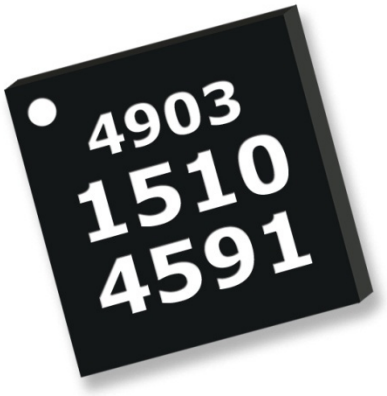
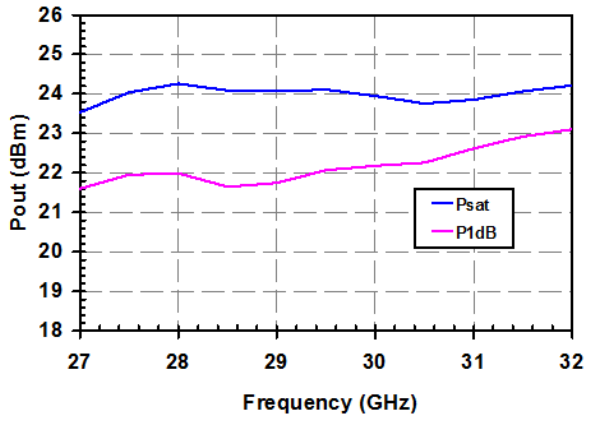
TGA4903-SM

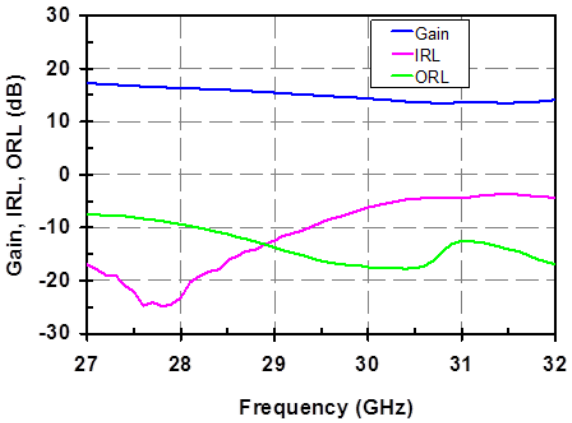
Ka-Band Medium Power Amplifier



Measured Performance

Bias conditions: Vd = 5 V, Id = 170 mA, Vg = -0.6 V, Typical





Key Features

- Frequency Range: 27 - 32 GHz
- Psat: 24 dBm, P1dB: 22 dBm
- Gain: 15 dB
- Return Loss: 10 dB
- Bias: Vd = 5 V, Id = 170 mA, Vg = -0.6 V Typical
- Package Dimensions: 4 x 4 x 0.85 mm

Primary Applications

- Vsat and Digital Radio
- Point-to-Multipoint Communications

Product Description

The TriQuint TGA4903-SM is a Ka-Band packaged medium Power Amplifier. The TGA4903-SM operates from 27-32 GHz and is designed using TriQuint's proven standard pHEMT production process.

The TGA4903-SM typically provides 22 dBm of output power at 1 dB gain compression, with small signal gain of 15 dB.

The TGA4903-SM is ideally suited for VSAT ground terminals, Point-to-Point Radios and Point-to-Multipoint communications.

Evaluation Boards are available.

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	12 V	
Vd	Drain Voltage	8 V	2/
Vg1 Vg2	Gate #1 Voltage Range Gate #2 Voltage Range	-5 to 0 V -5 to 0 V	
Id1 Id2	Drain #1 Current Drain #2Current	352 mA 320 mA	2/
Ig1 Ig2	Gate #1 Current Range Gate #2 Current Range	-0.9 to 16.5 mA -0.8 to 15 mA	
Pin	Input Continuous Wave Power	18 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
Vd	Drain Voltage	5 V
Id	Drain Current	170 mA
Id_Drive	Drain Current under RF Drive	300 mA
Vg	Gate Voltage	-0.6 V

1/ See Bias Procedures section for bias instructions.

Table III
RF Characterization Table

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	NOMINAL	UNITS
Gain	Small Signal Gain	f = 27 GHz	13	16	dB
Gain	Small Signal Gain	f = 28-30 GHz	12	15	dB
Gain	Small Signal Gain	f = 31-32 GHz	11	14	dB
IRL	Input Return Loss	f = 27-32 GHz		10	dB
ORL	Output Return Loss	f = 27-32 GHz		10	dB
Psat	Saturated Output Power	f = 27-32 GHz	22	24	dBm
P1dB	Output Power @ 1dB Compression	f = 27-32 GHz		22	dBm
TOI	Output TOI	f = 27-32 GHz		27	dBm
NF	Noise Figure	f = 27-32 GHz		12	dB

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Table IV
Power Dissipation and Thermal Properties

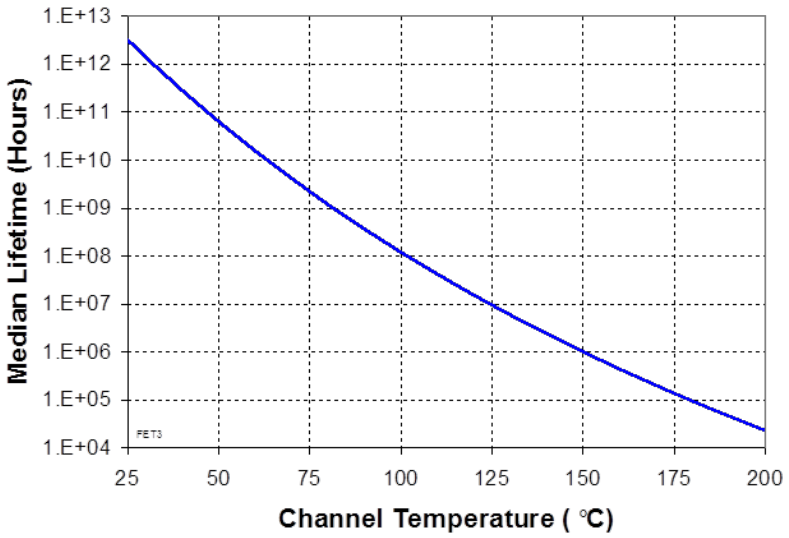
Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70°C	Pd = 2.0 W Tchannel = 200 °C Tm = 2.3 E4 Hrs	1/ 2/
Thermal Resistance, θjc	Vd = 5 V Id = 170 mA Pd = 0.85 W Tbaseplate = 70 °C	θjc = 65.2 °C/W Tchannel = 125 °C Tm = 9.13 E6 Hrs	
Thermal Resistance, θjc Under RF Drive	Vd = 5 V Id = 300 mA Pout = 24.5 dBm Pd = 1.25 W Tbaseplate = 70 °C	θjc = 65.2 °C/W Tchannel = 151 °C Tm = 8.92 E5 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 ºC – Tbase ºC)/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



Measured Data

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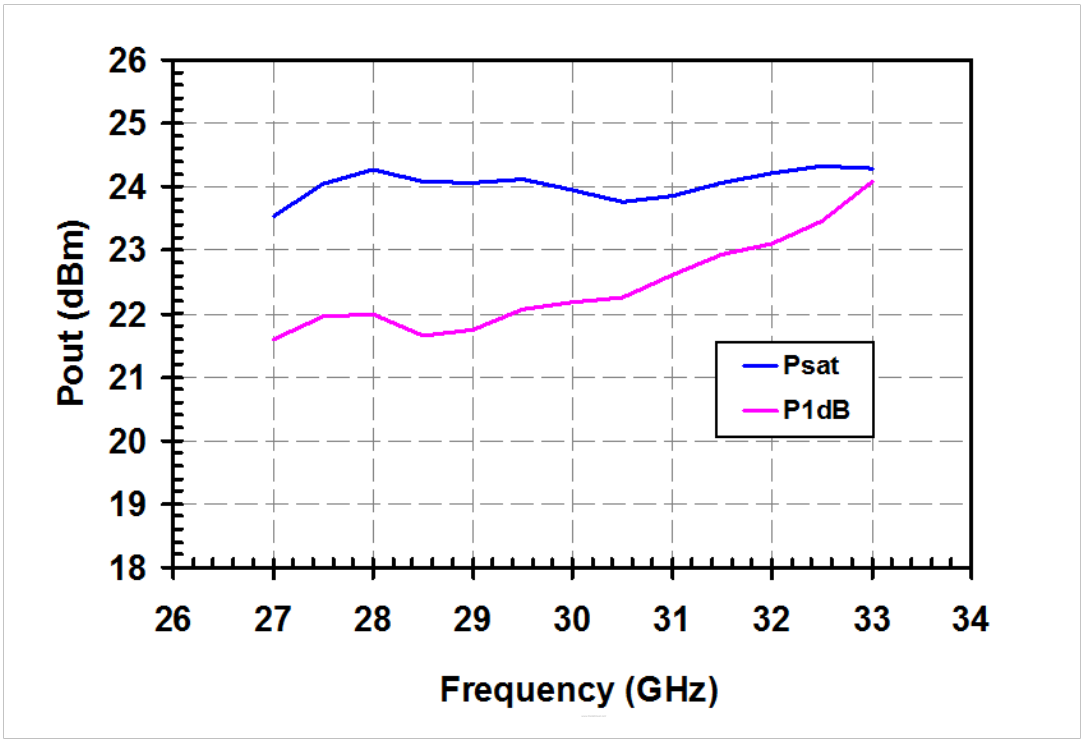

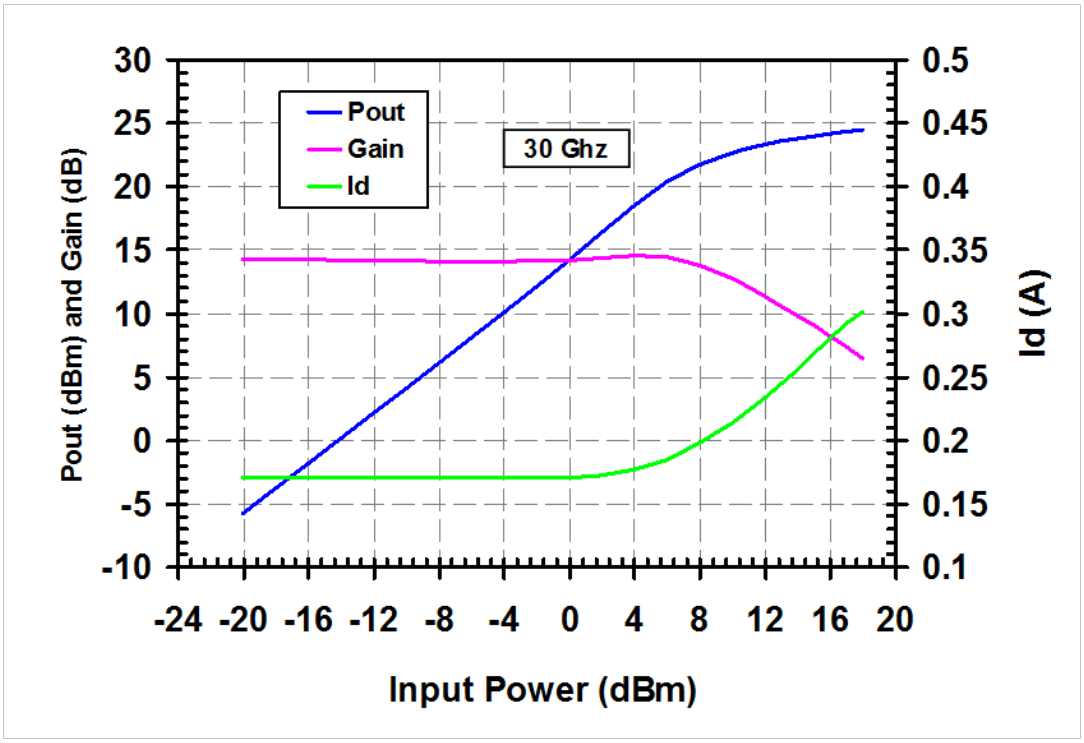

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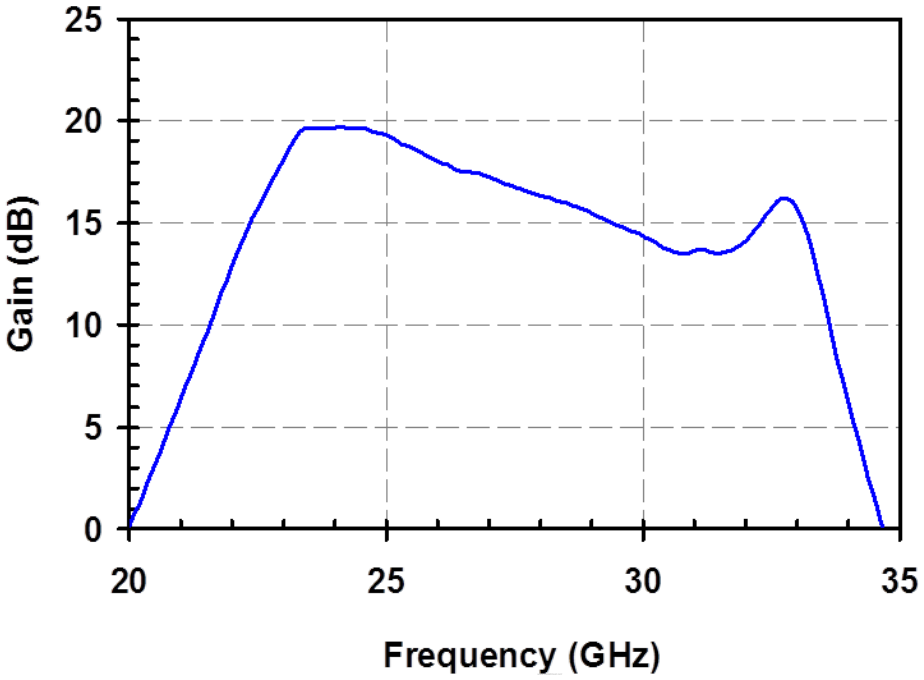

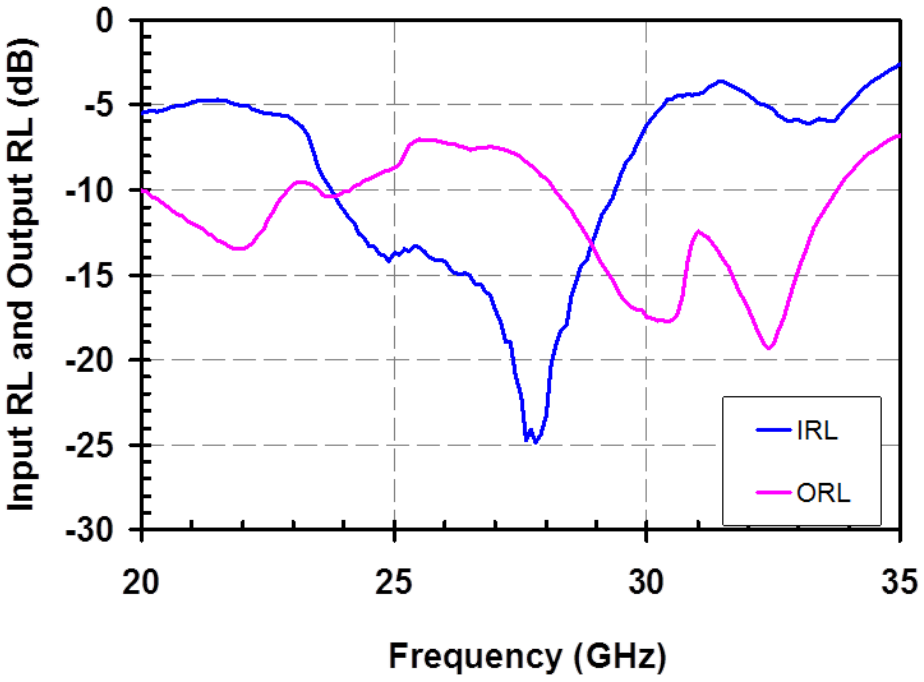

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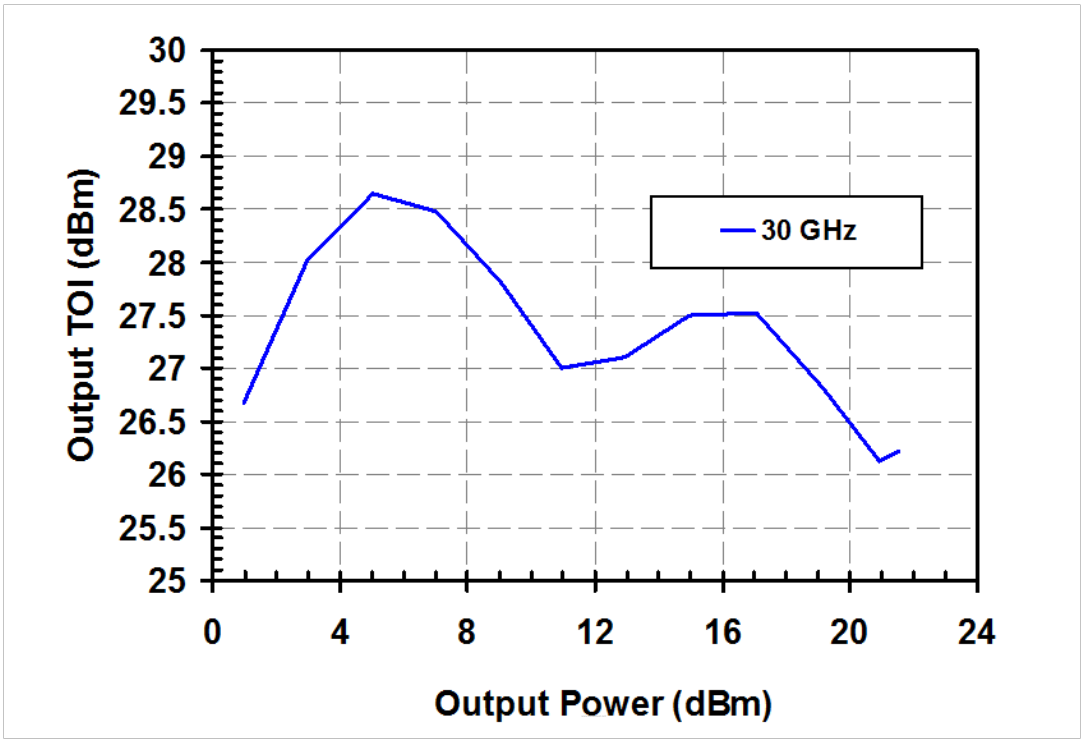

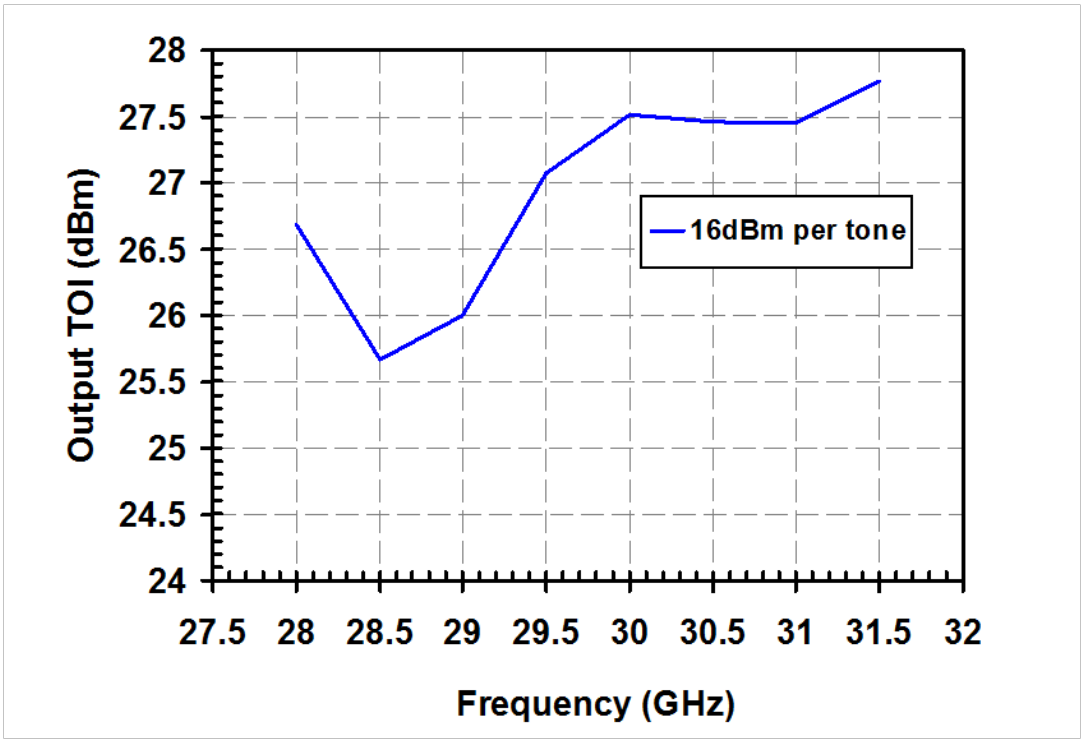

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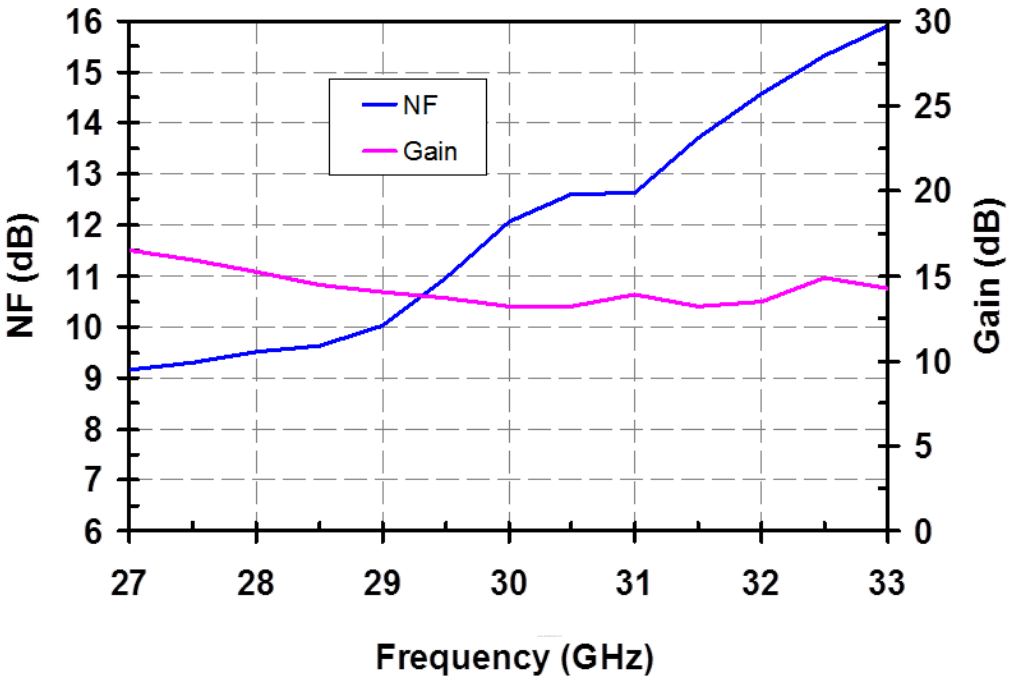

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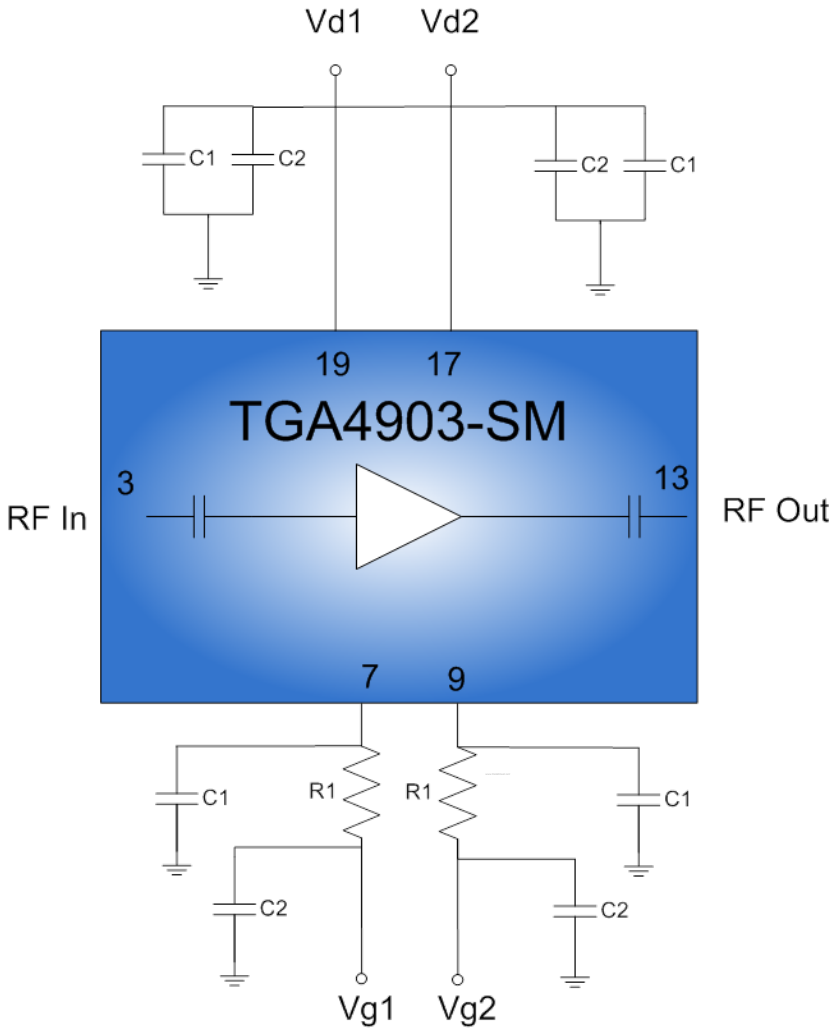
Electrical Schematic



Bias Procedures

Bias-up Procedure

Connect Vg1 and Vg2 together. (“Vg”)
Connect Vd1 and Vd2 together. (“Vd”)

Vg set to -1.5 V

Vd set to +5 V

Adjust Vg more positive until Id is 170 mA. This will be ~ Vg = -0.6 V

Apply RF signal to input

Bias-down Procedure

Turn off RF supply

Reduce Vg to -1.5V. Ensure Id ~ 0 mA

Turn Vd to 0 V

Turn Vg to 0 V

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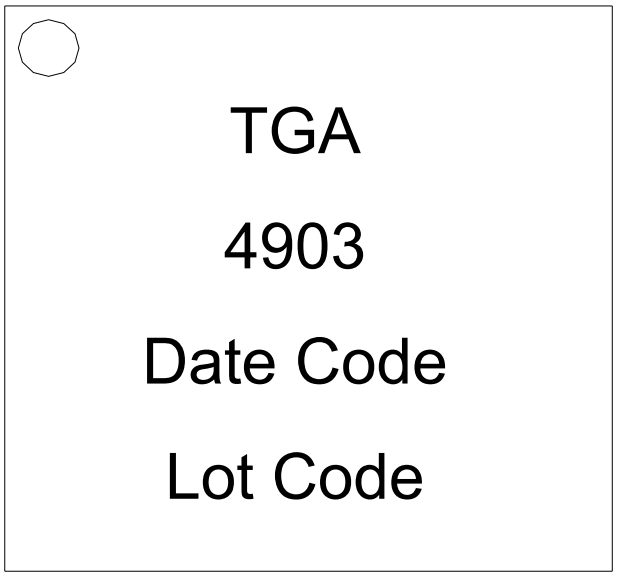
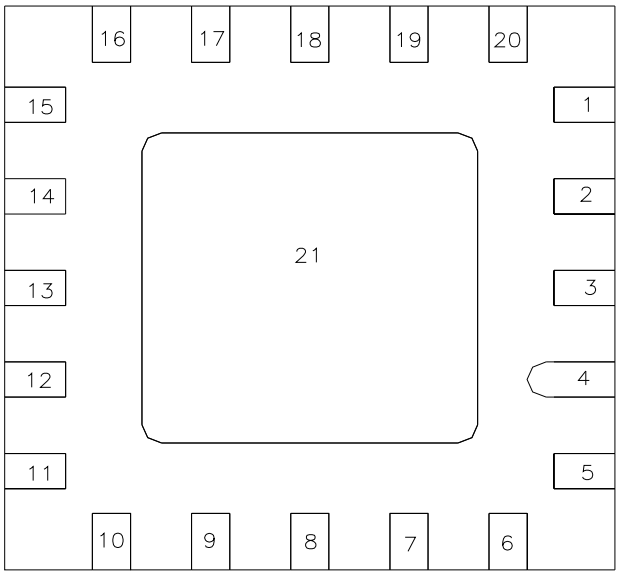
Package Pinout Diagram



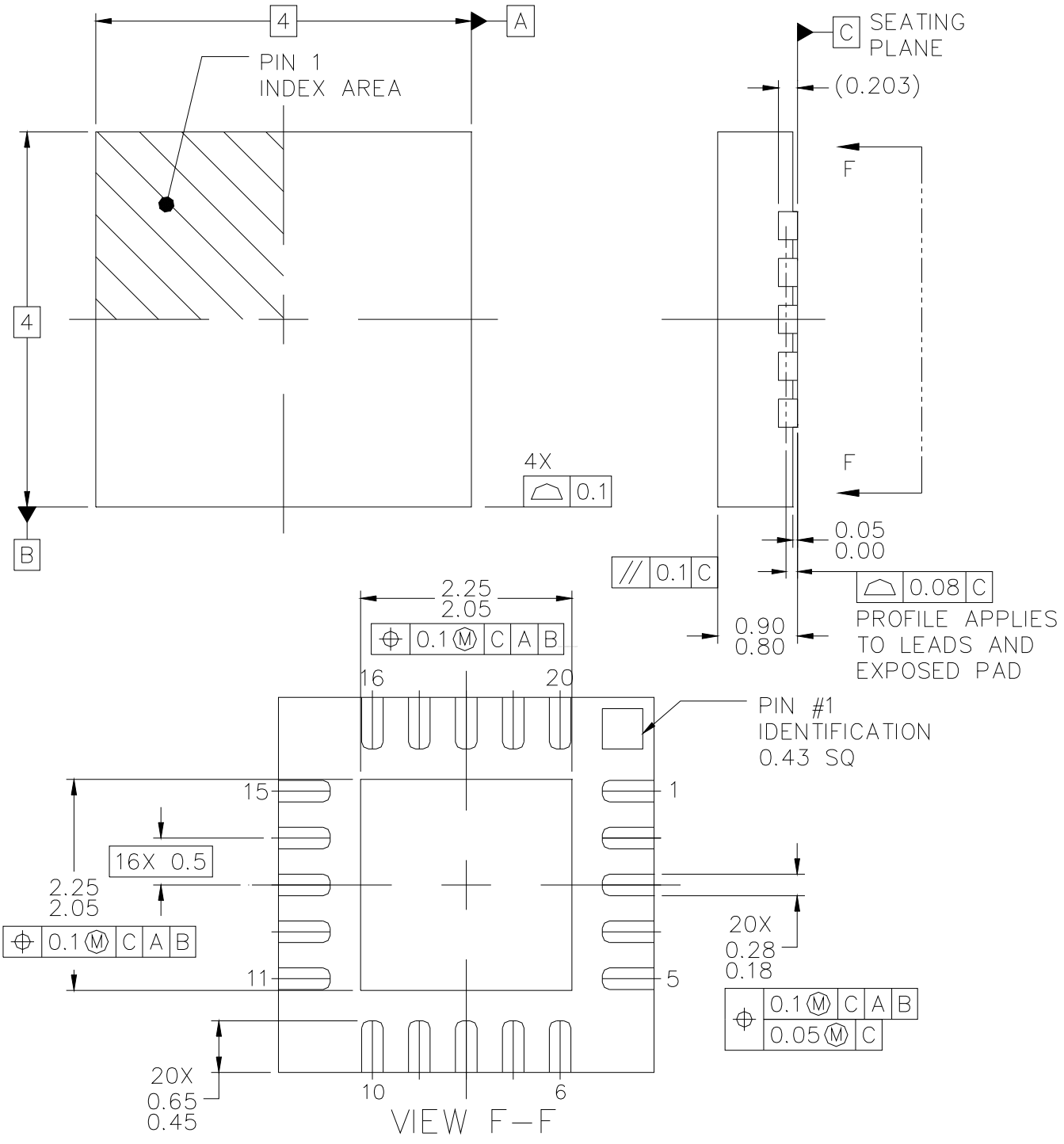
Top View

Dot indicates Pin 1



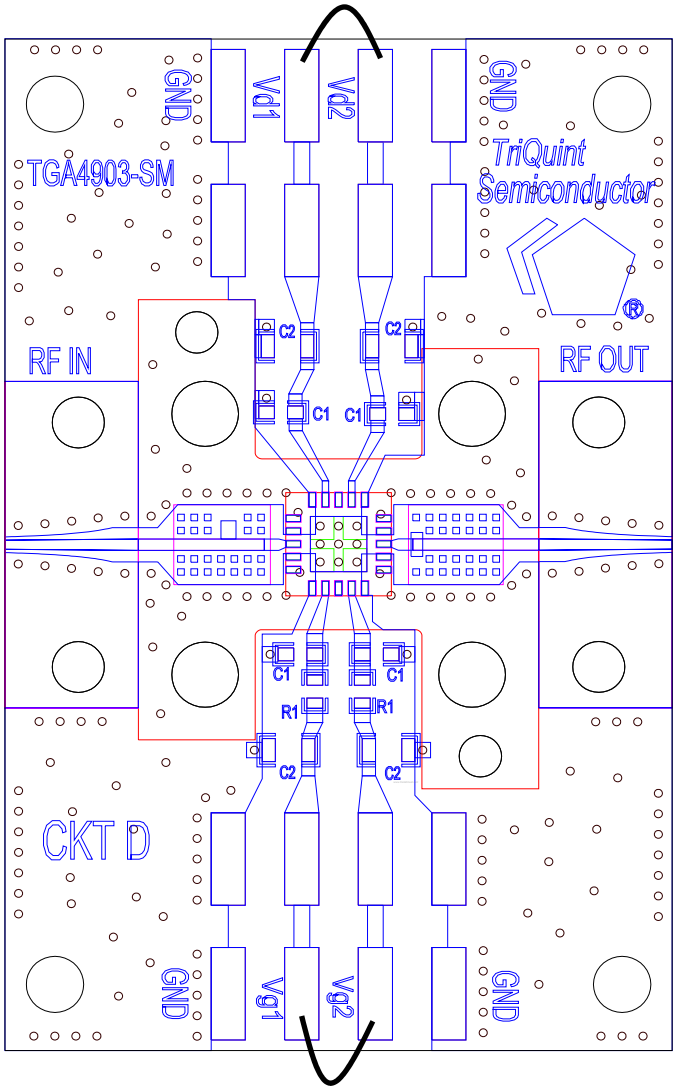
Bottom View

Pin	Description
1, 2, 4, 5, 6, 10, 11, 12, 14, 15, 16, 20, 21	GND
8,18	NC
3	RF Input
7	Vg1
9	Vg2
13	RF Output
17	Vd2
19	Vd1



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

Recommended Assembly Diagram



- **C1: 0402 100pF cap**
- **C2: 0603 1uF cap**
- **R1: 0402 10 ohm resistor**

- **In / Out tuning stubs for gain & power improvements**

- **Rogers RO4003C 8mil thick with 0.5oz cladding**

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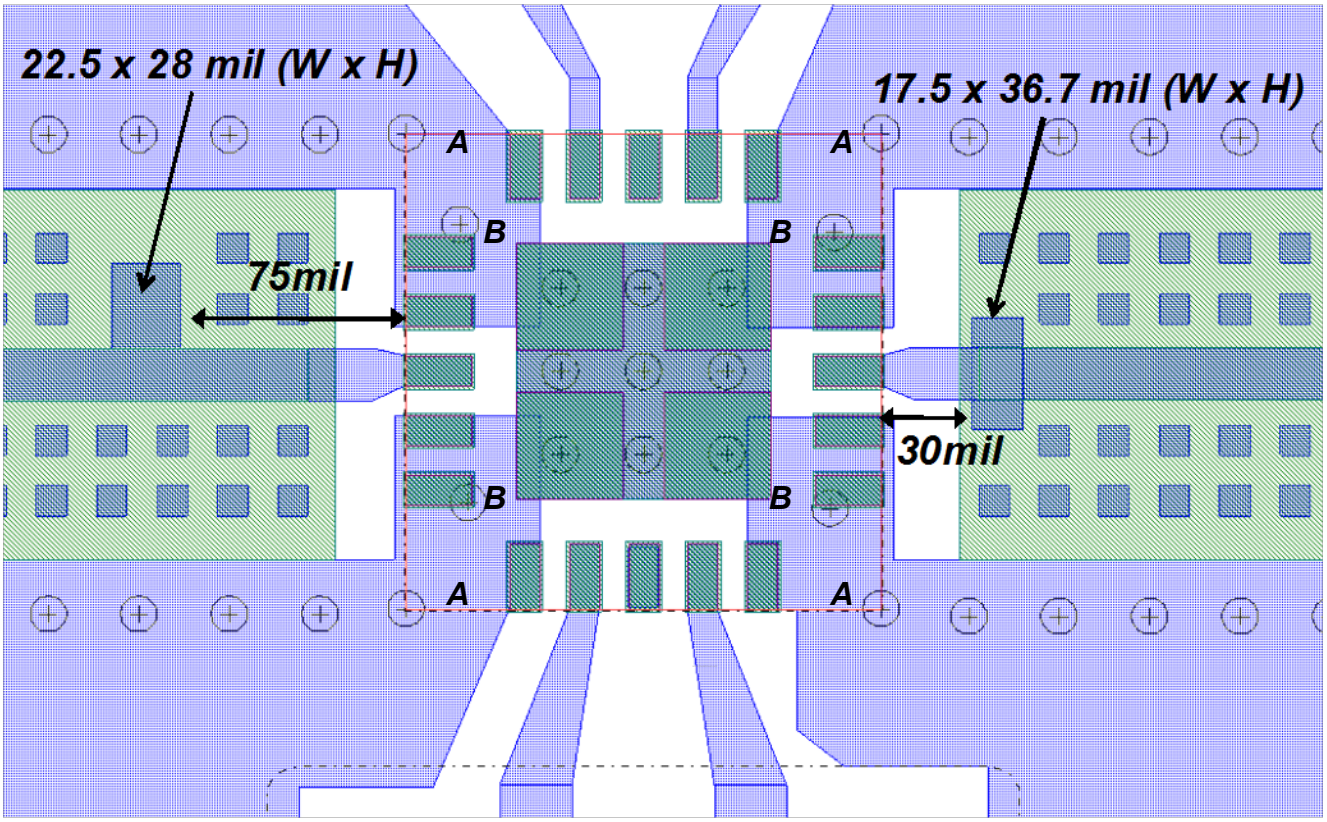
Recommended Board Tuning for Maximum Output Power



NOTE: Ground vias located at sites A and B, above, and grounded metal pads on PCB top metal, located under the package "GND" pads (see page 10), are critical for RF performance

Assembly Notes

Recommended Surface Mount Package Assembly

- Proper ESD precautions must be followed while handling packages.
- Clean the board 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
TGA4903-SM	QFN 4x4 Surface Mount

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