TGA4532-SM

K-Band Power Amplifier

Applications

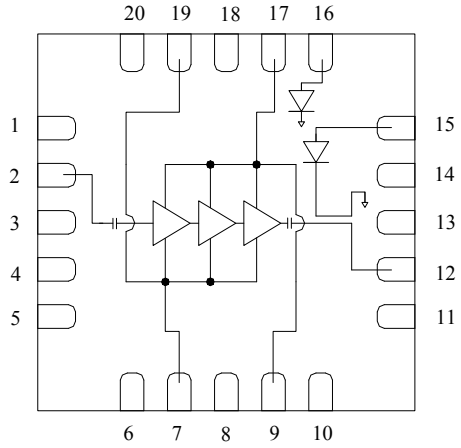
- Point-to-Point Radio
- K-band Sat-Com

QFN 4x4 mm 20L

Product Features

- Frequency Range: 17.7 – 19.7 GHz
- Power: 32.5 dBm Psat, 31 dBm P1dB
- Gain: 23 dB
- TOI: 41 dBm at 20 dBm/tone
- NF: 7 dB
- Integrated Power Detector
- Bias: Vd = 6 V, Idq = 900 mA, Vg = -0.68 V Typical
- Package Dimensions: 4.0 x 4.0 x 0.85 mm

Functional Block Diagram



General Description

The TriQuint TGA4532-SM is a K-Band Power Amplifier. The TGA4532-SM operates from 17.7 - 19.7 GHz and is designed using TriQuint's power pHEMT production process.

The TGA4532-SM typically provides 32.5 dBm of saturated output power with small signal gain of 23 dB.

The TGA4532-SM is available in a low-cost, surface mount 20 lead 4x4 QFN package and is ideally suited for Point-to-Point Radio.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pin Configuration

Pin #	Symbol
1, 3, 4, 5, 6, 10, 11, 13, 14, 20	N/C
2	RF IN
7, 19	Vg
8, 18	GND
12	RF OUT
9, 17	Vd
15	Vdet
16	Vref

Ordering Information

Part No.	ECCN	Description
TGA4532-SM	3A001.b.2.c	K-Band Power Amplifier

Standard T/R size = 1000 pieces on a 7" reel.

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage,Vd	+6.5 V
Gate Voltage,Vg	-4 to 0 V
Drain to Gate Voltage, Vd – Vg	10 V
Drain Current, Id	1960 mA
Gate Current, Ig	-8.2 to 113 mA
Power Dissipation, Pdiss	12.7 W
RF Input Power, CW, T = 25ºC	26 dBm
Channel Temperature, Tch	200 °C
Mounting Temperature (30 Seconds)	260 °C
Storage Temperature	-40 to 150 °C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Recommended Operating Conditions

Parameter	Min	Typical	Max	Units
Vd		6		V
Idq		900		mA
Id_drive (Under RF Drive)		1200		mA
Vg		-0.68		V

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

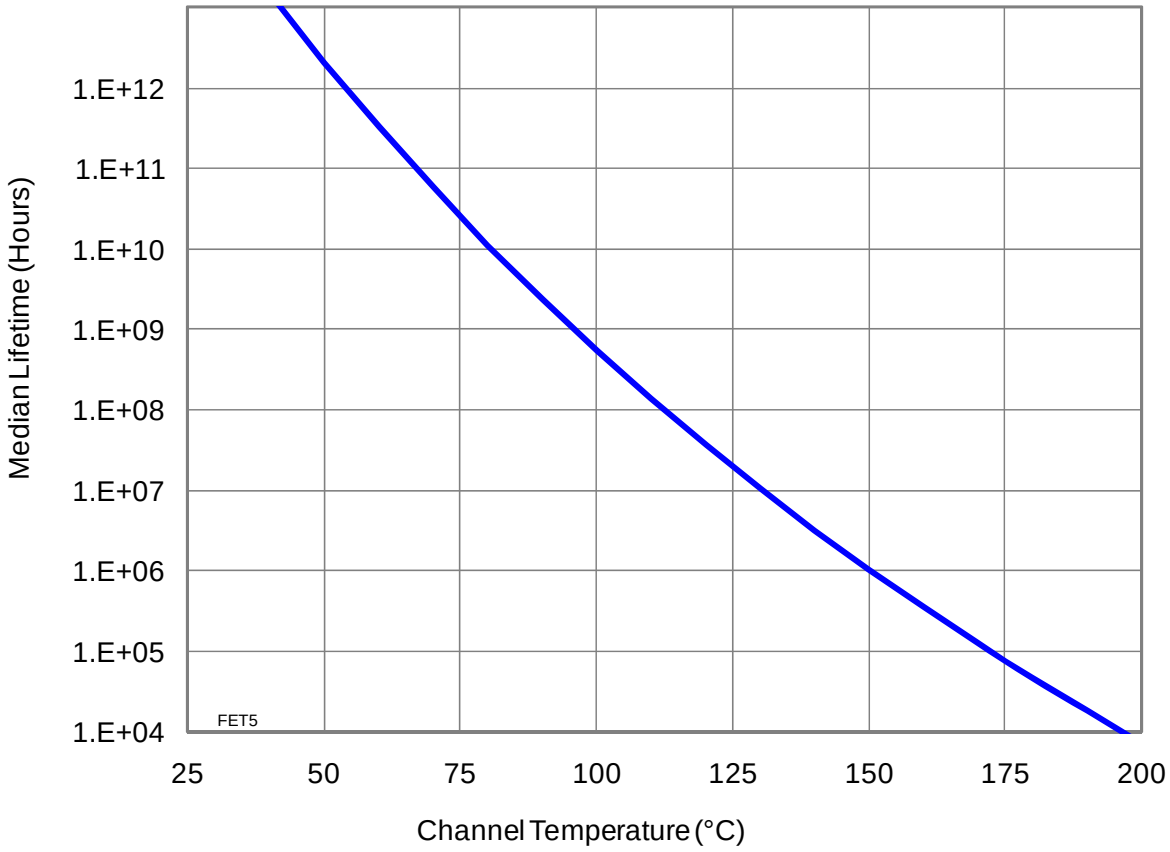
Test conditions unless otherwise noted: 25ºC, Vd = 6 V, Idq = 900 mA, Vg = -0.68 V Typical.

Parameter	Min	Typical	Max	Units
Operational Frequency Range	17.7		19.7	GHz
Gain	19	23		dB
Input Return Loss	10	12		dB
Output Return Loss	10	15		dB
Output Power @ Saturation		32.5		dBm
Output Power @ 1dB Gain Compression	29.5	31		dBm
Output TOI	38	41		dBm
Noise Figure		7		dB
Gain Temperature Coefficient		-0.023		dB/°C
Power Temperature Coefficient		-0.005		dB/°C

Specifications (cont.)

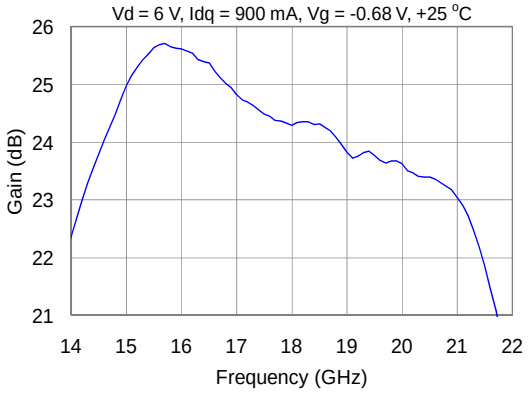
Thermal and Reliability Information

Parameter	Condition	Rating
Thermal Resistance, θ_{JC}, measured to back of package	Tbase = 85 °C	θ_{JC} = 8.51 °C/W
Channel Temperature (Tch), and Median Lifetime (Tm)	Tbase = 85 °C, Vd = 6 V, Idq = 900 mA, Pdiss = 5.4 W	Tch = 131 °C Tm = 9.5 E+6 Hours
Channel Temperature (Tch), and Median Lifetime (Tm) Under RF Drive	Tbase = 85 °C, Vd = 6 V, Id = 1200 mA, Pout = 32.5 dBm, Pdiss = 5.4 W	Tch = 131 °C Tm = 9.5 E+6 Hours

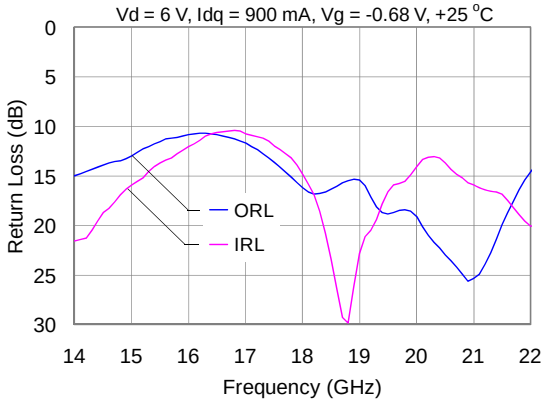


Typical Performance

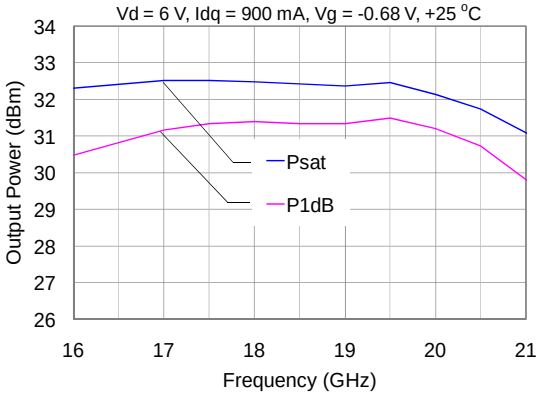
Gain vs. Frequency
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V, +25 °C



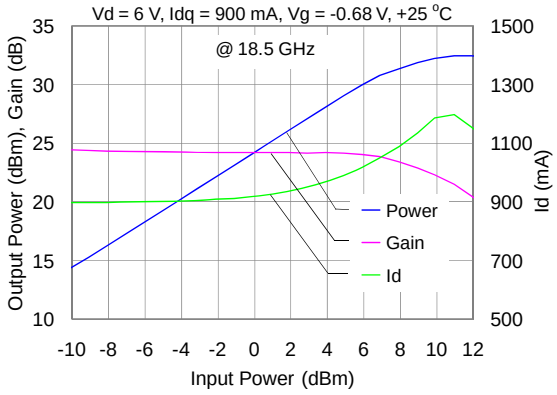
IRL, ORL vs Frequency
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V, +25 °C



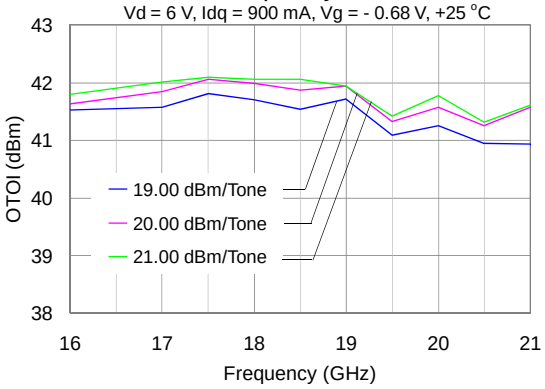
Output Power vs. Frequency
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V, +25 °C



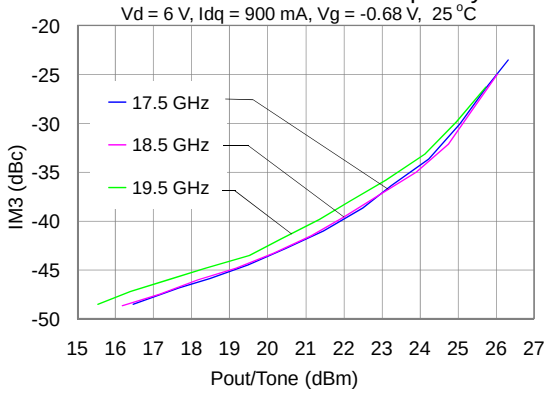
Power, Gain, Id vs. Input Power
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V, +25 °C



OTOI vs. Frequency vs. Pout/ Tone
Vd = 6 V, Idq = 900 mA, Vg = - 0.68 V, +25 °C

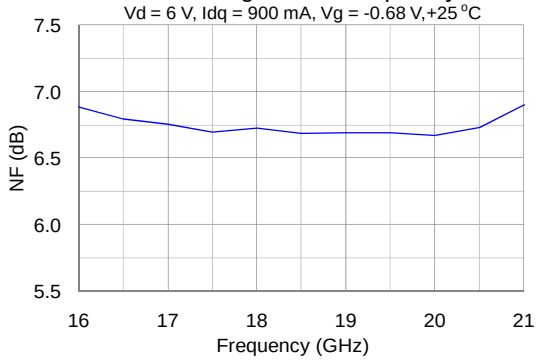


IM3 vs. Pout/Tone vs. Frequency
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V, 25 °C

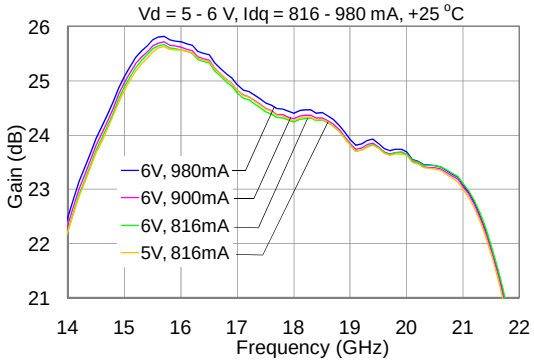


Typical Performance (cont.)

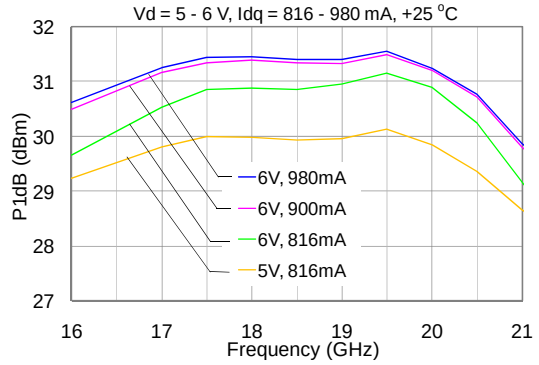
Noise Figure vs. Frequency
Vd = 6 V, Idq = 900 mA, Vg = -0.68 V,+25 °C



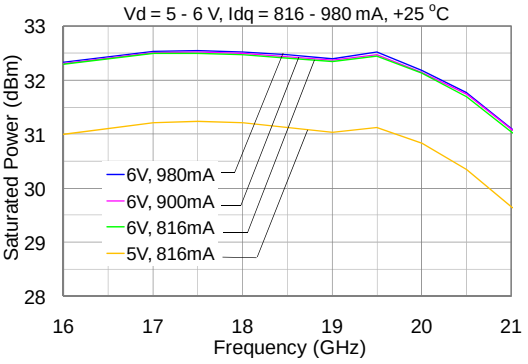
Gain vs. Frequency vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, +25 °C



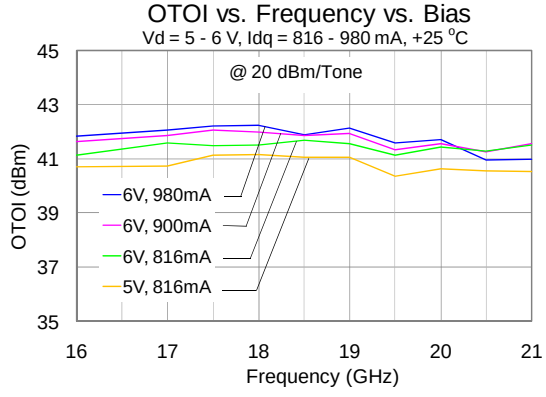
P1dB vs. Frequency vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, +25 °C



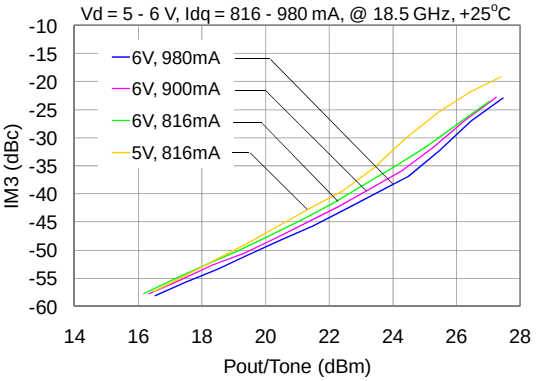
Saturated Power vs. Frequency vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, +25 °C



OTOI vs. Frequency vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, +25 °C

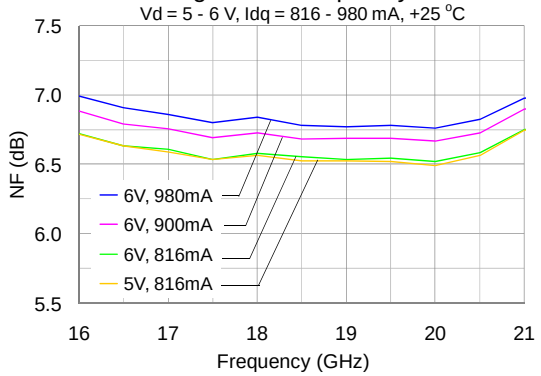


IM3 vs. Pout/Tone vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, @ 18.5 GHz, +25°C

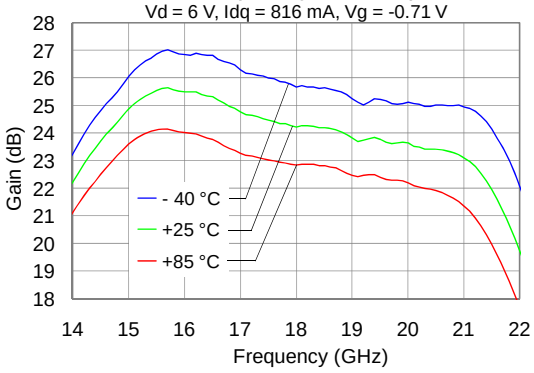


Typical Performance (cont.)

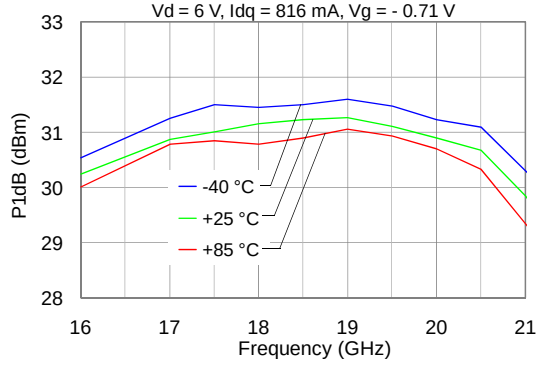
Noise Figure vs. Frequency vs. Bias
Vd = 5 - 6 V, Idq = 816 - 980 mA, +25 °C



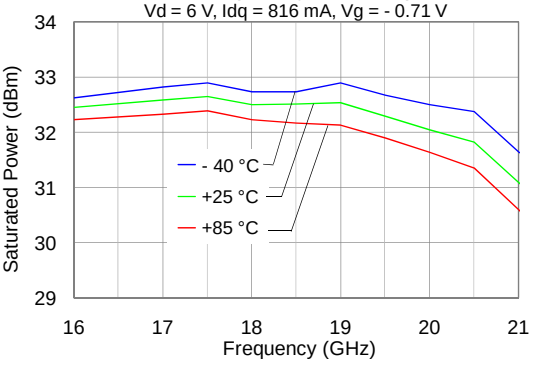
Gain vs. Frequency vs. Temperature
Vd = 6 V, Idq = 816 mA, Vg = -0.71 V



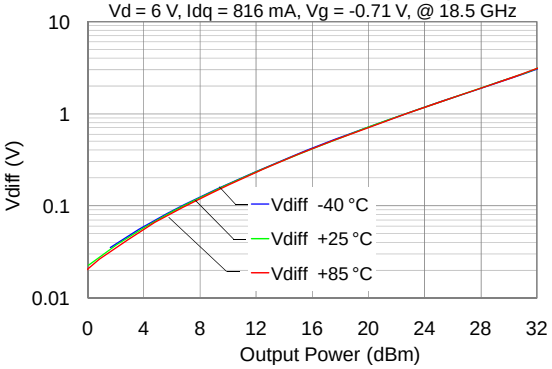
P1dB vs. Frequency vs. Temperature
Vd = 6 V, Idq = 816 mA, Vg = - 0.71 V



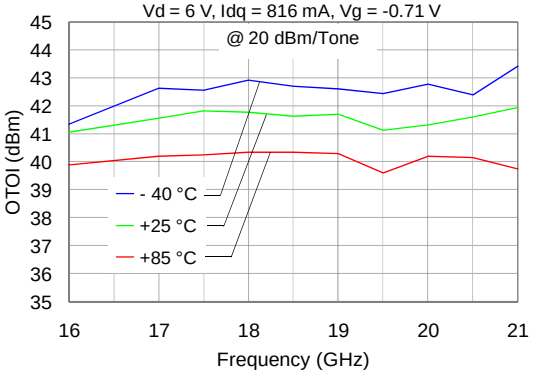
Psat vs. Frequency vs. Temperature
Vd = 6 V, Idq = 816 mA, Vg = - 0.71 V



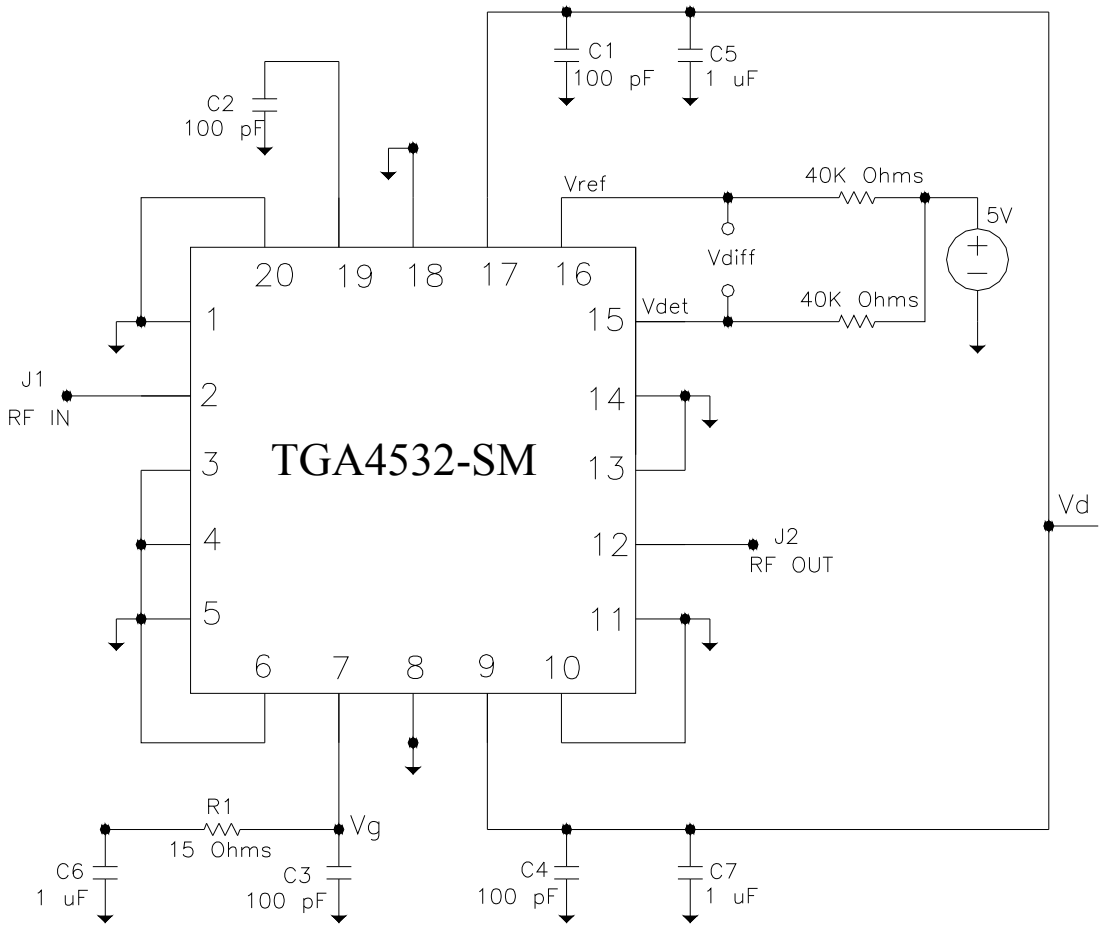
Power Detector vs. Pout vs.Temperature
Vd = 6 V, Idq = 816 mA, Vg = -0.71 V, @ 18.5 GHz



OTOI vs. Frequency vs. Temperature
Vd = 6 V, Idq = 816 mA, Vg = -0.71 V



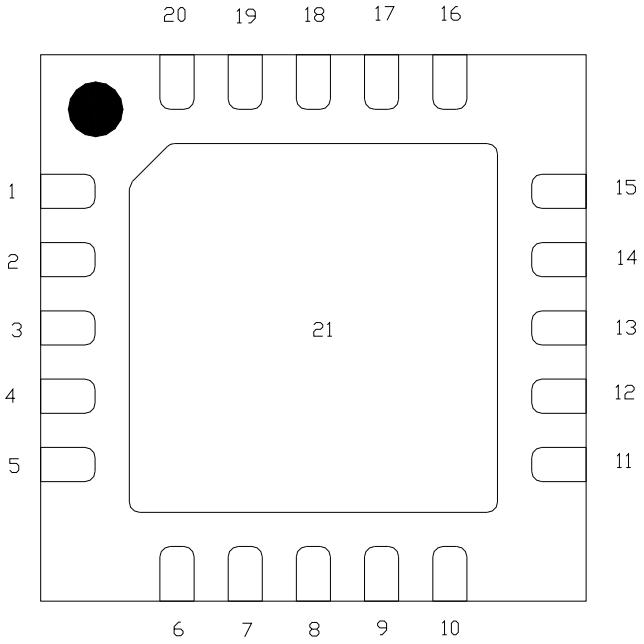
Application Circuit



Vg can be biased from either side (pin 7 or pin 19), and the non-biased side can be left open.
Vd must be biased from both sides (pin 9 and pin 17).

Bias-up Procedure	Bias-down Procedure
Vg set to -1.5 V	Turn off RF supply
Vd set to +6 V	Reduce Vg to -1.5V. Ensure Id ~ 0 mA
Adjust Vg more positive until quiescent Id is 900 mA. This will be ~ Vg = -0.68 V typical	Turn Vd to 0 V
Apply RF signal to RF Input	Turn Vg to 0 V

Pin Description

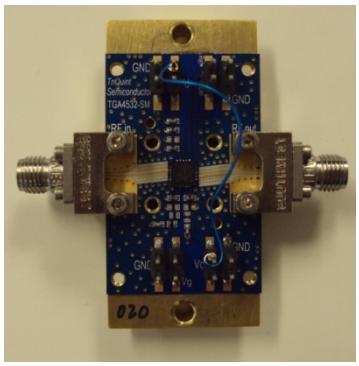


TOP VIEW

Pin	Symbol	Description
1, 3, 4, 5, 6, 10, 11, 13, 14, 20	N/C	No internal connection; must be grounded on PCB
2	RF IN	Input, matched to 50 ohms
7, 19	Vg	Gate voltage. Bias network is required; see Application Circuit on page 7 as an example. Can be biased from either pin.
8, 18	GND	Internal grounding; can be grounded or left open on PCB
12	RF OUT	Output, matched to 50 ohms
9, 17	Vd	Drain voltage. Bias network is required; see Application Circuit on page 7 as an example. Both pins must be biased.
15	Vdet	Detector diode output voltage. Varies with RF output power.
16	Vref	Reference diode output voltage.
21	GND	Backside Paddle. Multiple vias should be employed to minimize inductance and thermal resistance; see Mounting Configuration on page 11 for suggested footprint.

Applications Information

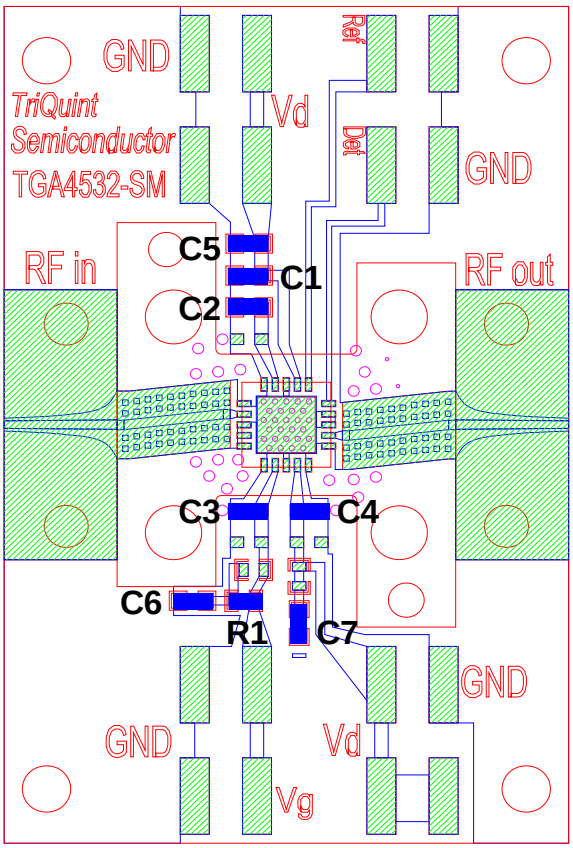
PC Board Layout



Top RF layer is 0.008" thick Rogers RO4003, ϵ_r = 3.38. Metal layers are 0.5-oz copper. Microstrip 50 Ω line detail: width = 0.0175".

The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

For further technical information, refer to the TGA4532-SM Product Information page.



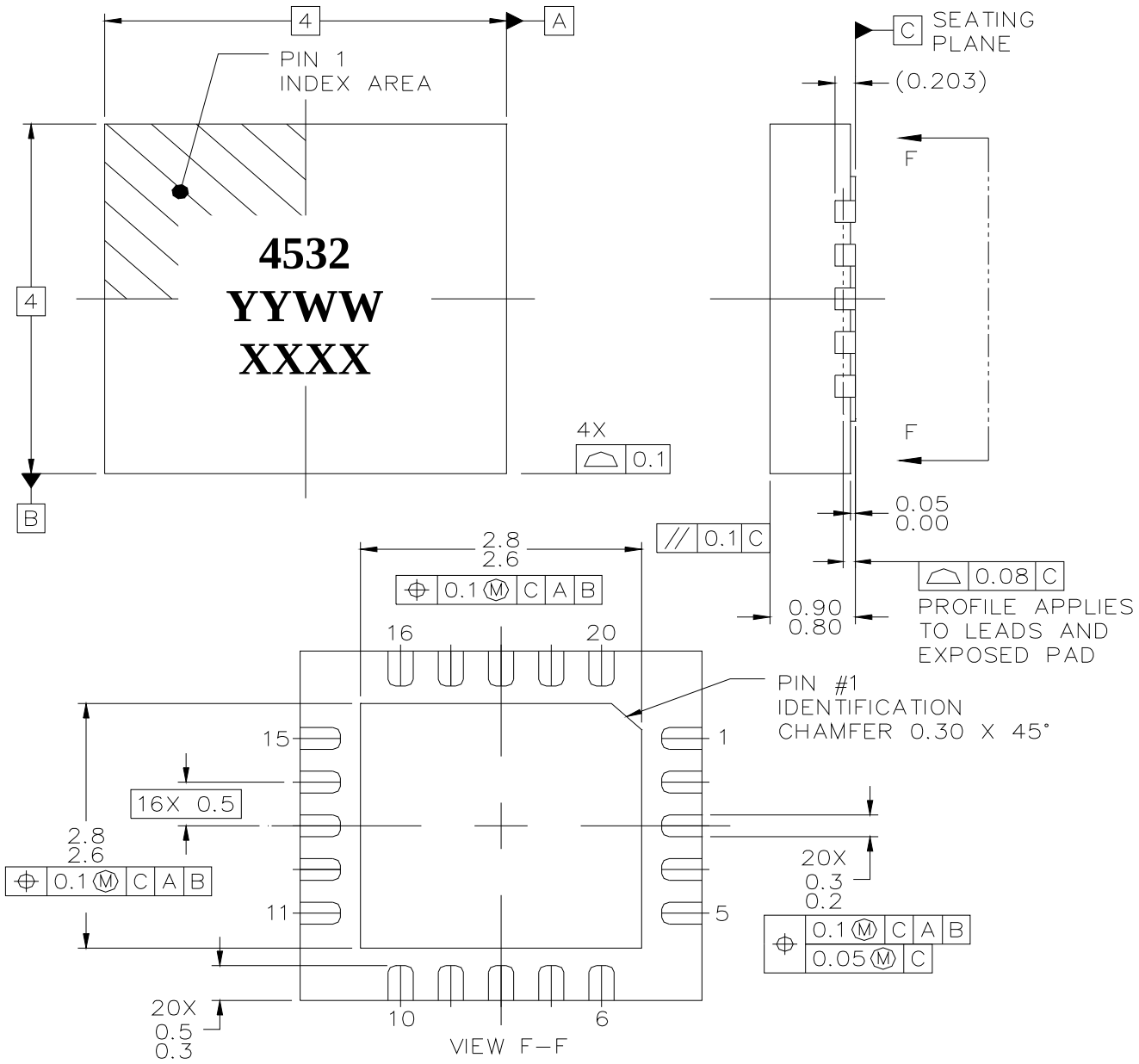
Bill of Material

Ref Des	Value	Description	Manufacturer	Part Number
C1, C2, C3, C4	100 pF	Cap, 0402, 50V, 5%, NPO	various	
C5, C6, C7	1 uF	Cap, 0603, 50V, 5%, COG	various	
R1	15 Ohms	Res, 0402, 1/16W, 5%, SMD	various	

Mechanical Information

Package Information and Dimensions

ll dimensions are in millimeters.



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 TGA4532-SM will be marked with the "4532" 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 "XXXX" is an generated number.

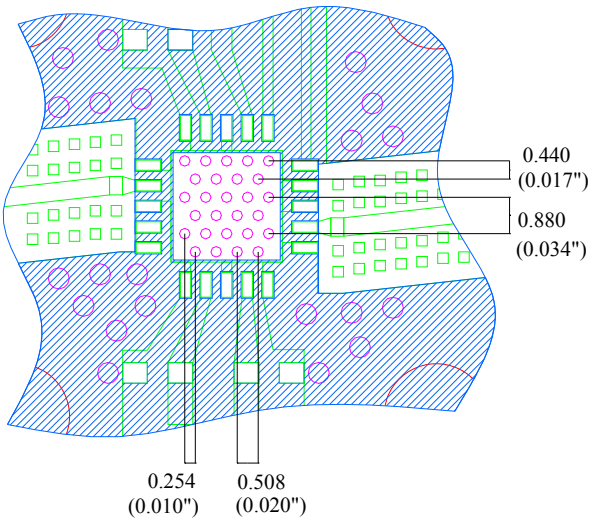
Mechanical Information (cont.)

Mounting Configuration

All dimensions are in millimeters (inches).

Notes:

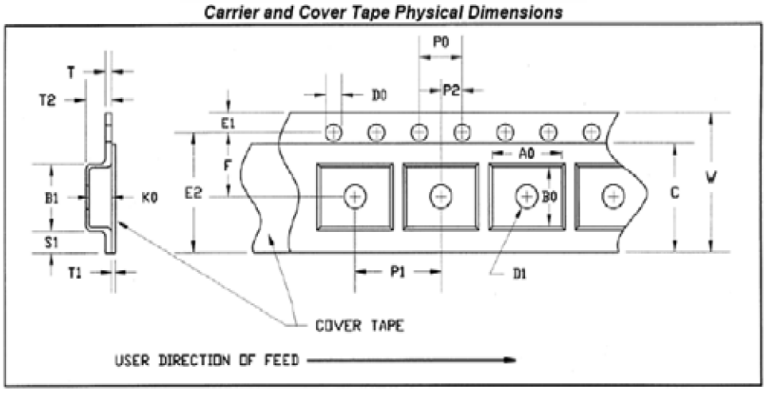
1. A heatsink underneath the area of the PCB for the mounted device is recommended for proper thermal operation.
2. Ground / thermal vias are critical for the proper performance of this device. Vias have a final plated thru diameter of 0.254 mm (0.010").



Tape and Reel Information

Tape and reel specifications for this part are also available on the TriQuint website in the "Application Notes" section.
Standard T/R size = 1000 pieces on a 7 x 0.5" reel.

Carrier and Cover Tape Physical Dimensions



CARRIER AND COVER TAPE DIMENSIONS

Part	Feature	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.171	4.35
	Width	B0	0.171	4.35
	Depth	K0	0.043	1.1
	Pitch	P1	0.315	8.0
Distance Between Centerline	Cavity to Perforation Length Direction	P2	0.079	2.0
	Cavity to Perforation Width Direction	F	0.217	5.5
Cover Tape	Width	C	0.374	9.5
Carrier Tape	Width	W	0.472	12.0

Product Compliance Information

ESD Information

Caution! ESD-Sensitive Device

ESD Rating:	Class 1A
Value:	≥ 250V and ≤ 500V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114

MSL Rating

Level 1 at +260 °C convection reflow
The part is rated Moisture Sensitivity Level 1 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

ECCN

US Department of Commerce 3A001.b.2.c

Solderability

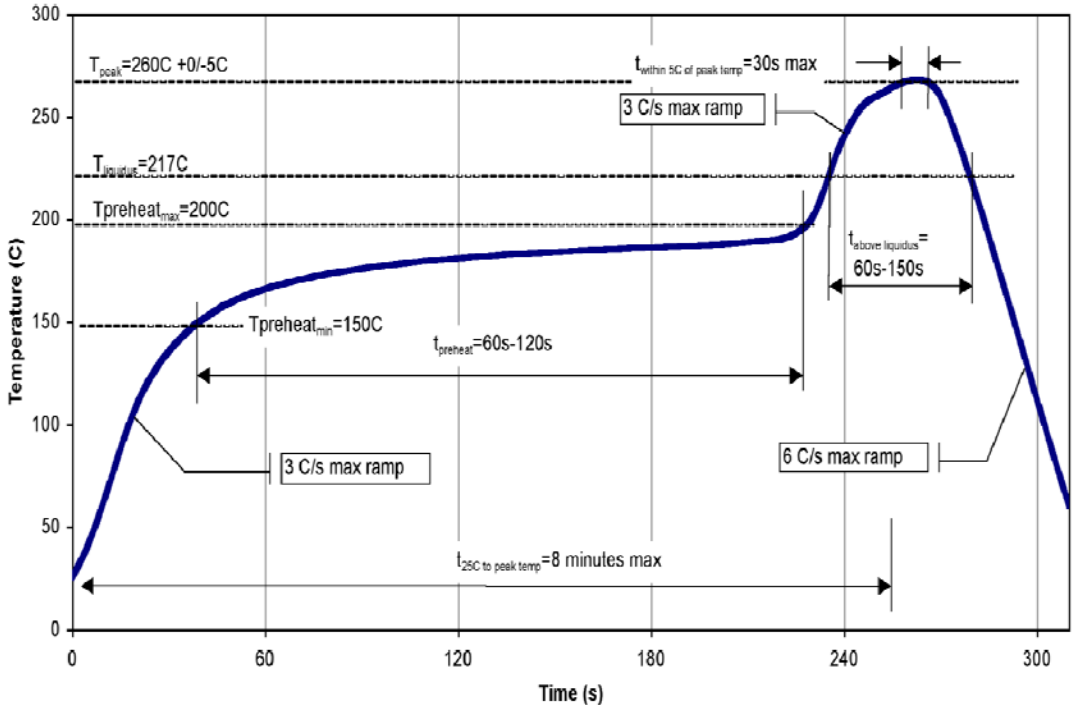
Compatible with the latest version of J-STD-020, Lead free solder, 260°

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Recommended Soldering Temperature Profile



Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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Email: info-sales@tqs.com **Fax:** +1.972.994.8504

For technical questions and application information:

Email: info-networks@tqs.com

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