

SAC3149Q6



GaAs MMIC Power Amplifier
8GHz~10.5GHz 37dBm

Rev 1.1

Features

- Frequency: 8GHz~10.5GHz
- Small Signal Gain: 23dB
- Output P-1dB: 37dBm CW
- PAE: 35%@OP-1dB, f=9.35GHz
- IM3: -24dBc, 29dBm/Tone@9.35GHz
- Package Size: 6mm×6mm×1.3mm
- Supply Voltage: +8V/-Vg
- Package: QFN6x6

Typical Applications

- X-band multifunction radar
- Point-to-Point Radio

General Description

SAC3149Q6 is a X-band GaAs MMIC power amplifier. SAC3149Q6 provides 23 dB of gain, and 37 dBm of output power for 1 dB compression and more than 30% PAE from a +8V supply.

The chip has surface passivation for protection and backside via holes and gold metallization to allow a conductive epoxy die attach process, It's ideal for Point-to-Point radio and multifunction radar applications

Electrical Performance

$T_A=25^{\circ}\text{C}$, $V_D=+8\text{V}$, $I_{DQ}=1.6\text{A}$, $Z_0=50\Omega$, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	8	—	10.5	GHz
Small Signal Gain	20	23	—	dB
Gain Flatness	—	±1	—	dB
Reverse Isolation	—	-65	—	dB
RF Input VSWR	—	2	—	:1
Power-Added Efficiency	—	30	—	%
Output P-1dB	—	37	—	dBm
IM ₃ *	—	24	—	dBc
Drain Voltage (V _D)	—	8	—	V
Gate Current	—	4	—	mA
Supply Current (I _D)**	—	—	4	A
Thermal Resistance	—	3.8	—	°C/W

* Pout/Tone=29dBm, fc=9.35GHz, Δf=1MHz

**Adjust Vg voltage (- 1.1~-0.65V) to make I_{DQ} about 1.6A, and typical Vg voltage is -0.85V

Absolute Maximum Ratings

Maximum Input Power	+20dBm	Operating Temperature (Backside)	-55°C~+85°C
Channel Temperature	165°C	Storage Temperature	-55°C~+150°C
Maximum V _D Supply	+8.5V	V _G Range	-1.5V(Pinch-off)~-0.3V

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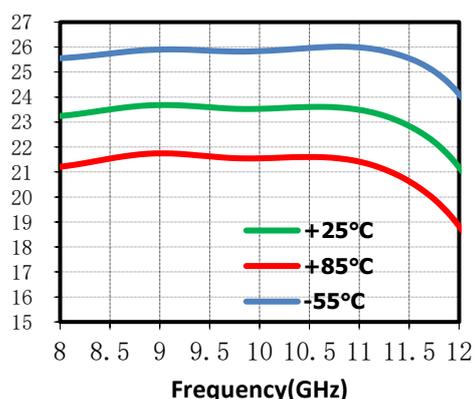
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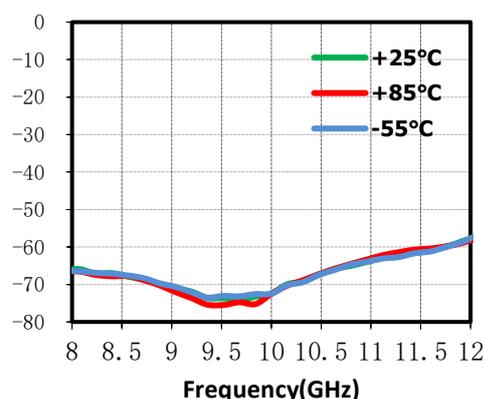
Typical Performance Curve

The following data are obtained from SAC3149Q6 evaluation board $V_D = +8V$, $I_{DQ} = 1.6A$, CW, $T_A = +25^\circ C$

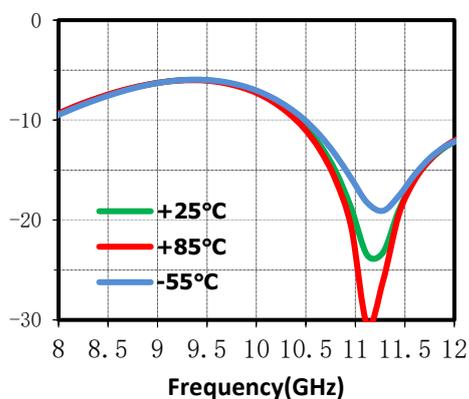
Small Signal Gain(dB) vs. Temperature



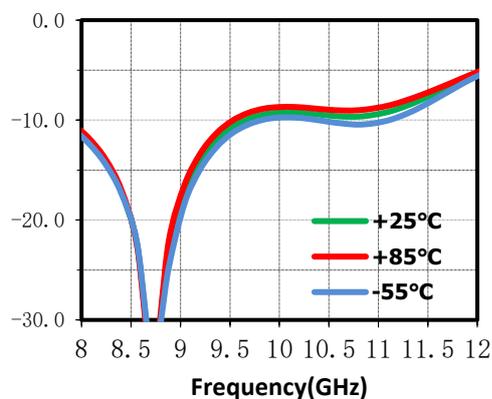
Isolation(dB) vs. Temperature



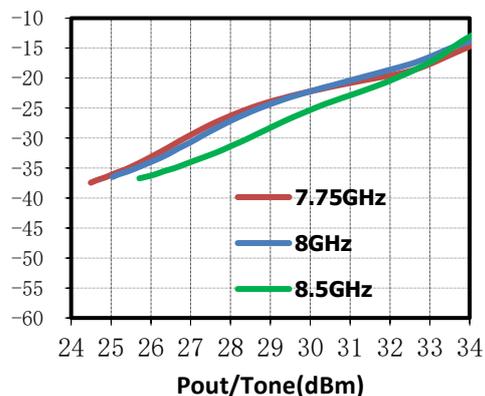
RF Input Return Loss (dB) vs. Temperature



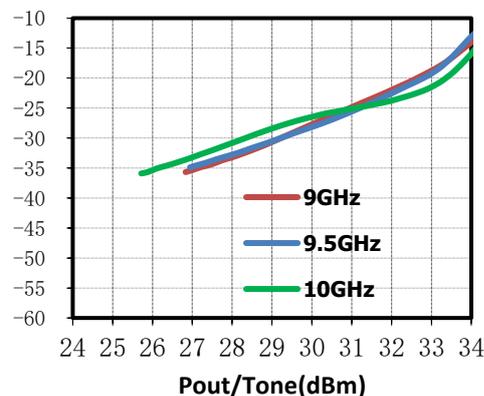
RF Output Return Loss(dB) vs. Temperature



IM3(dBc) vs. Pout/Tone



IM3(dBc) vs. Pout/Tone



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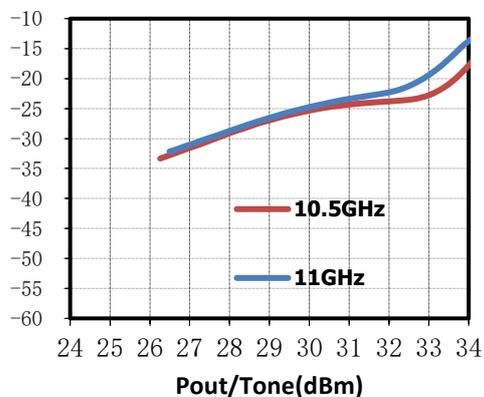
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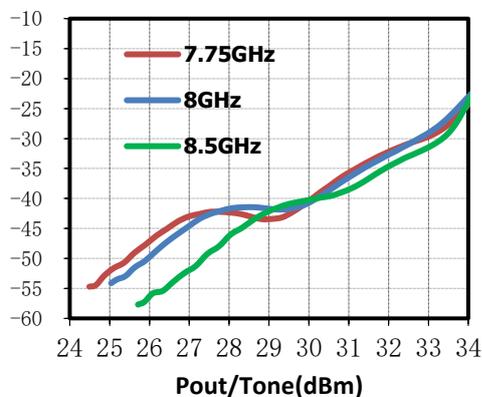
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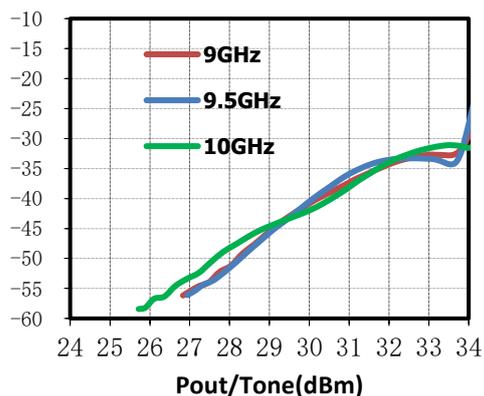
IM3(dBc)vs. Pout/Tone



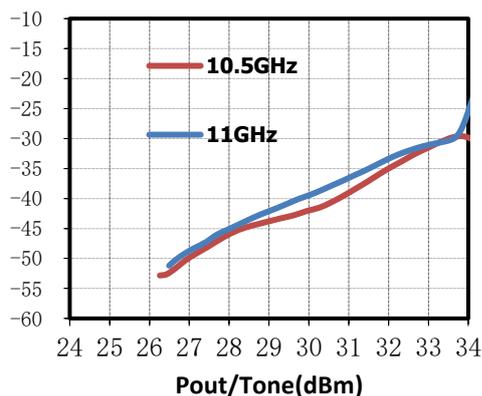
IM5(dBc)vs. Pout/Tone



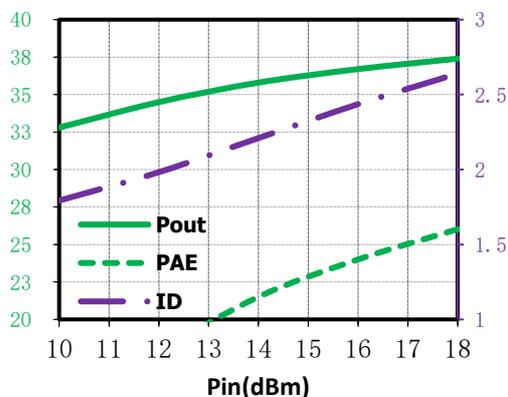
IM5(dBc)vs. Pout/Tone



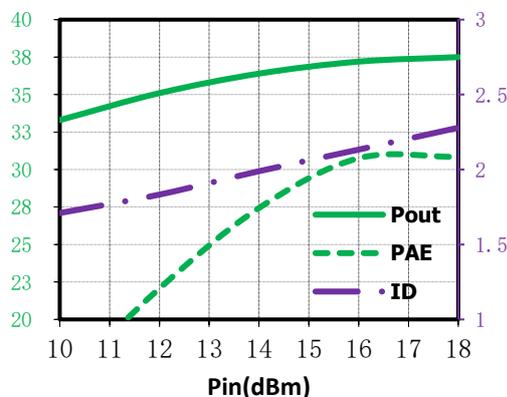
IM5(dBc)vs. Pout/Tone



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=8GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=8.5GHz



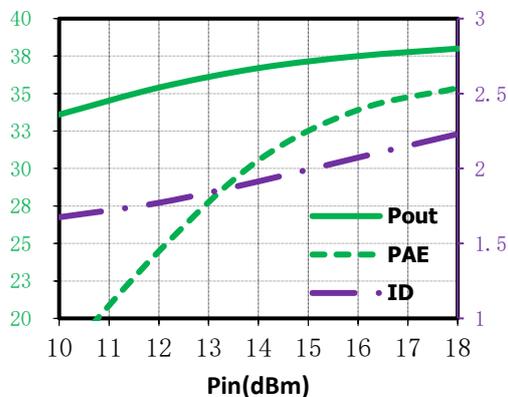
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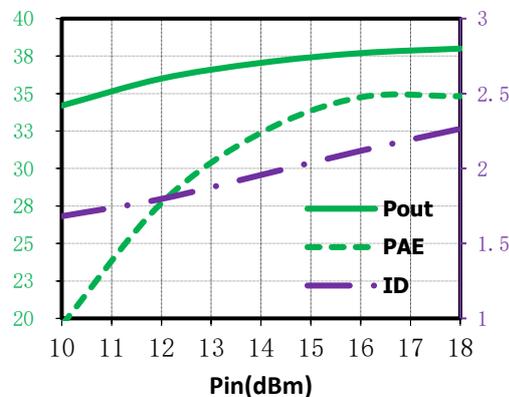
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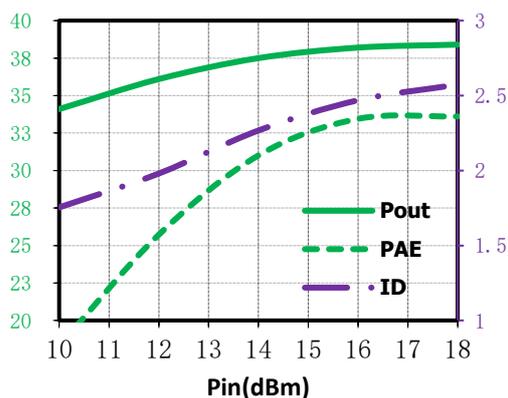
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=9GHz



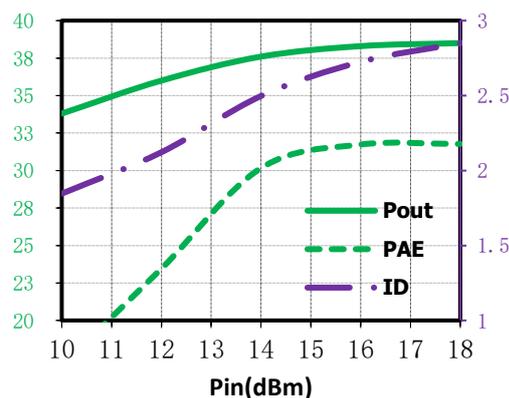
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=9.5GHz



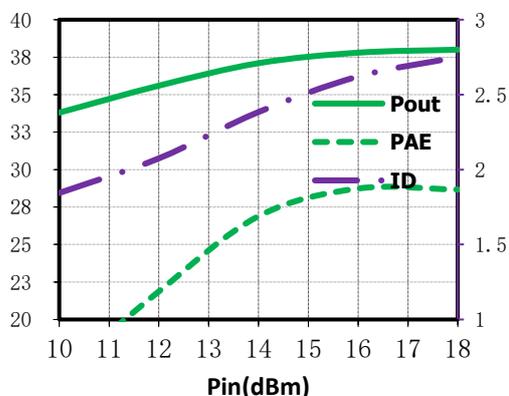
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=10GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=10.5GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=11GHz

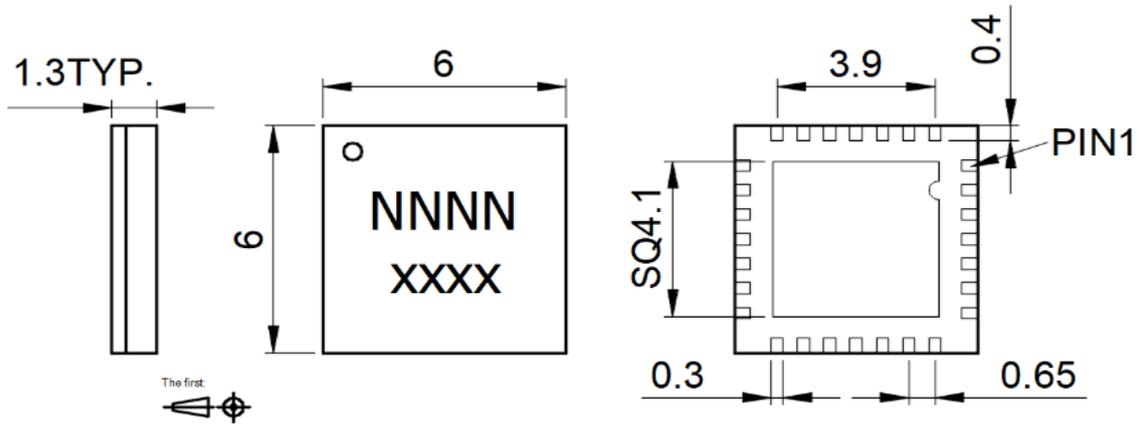


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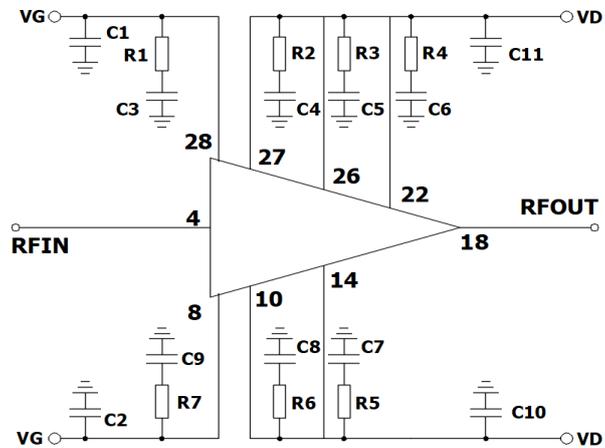
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Package Outline



Application Circuit



SAC3149Q6

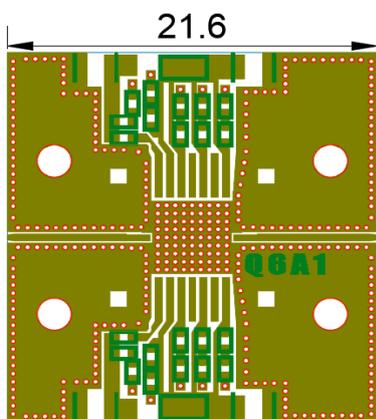
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Components List

Reference Des.	Value	Part Number	Manuf.	Size
C1、C2	10 μ F	—	—	0805
C3~C9	0.1 μ F	—	—	0402
C10、C11	0.47 μ F	—	—	0805
R1~R8	2.2 Ω	—	—	0402

SAC3149Q6 Evaluation board

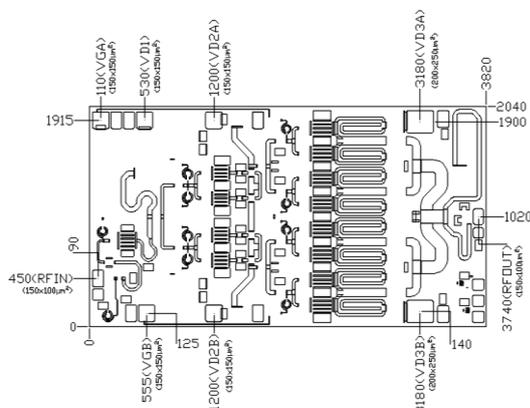


The Evaluation board is a 2-layer board fabricated using Rogers 4350 t=0.254 and using best practices for high frequency RF design. The RF input and RF output traces have a 50 Ω characteristic impedance.

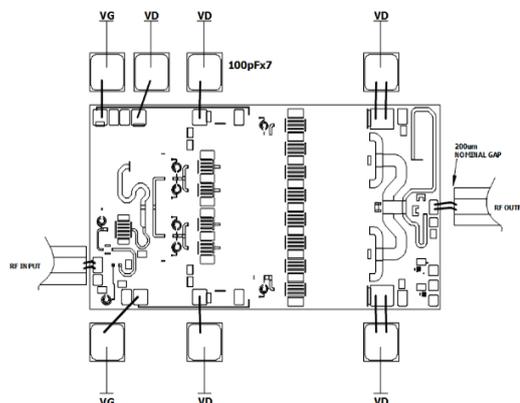
SAC3149Q6 package bottom center pad is used for RF grounding and heat dissipation. It is recommended that the vias in the pad area be made by copper filling process so that the heat can be smoothly transmitted to the cold side. Thin substrates with excellent heat conduction should be used as far as possible. Insufficient number of vias under the central pad, too small diameter (<0.3mm), too thin copper plating on the inner wall of the hole (<0.03mm), or insufficient solder filling will significantly affect the device cooling process, thereby reducing performance or even damaging.

Die Outline Drawing

(All dimensions in μ m)



Application Circuit



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Notes

1. SAC3149Q6 needs VDx and VGx bias. Before applying the positive drain voltage, make sure that the negative grid voltage has been applied;
2. The chip ratio shall be stored in a dry and nitrogen environment and used in an ultra-clean environment;
3. The GaAs material is brittle and cannot touch the chip surface. Be careful when using it;
4. The chip is sintered with conductive adhesive or alloy (the alloy temperature shall not exceed 300°C and the time shall not exceed 30 seconds) to make it fully grounded;
5. The gap between the chip microwave port and the substrate shall not exceed 0.35mm Φ eighteen μ m gold wire bonding, recommended gold wire length is 350~450 μ m;
6. The chip is sensitive to static electricity, so pay attention to anti-static during storage and use;
7. There is no need to add DC isolation capacitors to the RF input and output ports of the chip;
8. The moisture-proof grade of the packaged product is 2a, the storage environment is less than or equal to 30 °C/60% RH, and the service life of the surrounding workshop;
9. When using encapsulated products, try to use thin RF plates and increase the number of groundings vias at the bottom of the device to reduce the grounding inductance;
10. Remove the vacuum packaging, and bake in 125+/- 5° environment for 6 hours before upper reflow soldering.

Revision History

Revision	Date	Comment
1.0	April 23, 2022	First Release
1.1	May 31, 2022	Add bare chip information and correct the text description of precautions

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