

# TAT6254C

**Fiber To The Home RF Amplifier 47–1000 MHz**



## Applications

- High dynamic range FTTH
- GPON FTTH
- Multi Dwelling Unit TIA
- Mini-node



## Product Features

- Single 12 V or 5 V configuration
- Low Noise 3.9 pA/rtHz Equivalent Input Noise
- 19 or 23 dBmV/channel RF output, at 55.25MHz
- 33 dB AGC range, for -10 to +2 dBm optical inputs
- Low power consumption, 1.3 Watts at 12 V and 1.0 Watt at 5 V
- Potentially eliminates the need for costly balun and directional coupler
- Linearity better than -63 dBc CSO and CTB

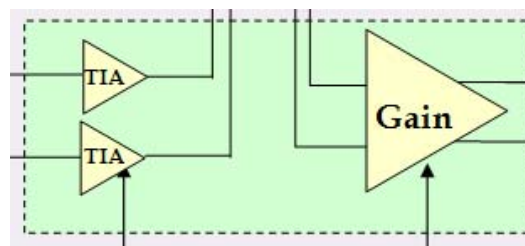
## General Description

The TriQuint TAT6254C FTTP SFU Video Receiver provides a low noise analog interface to CATV receivers and optical triplexers. The TAT6254C is intended for use in single family unit (SFU) analog video fiber to the premise (FTTP) applications.

The TAT6254C exhibits low input noise and distortion that provides performance margin critical to meeting stringent FTTP link requirements. It runs on either a single 12 V or 5 V supply, eliminating the need for an extra ONU power supply. The TAT6254C provides automatic gain control (AGC) to maintain a constant +19 dBmV/ch output (+23 dBmV in high output mode) to ensure consistent video quality and ease of design. The TAT6254C is fabricated using 6-inch GaAs pHEMT technology to optimize performance and cost.

The TAT6254C has the flexibility to be designed for a range of RF outputs and supply voltages. This datasheet discusses four configurations; standard RF output and high RF output with both 5V and 12V supplies.

## Functional Block Diagram



## Pin Configuration

| Pin #  | Symbol     |
|--------|------------|
| 1      | TIA IN A   |
| 2,4    | BIAS 1     |
| 3,13   | NC         |
| 5      | TIA IN B   |
| 6      | BIAS ADJ B |
| 7      | TIA OUT B  |
| 8, 18  | BIAS 2     |
| 9      | PA IN B    |
| 10     | TRIM B     |
| 11, 12 | PA OUT B   |
| 14, 15 | PA OUT A   |
| 16     | TRIM A     |
| 17     | PA IN A    |
| 19     | TIA OUT A  |
| 20     | BIAS ADJ A |
| EPAD   | GND        |

## Ordering Information

| Part No.    | Description               |
|-------------|---------------------------|
| TAT6254C    | CATV FTTH pHEMT amplifier |
| TAT6254C-EB | Evaluation Board          |

Standard T/R size = 2500 pieces on a 13" reel.

### Specifications

#### Absolute Maximum Ratings

| Parameter                                       | Rating         |
|-------------------------------------------------|----------------|
| Storage Temperature                             | -60 to +150 °C |
| Operating Temperature                           | -40 to +85 °C  |
| Device Voltage, $V_{DD}$                        | +15 V          |
| Thermal Resistance (jnc. to case) $\theta_{jc}$ | 17 °C/W        |

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

#### Recommended Operating Conditions

| Parameter                     | Min | Typ | Max | Units |
|-------------------------------|-----|-----|-----|-------|
| $V_{DD}$                      |     | 12  |     | V     |
| $T_J$ (for $>10^6$ hours MTF) |     |     | 150 | °C    |

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

#### Electrical Specifications

(Per Applications Circuit Herein)

| Parameter                                    | Conditions       | Min | Typical | Max  | Units   |
|----------------------------------------------|------------------|-----|---------|------|---------|
| Operational Frequency Range                  |                  | 47  |         | 1000 | MHz     |
| RF Gain at 553.25 MHz                        | See Note 1.      |     | 33      |      | dB      |
| Gain Flatness                                |                  |     | 1.0     |      | dB      |
| Tilt                                         | See Note 2.      |     | 3       |      | dB      |
| Equivalent Input Noise                       |                  |     | 3.9     |      | pA/rtHz |
| RF Output Level @ 55.25 MHz, Standard Output | See Note 3.      | 18  | 19      |      | dBmV/ch |
| RF Output Level @ 55.25 MHz, High Output     | See Notes 3 & 5. | 22  | 23      |      | dBmV/ch |
| Output Return Loss                           |                  |     | 16      |      | dB      |
| CSO                                          | See Note 4.      |     | -63     |      | dBc     |
| CTB                                          | See Note 4.      |     | -63     |      | dBc     |
| Gain Control Range                           | See Note 6.      |     | 33      |      | dB      |
| Power Supply Current @ 12 V                  |                  |     | 120     |      | mA      |
| Power Supply Current @ 5 V                   |                  |     | 200     |      | mA      |

- 1) Gain =  $20 \cdot \log(Z/75)$
- 2) From 54 MHz to 870 MHz; higher tilt possible
- 3) AGC using 3.3 %/ch output level fixed by external AGC
- 4) 80 channels analog NTSC
- 5) Uses output transformer
- 6) With suggested application circuit

#### Optical Input and Triplexer Requirements

| Parameter                          | Conditions | Min | Typical | Max | Units |
|------------------------------------|------------|-----|---------|-----|-------|
| Optical Input Power                |            | -10 |         | 2   | dBm   |
| Optical Modulation Index           |            |     | 3.3     |     | %/ch  |
| Triplexer 1550 nm PIN Responsivity |            |     |         | 0.9 | mA/mW |
| Triplexer 1550 nm PIN Capacitance  |            |     |         | 0.9 | pF    |

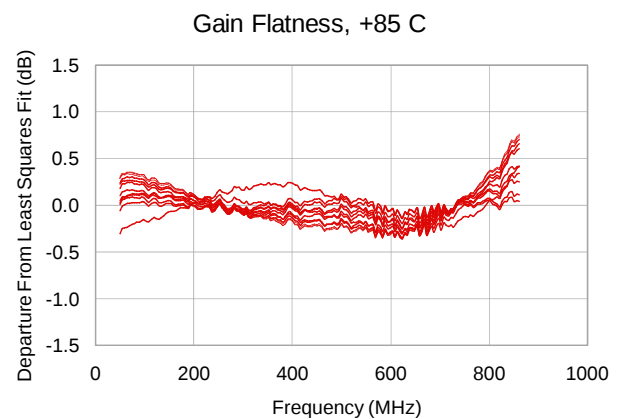
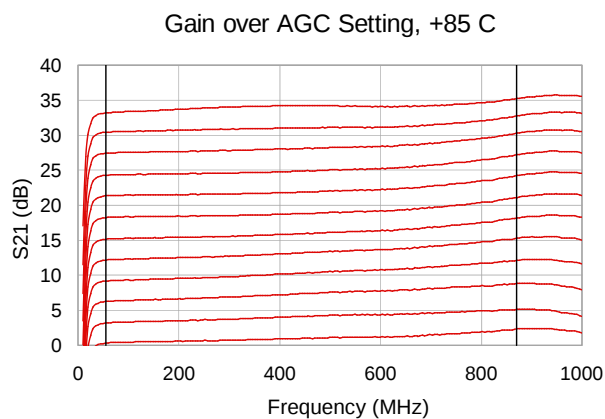
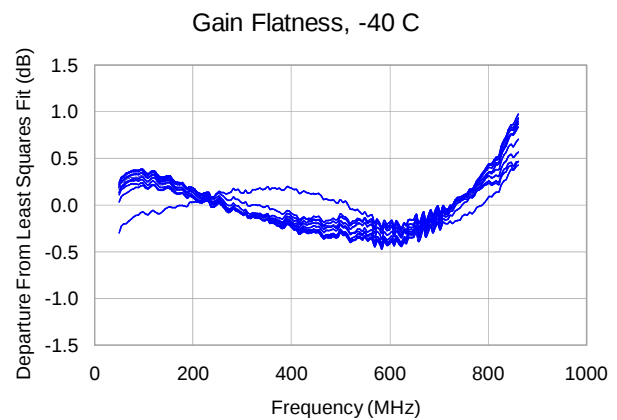
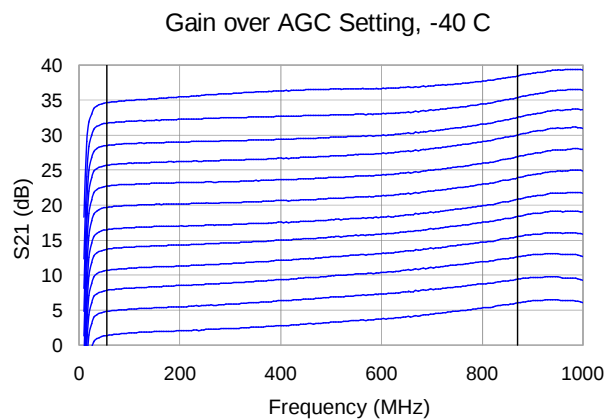
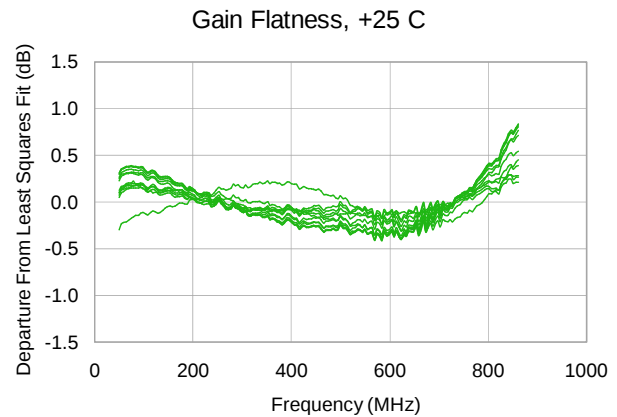
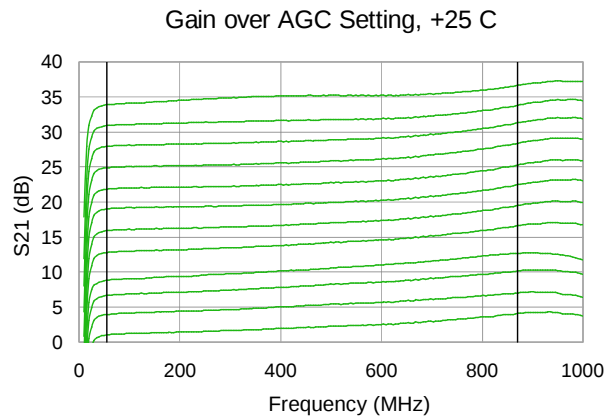
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## 12 V Standard Output Application Board Typical Performance

$V_{DD} = +12\text{ V}$ ,  $I_{DD} = 120\text{ mA}$ , Temperatures are ambient



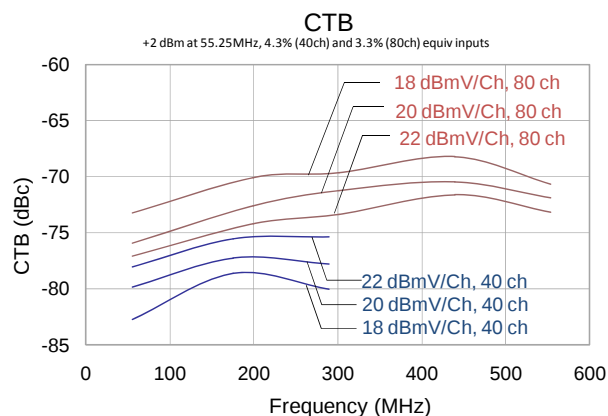
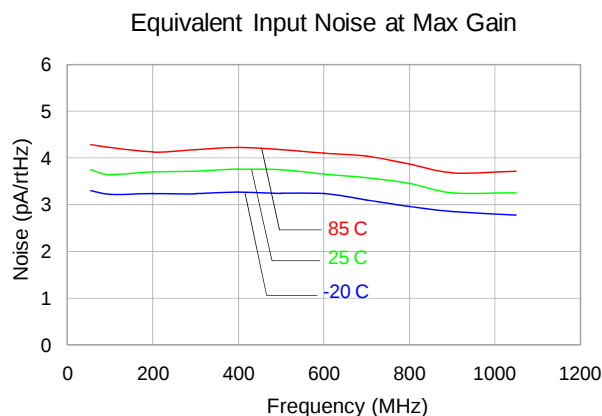
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## 12 V Standard Output Application Board Typical Performance (cont'd)

$V_{DD} = +12\text{ V}$ ,  $I_{DD} = 120\text{ mA}$ ,  $25\text{ }^{\circ}\text{C}$  unless otherwise stated, Temperatures are ambient



For performance data using 5 V Output, please email [sicapplication.engineering@tqs.com](mailto:sicapplication.engineering@tqs.com).

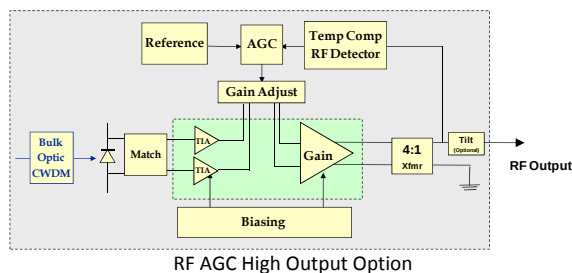
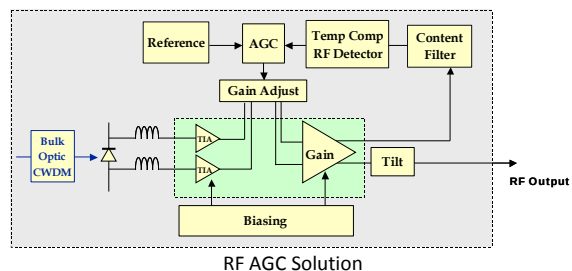
## Detailed Device Description And Application Overview

The TAT6254C integrates two low noise high gain trans-impedance amplifiers in a differential configuration followed by an output amplifier. It provides a low input impedance to minimize the effects of photodiode capacitances and stray impedance affects on gain flatness.

The TAT6254C is fabricated using high gain Gallium Arsenide pHEMT technology developed for high-volume commercial markets. It provides improved gain and noise compared to older MESFET technologies and lower gain pHEMT technologies.

The TAT6254C was designed as a general purpose FTTP receiver. While it eliminates the need for costly hand-wound parts such as baluns and directional couplers, it allows users wide flexibility in setting gain, tilt, and bias levels to best meet the requirements posed by different operators and architectures. The TAT6254C provides the flexibility to address high levels of gain required by GPON architectures. Designers can easily modify external circuit values to enable wider optical input ranges, such as needed in newer GPON architectures.

The TAT6254C provides two high level outputs. One output drives an optical tilt network while the other drives a content filter and an RF detection circuit. The TAT6254C does not require an output balun. Because the two equal outputs have a high level of isolation; the TAT6254C effectively provides an integrated directional coupler with extra gain to drive the RF detection circuit at a high level. This eases offset voltage requirements on operational amplifiers used in the AGC block.



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Gain control is accommodated with a low cost external PIN diode circuit placed between the input trans-impedance amplifier and the output amplifier. This helps reduce the die size of the TAT6254C and provides for excellent PIN diode distortion characteristics over a continuous control range.

Up to 33 dB of gain control is possible using the recommended 12 V standard output application circuit.

The application circuits are optimized for 870 MHz performance with slight rolloff for use in combination with a post filter for applications such as MoCA. For optimized performance at 1 GHz and beyond, it is recommended that a low capacitance photodiode be used with a change in value of the peaking inductors L1 and L2. For further guidance, please contact TriQuint Semiconductor Application Engineering.

For high output operation, refer to the appropriate 5 V high output application circuit. This option uses a 4:1 transformer to combine the outputs of the second stage.

For further information email [sjcappplication.engineering@tqs.com](mailto:sjcappplication.engineering@tqs.com).

### Pin Description

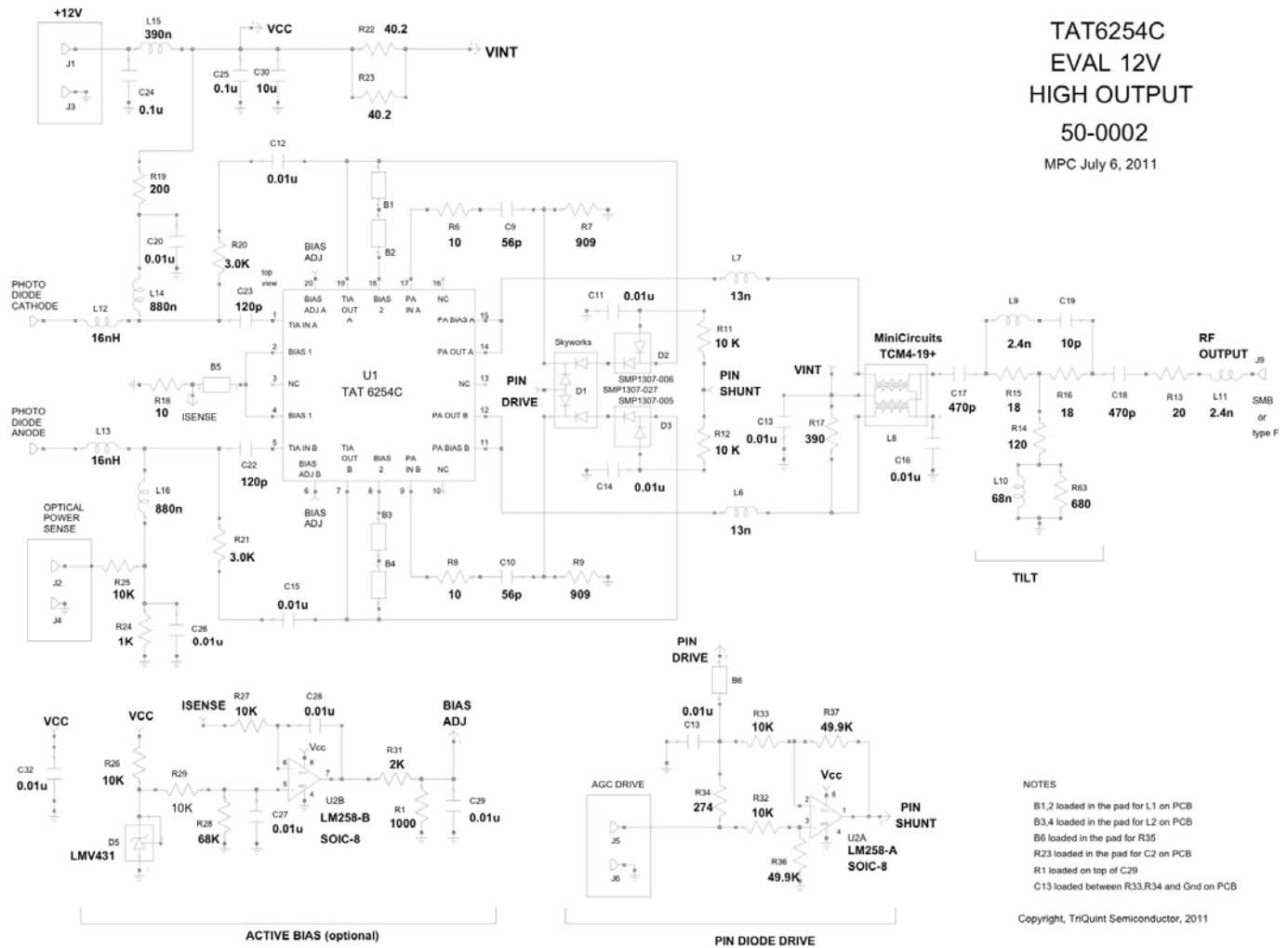
| Pin    | Symbol     | Description                                     |
|--------|------------|-------------------------------------------------|
| 1      | TIA IN A   | Input to trans-impedance amplifier A            |
| 2,4    | BIAS 1     | Bias Port                                       |
| 3,13   | NC         | No Connect                                      |
| 5      | TIA IN B   | Input to trans-impedance amplifier B            |
| 6      | BIAS ADJ B | Bias adjustment for trans-impedance amplifier B |
| 7      | TIA OUT B  | Output of trans-impedance amplifier B           |
| 8, 18  | BIAS 2     | Bias port                                       |
| 9      | PA IN B    | Input to post-amplifier B                       |
| 11, 12 | PA OUT B   | Output of post amplifier B                      |
| 14, 15 | PA OUT A   | Output of post amplifier A                      |
| 17     | PA IN A    | Input to post amplifier A                       |
| 19     | TIA OUT A  | Output of trans-impedance amplifier A           |
| 20     | BIAS ADJ A | Bias adjustment for trans-impedance amplifier A |
| EPAD   | GND        | Ground                                          |

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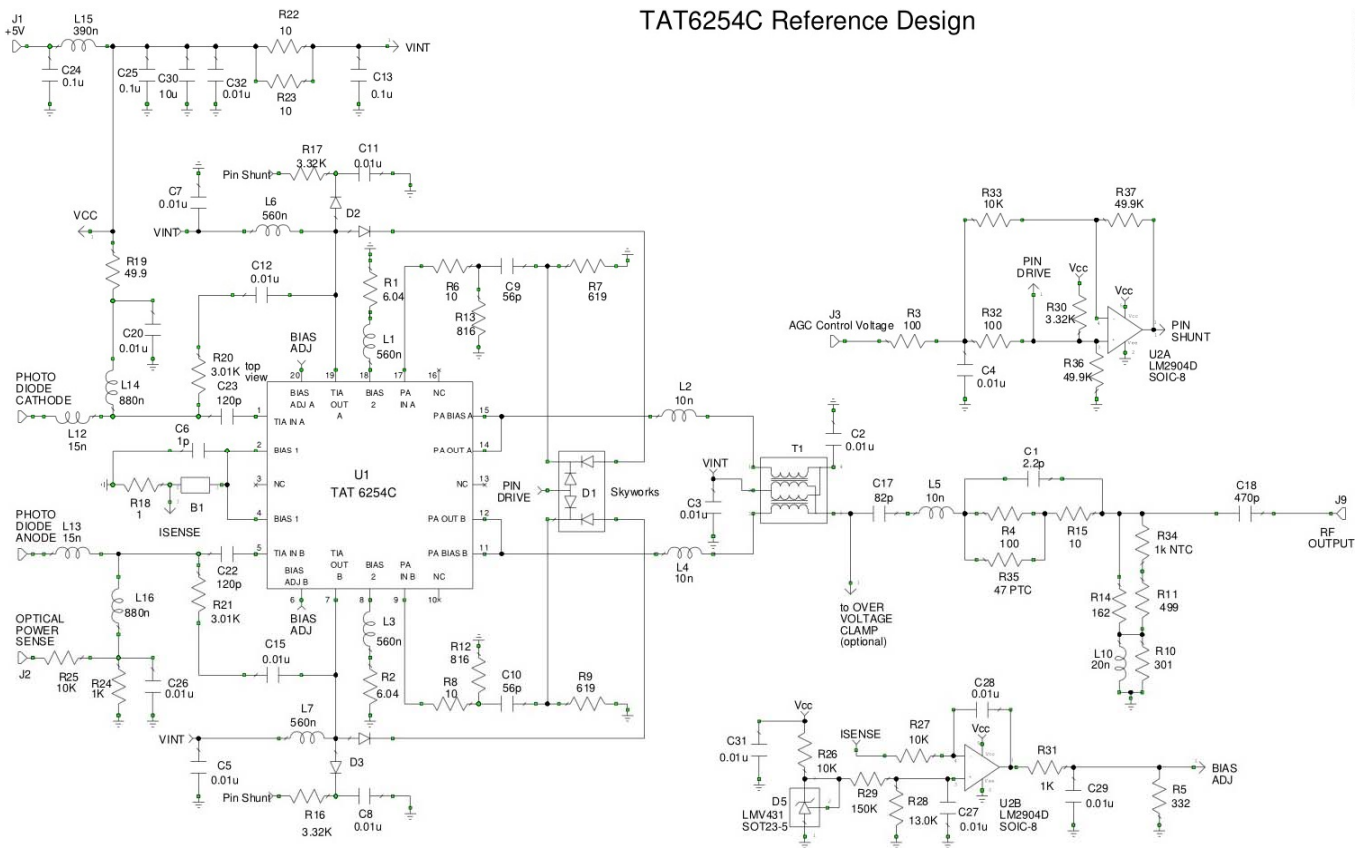


## 12 V High Output Schematic



## 5 V High Output Schematic

## TAT6254C Reference Design

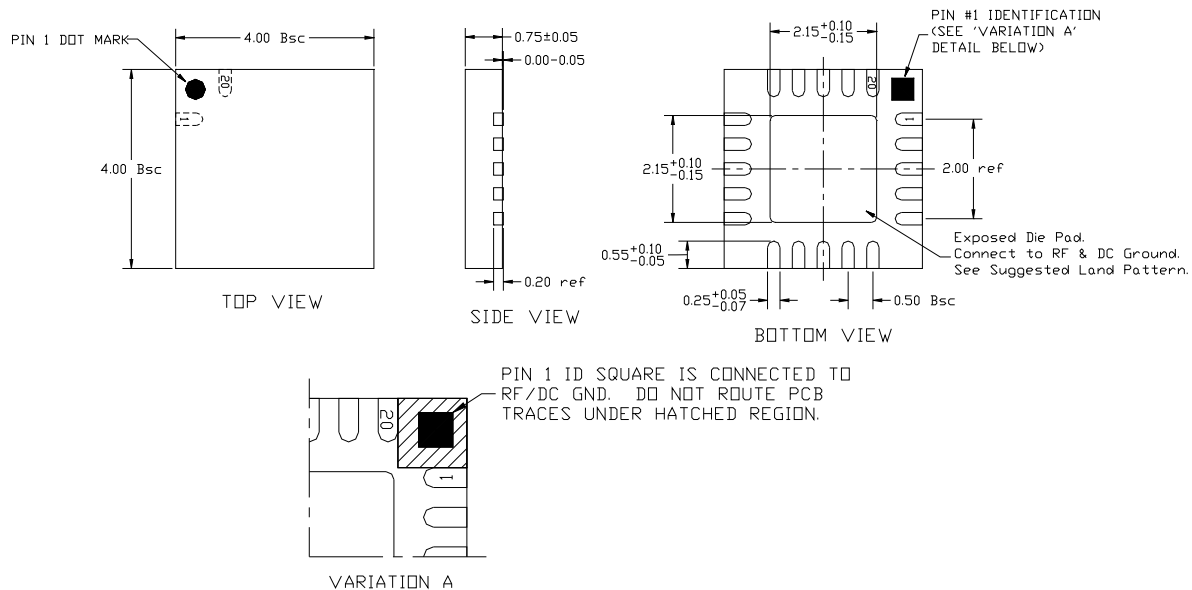


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### Mechanical Information

#### Package Information and Dimensions

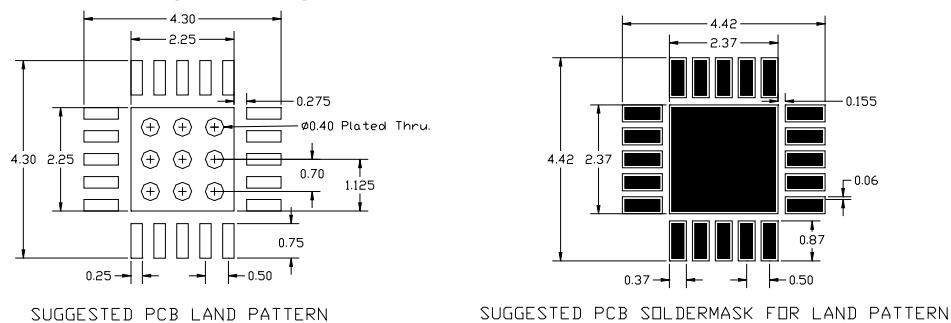
This package is lead-free/RoHS-compliant. It is compatible with both lead-free (maximum 260 °C reflow temperature) and lead (maximum 245 °C reflow temperature) soldering processes.



Pin #1 Identification Detail

#### Mounting Configuration

All dimensions are in millimeters. Angles are in degrees.



### Product Compliance Information

#### ESD Information



#### Caution! ESD-Sensitive Device

ESD Rating: Class 1A  
Value: Passes  $\geq 250$  V min.  
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV  
Value: Passes  $\geq 1000$  V min.  
Test: Charged Device Model (CDM)  
Standard:

#### MSL Rating

The part is rated Moisture Sensitivity Level 3 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

#### 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

### Contact Information

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

Web: [www.triquint.com](http://www.triquint.com)  
Email: [info-sales@tqs.com](mailto:info-sales@tqs.com)

Tel: +1.707.526.4498  
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For technical questions and application information:

Email: [sicapplication.engineering@tqs.com](mailto:sicapplication.engineering@tqs.com)

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