SAC3151

GaAs MMIC Power Amplifier
12.7GHz~15.5GHz 39dBm

Rev 1.0

Features

- Frequency：12.7GHz~15.5GHz
- Small Signal Gain: 20dB
- Output P_{-1}dB: 39dBm
- PAE: 35%@P_{-1}dB，f=14GHz
- IM_3: -25dBc, 30dBm/Tone@14GHz
- Die size: 4.1mm×4.5mm×0.1mm
- Supply Voltage: +8V/-Vg
- Packaged: Bare Die

Typical Applications

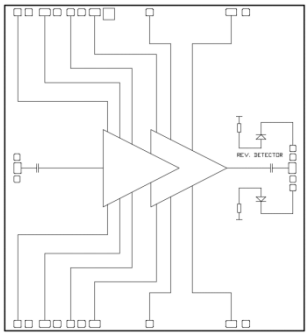
- Point-to-Point Radios
- SATCOM
- Military and Space
- Radar

General Description

SAC3151 is a Ku-band GaAs MMIC power amplifier. SAC3151 provides 20 dB of gain, and 39dBm of output power for 1 dB compression and 35% PAE from +8V supply.

The chip has surface passivation for protection and backside via holes and gold metallization to allow a conductive epoxy die attach process.

Functional Diagram



Electrical Performance

T_A=25℃, V_D=+8V, I_{DQ}=2.2A, Z_0=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	12.7	—	15.5	GHz
Small Signal Gain	16	20	—	dB
Small Signal Gain Flatness	—	±1.5	—	dB
Reverse Isolation	—	-65	—	dB
RF Input VSWR	—	1.8	—	:1
Output P_{-1}dB	37.5	39	—	dBm
IM_3*	—	25	—	dBc
Drain Voltage (V_D)	8	—	8.5	V
Gate Current	—	2	22	mA
Supply Current (I_D)***	—	—	5	A
Thermal Resistance**	—	2.8	—	℃/W

* Pout/Tone= 30dBm, fc = 14GHz, Δf = 4MHz

** Measurement taken at Pout = OP_{-1}dB, IR method. 100% DC power is dissipated on the device the thermal resistance is 3.1℃/W

*** Adjust Vg between -1.5V to -0.4V to achieve I_{DQ}= 2.2A , and typical Vg voltage is -0.8V.

Absolute Maximum Ratings

Maximum Input Power	+25dBm	Operating Temperature (Backside)	-55℃~+85℃
Channel Temperature	150℃	Storage Temperature	-55℃~+150℃
Maximum V_D	+8.5V	V_G Range	-3V~-0.4V

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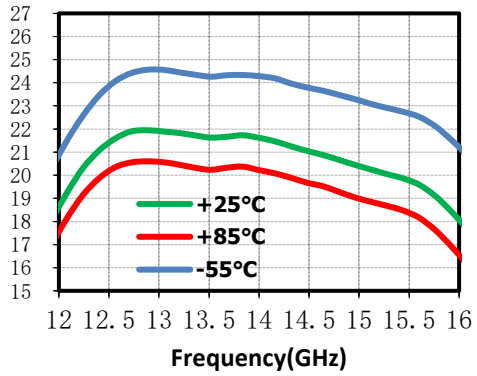
Typical Performance Curve

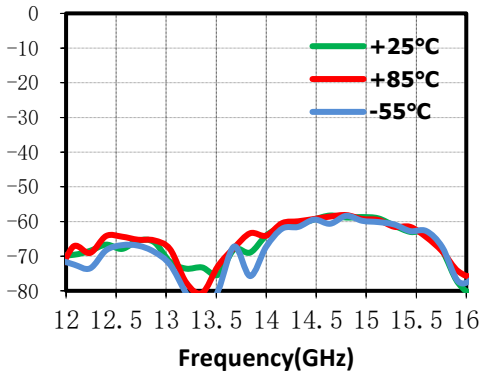
The following data are obtained by SAC3151 evaluation board

V_D = + 8V, I_{DQ} = 2.2A, CW, T_A = + 25℃

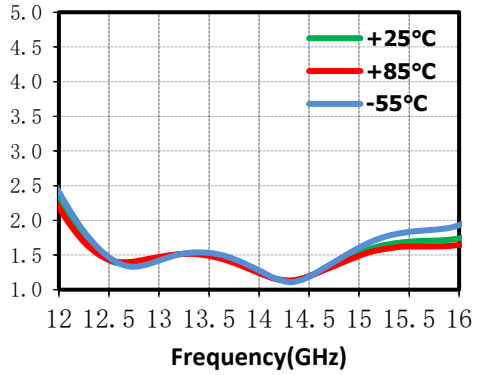
Small Signal Gain(dB) vs. Temperature



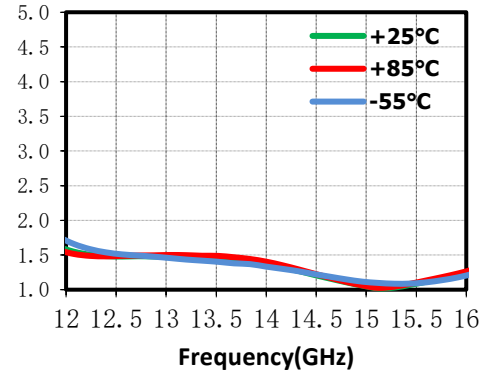
Isolation(dB) vs. Temperature



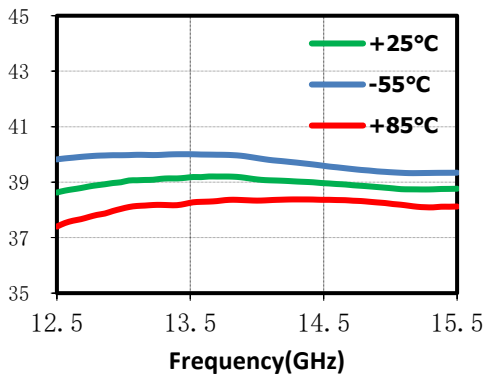
RF Input VSWR (:1) vs. Temperature



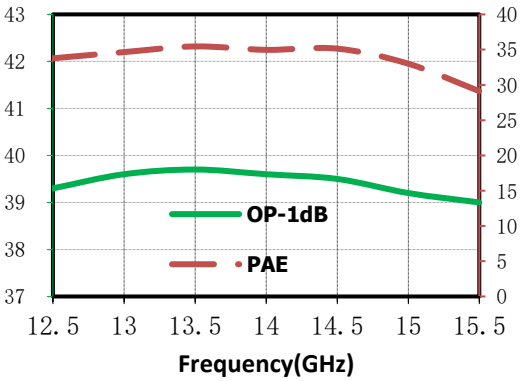
RF Output VSWR (:1) vs. Temperature



Output P_{-1}dB(dBm)vs. Temperature



OP_{-1}dB(dBm), PAE vs. Frequency



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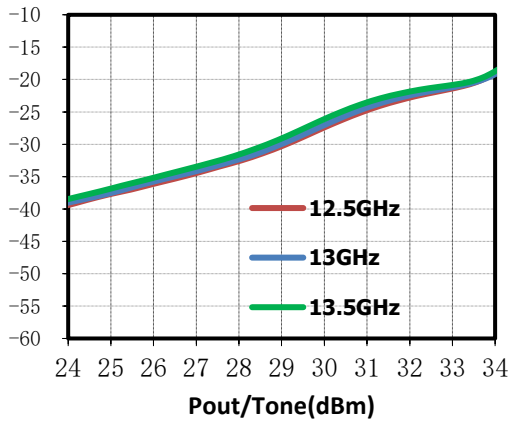
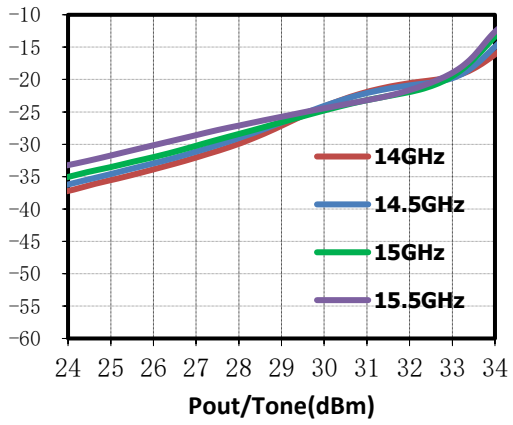
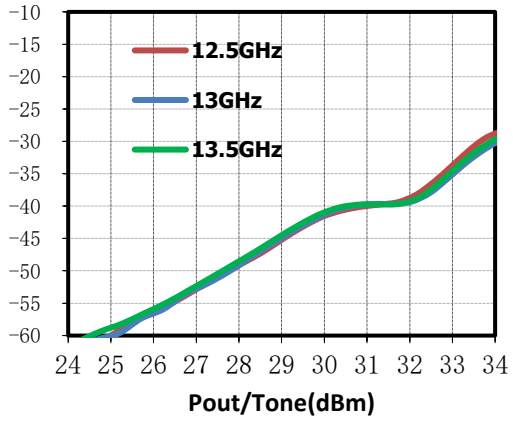
IM_3(dBc)vs. Pout/Tone



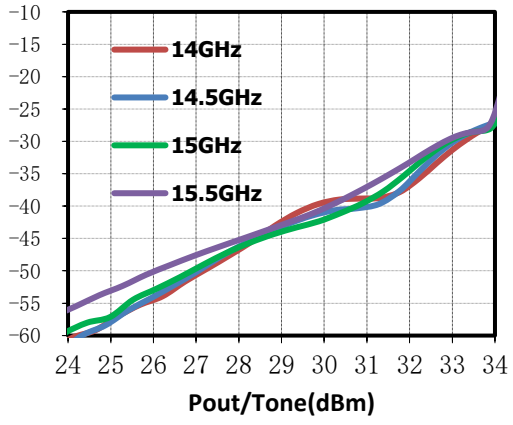
IM_3(dBc)vs. Pout/Tone



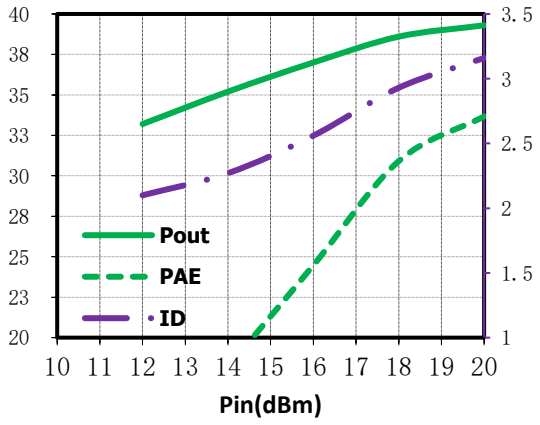
IM_5(dBc)vs. Pout/Tone



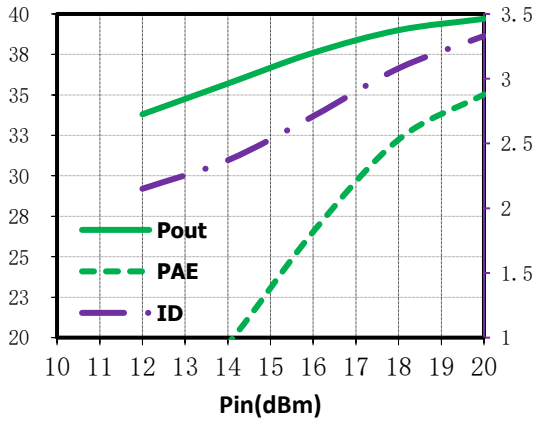
IM_5(dBc)vs. Pout/Tone



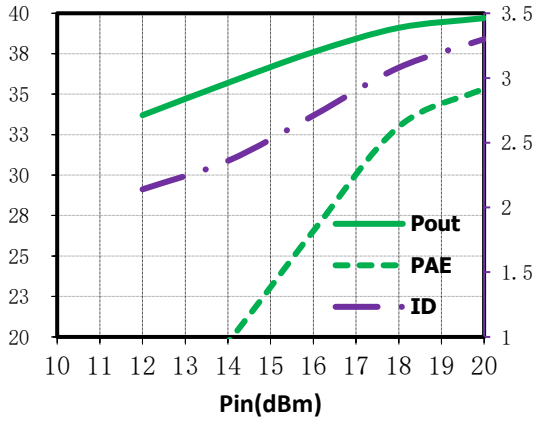
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=12.5GHz



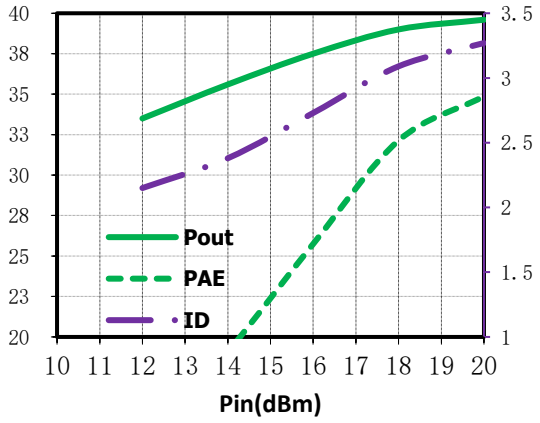
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=13GHz



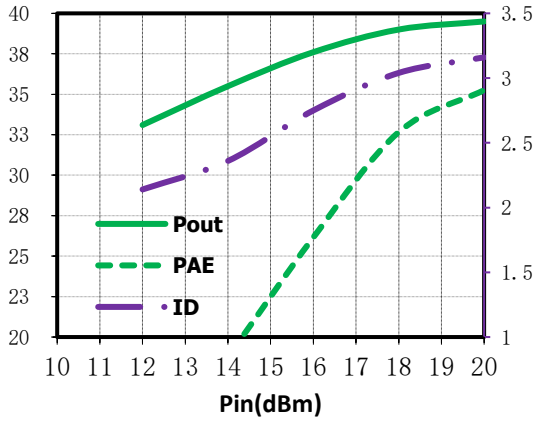
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=13.5GHz



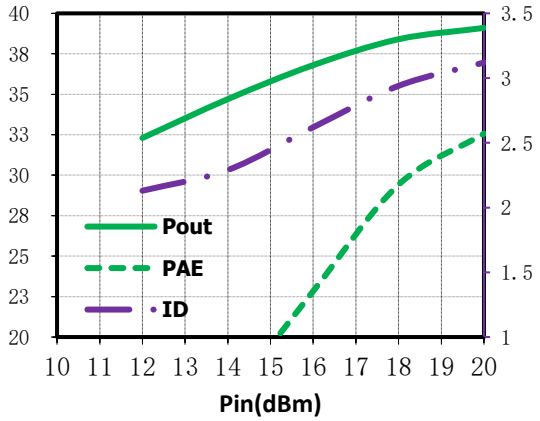
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=14GHz



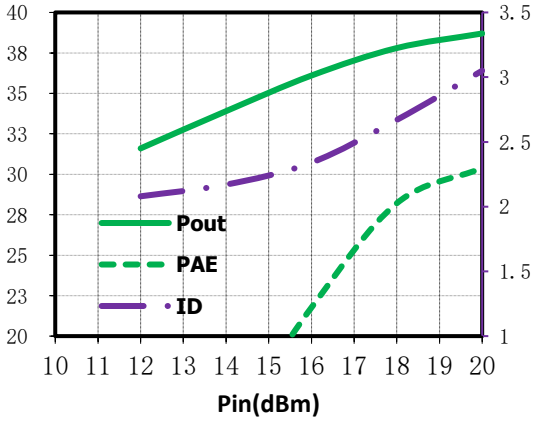
Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=14.5GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=15GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin, f=15.5GHz



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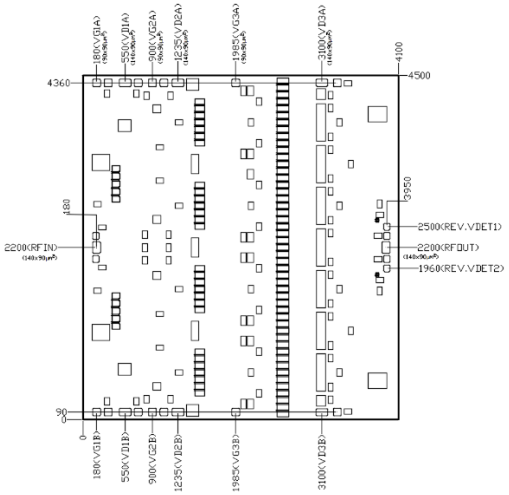
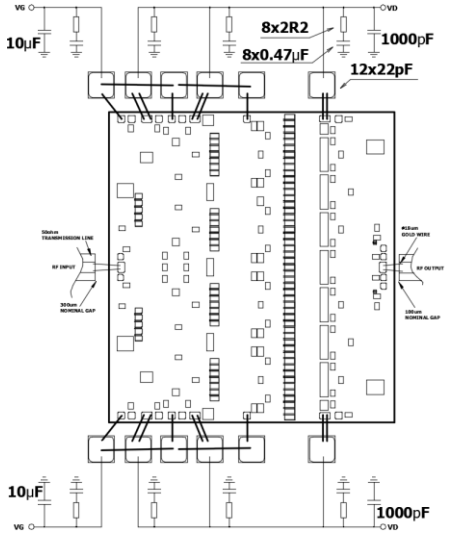
Die Outline

(All dimensions in μm)



t=100μm

Assembly Diagram



VDx and VGx need to be fed simultaneously on both sides

Attention:

1. SAC3151 requires drain positive voltage (VDx) and gate negative voltage (VGx) bias, which shall be applied before applying drain positive voltage Ensure that the gate negative voltage is applied;
2. Vacuum AuSn eutectic soldering is recommended;
3. The single-layer decoupling capacitor shall be of small volume and thin dielectric type as far as possible;
4. When using drain pulse voltage modulation, ensure that the maximum overshoot voltage does not exceed 8.5V.

Revision History

Revision	Date	Comment
1.0	December 1, 2022	First Release