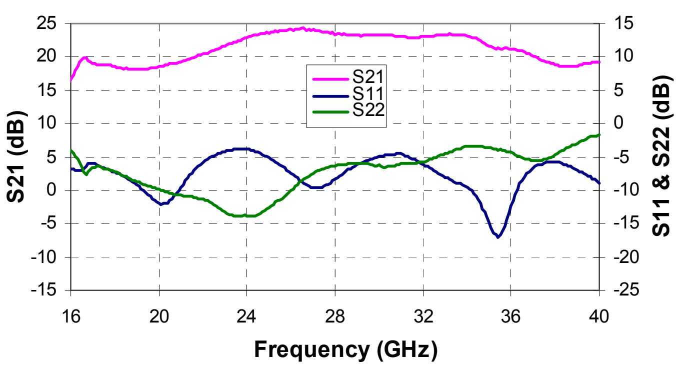
TGA4031-SM

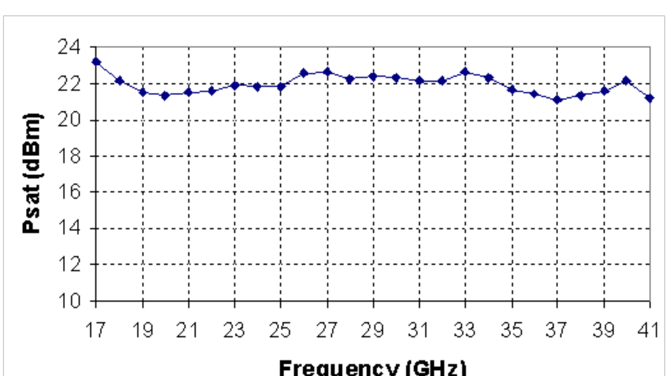
17 – 40 GHz MPA/Multiplier

Measured Performance

Bias at Vd = 5V, Id = 140mA and Vg = -0.75V (Typical)



Bias at Vd = 5V, Id = 140mA and Vg = -0.75V (Typical)



Key Features

- RF Output Frequency Range: 17 - 40 GHz
- 22 dB Nominal Gain
- 22 dBm Nominal Output Maximum Power
- 2x and 3x Multiplier Function
- Bias: Vd = 5V, Id = 140mA
- Package Dimensions: 3.0 x 3.0 x 1.17 mm

Primary Applications

- Point-to-Point Radio
- EW
- Instrumentation
- Frequency Multiplier

Product Description

The TriQuint TGA4031-SM is an Medium Power Amplifier and Multiplier for wide band for 17 – 40 GHz applications. The part is designed using TriQuint's power pHEMT production process.

The TGA4031-SM provides a nominal 22 dB small signal gain with 22 dBm output maximum power. For 2x and 3x Multiplier function, TGA4031-SM provides 15 dBm typical output power @ 9 dBm Pin.

This part is ideally suited for applications such as Point-to-Point Radio, EW, instrumentation and frequency multipliers.

Evaluation boards are available upon request.

Lead-free and RoHS compliant

Datasheet subject to change without notice.

Table I
Absolute Maximum Ratings 1/

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage range	8V	
Vd	Drain Supply Voltage Range	6 V	
Vg	Gate Supply Voltage Range	-3 – 0 V	
Id	Drain Current	400 mA	
|Ig|	Gate Current	1.38 mA	
Pin	Input Continuous Wave Power	20 dBm	

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.

Table II
Recommended Operating Conditions

Symbol	Parameter	Value
Vd	Drain Voltage	5 V
Id	Drain Current	140 mA
Vg	Gate Voltage (Typical)	-0.75 V
Vd1	Drain Voltage	1 V
Vg1	Gate Voltage	-1.1 V

See bias plan on page 14 for amplifier and 2x multiplier, page 15 for 3x multiplier

Table III
RF Characterization Table

Bias: Vd=5V, Id= 140mA, Vg = -0.75V (typical), T_A= 25 °C

PARAMETER	AMPLIFIER	2X MULTIPLIER	3x MULTIPLIER	UNITS
RF Output Frequencies	17 - 40	22 - 38	23 - 31	GHz
S21, Small Signal Gain	22	-	-	dB
S11, Input Return Loss	10	-	-	dB
S22, Output Return Loss	5	5	5	dB
Psat, Maximum Output Power	22			dBm
P1dB, Output Power @ 1 dB Gain Compression	18			dBm
IMD3@ 11 dBm Pout/Tone	28			dBc
Output Power @ Pin = 9 dBm	-	15	15	dBm
Conversion Gain	-	9	5	dB
Gain Temperature coefficient	-0.04			dB/°C

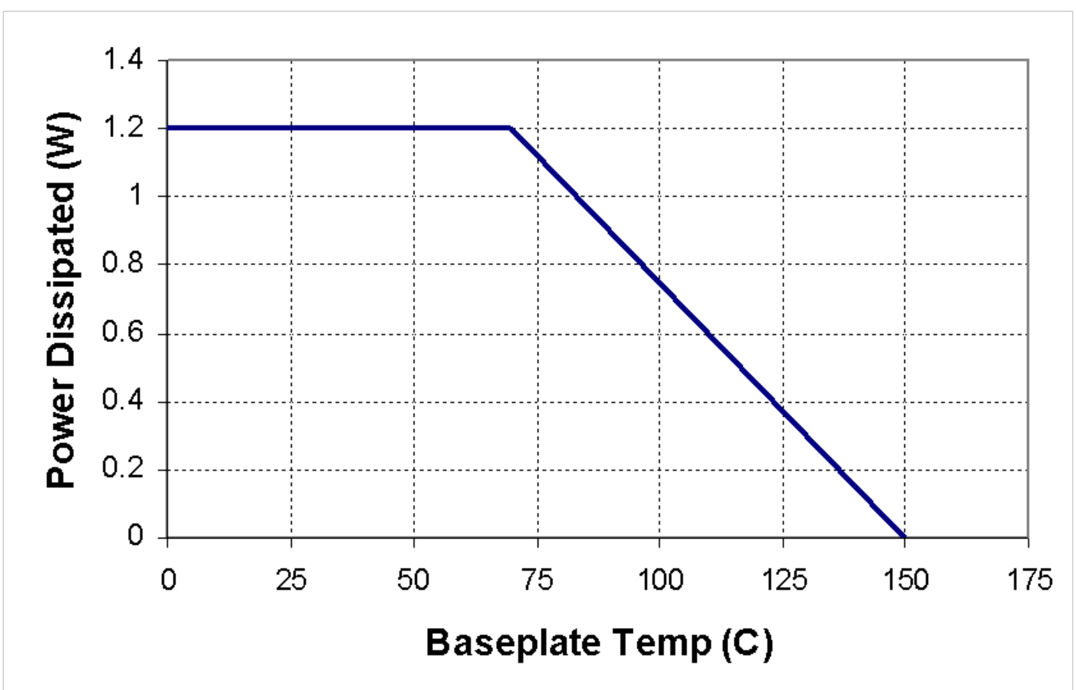
Table IV
Power Dissipation and Thermal Properties

Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70 ºC	Pd = 1.2 W Tchannel = 150 ºC Tm = 1.0E+6 Hrs	1/ 2/
Thermal Resistance, θjc	Vd = 5V Id = 140mA Pd = 0.7W	θjc = 66.7 (ºC/W) Tchannel = 116 ºC Tm = 2.4E+7 Hrs	
Mounting Temperature	30 seconds	260 ºC Max	
Storage Temperature		-65 to 150 ºC	

1/ For a median life, Tm, of 1E+6 hours, power dissipation is limited to

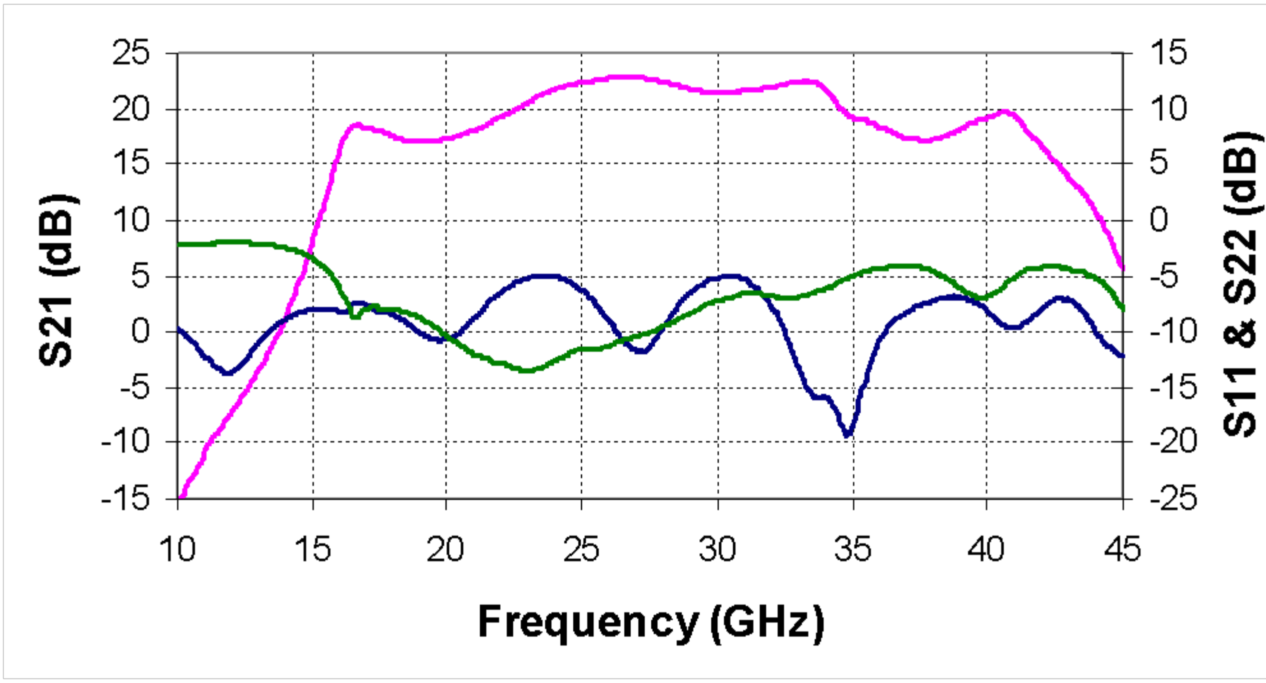
Pd(max) = (Tchannel ºC – Tbase ºC)/θjc.

2/ Channel operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.

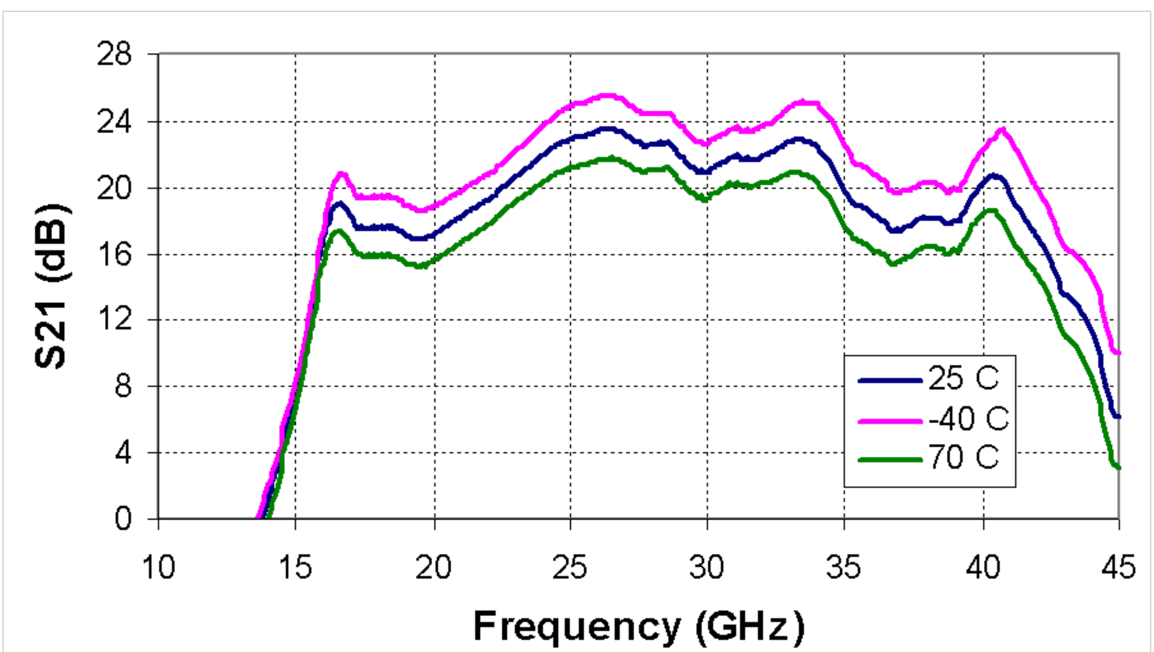


Measured Data

Bias Conditions: Vd = 5V, Idq = 140 mA, Vg = -0.75 V (Typical)



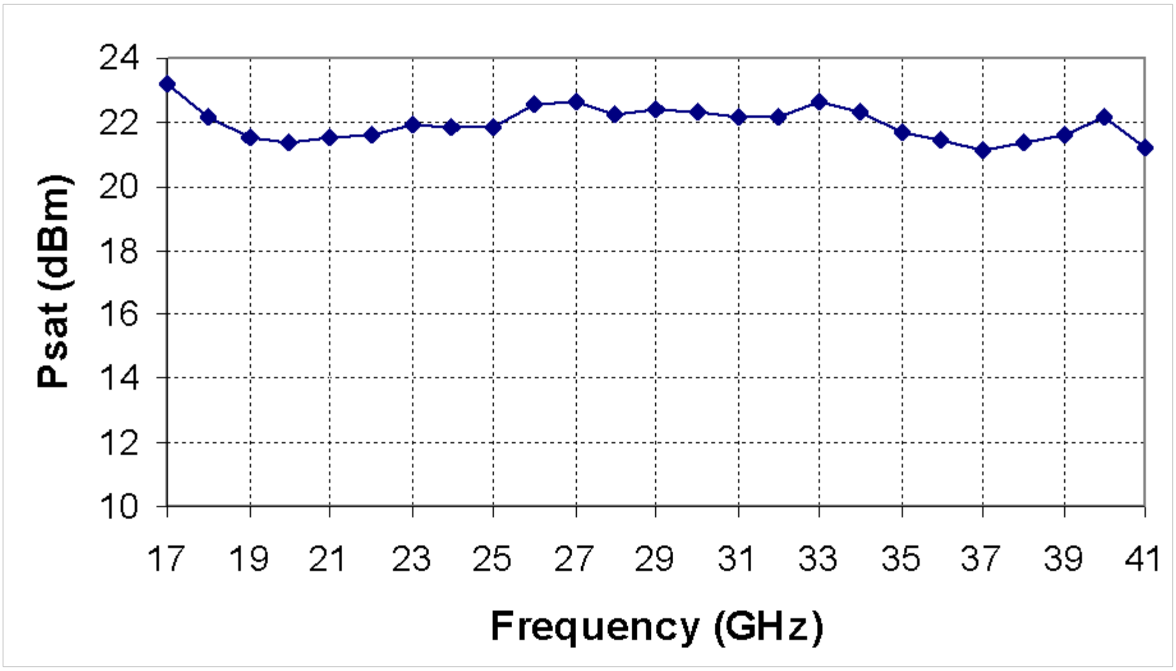
This is device s-parameter

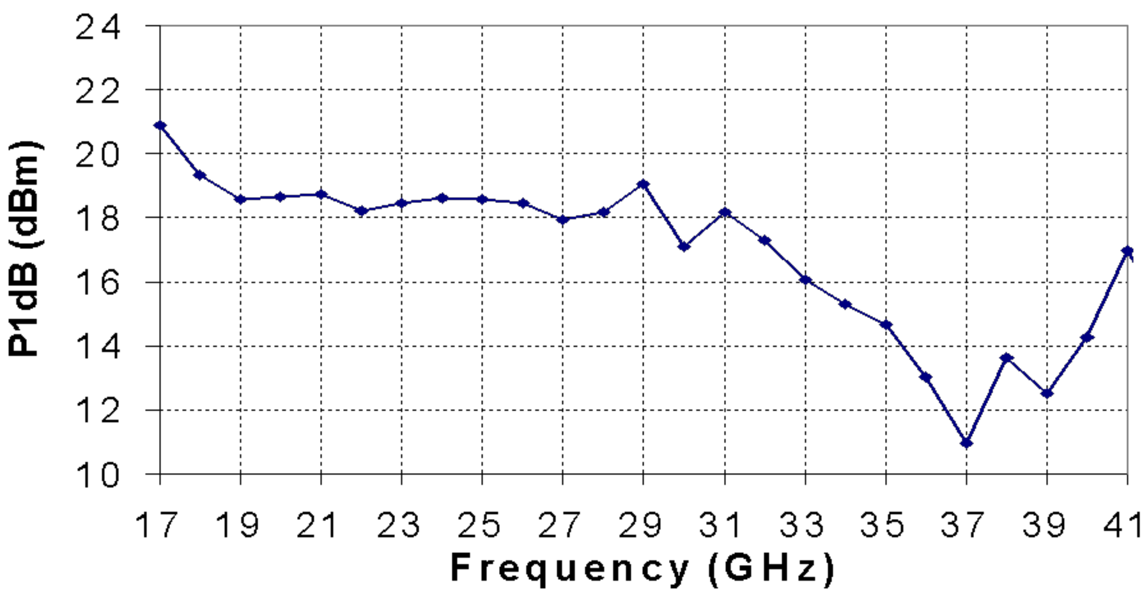


This is evaluation board s-parameter

Measured Data

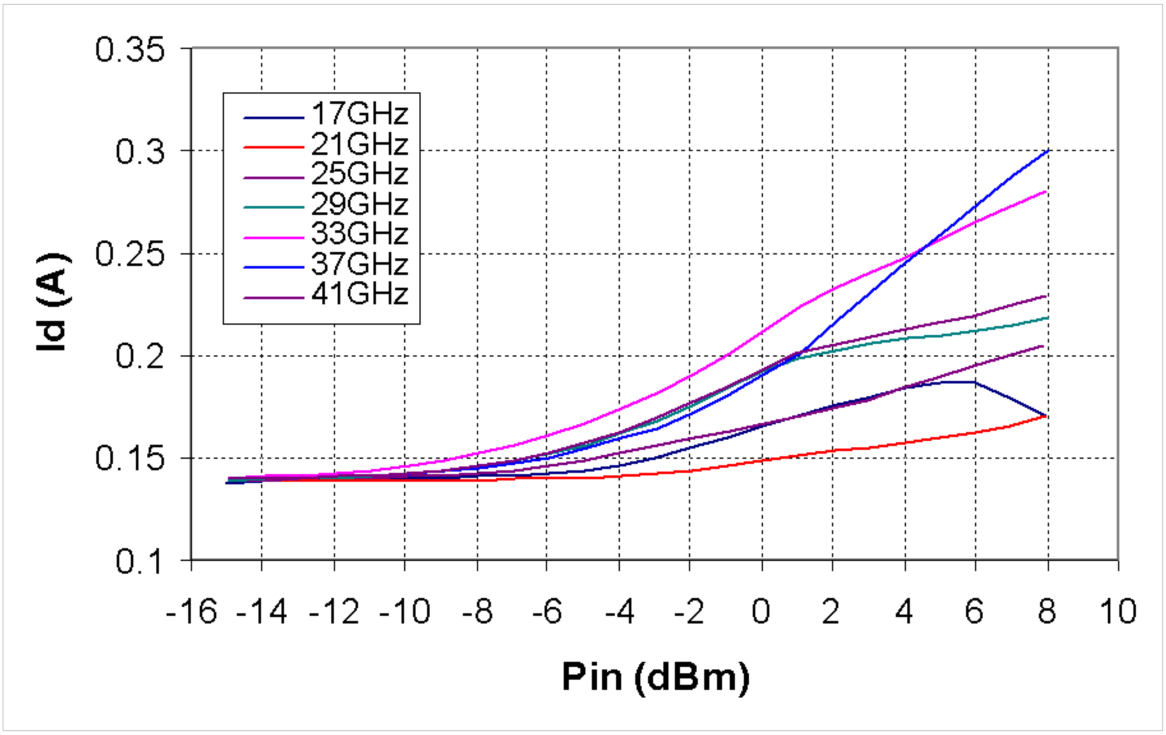
Bias Conditions: Vd = 5V, Idq = 140 mA, Vg = -0.75 V (Typical)

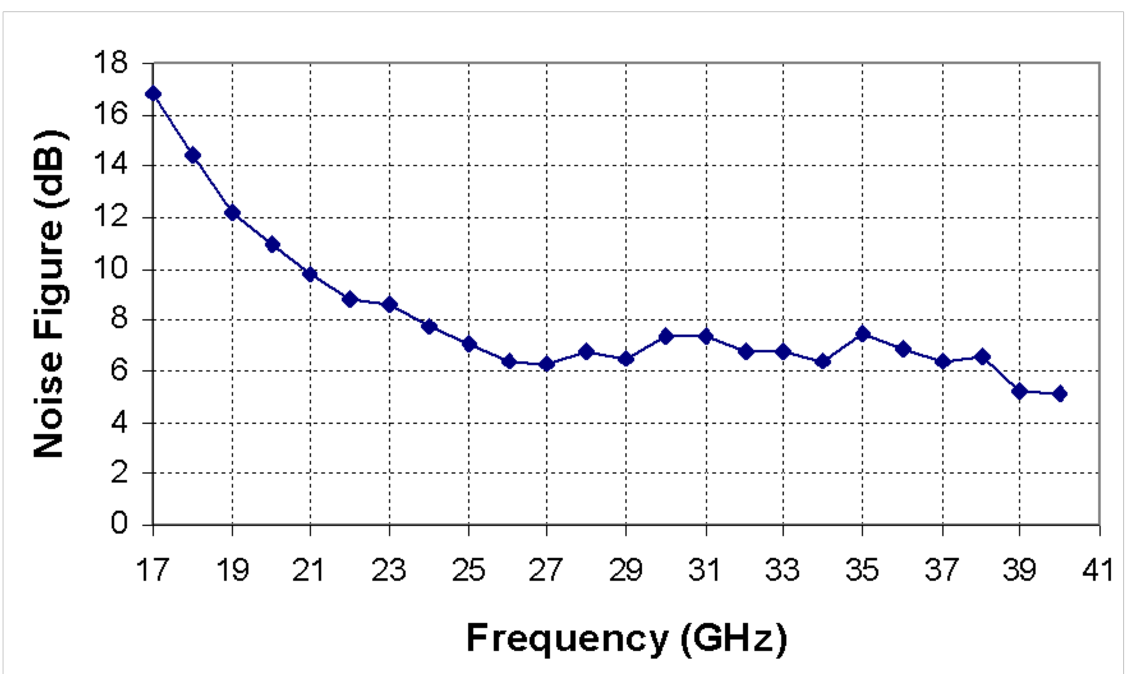




Measured Data

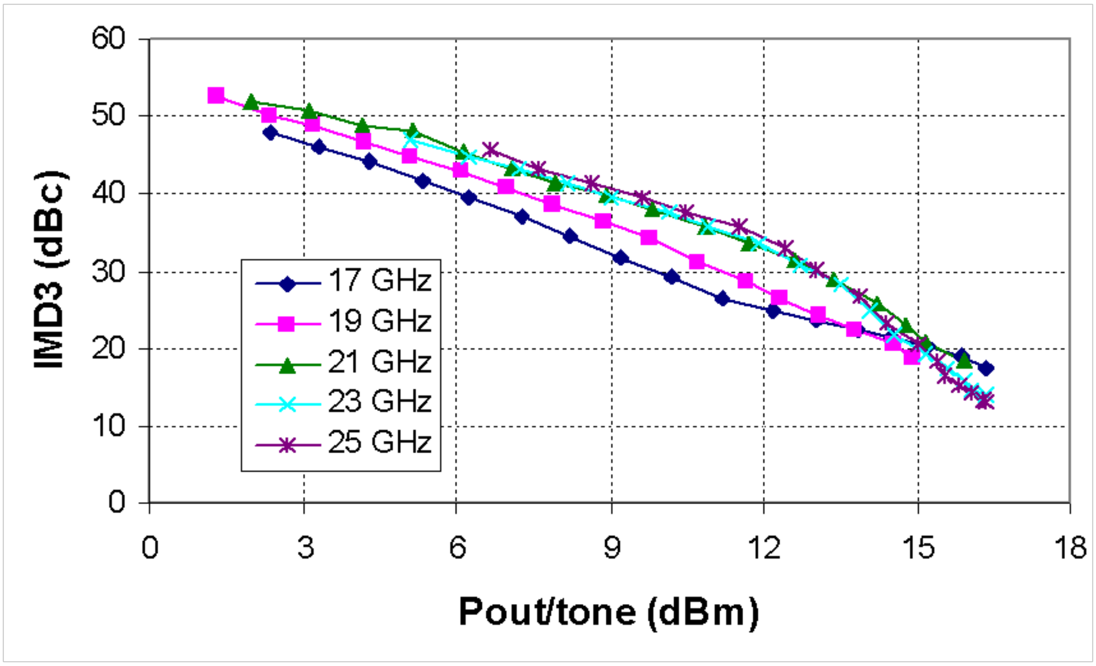
Bias Conditions: Vd = 5V, Idq = 140 mA, Vg = -0.75 V (Typical)

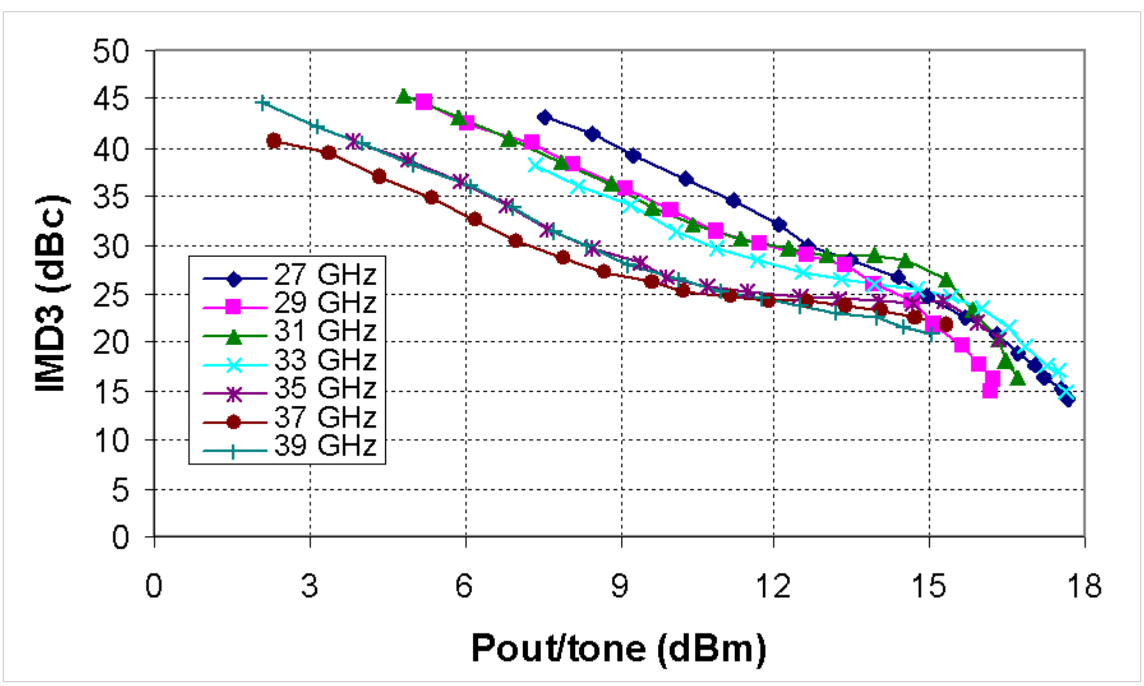




Measured Data

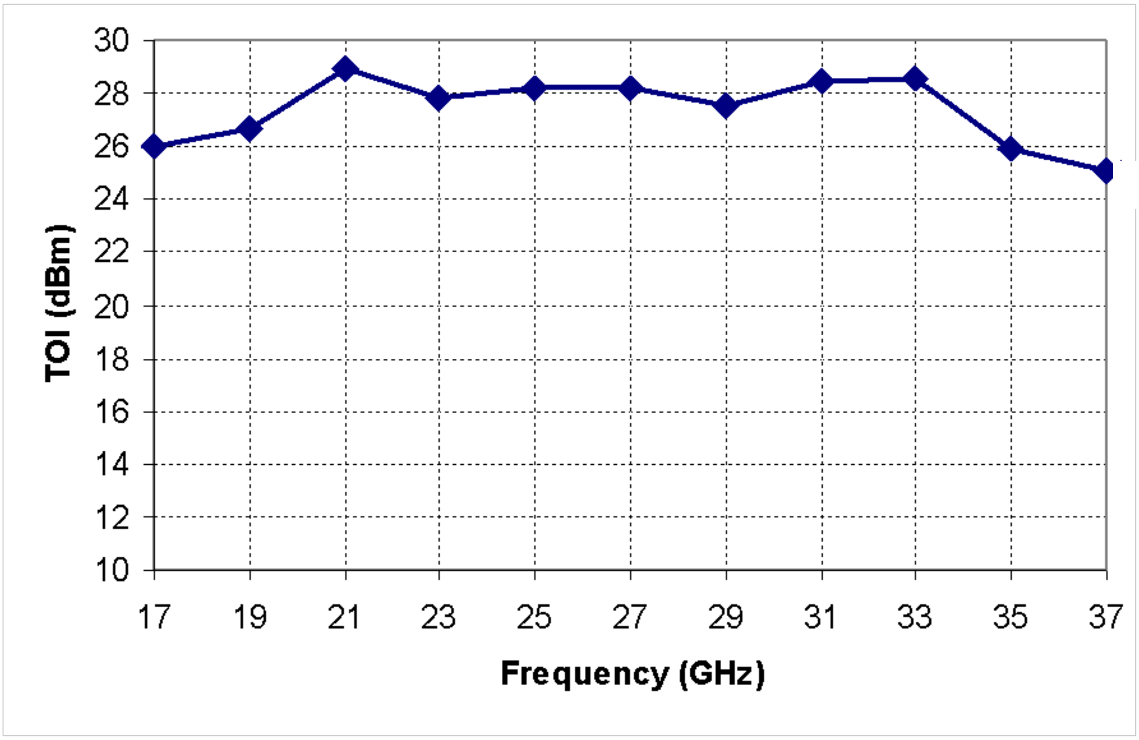
Bias Conditions: Vd = 5V, Idq = 140 mA, Vg = -0.75 V (Typical)





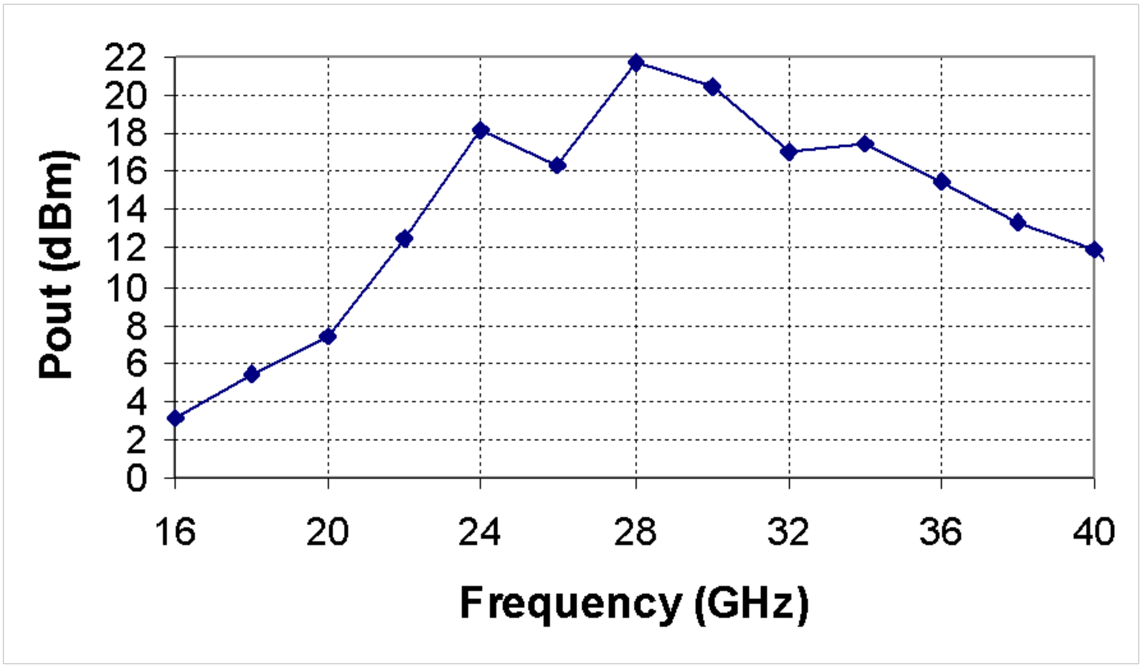
Measured Data

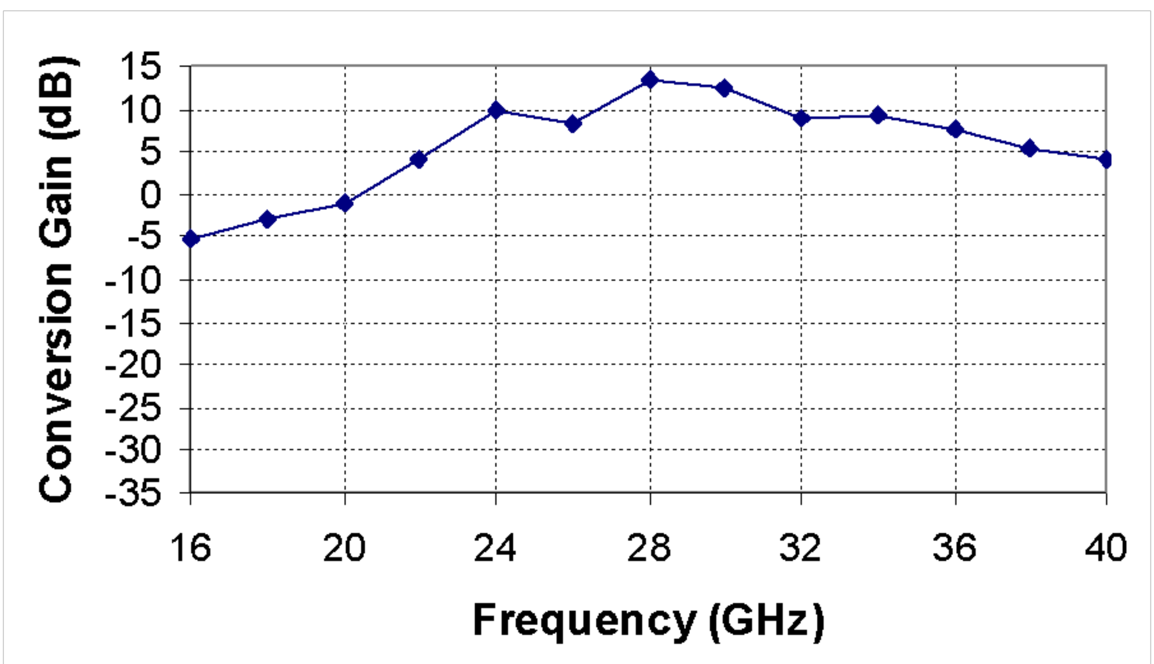
Bias Conditions: Vd = 5V, Idq = 140 mA, Vg = -0.75 V (Typical)



Measured 2X Multiplier Data

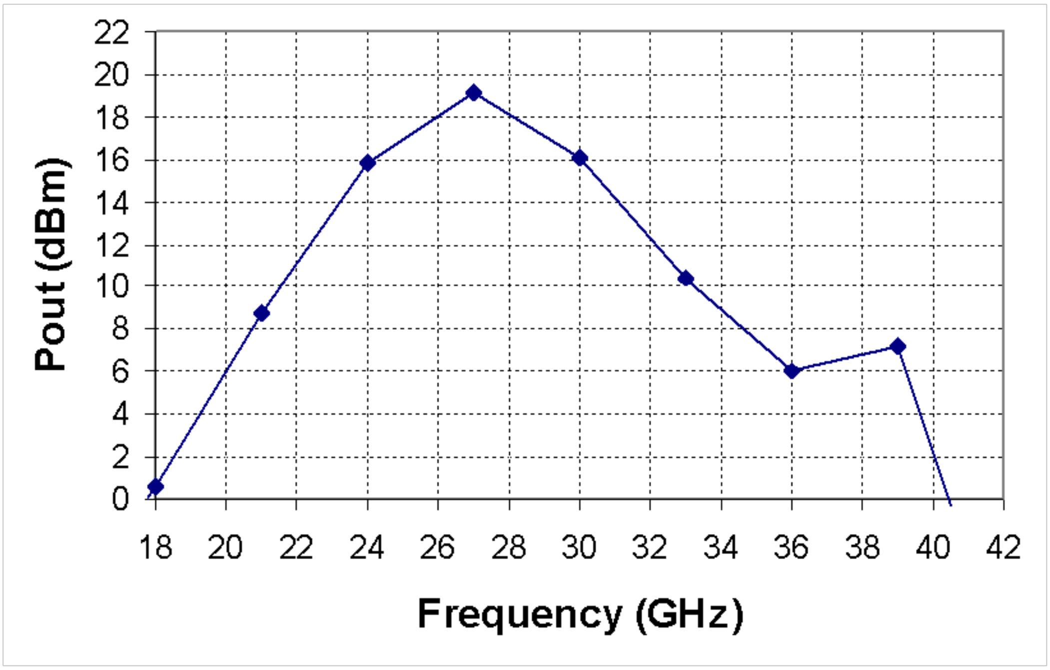
Bias Conditions: Vd = 5 V, Idq = 120 mA, Vg1 = -1.1 V, Pin = 9 dBm

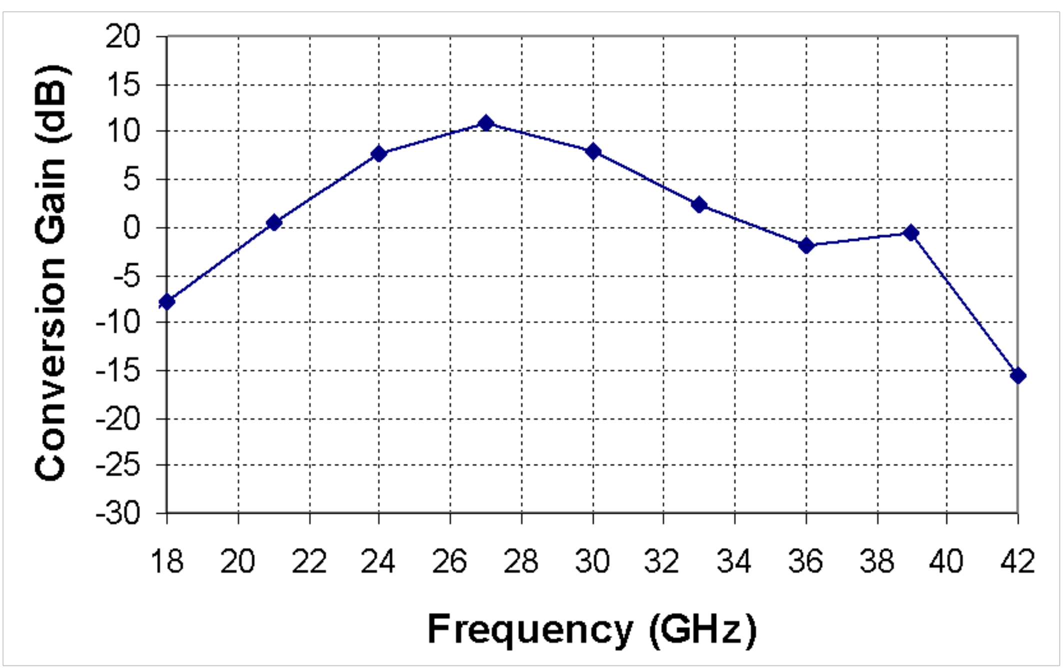




Measured 3X Multiplier Data

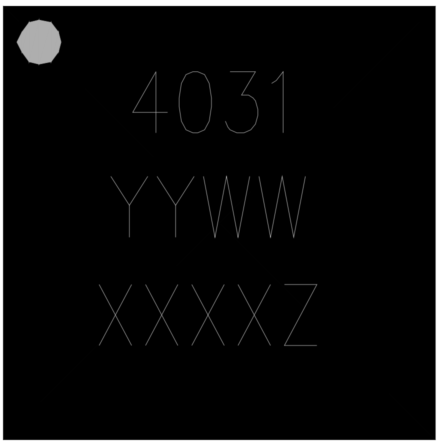
Bias Conditions: Vd = 5 V, Vd1 = 1 V, Idq = 160 mA, Pin = 9 dBm



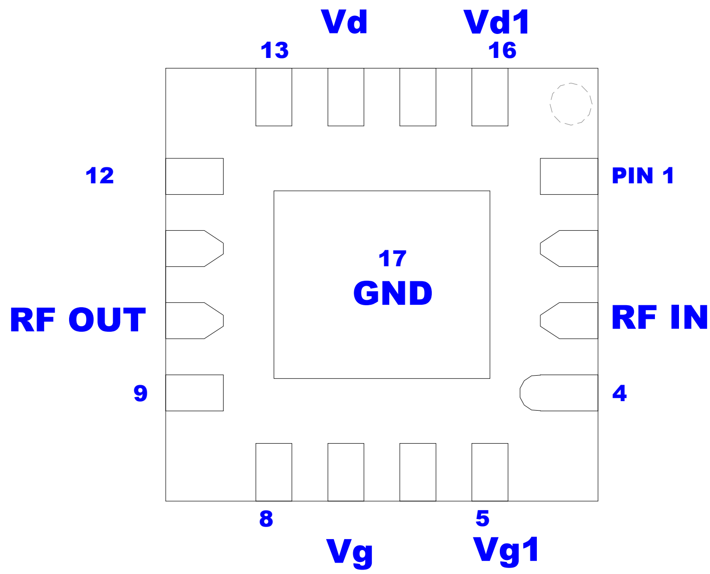


Mechanical Drawing

Top View



Bottom View



Pin	Symbol	Description
1, 4, 9, 12	GND	Internal grounding; must be grounded on PCB
2, 11	N/C	No internal connection; must be grounded on PCB
3	RF IN	Input, matched to 50 ohms
5	Vg1	Gate 1 voltage. Bias network is required; see Evaluation Board on page 14 as an example
6, 8, 13, 15	GND	No internal connection; can be grounded on PCB or left open
7	Vg	Gate voltage. Bias network is required; see Evaluation Board on page 14 as an example
10	RF OUT	Output, matched to 50 ohms
14	Vd	Drain voltage. Bias network is required; see Evaluation Board on page 14 as an example
16	Vd1	Drain 1 voltage. Bias network is required; see Evaluation Board on page 14 as an example
17	GND	Backside Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

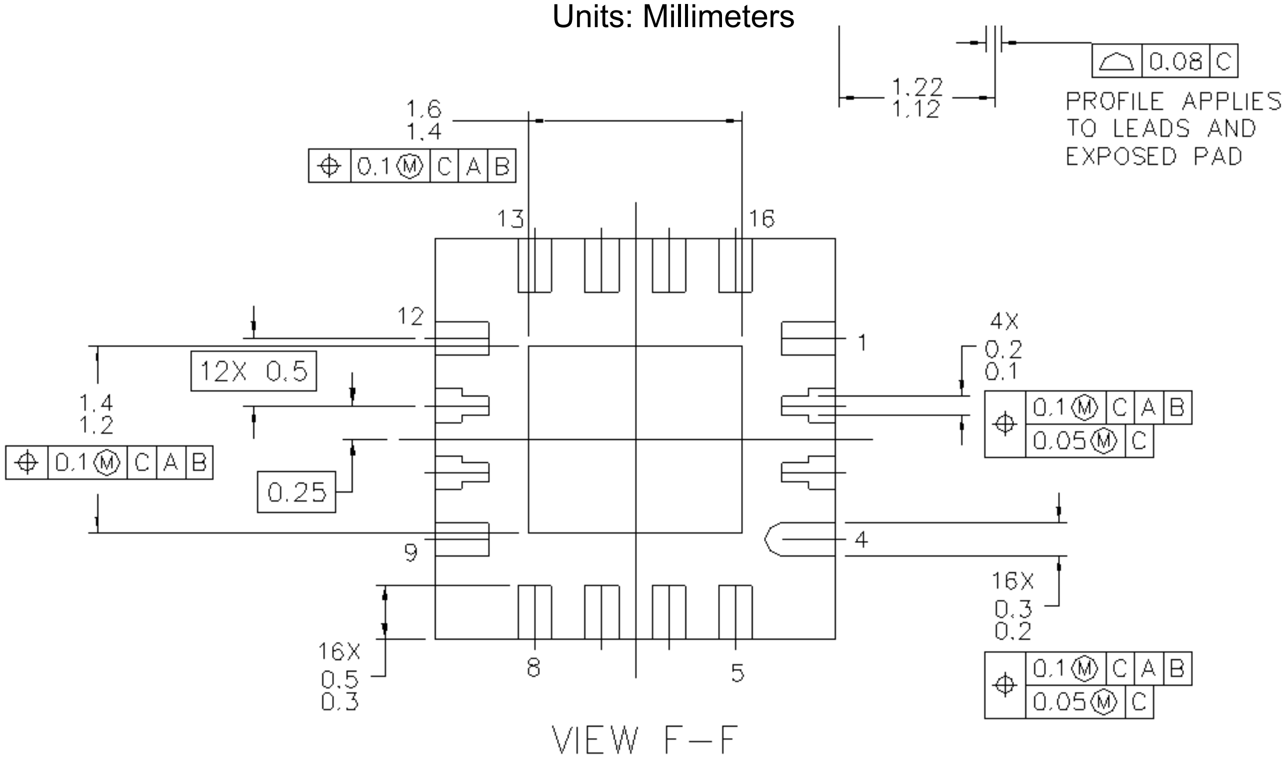
This package is lead-free/RoHS-compliant. The package base is copper alloy and the plating material on the leads is NiPdAu. It is compatible with both lead-free (maximum 260 °C reflow temperature) and tin-lead (maximum 245 °C reflow temperature) soldering processes.

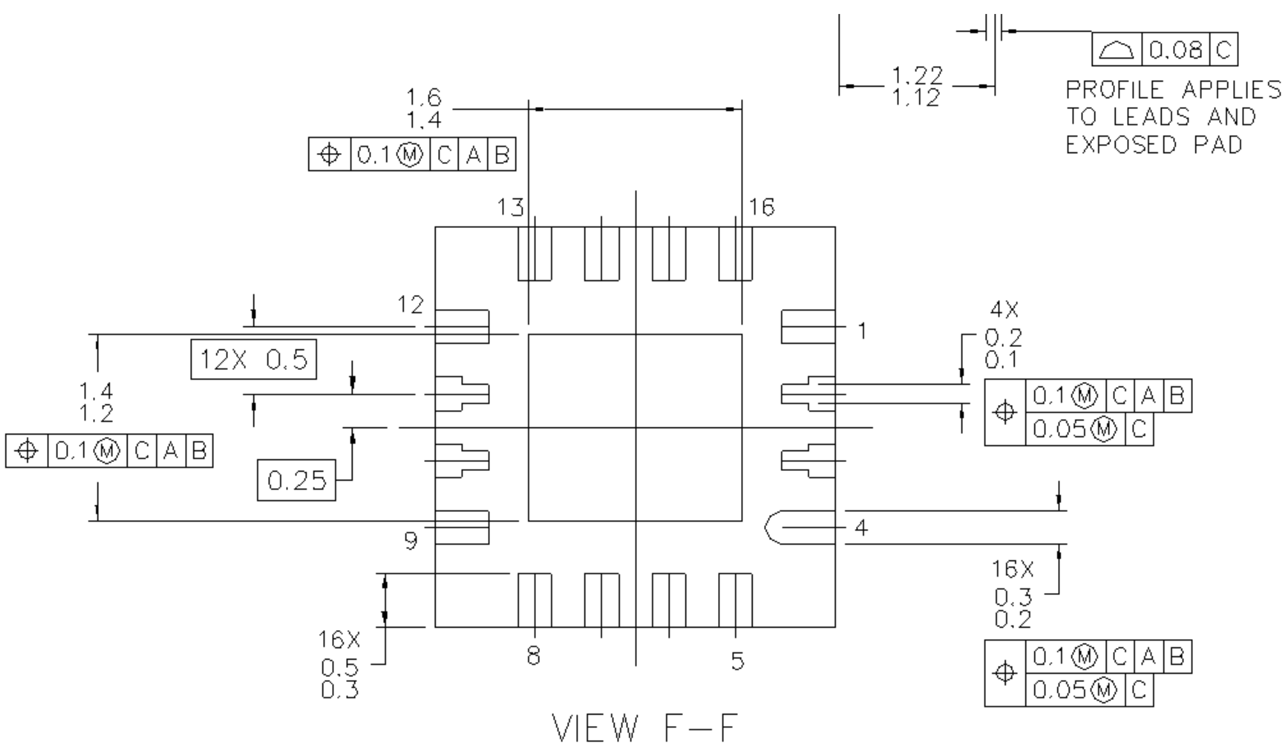
The TGA44031-SM will be marked with the “4031” designator and a lot code marked below the part designator. The “YY” represents the last two digits of the year the part was manufactured, the “WW” is the work week, and the “XXXXZ” is the lot wafer code.

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

Mechanical Drawing (Cont)

Units: Millimeters





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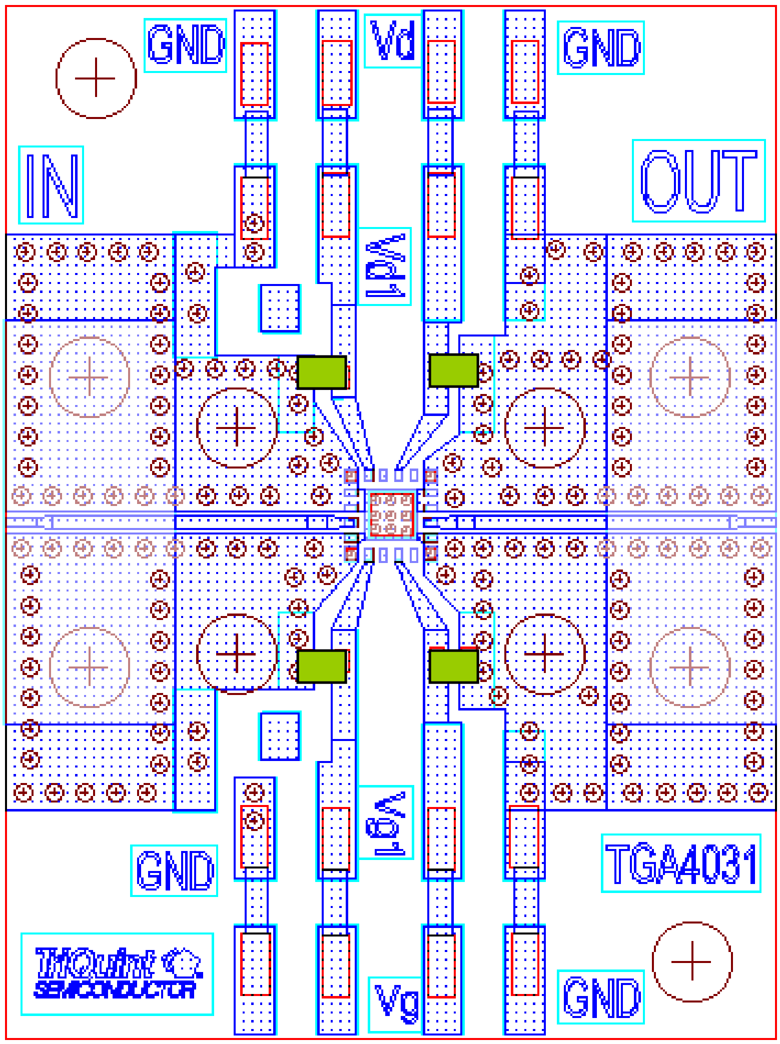
Evaluation Board

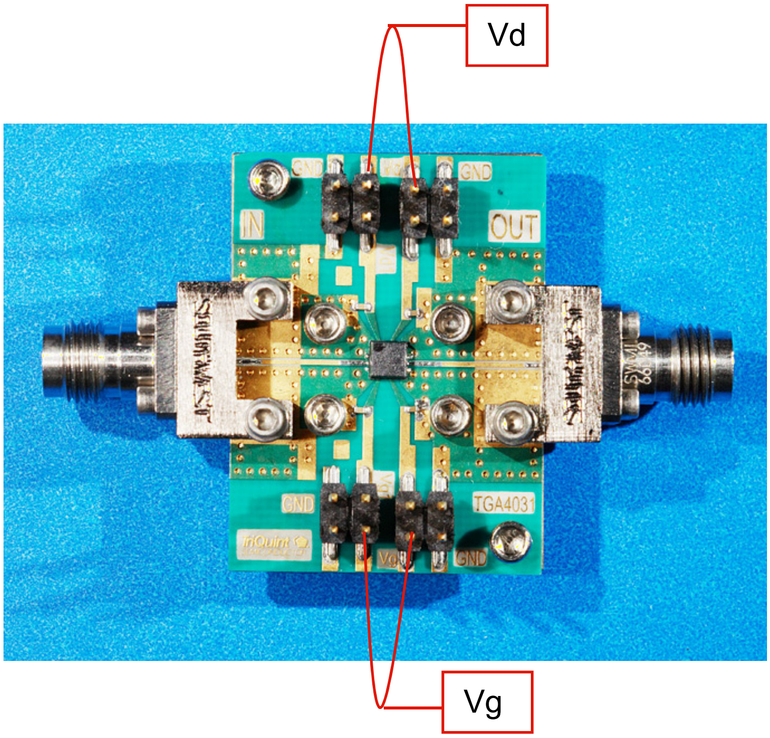


0402 0.01 uF capacitors

Board material is 8 mil ROGERS RO4003

Recommended Power Supply Connection Diagram

Amplifier & 2X Multiplier



Bias Procedure

Powering up:

Set Vg (starting from 0V) to –1.5V

Increase Vd (starting from 0V) to desired voltage 5V

Make Vg more positive, ending up at approx –0.75V. Id ~140mA.

Apply RF (max input level +20dBm).

Powering down:

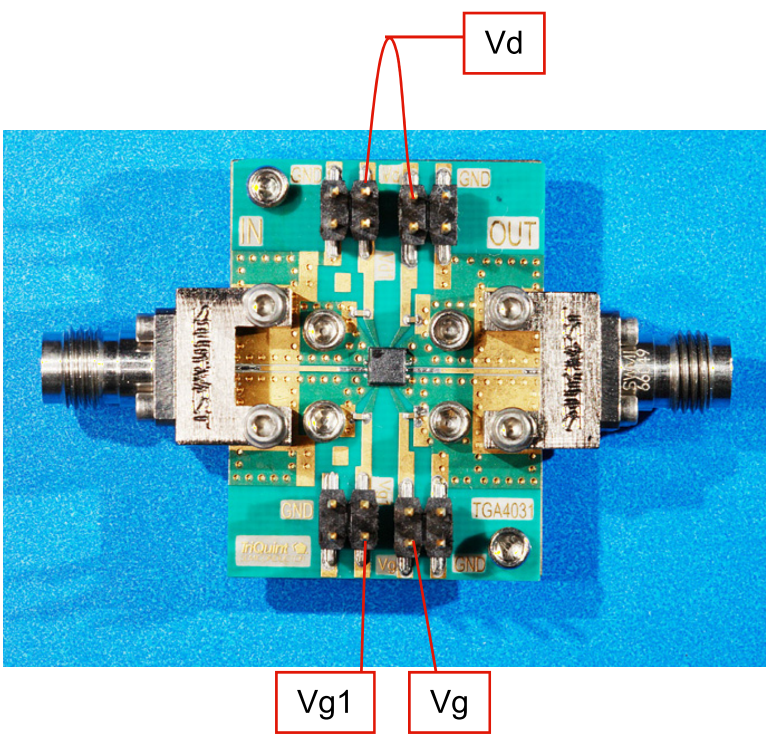
Remove RF

Reduce Vd to 0V

Set Vg to -1.5V.

Amplifier

Set Vd = 5.0V
Vary (Vg + Vg1) to achieve
Id = 140mA

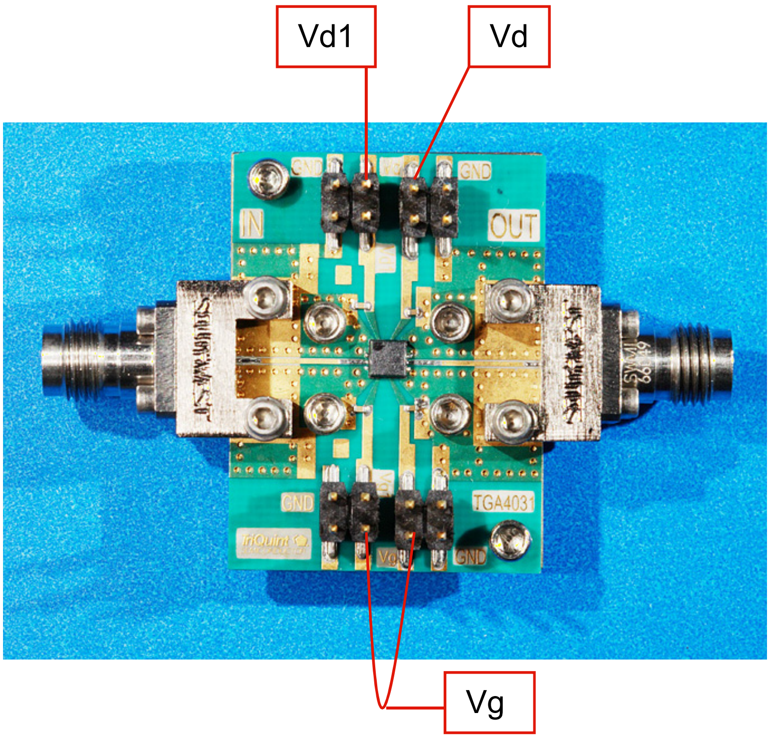


2x Multiplier

Set Vd = 5.0V
Set Vg1 = -1.1V
Vary Vg to achieve
Id = 120mA

Recommended Power Supply Connection Diagram

3X Multiplier



3x Multiplier

Set Vd = 5.0V
Set Vd1 = 1.0V
Vary (Vg + Vg1) to achieve (Id + Id1) = 160mA

Recommended Surface Mount Package Assembly

Proper ESD precautions must be followed while handling packages.

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.

Solder attach process requires the use of no clean flux.

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
TGA4031-SM	3X3 QFN