SAC3114

GaAs MMIC Power Amplifier
8GHz～12GHz　39dBm

Rev2.0

Features

- Frequency: 8GHz~12GHz
- Gain: 25dB
- Output P_{-3}dB: 39.5dBm
- Supply Voltage: +8V
- Power-Added Efficiency: 33%@Mid-band
- Die Size: 3.97mm×4.07mm×0.1mm
- Packaged: Bare Die

Typical Applications

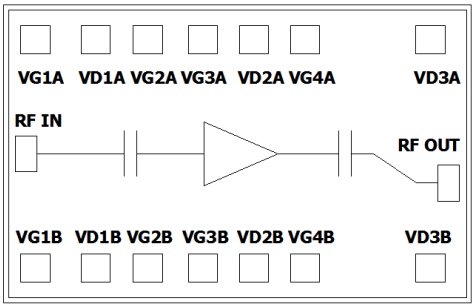
- Microwave radio including point to point communication
- Telecommunication
- Weather radar
- Optical communication
- Test instrumentation
- SatCom
- VSAT
- Military and Aerospace

General Description

SAC3114 is a X-band GaAs MMIC power amplifier. SAC3114 provides 25 dB of gain, and 39.5dBm of output power for 3 dB compression and more than 33%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. This device is well suited for communications, Point to Point radio and radar applications.

Functional Diagram



Electrical Performance

T_A=25℃, V_D=+8V, I_D=3A, Z_0=50Ω, pulse width=100uS,10% duty cycle

Parameter	Min.	Typ.	Max.	Units
Frequency Range		8~12		GHz
Small Signal Gain	22	25	—	dB
Small Signal Gain Flatness	—	±2	—	dB
Reverse Isolation	—	-45	—	dB
Input Return Loss	—	-12	—	dB
Power-Added Efficiency	—	33	—	%
Output Power for 3 dB Compression (OP_{-3}dB)	39.3	40	—	dBm
Drain Voltage (V_D)	—	8	8.5	V
Gate Current	—	17	80	mA
Supply Current (I_D)	—	4	5.3	A
Thermal Resistance	—	4	—	℃/W

Absolute Maximum Ratings

Maximum Input Power	+22dBm	Operating Temperature	-40℃～+70℃
Channel Temperature	+150℃	Storage Temperature	-65℃～+150℃
Maximum V_D	+9V	Maximum V_G	-1.2V

The MMIC power dissipation is limited by the die thermal resistance, it has been designed to work in pulse mode, SAC3114 can be operated at a duty cycle as high as 50%. Drain switch mode is the preferred control mode.

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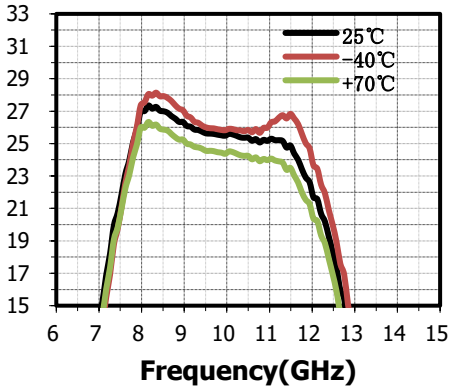
Typical Small Signal Performance Curve

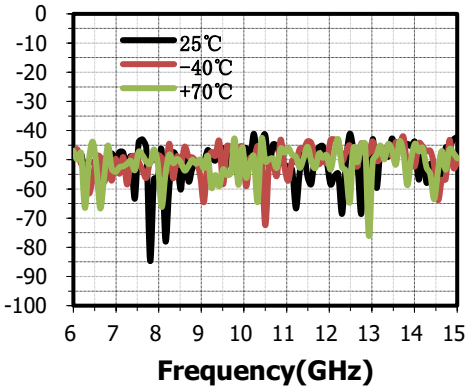
The results captured in the test-jig environment within connector plan

V_D=+8V I_D=3A

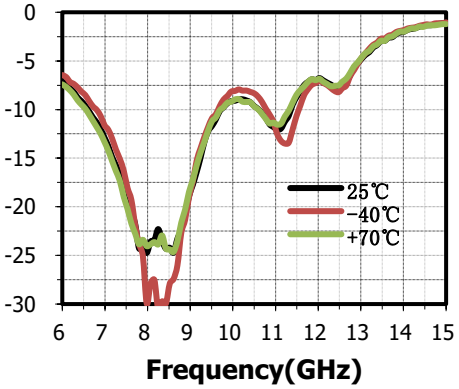
Small Signal Gain(dB) vs.Temperature



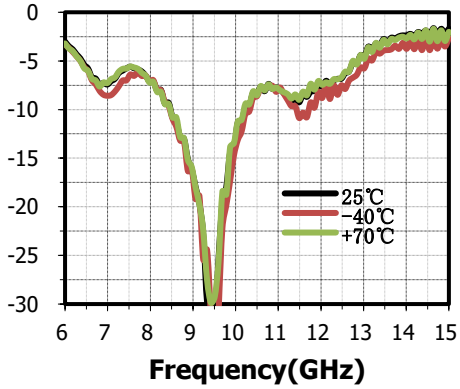
Reverse Isolation(dB) vs.Temperature



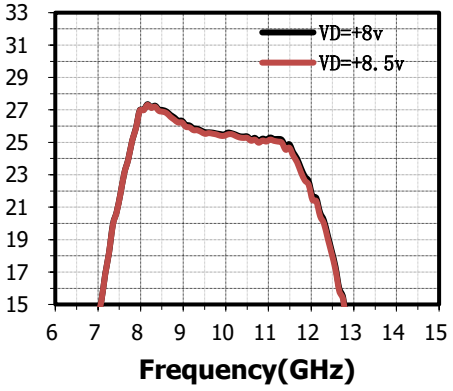
Input Return Loss(dB) vs.Temperature



Output Return Loss(dB) vs.Temperature



Small Signal Gain(dB) vs.Drain Supply



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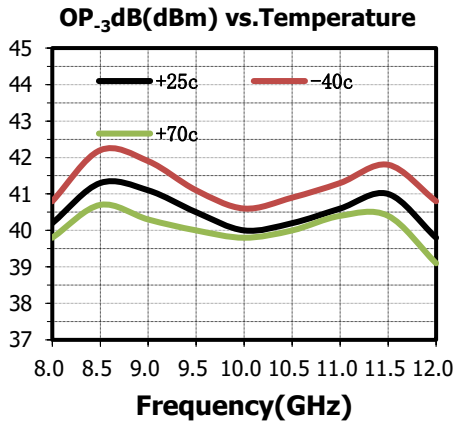
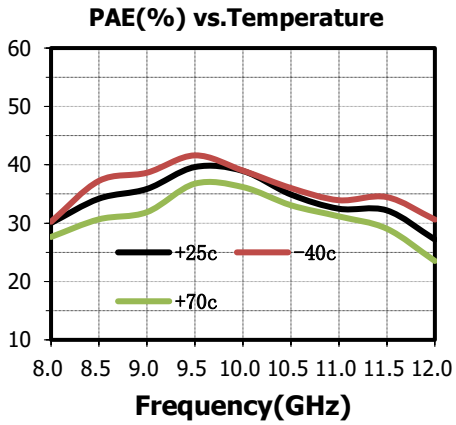
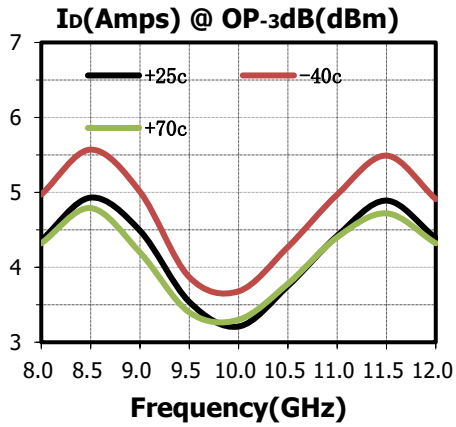
Typical Large Signal Performance Curve

The results captured in the test-jig environment within connector plan, then de-embedded the housing an come back in the die plan

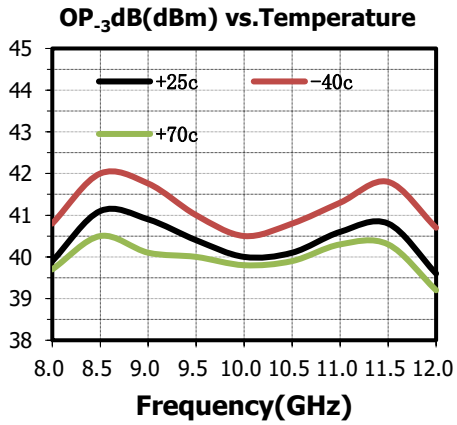
V_D=+8V I_D=3A Pulse width=100uS 10% Duty cycle

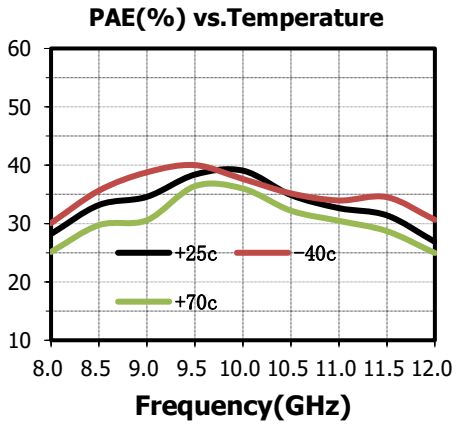






V_D=+8V I_D=3A Pulse width=300uS 30% Duty cycle





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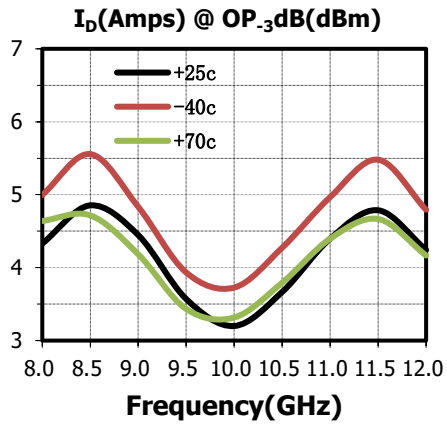

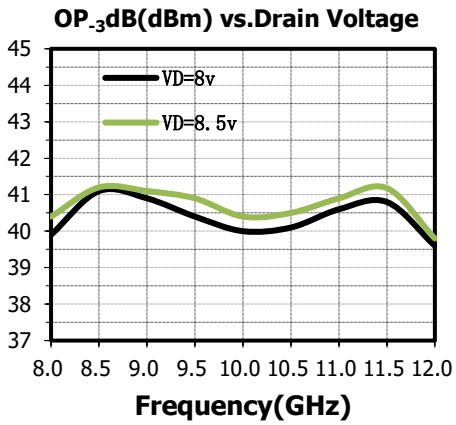

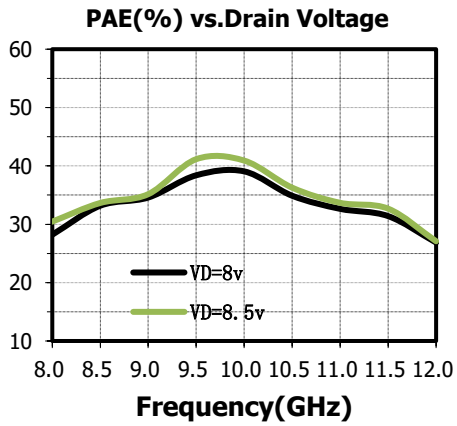

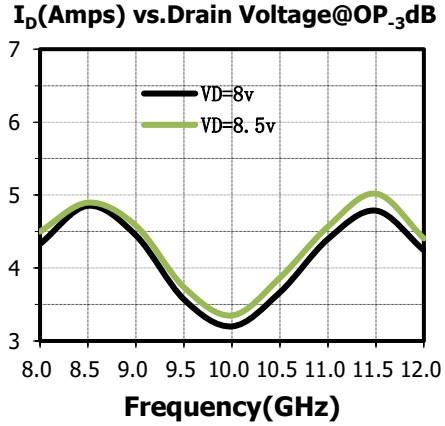

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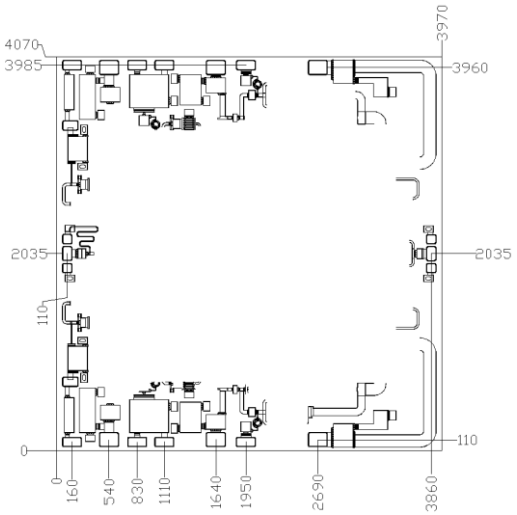
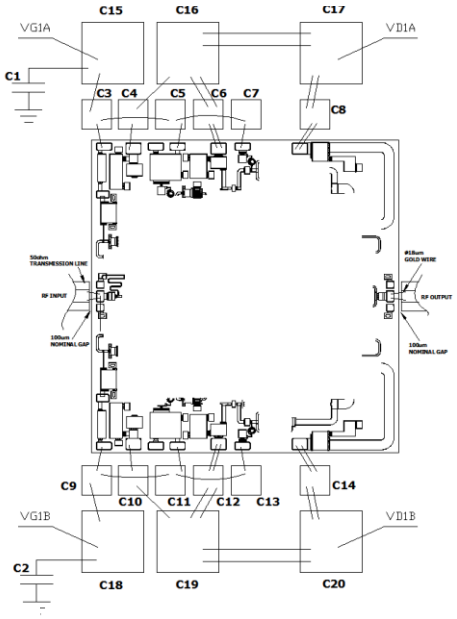
Die Outline

(All dimensions in um)



Assembly Diagram



Bonding pad size:
130x80um VG、RF IN、RFOUT pads
180x130um VD pads

Components List

Reference Des.	Value	Part Number	Manuf.	Size
C1～C2	1uF	GRM155R61A105KE15D	Murata	0402
C3～C14	300pF	—	ANY	SLC
C15～C20	1000pF	—	ANY	SLC

Notes

1. SAC3114 is biased with a positive drain supply and negative gate supply. The recommended gate voltage is set to -0.7～-0.85 V.
2. RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a double bond wire as shown.
3. The backside of SAC3114 is RF ground. Eutectic mounting is preferred, if using conductive epoxy, recommended epoxies are Die Mat DM6030HK or DM6030HK-Pt cured per the manufacturer's cure schedule. Epoxy should be applied in accordance with the manufacturer's specifications and should avoid contact with the top surface of the die. An epoxy fillet should be visible around the total die periphery.
4. Bypass caps C1～C2 should be placed no farther than 1.5mm from the amplifier.

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