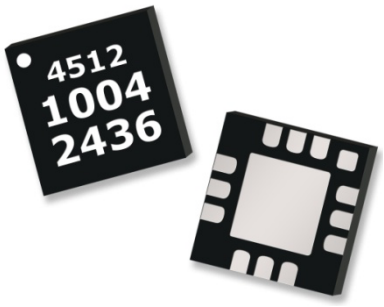
TGA4512-SM

Ka-Band Driver Amplifier

Applications

- Ka-band VSAT Ground Terminal
- Point-to-Point Radio

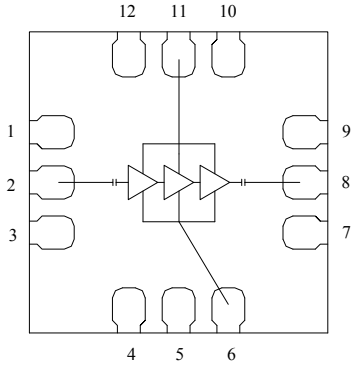


QFN 3x3mm 12L

Product Features

- Frequency Range: 28 – 32 GHz
- Power: 17 dBm Psat, 16 dBm P1dB
- Gain: 14.5 dB
- TOI: 24dBm
- NF: 7.5 dB
- Bias: Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical
- Package Dimensions: 3.0 x 3.0 x 0.85 mm

Functional Block Diagram



General Description

The TriQuint TGA4512-SM is a Ka-Band Packaged Driver Amplifier. The TGA4512-SM operates from 28-32 GHz and is designed using TriQuint's power pHEMT production process.

The TGA4512-SM typically provides 17 dBm of saturated output power with small signal gain of 14.5 dB.

The TGA4512-SM is available in a low-cost, surface mount 12 lead 3x3 QFN package and is ideally suited for Ka-band VSAT Ground Terminal, and Point-to-Point Radio.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pin Configuration

Pin #	Symbol
1, 3, 4, 5, 7, 9, 10, 12	N/C
2	RF IN
6	Vg
8	RF OUT
11	Vd

Ordering Information

Part No.	ECCN	Description
TGA4512-SM	3A001.b.2.d	Ka-band Driver Amplifier

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

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage,Vd	+8 V
Gate Voltage,Vg	-5 to 0 V
Drain Current, Id	100 mA
Gate Current, Ig	-0.6 to 3.5
Power Dissipation, Pdiss	0.65 W
RF Input Power, CW, 50Ω,T = 25ºC	18 dBm
Channel Temperature, Tch	200 ºC
Mounting Temperature (30 Seconds)	260 ºC
Storage Temperature	-40 to 150

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
Id		80		mA
Id_drive (Under RF Drive)		100		mA
Vg		-0.45		V

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

Electrical Specifications

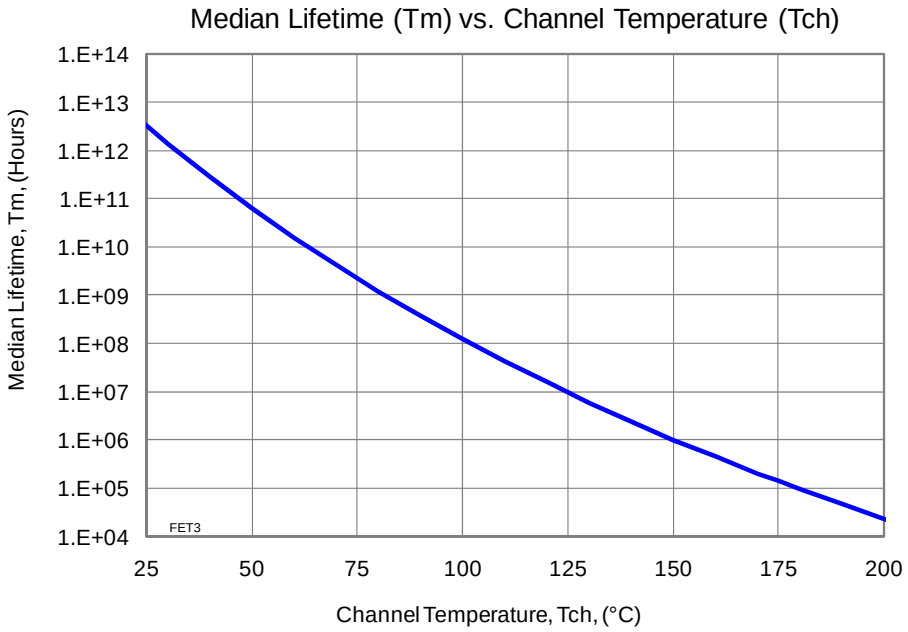
Test conditions unless otherwise noted: 25ºC, Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical.

Parameter	Min	Typical	Max	Units
Operational Frequency Range	28		32	GHz
Gain	11	14.5		dB
Input Return Loss		-12		dB
Output Return Loss		-10		dB
Output Power @ Saturation	14	17		dBm
Output Power @ 1dB Gain Compression		16		dBm
Output TOI		24		dBm
Noise Figure		7.5		dB
Gain Temperature Coefficient		-0.38		dB/°C
Power Temperature Coefficient		-0.01		dBm/°C

Specifications (cont.)

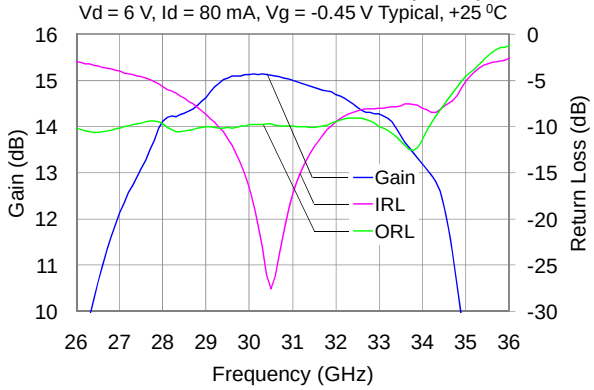
Thermal and Reliability Information

Parameter	Condition	Rating
Thermal Resistance, θ_{JC}, measured to back of package	Tbase = 85 °C	θ_{JC} = 117.5 °C/W
Channel Temperature (Tch), and Median Lifetime (Tm)	Tbase = 85 °C, Vd = 6 V, Id = 80 mA, Pdiss = 0.48 W	Tch = 141 °C Tm = 2.2 E+6 Hours
Channel Temperature (Tch), and Median Lifetime (Tm) Under RF Drive	Tbase = 85 °C, Vd = 6 V, Id = 100 mA, Pout = 16.9 dBm, Pdiss = 0.55 W	Tch = 150 °C Tm = 1 E+6 Hours

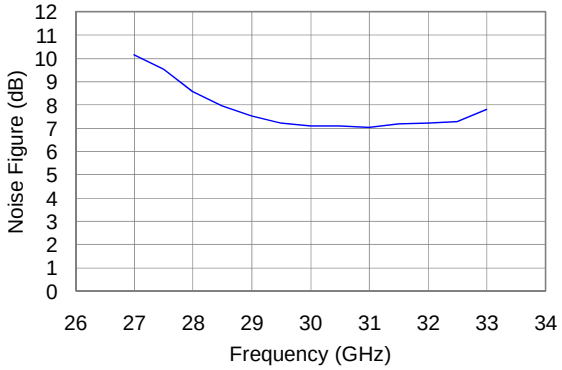


Typical Performance

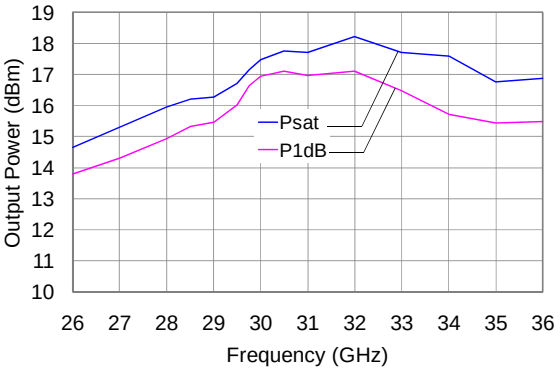
Gain, Return Loss vs. Frequency
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C



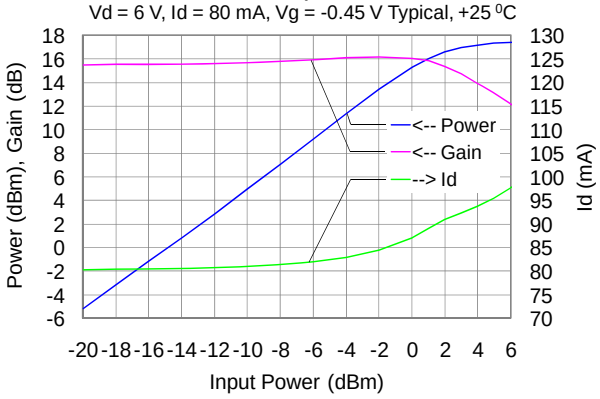
Noise Figure vs. Frequency
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C



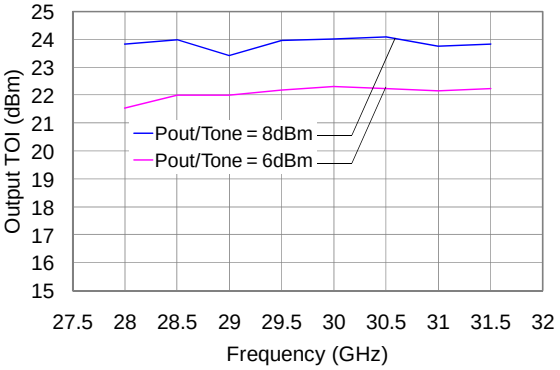
Power vs. Frequency
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C



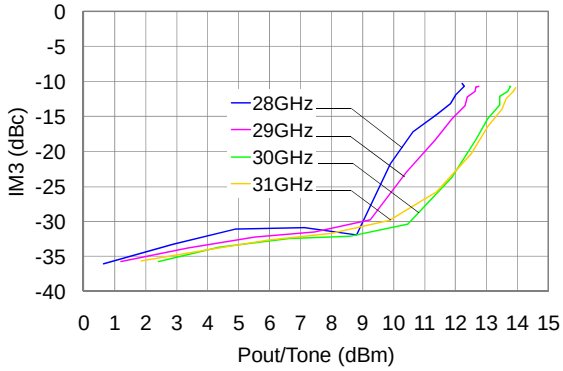
Power, Gain, Id vs. Input Power @ 30 GHz
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C



TOI vs. Frequency vs. Pout/Tone
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C

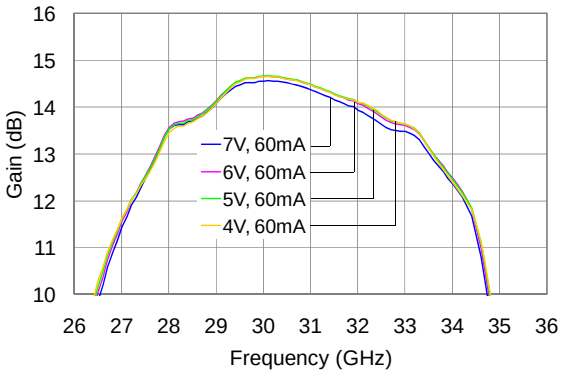


IM3 vs. Pout/Tone vs. Frequency
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical, +25 °C

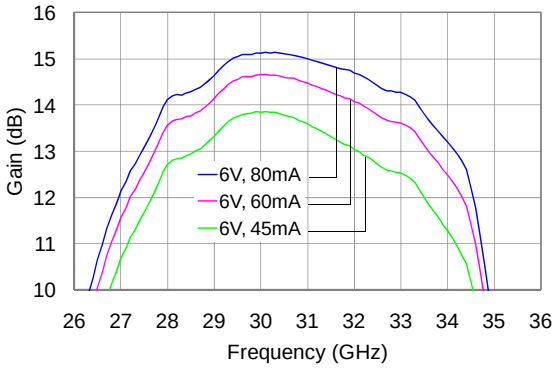


Typical Performance (cont.)

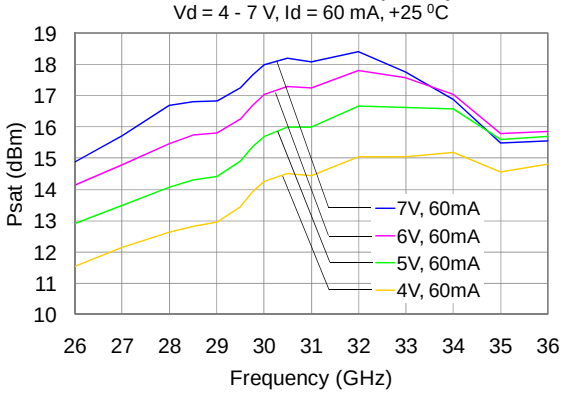
Gain vs. Frequency vs. Vd
Vd = 4 - 7 V, Id = 60 mA, +25 °C



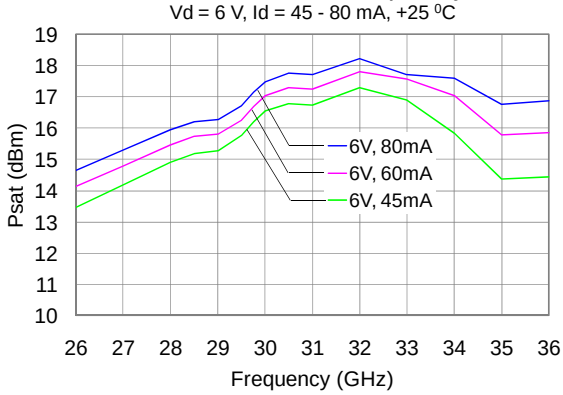
Gain vs. Frequency vs. Id
Vd = 4 - 7 V, Id = 60 mA, +25 °C



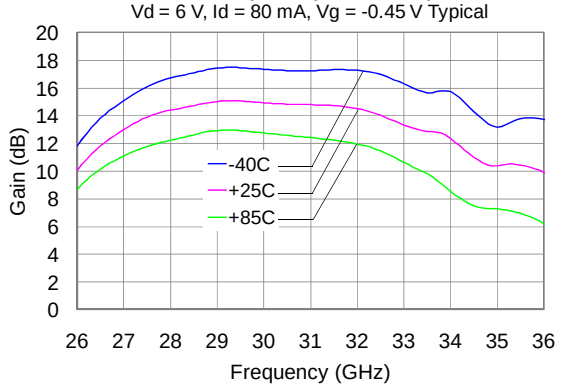
Saturated Power vs. Frequency vs. Vd
Vd = 4 - 7 V, Id = 60 mA, +25 °C



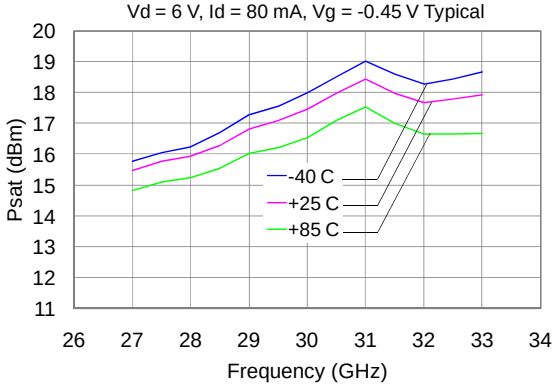
Saturated Power vs. Frequency vs. Id
Vd = 6 V, Id = 45 - 80 mA, +25 °C



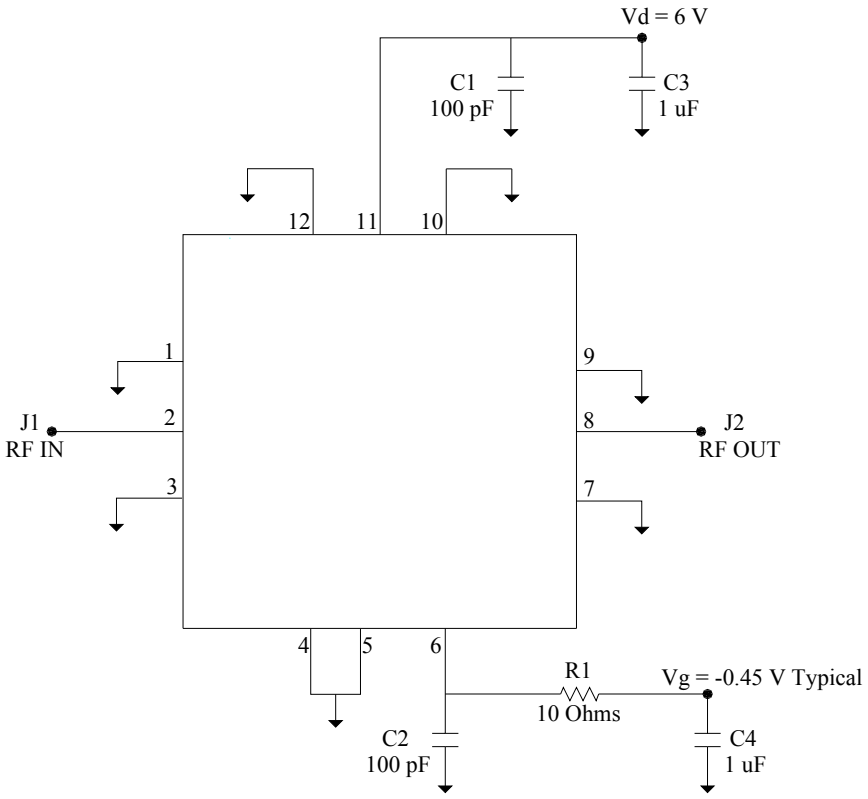
Gain vs. Frequency vs. Temperature
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical



Psat vs. Frequency vs. Temperature
Vd = 6 V, Id = 80 mA, Vg = -0.45 V Typical

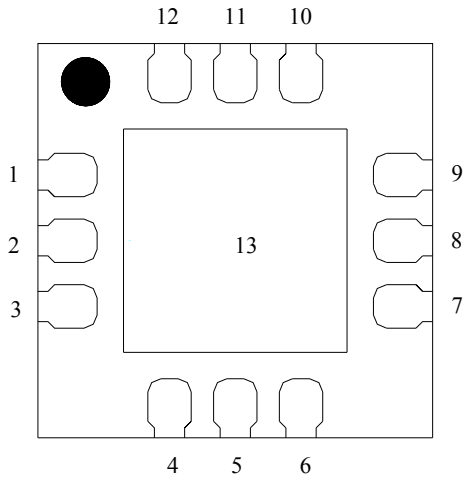


Application Circuit



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 80 mA. This will be ~ Vg = -0.45 V	Turn Vd to 0 V
Apply RF signal to RF Input	Turn Vg to 0 V

Pin Description

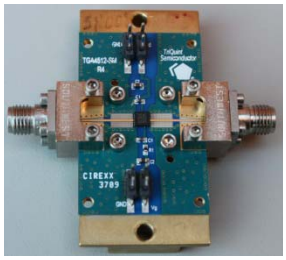


Pin	Symbol	Description
1, 3, 7, 9	N/C	No internal connection; must be grounded on PCB
2	RF IN	Input, matched to 50 ohms
4, 5, 10, 12	N/C	No internal connection. Can be grounded or left open
6	Vg	Gate voltage. Bias network is required; see Application Circuit on page 11 as an example.
8	RF OUT	Output, matched to 50 ohms
11	Vd	Drain voltage. Bias network is required; see Application Circuit on page 11 as an example.
13	GND	Backside Paddle. Multiple vias should be employed to minimize inductance and thermal resistance; see Mounting Configuration on page 15 for suggested footprint.

Applications Information

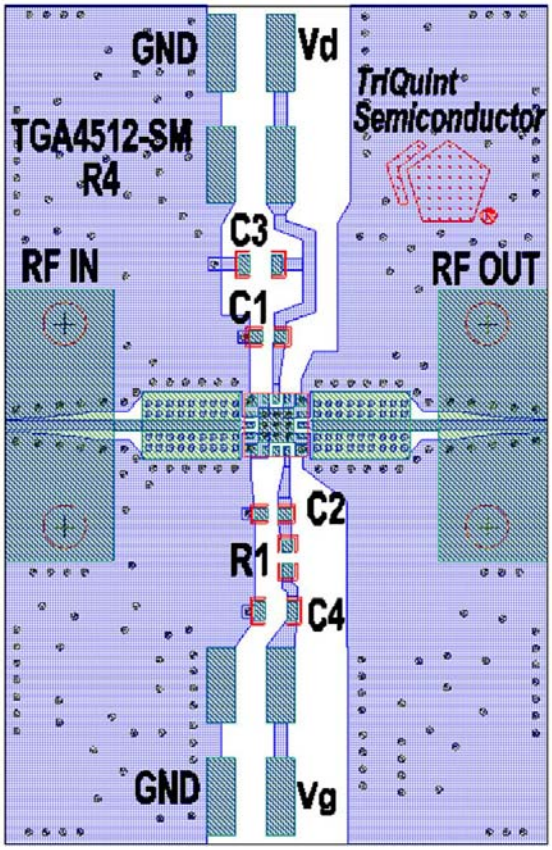
PC Board Layout

Top RF layer is 0.008" thick Rogers RO4003, ϵ_r = 3.38. Metal layers are 1-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 TGA4512-SM Product Information page.



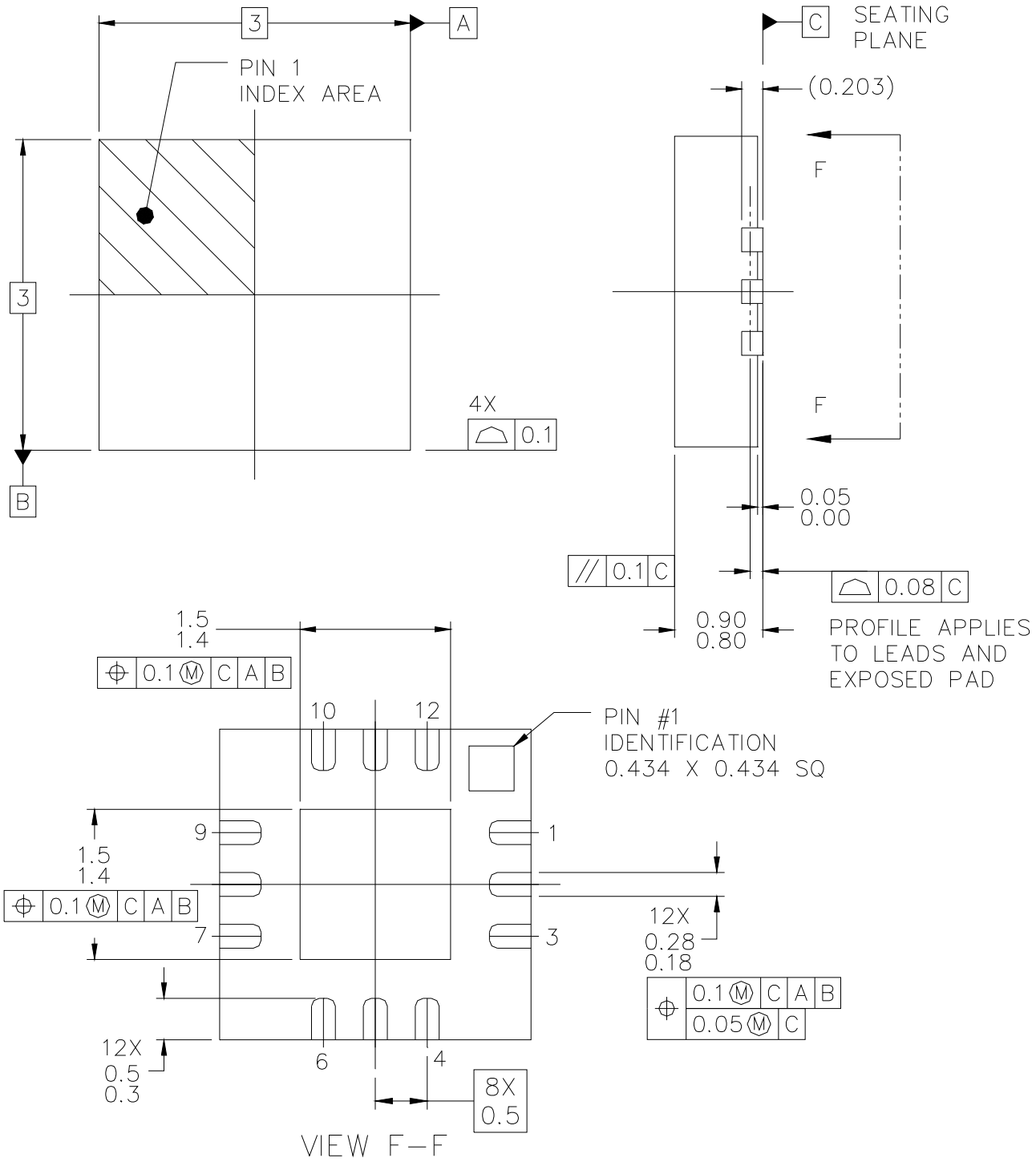
Bill of Material

Ref Des	Value	Description	Manufacturer	Part Number
C1, C2	100 pF	Cap, 0402, 50V, 5%, NPO	various	
C3, C4	1 uF	Cap, 0603, 50V, 5%, NPO	various	
R1	10 Ohms	Res, 0402, 1/16W, 5%, NPO	various	

Mechanical Information

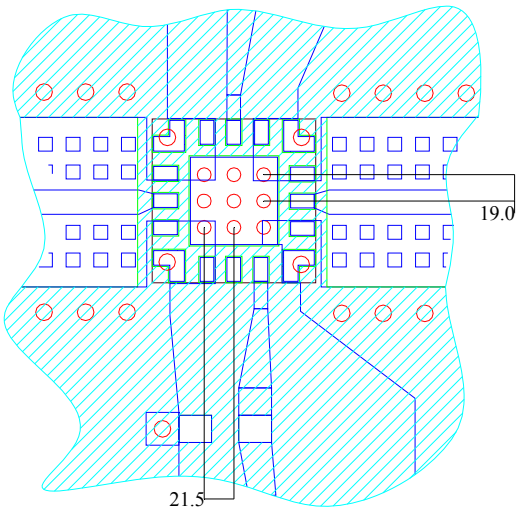
Package Information and Dimensions

All 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 matte tin. It is compatible with both lead-free (maximum 260 °C reflow temperature) and tin-lead (maximum 245 °C reflow temperature) soldering processes.

The TGA4512-SM will be marked with the "4512" 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 auto-generated number.



Mechanical Information (cont.)

Mounting Configuration

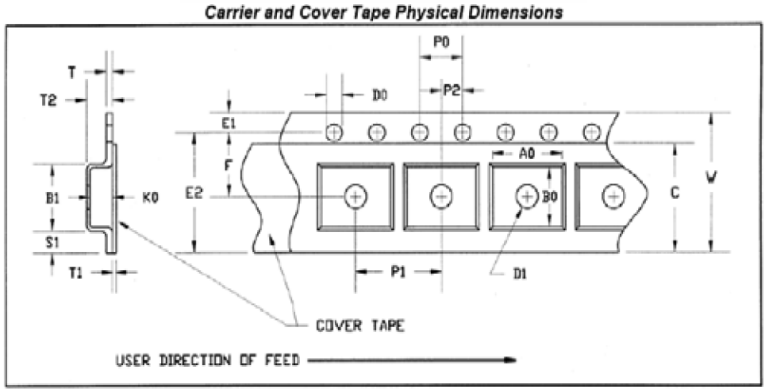
All dimensions are in millimeters (inches).

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 .25 mm (.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	0.130	3.3
	Width	B0	0.130	3.3
	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	0.362	9.2
Carrier Tape	Width	W	0.472	12.0

Product Compliance Information

ESD Information

Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: Passes ≥ TBD min.
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

MSL Rating

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

ECCN

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

Solderability

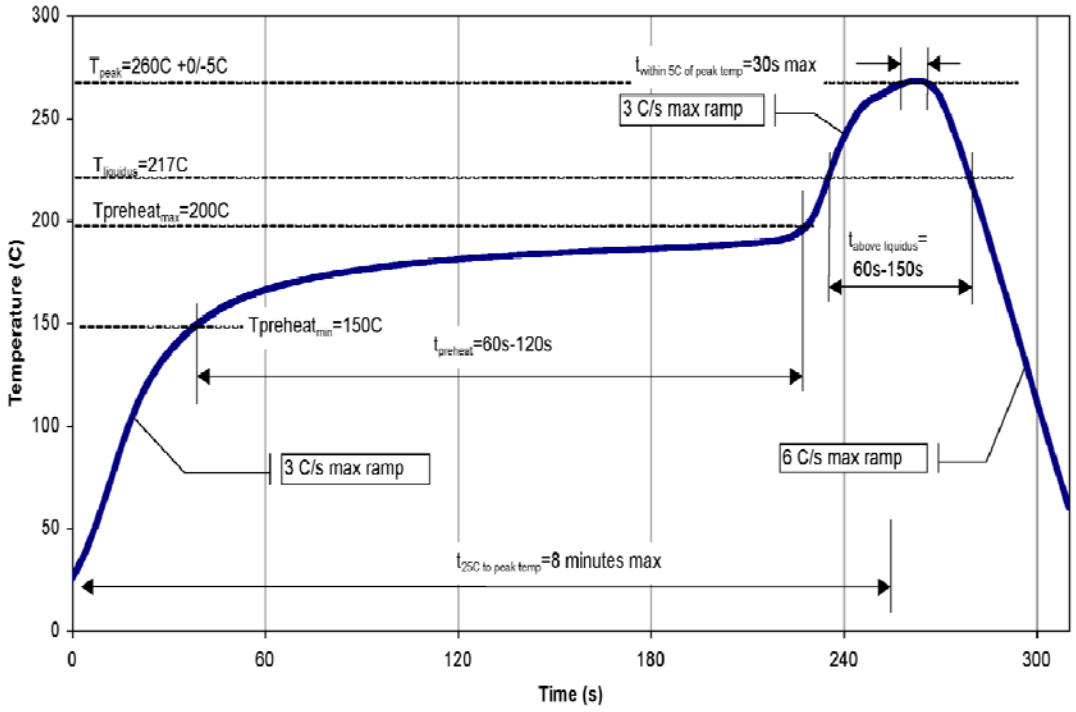
Compatible with the latest version of J-STD-020, Lead free solder, 260°

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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For technical questions and application information:

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