

TGA2807-SM

CATV Ultra Linear Gain Amplifier



Applications

- CATV EDGE QAM Cards
- CMTS Equipment



28-pin 5x5 mm QFN Package

Product Features

- 40-1000 MHz Bandwidth
- DOCSIS 3.0 Compliant
- ACPR: -69 dBc at 61 dBmV Pout
- Pdiss: 1.9 W
- 18.5 dB Typical Gain
- 28 dBm P_{SAT}
- 2.3 dB typical noise figure
- 20 dB Typical Output Return Loss
- 6 V Single Supply
- 318 mA Current Draw
- 5 x 5 mm QFN Package

General Description

The TriQuint TGA2807-SM is an ultra-linear packaged Gain Block which operates from 40 MHz to 1 GHz.

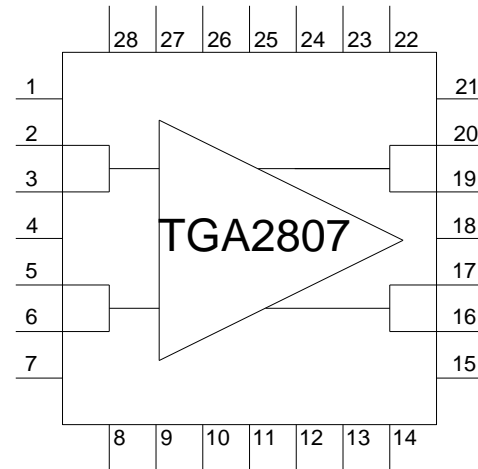
The TGA2807-SM provides flat gain along with ultra-low distortion. It also provides high output power with low DC power consumption.

This amplifier is ideally suited for use in CATV headend systems or other applications requiring low noise and low distortion.

Demonstration Boards are available.

Lead-free and RoHS compliant.

Functional Block Diagram



Pin Configuration

| Pin # | Symbol |
|--|-------------------------|
| 2, 3 | RF Input 1 |
| 5, 6 | RF Input 2 |
| 9, 27, 29 | Ground |
| 10 | VG2 (Optional) |
| 11, 25 | Voltage Supply |
| 12, 24 | Voltage Supply (Choked) |
| 13 | Current Sense |
| 16, 17 | RF Output 2 |
| 19, 20 | RF Output 1 |
| 26 | VG1 (Optional) |
| 1, 4, 7, 8, 14, 15, 18, 21, 22, 23, 28 | No Connect |
| 29 | Ground Slug |

Ordering Information

| Part No. | Description |
|------------|--|
| TGA2807-SM | CATV Ultra Linear Gain Amplifier (lead-free/RoHS compliant 5x5 QFN Pkg) |

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

Specifications

Absolute Maximum Ratings¹

| Parameter | Rating |
|------------------------|----------------|
| Device Voltage | +11.0 V |
| Continuous Input Power | 73.8 dBmV |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to 85 °C |

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|---|-----|------|-----|-------|
| V _{DD} | 6 | 7 | 7.5 | V |
| I _{DD} | 240 | 318 | 380 | mA |
| V _{G1} | | 0.95 | | V |
| V _{G2} | | 2.65 | | V |
| T _J (for > 10 ⁶ hours MTTF) | | | 150 | °C |

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

Electrical Specifications

Test conditions unless otherwise noted: 25 °C, +6 V V_{DD}

| Parameter | Conditions | Min | Typical | Max | Units |
|--|---------------|-----|---------|-------|-------|
| Operational Frequency Range | | 40 | | 1000 | MHz |
| Gain | Note 9 | 17 | 18.5 | 22 | dB |
| Gain Flatness | Note 1 | | ±0.5 | | dB |
| Noise Figure | Note 2 | 1.9 | 2.4 | 4.0 | dB |
| Input Return Loss | | 10 | 15 | | dB |
| Output Return Loss | | 10 | 20 | | dB |
| Output IP3 (150 MHz) | Note 3 | | 43 | | dBm |
| I _{DD} | Note 9 | 240 | 318 | 380 | mA |
| P _{SAT} | Note 4 | | 28 | | dBm |
| ACPR | Notes 5, 8, 9 | | -69 | -63.5 | dBc |
| Harmonics (2 nd – 4 th) | Note 6 | | -69 | | dBc |
| Thermal Resistance (jnt to case) θ _{jc} | Note 7 | | 16.7 | | °C/W |

Notes:

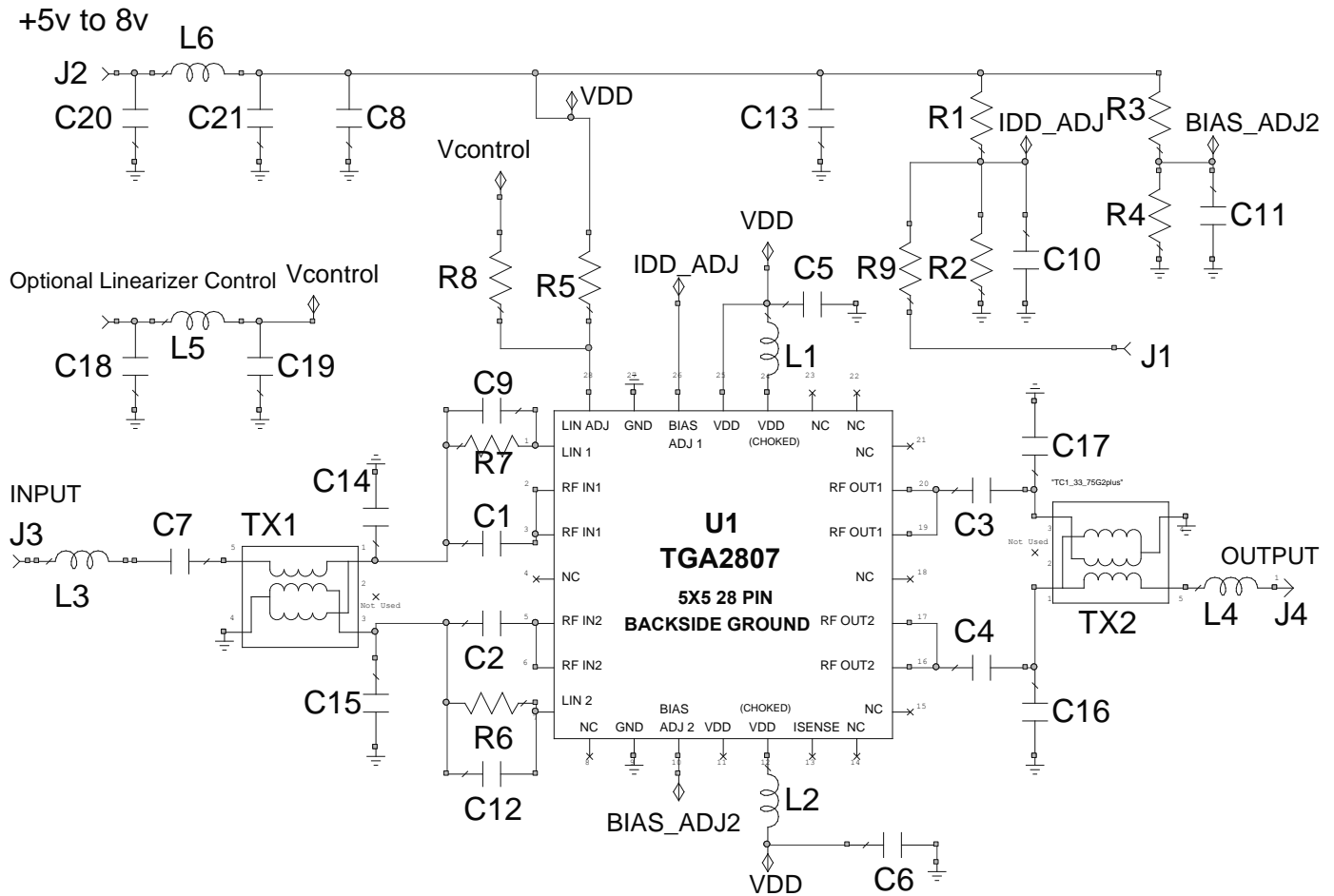
- Flatness determined by deviation from a straight-line curve fit across the entire band
- At 500 MHz
- At 15 dBm output power per tone
- Measured at 750 MHz
- Using single channel 256-QAM at 858 MHz and 61 dBmV output power, measured in the band 750 kHz from channel block edge to 6 MHz from channel block edge
- Using quad 256-QAM channels at 54 dBmV output power per channel
- Refer to Thermal Analysis Report TGA2807
- ACPR degrades at as V_{DD} less than 7.0 V
- Tested in production

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Application Circuit Reference Design 40-1000 MHz



TGA2807-SM

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Application Circuit BOM 40-1000 MHz

Bill of Materials

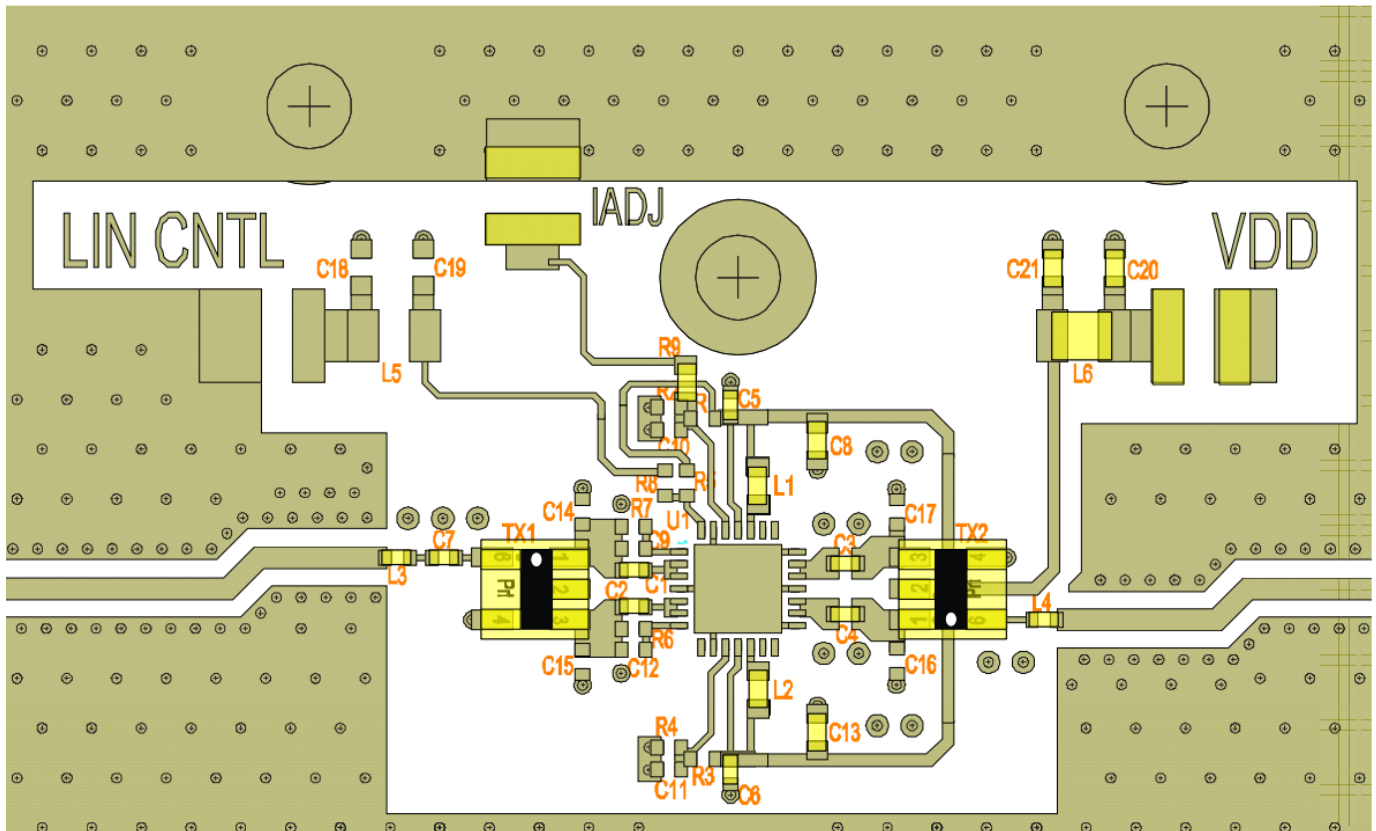
| Ref Des | Value | Description | Manufacturer | Part Number |
|---|--------|---|--------------|----------------|
| U1 | -- | TGA2807-SM 40MHz-1GHz, CATV Gain Block | TriQuint | |
| C1, C2, C5, C6, C7, L4 | 0.01uF | Ceramic Cap, 0402, NPO, 16V | Various | |
| C3, C4 | 470pF | Ceramic Cap, 0402, 16V, 10% | Various | |
| C8, C13, C20, C21 | 0.1uF | Ceramic Cap, 0603, 16V, 10% | Various | |
| TX1, TX2 | 1:1 | 75Ω , 1:1Transformer | MiniCircuits | TC1-33-75G2+ |
| L1, L2 | 560nH | Ind, ferrite, 0603, 530 mA, 5% | Coilcraft | 0603AF-561XJR |
| L3 | 0Ω | Res, Chip, 0402 | | |
| L6 | 0.9uH | Ind, Chip, 1008, 5%, 1.4A | Coilcraft | 1008AF-901XJLB |
| R1, R2, R3, R4, R5, R6, R7, R8, R9, C9, C10, C11, C12,C14, C15, C16, C17, C18, C19, L5 | DNP | Do Not Place | | |

**Note, BOM is based on the minimal design. Additional loads for appropriate bias adjustments.*

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Layout Drawing



TGA2807-SM

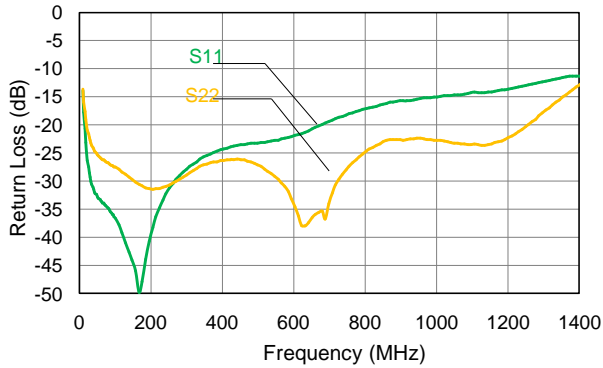
CATV Ultra Linear Gain Amplifier



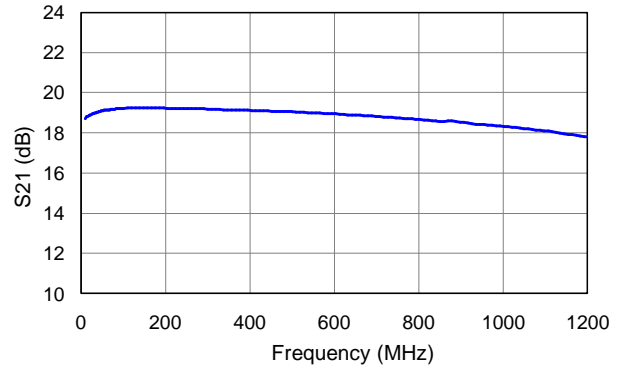
50-1000 MHz Application Board Typical Performance

$V_{DD} = +6\text{ V}$, $I_{DD} = 318\text{ mA}$, $75\ \Omega$, 83 channels, $25\ ^\circ\text{C}$, App Circuit for TGA2807

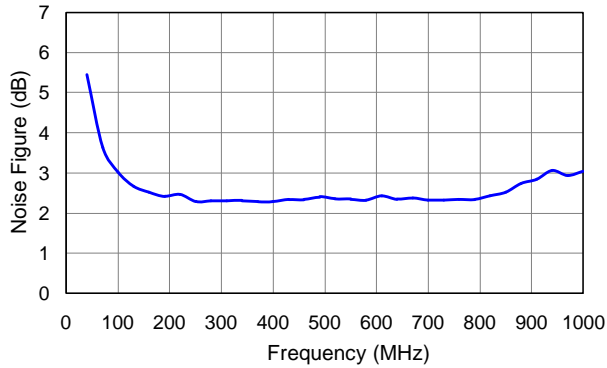
Return Loss



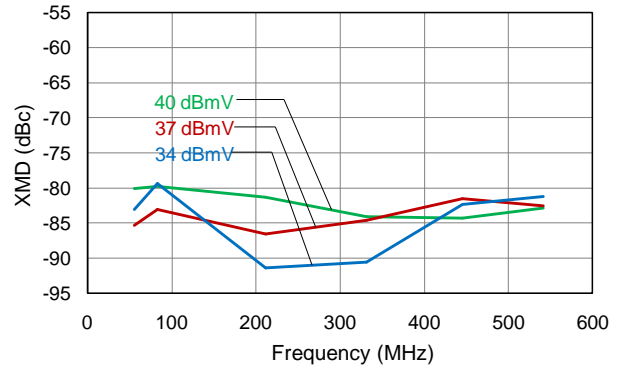
Gain



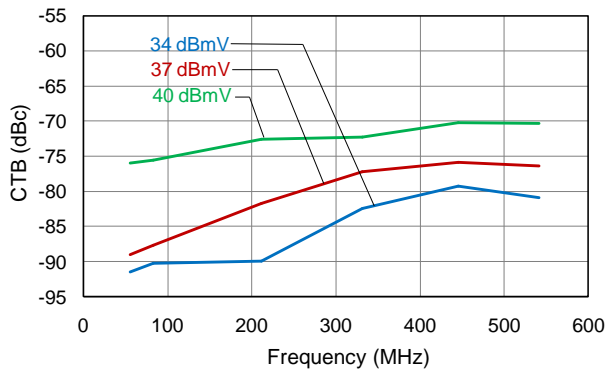
Noise Figure



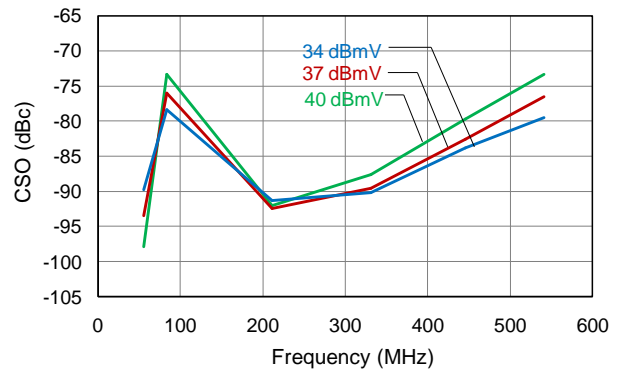
XMD



CTB



CSO



TGA2807-SM

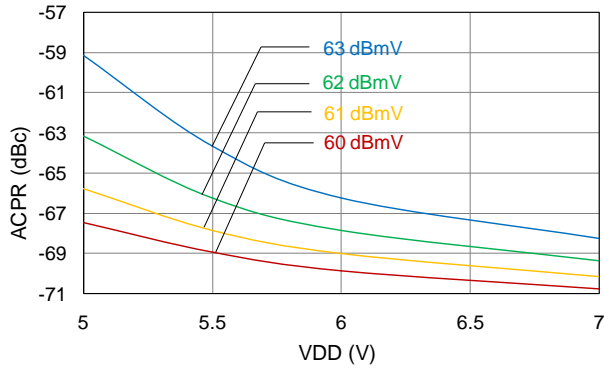
CATV Ultra Linear Gain Amplifier



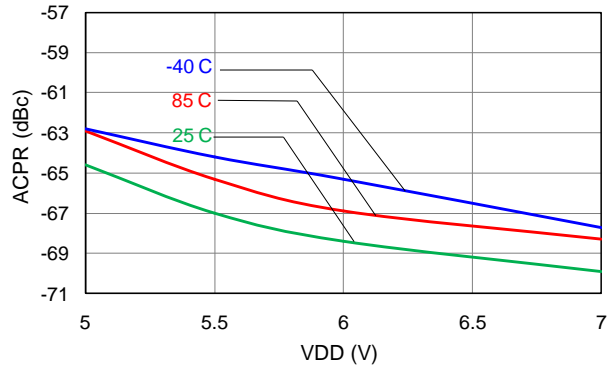
50-1000 MHz Application Board Typical Performance

75 Ω , single 256-QAM channel

ACPR vs P_{OUT} and V_{DD}

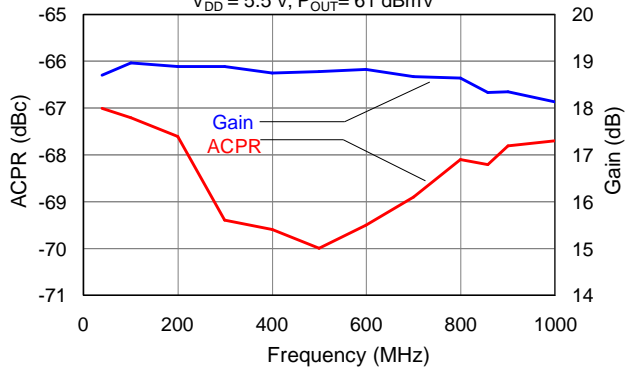


ACPR vs V_{DD} vs Temp



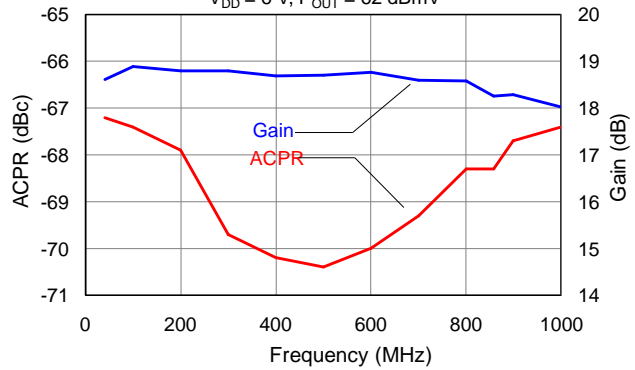
ACPR & Gain

$V_{DD} = 5.5 \text{ V}$, $P_{OUT} = 61 \text{ dBmV}$

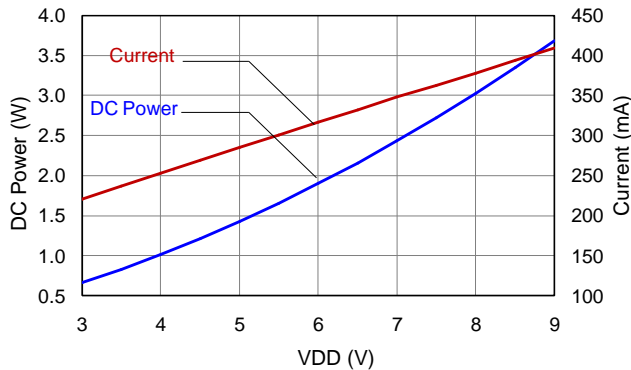


ACPR & Gain

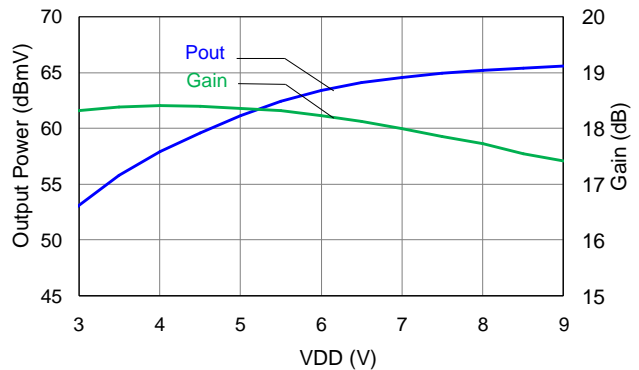
$V_{DD} = 6 \text{ V}$, $P_{OUT} = 62 \text{ dBmV}$



DC Power and V_{DD} to Maintain -66 dBc ACPR



P_{OUT} and V_{DD} to Maintain -66 dBc ACPR



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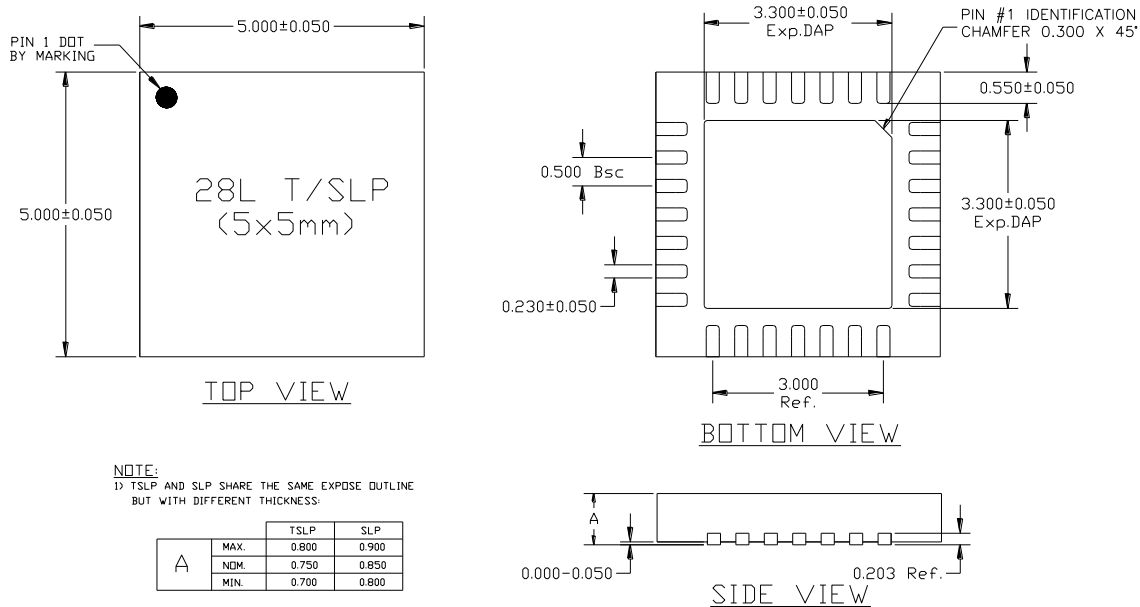


Mechanical Information

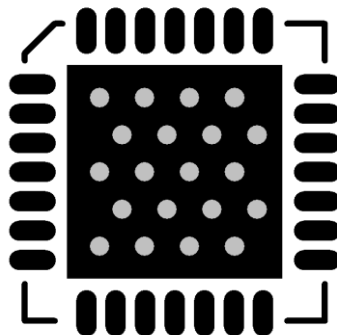
Package Information and Dimensions

This package is lead-free/RoHS-compliant. The plating material on the leads is 100 % Matte Tin. It is compatible with both lead-free (maximum 260 °C reflow temperature) and lead (maximum 245 °C reflow temperature) soldering processes.

The TGA2807 will be marked with a “2807” designator and 2 lines of 4 digit alphanumeric lot code (YYWW on the second line, and XXXX on the third). The first four digits are a date code consisting of the year and work week (YYWW) of assembly. The last four digits are the lot code (XXXX).



Mounting Configuration



Notes:

1. Ground / thermal vias are critical for the proper performance of this device. Vias should use a .35mm (#80/.0135”) diameter drill and have a final, plated thru diameter of .25 mm (.010”).
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. RF trace width depends upon the PC board material and construction.
4. All dimensions are in millimeters (inches). Angles are in degrees.

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Product Compliance Information

ESD Information



Caution! ESD-Sensitive Device

ESD Rating: Class 1 A

Value: Passes ≥ 450 V min.

Test: Human Body Model (HBM)

Standard: JEDEC Standard JESD22-A114

For additional guidance regarding ESD and surge protection, please consult with Application Engineering.

Solderability

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

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

MSL Rating

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

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Contact Information

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