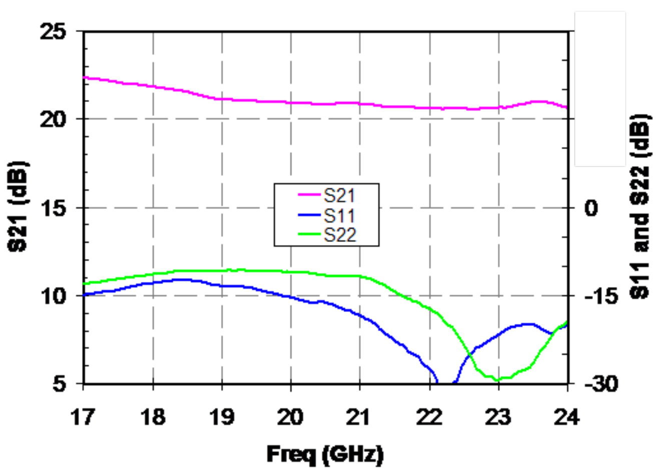
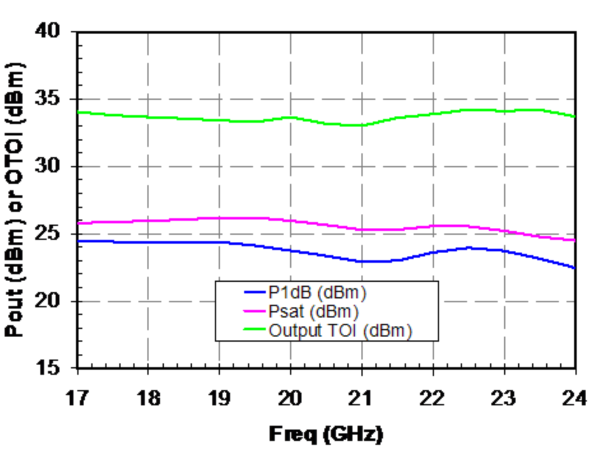
TGA2521-SM

17-24 GHz Linear Driver Amplifier

Measured Performance

Bias conditions: Vd = 5 V, Id = 320 mA, Vg = -0.5 V Typical





Key Features

- Frequency Range: 17-24 GHz
- 25.5 dBm Nominal Psat, 23.5 dBm Nominal P1dB
- Gain: 20 dB
- OTOI: 33 dBm Typical
- Bias: Vd = 5 V, Idq = 320 mA, Vg = -0.5 V Typical
- Package Dimensions: 4 x 4 x 0.85 mm

Primary Applications

- Point-to-Point Radio
- Point-to-Multipoint Communications

Product Description

The TriQuint TGA2521-SM is a three stage HPA MMIC design using TriQuint's proven 0.25 um Power pHEMT process. The TGA2521-SM is designed to support a variety of millimeter wave applications including point-to-point digital radio and other K band linear gain applications.

The TGA2521-SM provides 23.5 dBm nominal output power at 1dB compression across 17-24GHz. Typical small signal gain is 20 dB at 17GHz and 20dB at 23GHz.

The TGA2521-SM requires minimum off-chip components. Each device is DC and RF tested for key parameters. The device is available in a 4x4mm plastic QFN package.

Lead-free and RoHS compliant.

Datasheet subject to change without notice.

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Table I
Absolute Maximum Ratings 1/

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage	11 V	
Vd1, Vd2	Drain Voltage	8 V	2/
Vg1, Vg2	Gate Voltage Range	-5 to 0 V	
Id1	Drain Current	115 mA	2/
Id2	Drain Current	407 mA	2/
Ig1	Gate Current Range	8 mA	
Ig2	Gate Current Range	34 mA	
Pin	Input Continuous Wave Power	23 dBm	2/
Tchannel	Channel Temperature	200 °C	

1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device and / or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum power dissipation listed in Table IV.

Table II
Recommended Operating Conditions

Symbol	Parameter 1/	Value
Vd1, Vd2	Drain Voltage	5 V
Id1+Id2	Drain Current	320 mA
Id_Drive	Drain Current under RF Drive	TBD mA
Vg1 Vg2	Gate #1 Voltage Gate #2 Voltage	-0.5 V -0.5 V

1/ See assembly diagram for bias instructions.

Table III
RF Characterization Table

Bias: Vd = 5 V, Id = 320 mA, Vg = -0.5 V, typical

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	NOM	MAX	UNITS
Gain	Small Signal Gain	f = 17.7 – 23.6 GHz	18.5	20		dB
IRL	Input Return Loss	f = 17.7 – 23.6 GHz		14		dB
ORL	Output Return Loss	f = 17.7 – 23.6 GHz		12		dB
Psat	Saturated Output Power 1/	f = 17.7 – 23.6 GHz	23	25.5		dBm
P1dB	Output Power @ 1dB Compression 1/	f = 17.7 – 23.6 GHz	21	23.5		dBm
TOI	Output TOI	f = 17.7 – 23.6 GHz	30	33		dBm
NF	Noise Figure	f = 17.7 – 23.6 GHz		5	7	dB

1/ Psat and P1dB measurements performed with Vg held constant. Drain current increases under RF drive.

Table IV
Power Dissipation and Thermal Properties

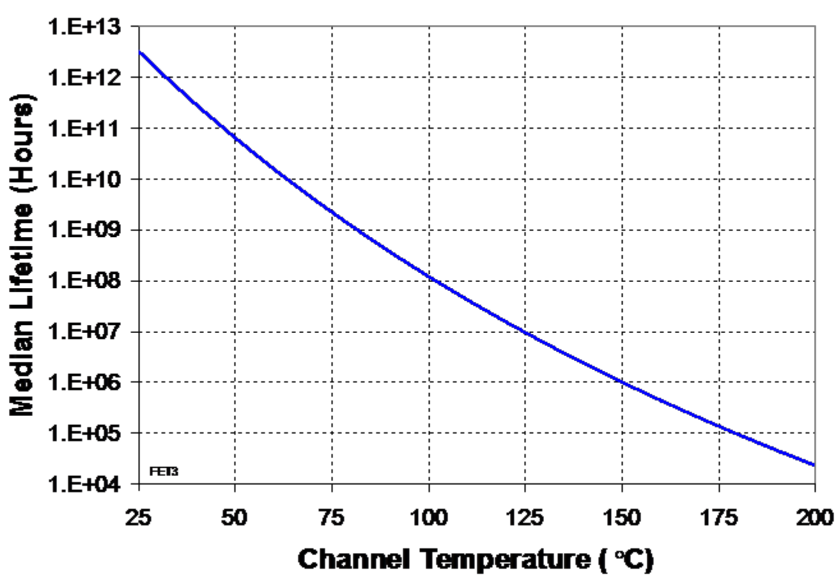
Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 85 °C	Pd = 3.9 W Tchannel = 200 °C	1/ 2/
Thermal Resistance, θjc	Vd = 5 V Id = 320 mA Pd = 1.6 W	θjc = 29.5 °C/W Tchannel = 127 °C Tm = 7.7E+6 Hrs	
Thermal Resistance, θjc Under RF Drive	Vd = 5 V Id = TBD mA Pout = TBD dBm Pd = TBD W	θjc = TBD °C/W Tchannel = TBD °C Tm = TBD Hrs	
Mounting Temperature	30 Seconds	320 °C	
Storage Temperature		-65 to 150 °C	

1/ For a median life of 1E+6 hours, Power Dissipation is limited to

Pd(max) = (150 °C – Tbase °C)/θjc.

2/ Channel operating temperature will directly affect the device lifetime. For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.

Median Lifetime (Tm) vs. Channel Temperature



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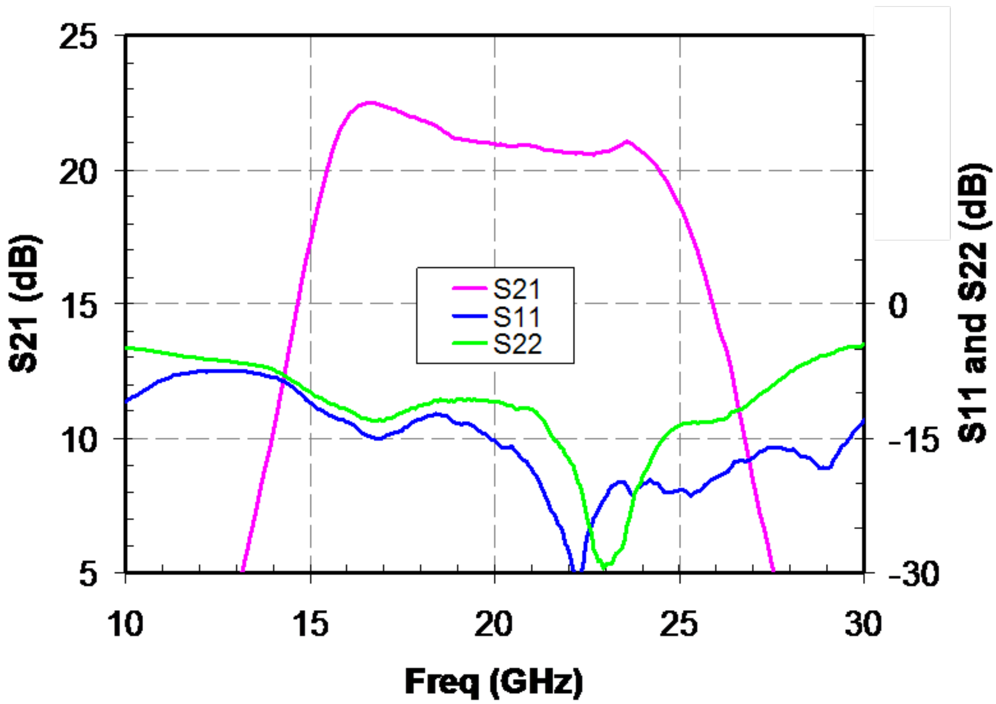
Measured Data

Bias conditions: Vd = 5 V, Id = 320 mA, Vg = -0.5 V Typical



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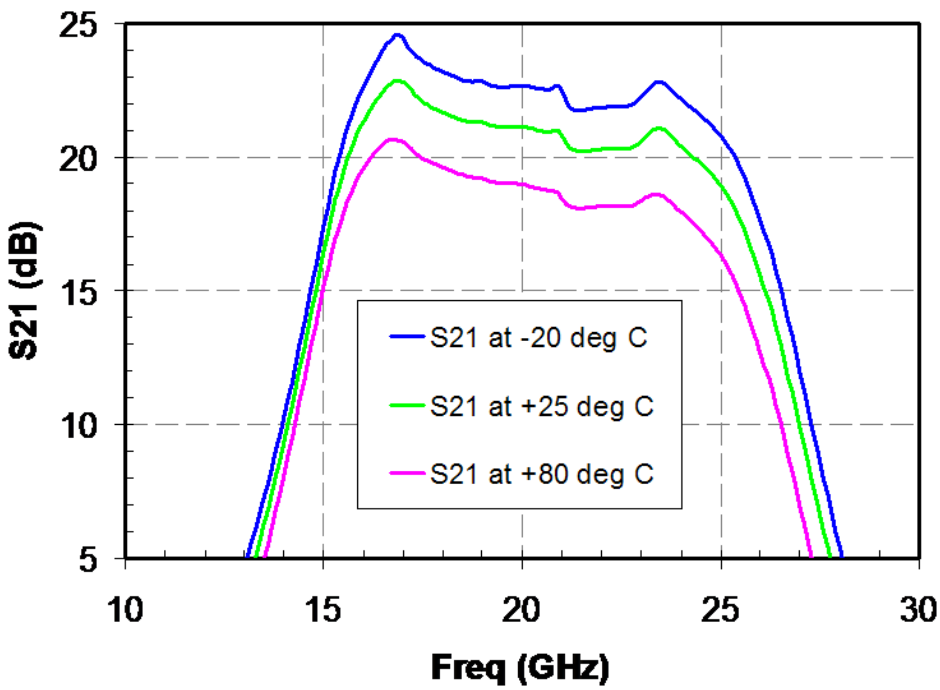

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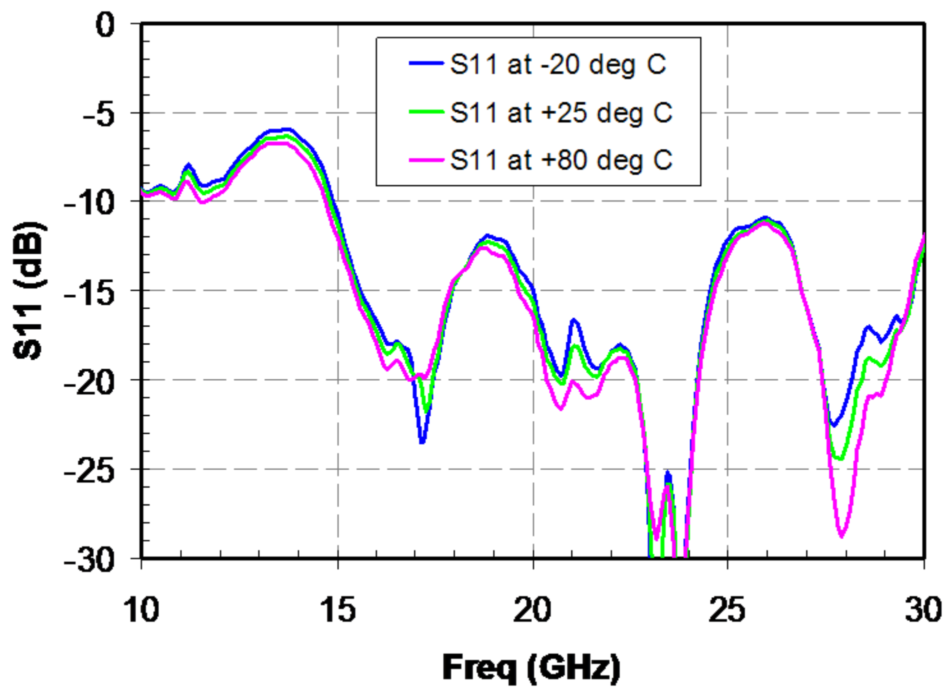
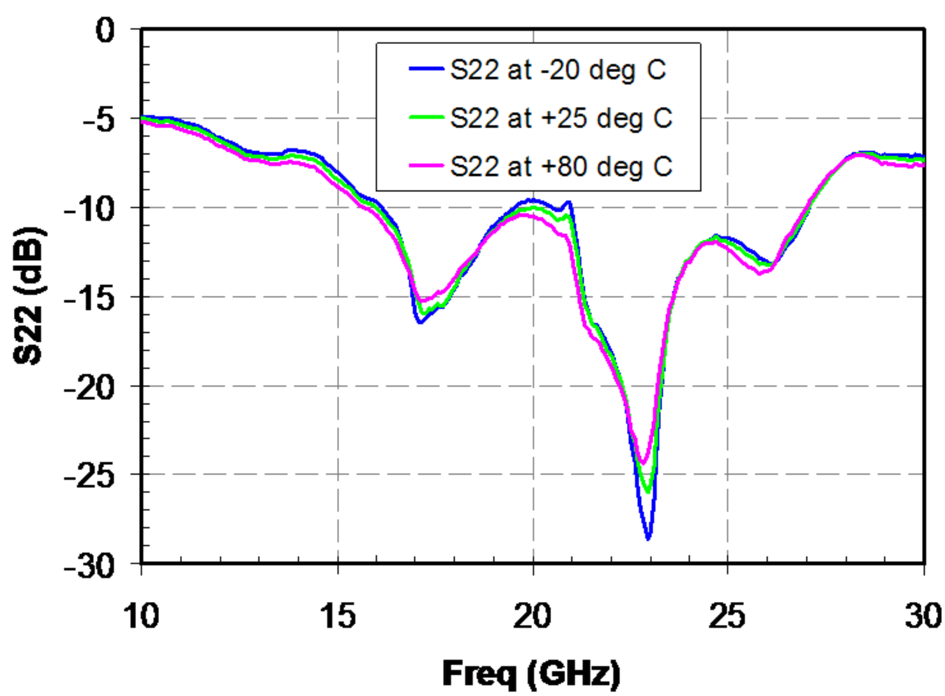
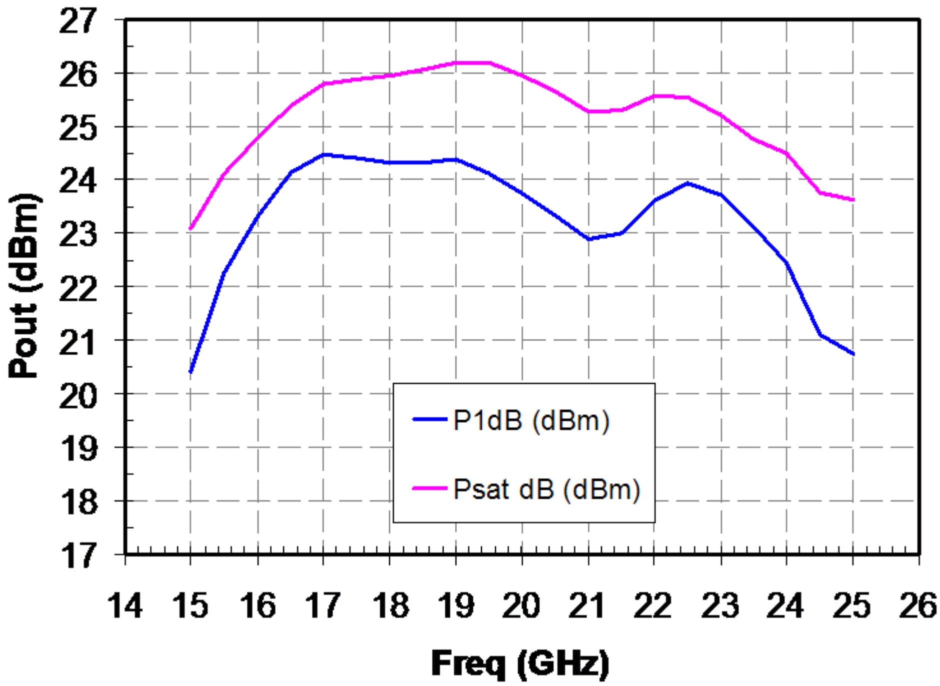


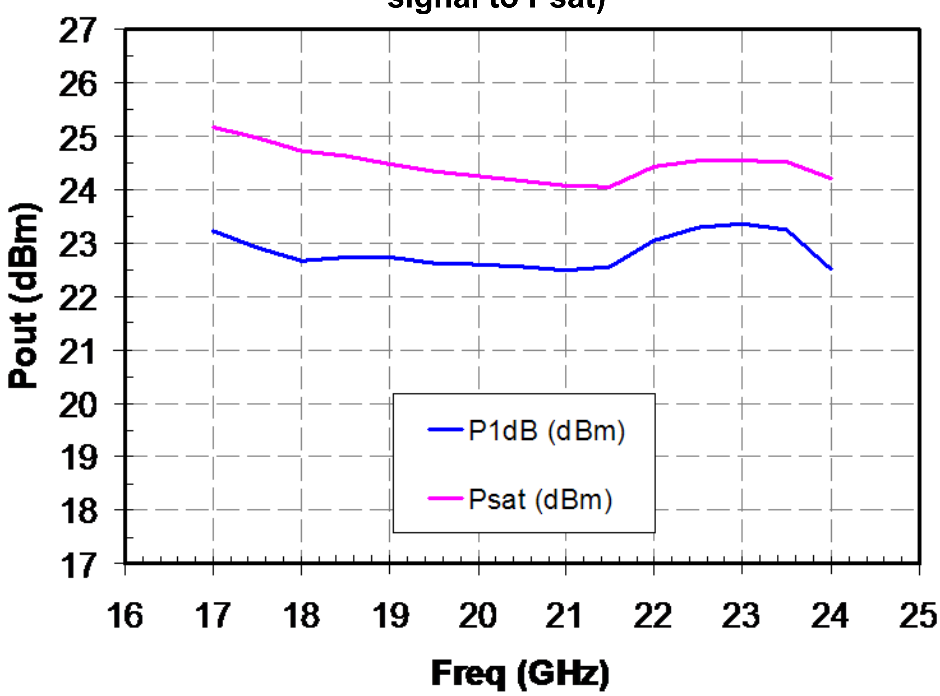


Measured Data

Bias conditions: Vd = 5 V, Idq = 320 mA, Vg = -0.5 V (Vg held constant from small signal to Psat)

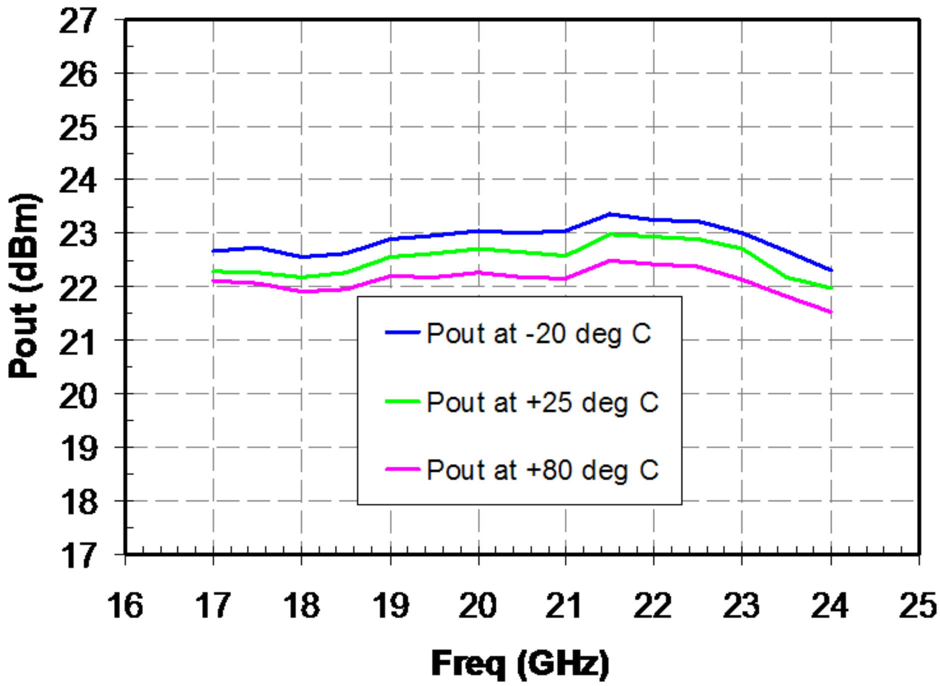


Bias conditions: Vd = 5 V, Id = 320 mA, Vg = -0.5 V (Id held constant from small signal to Psat)



Measured Data

Bias conditions: Vd = 5 V, Id = 320 mA, Vg = -0.5 V Typical (Id held constant from small signal to Psat)



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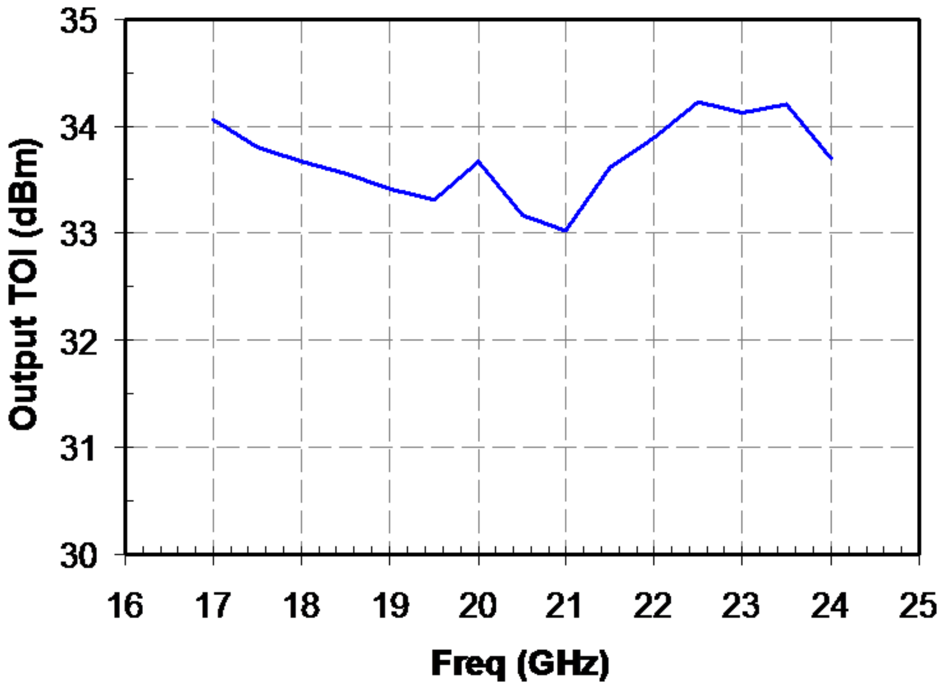

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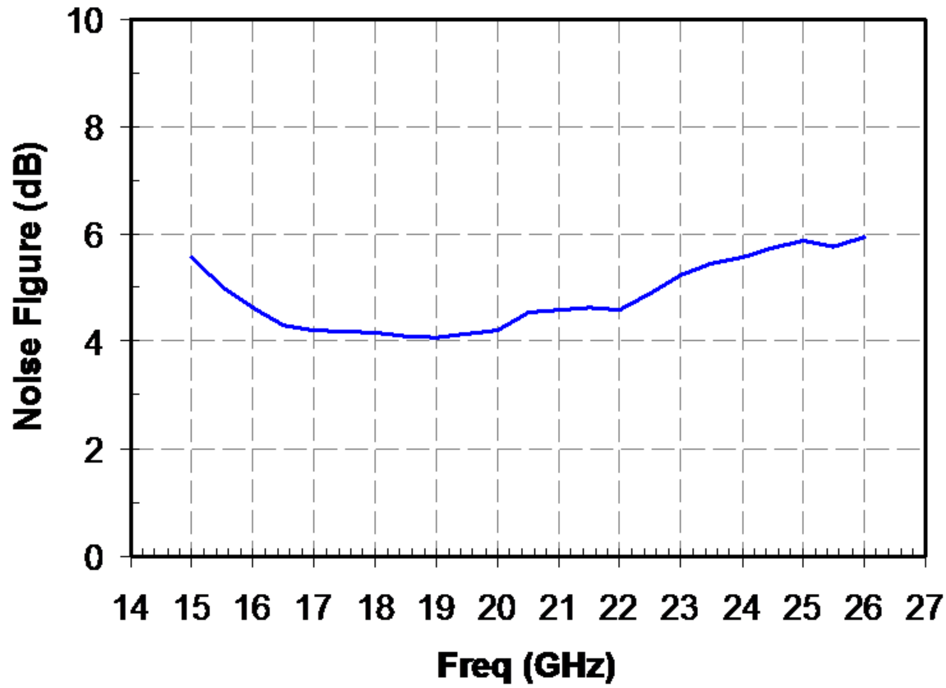

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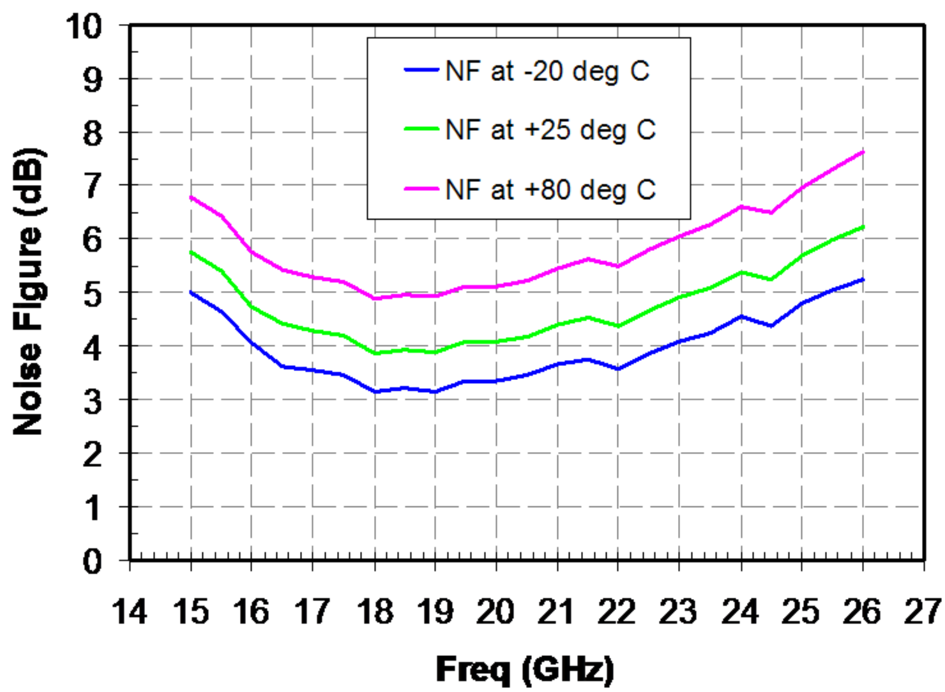
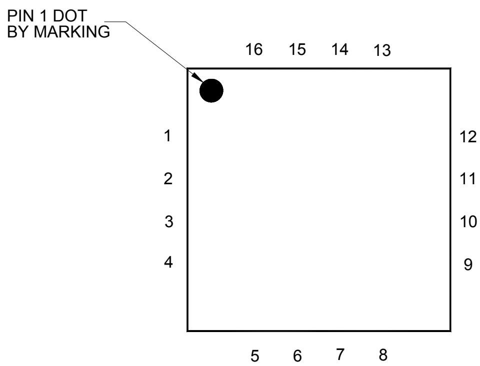
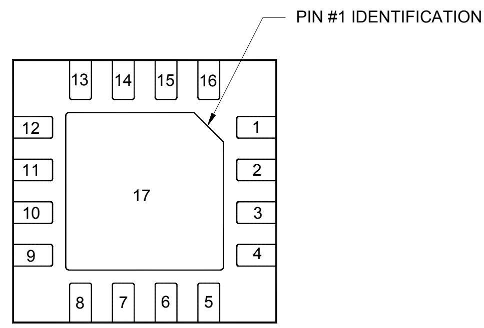


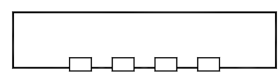
Package Pinout



TOP VIEW



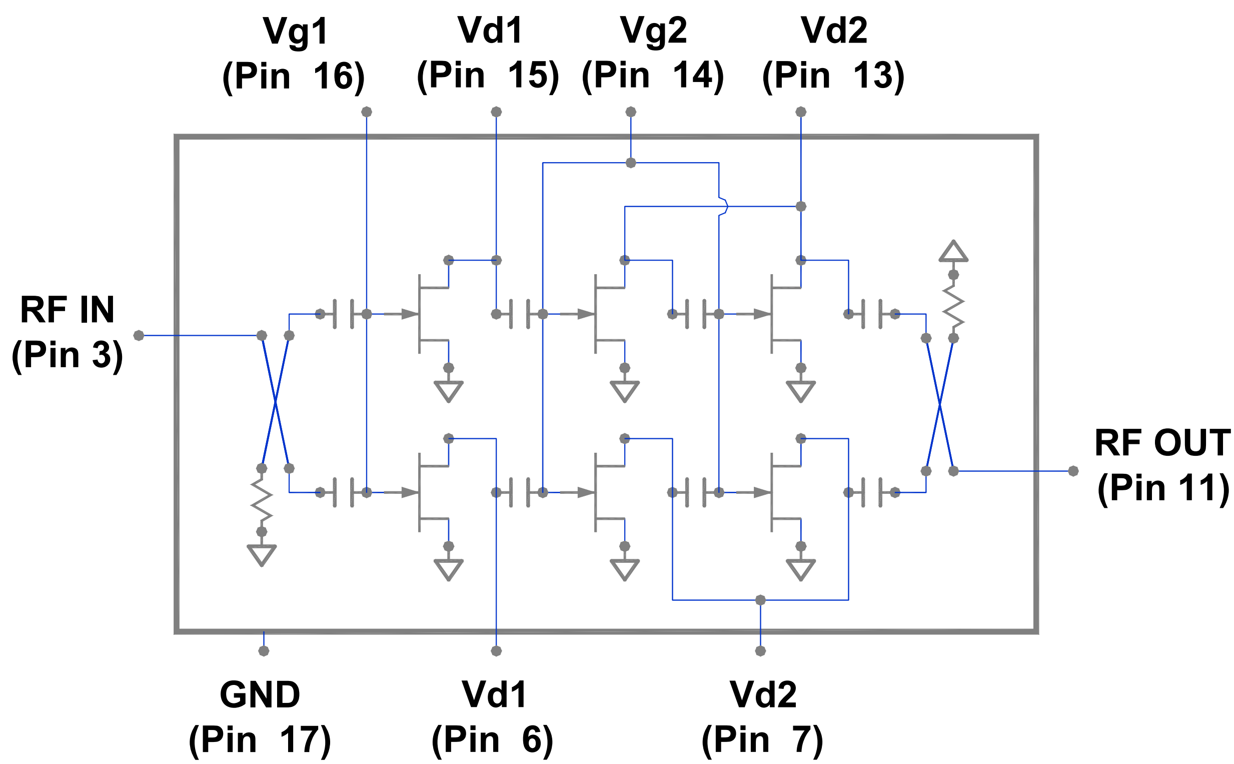
BOTTOM VIEW



SIDE VIEW

Pin	Description
3	RF In
11	RF Out
16	Vg1
14	Vg2
15	Vd1 (top)
6	Vd1 (bot)
13	Vd2 (top)
7	Vd2 (bot)
1,2,4,9,10,12,17	GND
5,8	No Connect

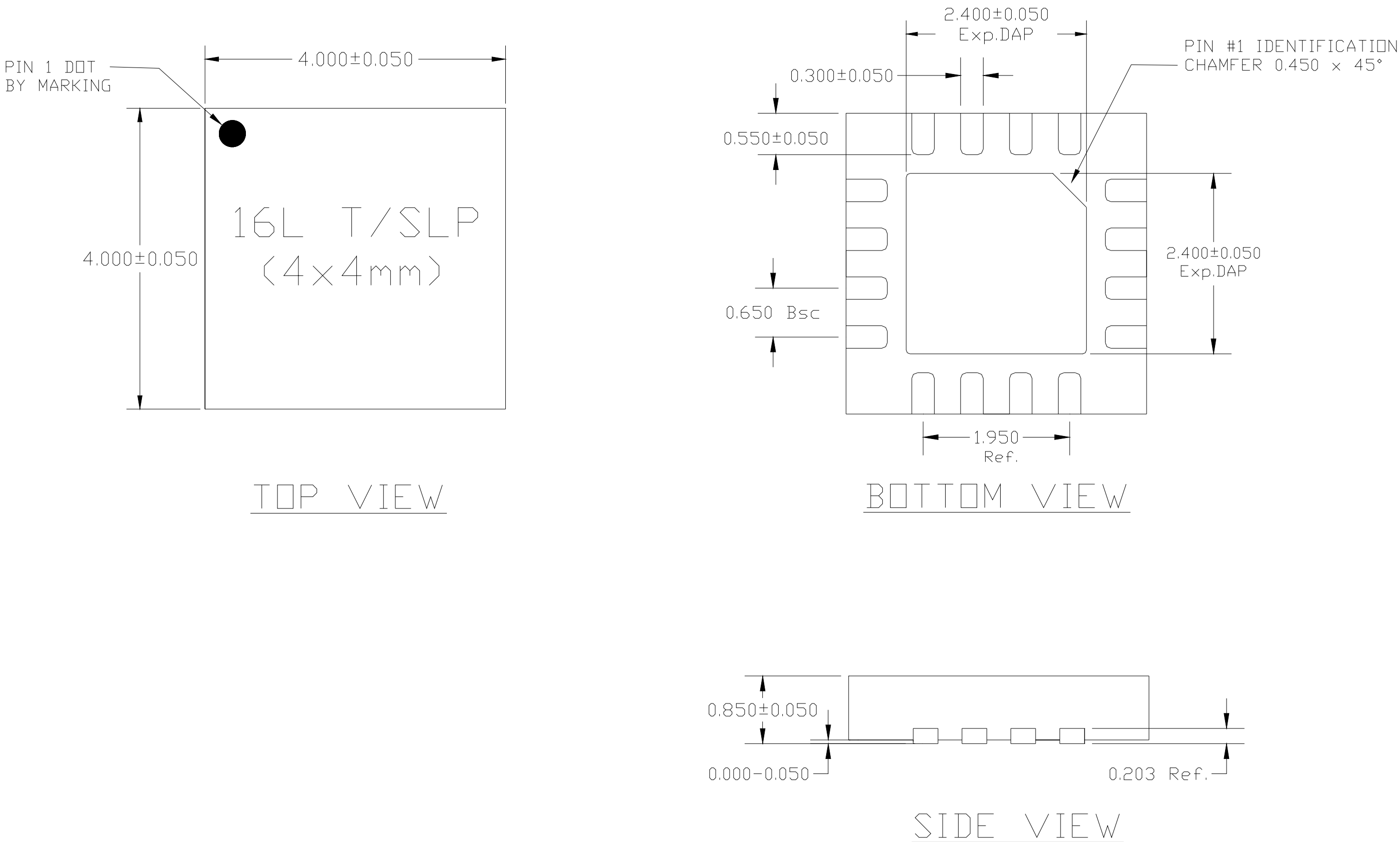
Electrical Schematic



Bias Procedures

Bias-up Procedure	Bias-down Procedure
Vg1, Vg2 set to -1.5 V	Turn off RF supply
Vd1, Vd2 set to +5 V	Reduce Vg1, Vg2 to -1.5V. Ensure Id ~ 0 mA
Adjust Vg1, Vg2 more positive until Id is 320 mA. This will be ~ Vg = -0.5 V	Turn Vd1, Vd2 to 0 V
Apply RF signal to input	Turn Vg1, Vg2 to 0 V

Mechanical Drawing



Units: millimeters

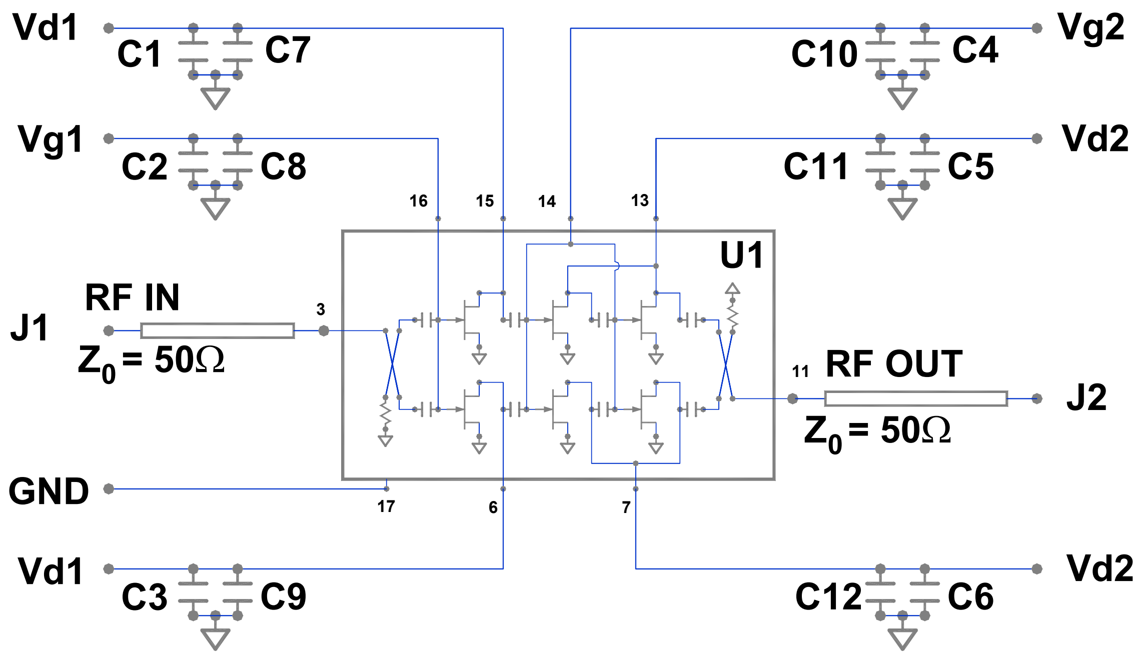
Thickness: 0.85

Pkg x,y size tolerance: +/- 0.050

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

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

Recommended Application Circuit



Ref Designator	Value	Description
U1	--	TriQuint TGA2521-SM
C1 C2 C3 C4 C5 C6	1.0 µF	1206 SMT Ceramic Capacitor
C7 C8 C9 C10 C11 C12	0.01 µF	0603 SMT Ceramic Capacitor
J1, J2	1092-01A-5	Southwest Microwave End Launch Connector

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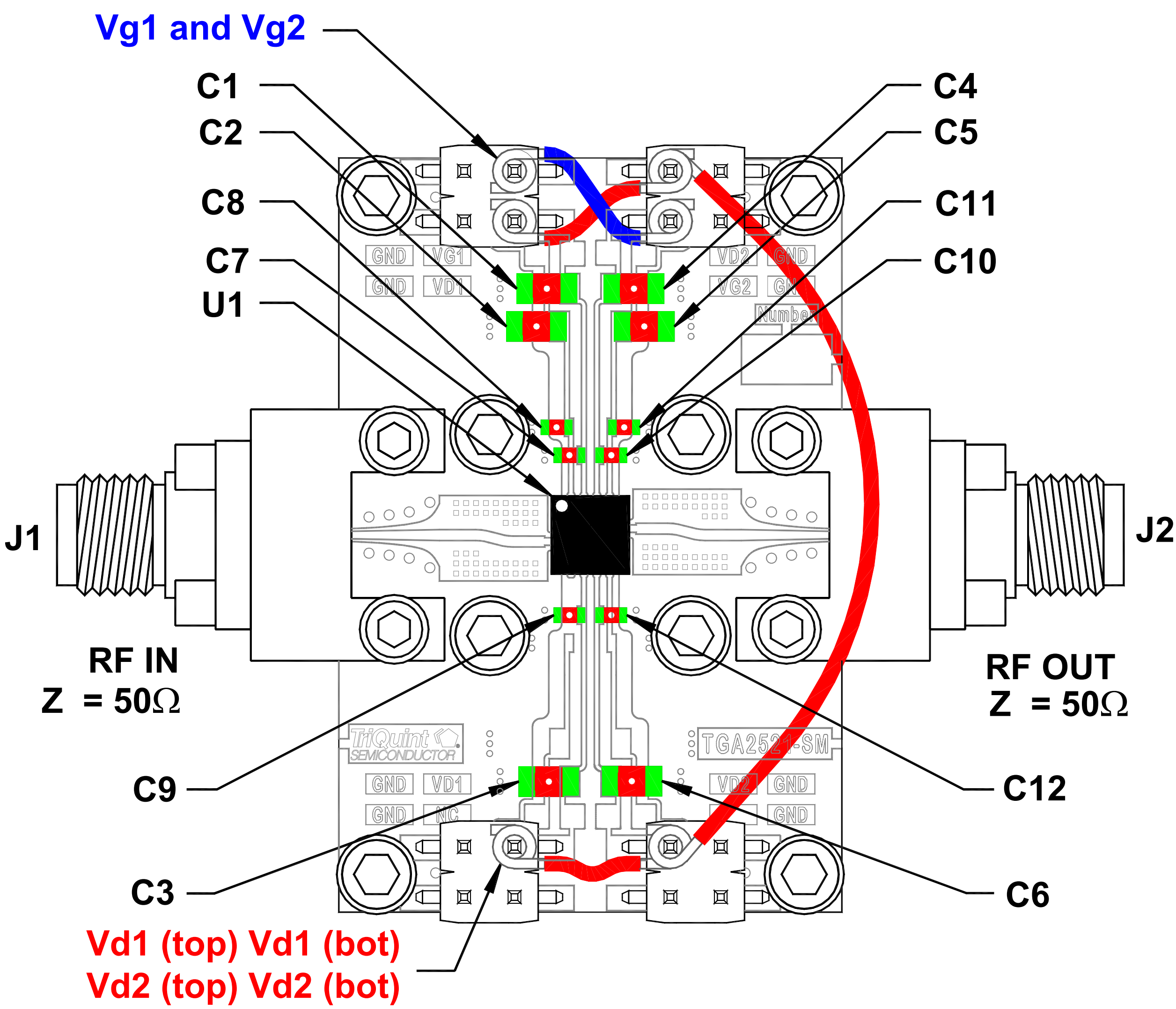
Recommended Assembly Diagram



Board Material: 10 mil thick Rogers 4350

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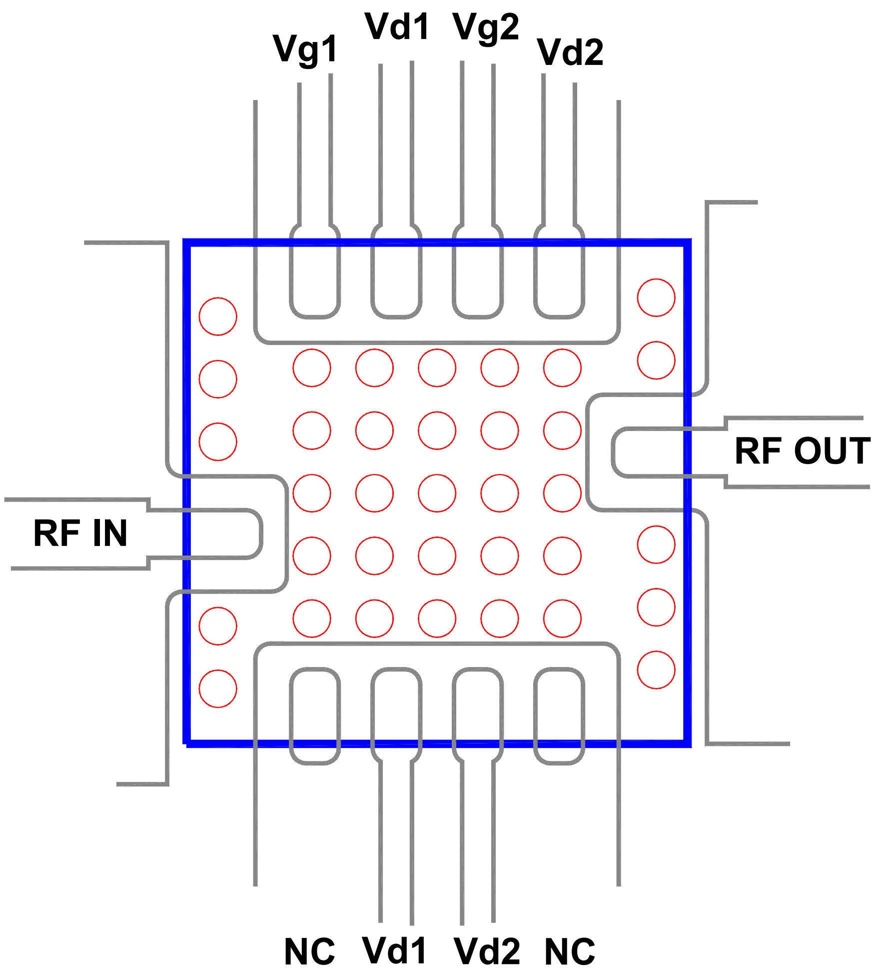
Recommended Land Pattern



Board Material: 10 mil thick Rogers 4350

Open Plated Vias in Center of Land pattern; Vias are 12 mil Diameter, 20 mil center-to-center spacing

Assembly Notes

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.

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
TGA2521-SM, TAPE AND REEL	4mm x 4mm QFN Surface Mount, TAPE AND REEL

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