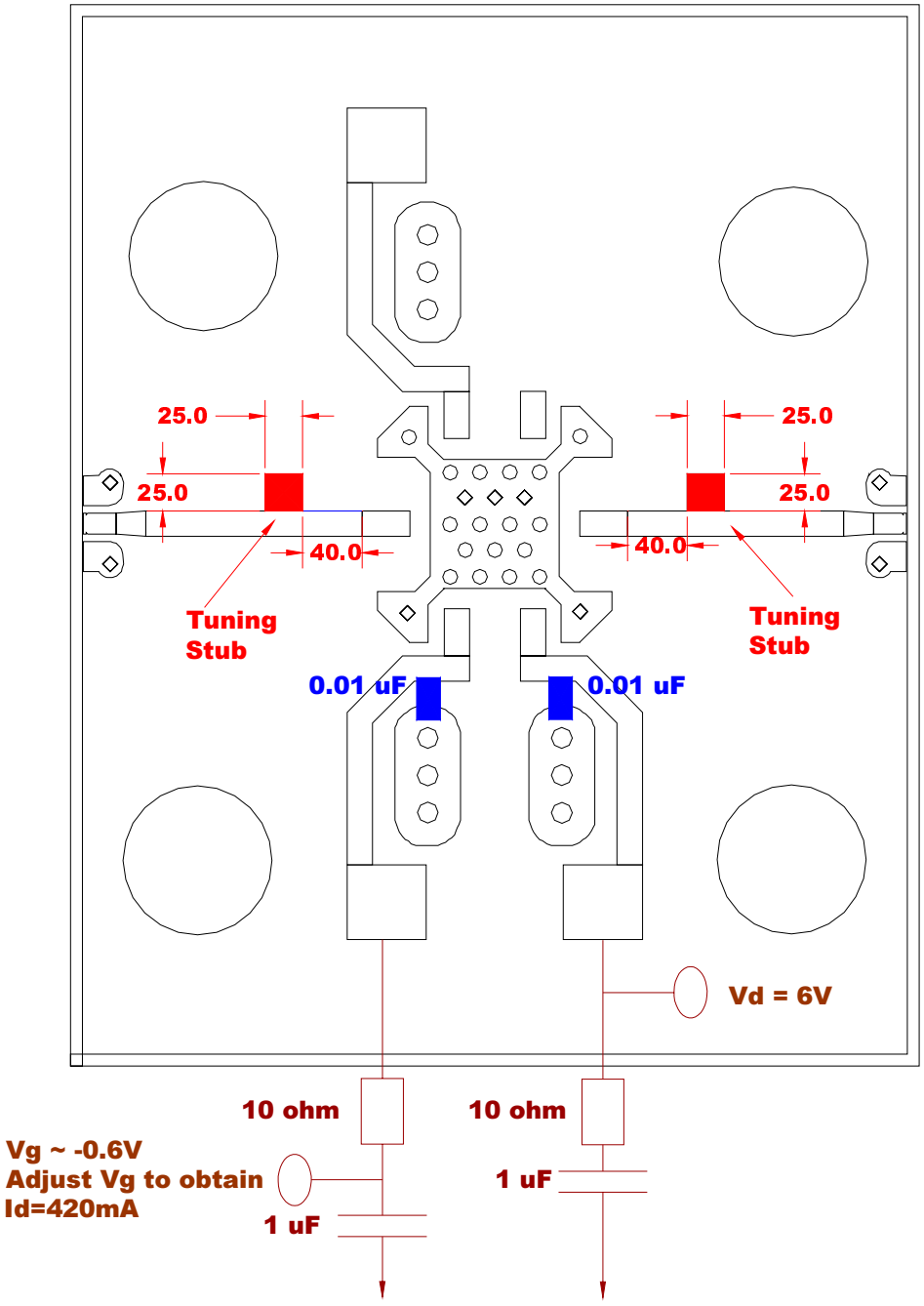


Units: millimeters. Tolerance is ± 0.076mm unless otherwise specified

Bottom view

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

Recommended Board Layout Assembly *



Units: mils

* The layout is a general purpose drawing that needs to be tuned for the specific application. PCB is RO4003 8 mil thickness, 0.5 oz standard copper cladding, with Er = 3.38.

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Recommended Surface Mount Package Assembly

Proper ESD precautions must be followed while handling packages.

Clean the board with acetone. Rinse with alcohol. Allow the circuit to fully dry.

TriQuint recommends using a conductive solder paste for attachment. Follow solder paste and reflow oven vendors' recommendations when developing a solder reflow profile. Typical solder reflow profiles are listed in the table below.

Hand soldering is not recommended. Solder paste can be applied using a stencil printer or dot placement. The volume of solder paste depends on PCB and component layout and should be well controlled to ensure consistent mechanical and electrical performance.

Clean the assembly with alcohol.

Typical Solder Reflow Profiles

Reflow Profile	SnPb	Pb Free
Ramp-up Rate	3 °C/sec	3 °C/sec
Activation Time and Temperature	60 – 120 sec @ 140 – 160 °C	60 – 180 sec @ 150 – 200 °C
Time above Melting Point	60 – 150 sec	60 – 150 sec
Max Peak Temperature	240 °C	260 °C
Time within 5 °C of Peak Temperature	10 – 20 sec	10 – 20 sec
Ramp-down Rate	4 – 6 °C/sec	4 – 6 °C/sec

Ordering Information

Part	Package Style
TGA4509-SM	QFN 4x4 Surface Mount

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