

# SAC3127AQ6



GaAs MMIC Power Amplifier  
27.5GHz~31GHz 35dBm

Rev1.0

## Features

- Frequency: 27.5GHz~31GHz
- Gain: 27dB
- Output P<sub>-1dB</sub>: 35dBm
- Supply Voltage: +6V
- Power-Added Efficiency: 25%@P<sub>-1dB</sub>
- IM3 Level: -25dBc @ P<sub>OUT</sub> 25 dBm/tone
- -20dBc @ P<sub>OUT</sub> 29 dBm/tone
- Package: QFN6×6

## Typical Applications

- Microwave radio
- SatCom
- VSAT

## General Description

SAC3127AQ6 is a Ka-band GaAs power amplifier. SAC3127AQ6 provides 26 dB of gain, and 35 dBm of output power for 1 dB compression (Typ.) from a +6V supply.

SAC3127AQ6 is housed inside a low-cost RoHS compliant QFN6x6 industry standard SMT package

## Electrical Performance

T<sub>A</sub>=25°C, V<sub>D</sub>=+6V, I<sub>D</sub>=2.5A, Z<sub>0</sub>=50Ω, CW

| Parameter                                               | Min.    | Typ. | Max. | Units |
|---------------------------------------------------------|---------|------|------|-------|
| Frequency Range                                         | 27.5~31 |      |      | GHz   |
| Small Signal Gain                                       | 23      | 26   | —    | dB    |
| Small Signal Gain Flatness                              | —       | ±1   | ±2   | dB    |
| Reverse Isolation                                       | —       | -50  | —    | dB    |
| Input VSWR                                              | —       | 2    | 3.5  | :1    |
| Power-Added Efficiency                                  | —       | 25   | —    | %     |
| Output Power for 1 dB Compression (OP <sub>-1dB</sub> ) | 35      | 36   | —    | dBm   |
| IM <sub>3</sub> Level*                                  | —       | -20  | —    | dBc   |
| Drain Voltage (V <sub>D</sub> )                         | 5       | —    | 6    | V     |
| Gate Current (I <sub>G</sub> )                          | —       | 5    | 28   | mA    |
| Supply Current (I <sub>D</sub> )                        | —       | 3    | 3.7  | A     |
| Thermal Resistance                                      | —       | TBD  | —    | °C/W  |

\* Measurement taken at P<sub>out</sub> / Tone = 27 dBm, f<sub>c</sub>= 29GHz, Δf=4MHz

## Absolute Maximum Ratings

|                        |        |                        |                |
|------------------------|--------|------------------------|----------------|
| Maximum Input Power    | +17dBm | Operating Temperature  | -55°C~+85°C    |
| Channel Temperature    | +150°C | Storage Temperature    | -65°C~+150°C   |
| Maximum V <sub>D</sub> | +6.5V  | Maximum V <sub>G</sub> | -2V(Pinch-off) |

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# SAC3127AQ6



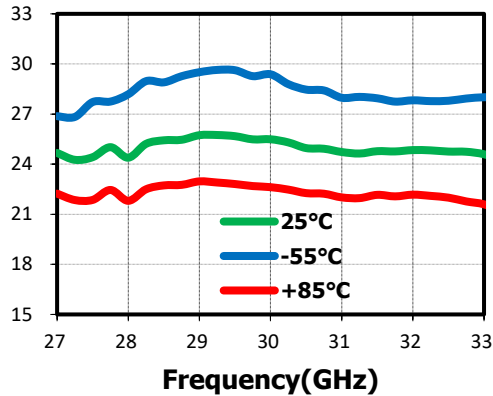
GaAs MMIC Power Amplifier  
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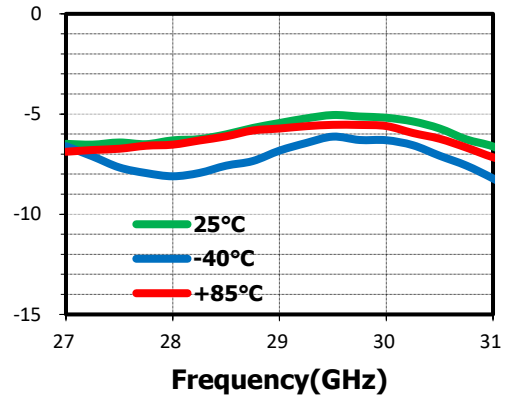
## Typical Performance Curve

$V_D=+6V$   $I_D=2.5A$  CW

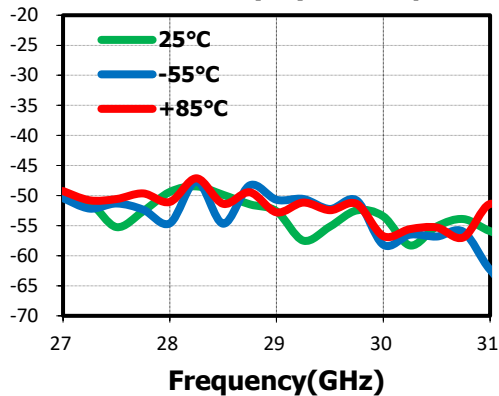
Small Signal Gain(dB) vs.Temperature



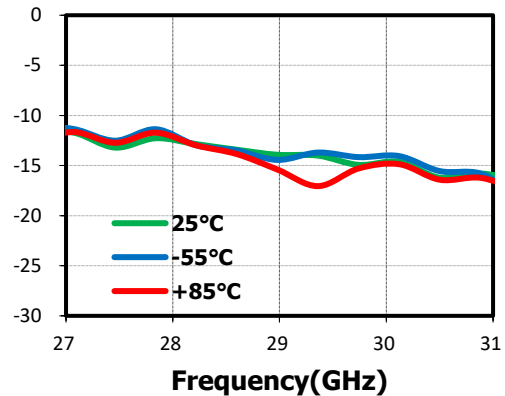
Input Return Loss(dB) vs.Temperature



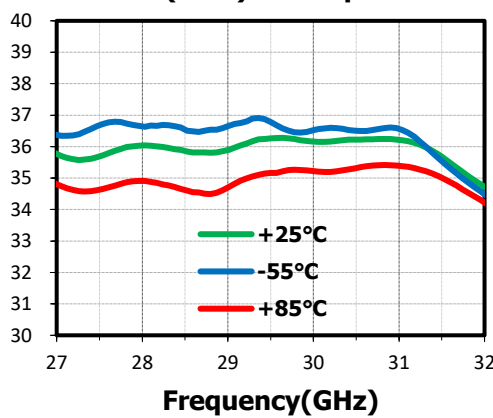
Reverse Isolation(dB) vs.Temperature



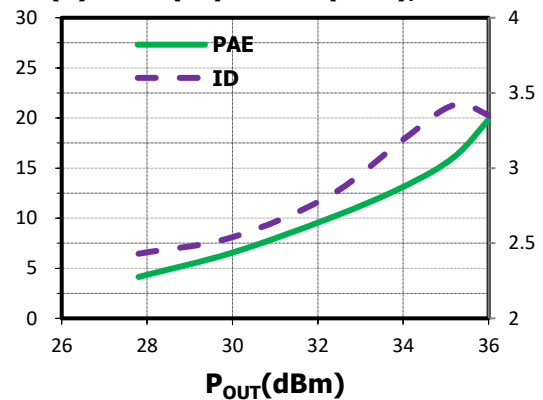
Output Return Loss(dB) vs.Temperature



OP-1dB(dBm)vs.Temperature



ID(A)、PAE(%)vs.Pout(dBm),f=27GHz

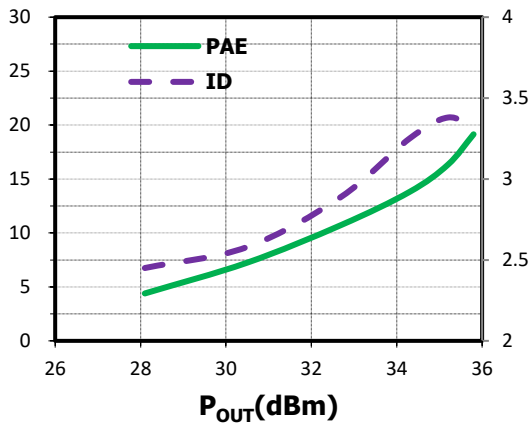


# SAC3127AQ6

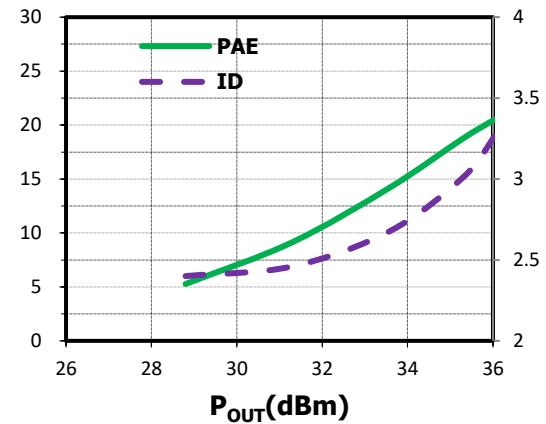
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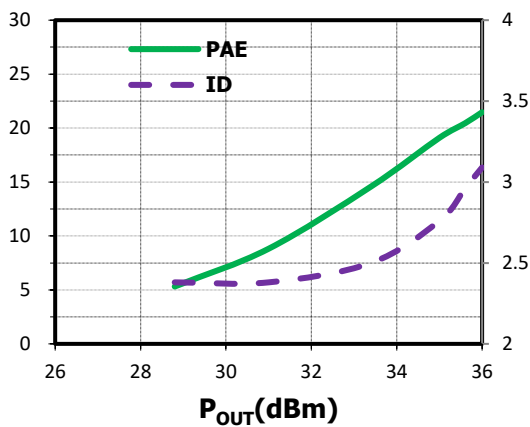
**ID(A)、PAE(%)vs.Pout(dBm),f=28GHz**



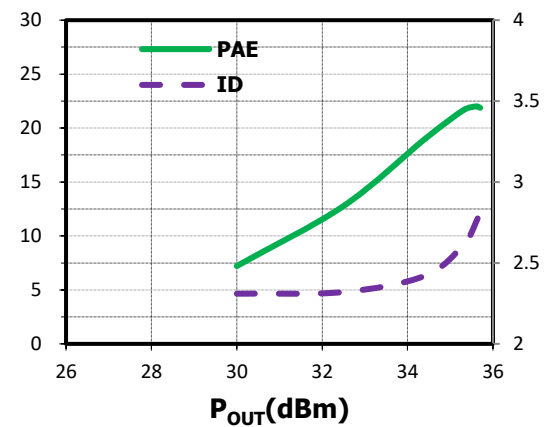
**ID(A)、PAE(%)vs.Pout(dBm),f=29GHz**



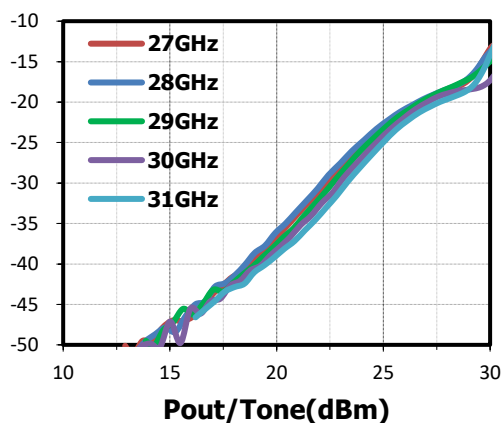
**ID(A)、PAE(%)vs.Pout(dBm),f=30GHz**



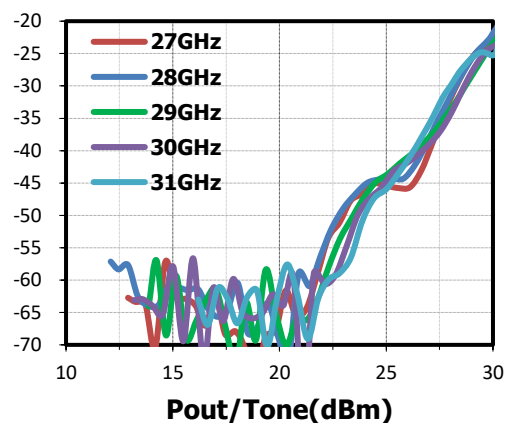
**ID(A)、PAE(%)vs.Pout(dBm),f=31GHz**



**IM3(dBc)vs.Pout/Tone**



**IM5(dBc)vs.Pout/Tone**





**Rev1.0**

(All dimensions in  $\mu\text{m}$ )



## Components List

| Reference Des. | Value  | Part Number       | Manuf. | Size |
|----------------|--------|-------------------|--------|------|
| C11~C14        | 10uF   | CC0805KKX5R6BB106 | Yageo  | 0805 |
| C3~C10         | 0.47uF | CC402KRX5R6BB474  | Yageo  | 0402 |
| R1~R10         | 5.1Ω   | —                 | ANY    | 0402 |

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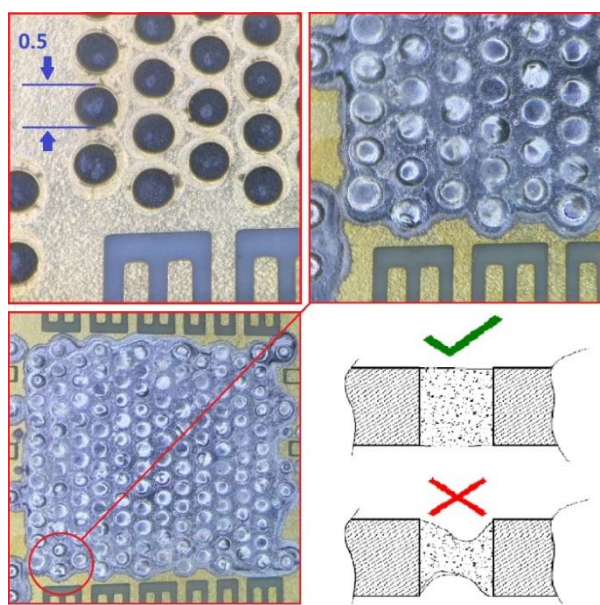
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The Evaluation board is a 2-layers board fabricated using Rogers 4350  $t=0.254$  and using best practices for high frequency RF design. The RF input and RF output traces have a  $50\ \Omega$  characteristic impedance.

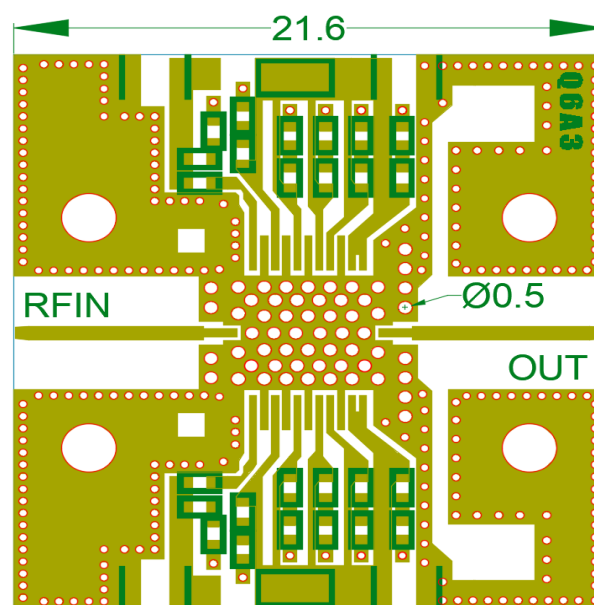
The bottom center pad of SAC3127AQ6 is used for RF grounding and heat dissipation. For best heat dissipation, copper-filled vias are highly recommended, SAC3127AQ6 is high power dissipation surface mount components and require a well-designed thermal mount. All the heat generated by the device is expected to be removed through the bottom heat slug with a low thermal resistance path to the chassis. The use of multiple copper-filled vias or solder-filled vias under the package's heat slug while using an indium foil between the PCB and chassis provides a low thermal resistance mount, Insufficient number of vias or insufficient solder filling will significantly affect the heat dissipation process of the device, and then reduce the performance or even damage the device.

As shown in Figure 1, It is a simple way to fill vias by solder. After soldering process, it is should be check top and bottom layers of PCB carefully to make sure the solder is fully filled in the via holes.

**Figure 1**



**Evaluation Board**



## Attention:

1. SAC3127AQ6 requires V<sub>Dx</sub> and V<sub>Gx</sub> bias.  
Turn-on: Apply V<sub>Gx</sub>, Apply V<sub>Dx</sub>, Apply RFIN signal.  
Turn-off: Remove RFIN signal, Decrease V<sub>G</sub> to -1.5 V (pinch-off), Decrease V<sub>D</sub> to 0 V
2. The moisture resistant grade of products is 2a, the storage environment  $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ , the surrounding workshop life is 4 weeks;
3. After un-packing, it is necessary to bake the parts for 6 hours in  $125\pm 5^{\circ}$  environment before soldering;
4. GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test;
5. Ultrasonic cleaning is prohibited;
6. It is extremely not recommended to heat the package directly from the top.

## Revision History

| Revision | Date          | Comment       |
|----------|---------------|---------------|
| 1.0      | Oct. 20, 2022 | First Release |

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