SAC3115

GaAs MMIC Power Amplifier
13.5GHz~14.75GHz 40dBm

Rev2.1

Features

- Frequency: 13.5GHz~14.75GHz
- Gain: 24dB
- Output P_{-1}dB: 40dBm
- Supply Voltage: +8V
- Power-Added Efficiency: 38%
- Die Size: 3.51mm×3.51mm×0.1mm
- Packaged: Bare Die

Typical Applications

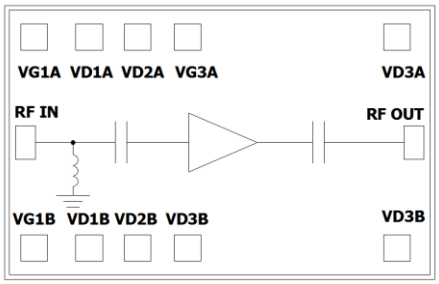
- Point-to-Point Radios
- SATCOM
- Military and Space
- Test and Measurement
- Radar

General Description

The SAC3115 is a Ku-band GaAs MMIC power amplifier. The SAC3115 provides 24 dB of gain, and 40dBm of output power for 1 dB compression and more than 38%PAE from a +8V supply.

The chip has surface passivation for protection and backside via holes and gold metallisation 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=2.5A,Z_0=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range		13.5~14.75		GHz
Small Signal Gain	20	24	—	dB
Small Signal Gain Flatness	—	±1.5	—	dB
Reverse Isolation	—	-55	—	dB
Input Return Loss	—	-10	—	dB
Power-Added Efficiency	—	38	—	%
Output Power for 1 dB Compression (OP_{-1}dB)	39.5	40.3	—	dBm
Output Third Order Intercept(OIP_3)*	—	44	—	dBm
Drain Voltage(V_D)	—	8	8.5	V
Gate Current	—	15	70	mA
Supply Current(I_D)	—	3.5	4.5	A
Thermal Resistance	—	4.2	—	℃/W

* Measurement taken at Pin / Tone = -7 dBm, fc= 14GHz,Δ f=10MHz

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Absolute Maximum Ratings

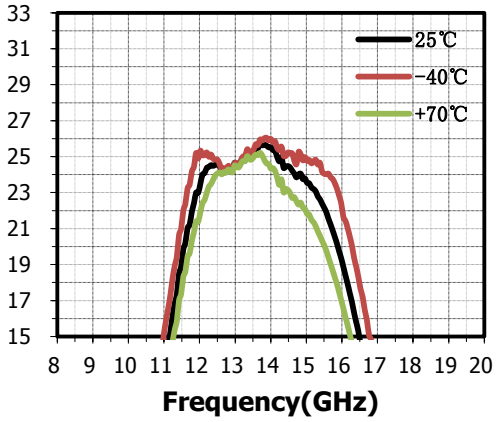
Maximum Input Power	+22dBm	Operating Temperature	-40℃~+70℃
Channel Temperature	+150℃	Storage Temperature	-65℃~+150℃
Maximum V_D	+9V	Maximum V_G	-1.2V

Typical Small Signal Performance Curve

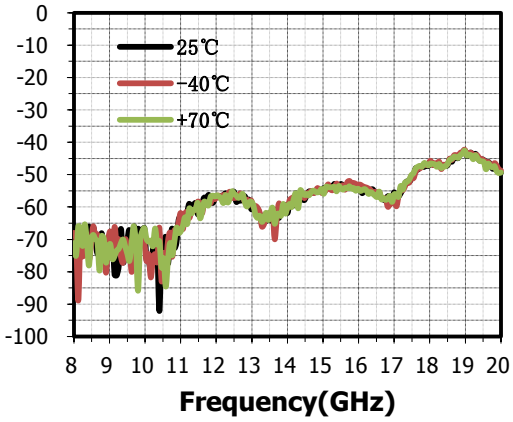
The results captured in the test-jig environment within connector plan

V_D=+8v I_D=2.5A

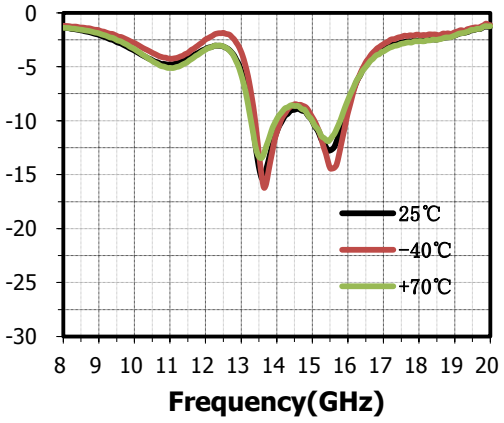
Small Signal Gain(dB) vs.Temperature



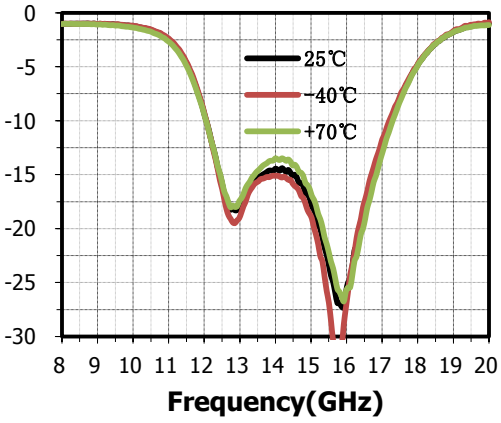
Reverse Isolation(dB) vs.Temperature



Input Return Loss(dB) vs.Temperature



Output Return Loss(dB) vs.Temperature



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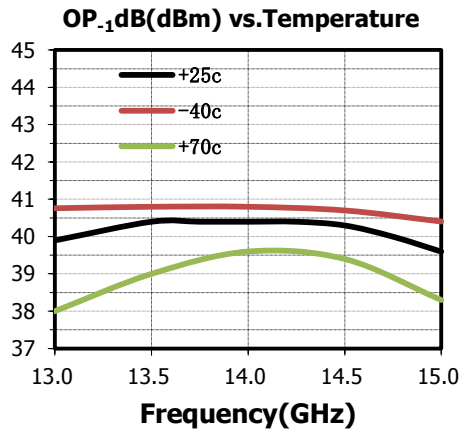
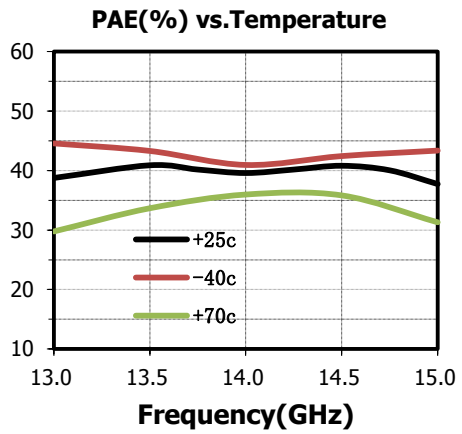
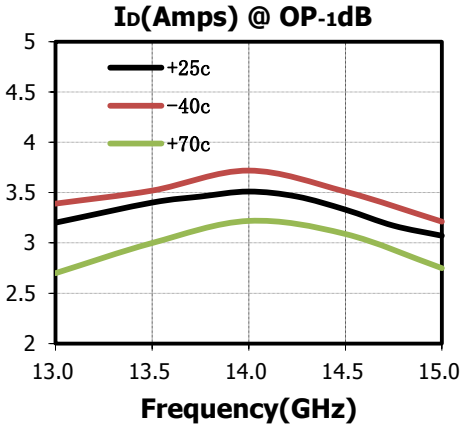
Power and PAE Performance Curve

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=2.5A CW

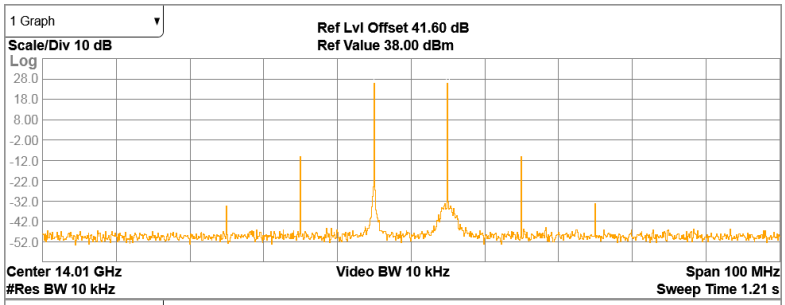






Output IP3 Performance Curve

Fc=14GHz Pout/Tone=26dBm

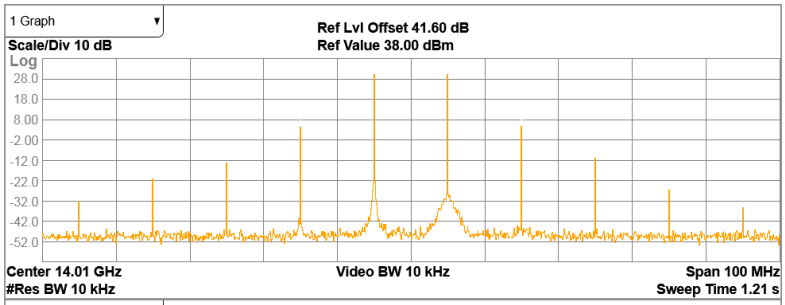


2 Metrics

	Frequency (MHz)	Amplitude (dBm)	Amplitude (dBc)	TOI (dBm)
Lower 3rd	13990.0000	-10.11	-36.13	44.09
Lower Tone	14000.0000	26.02		
Upper Tone	14010.0000	26.02		
Upper 3rd	14020.0000	-10.40	-36.42	44.23

TOI	44.09 dBm
Δ	-36.13 dBc

Fc=14GHz Pout/Tone=30dBm

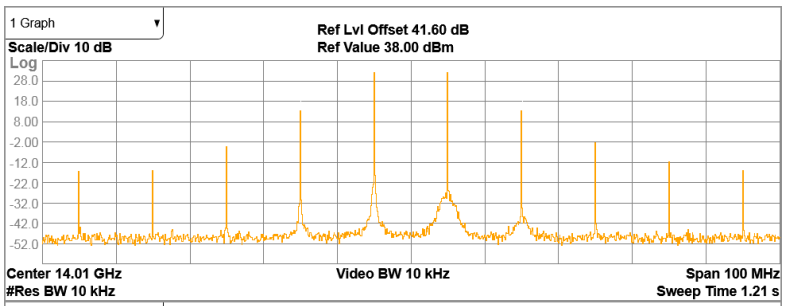


2 Metrics

	Frequency (MHz)	Amplitude (dBm)	Amplitude (dBc)	TOI (dBm)
Lower 3rd	13990.0000	4.321	-25.72	42.89
Lower Tone	14000.0000	30.03		
Upper Tone	14010.0000	30.05		
Upper 3rd	14020.0000	4.560	-25.48	42.78

TOI	42.78 dBm
Δ	-25.48 dBc

Fc=14GHz Pout/Tone=32dBm



2 Metrics

	Frequency (MHz)	Amplitude (dBm)	Amplitude (dBc)	TOI (dBm)
Lower 3rd	13990.0000	13.30	-18.79	41.48
Lower Tone	14000.0000	32.07		
Upper Tone	14010.0000	32.12		
Upper 3rd	14020.0000	13.22	-18.88	41.55

TOI	41.48 dBm
Δ	-18.79 dBc

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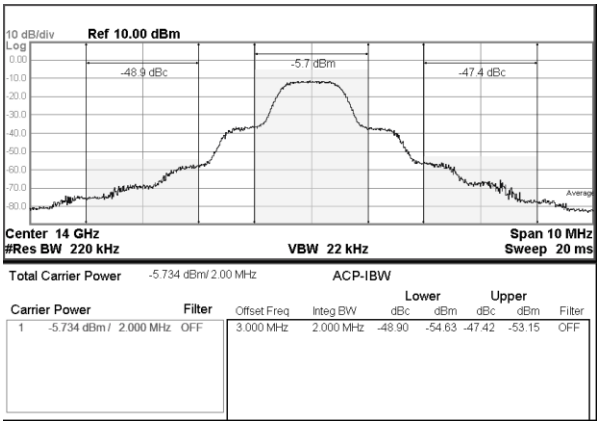
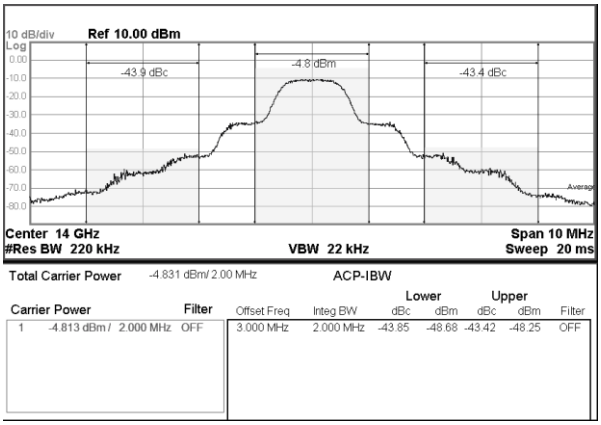
ACPR Characteristics

QPSK Symbol Rate=1M Filterα =0.3

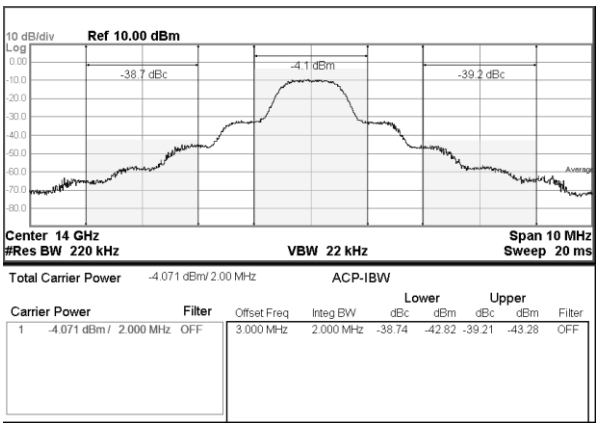
Fc=14GHz Pout=37dBm



Fc=14GHz Pout=38dBm

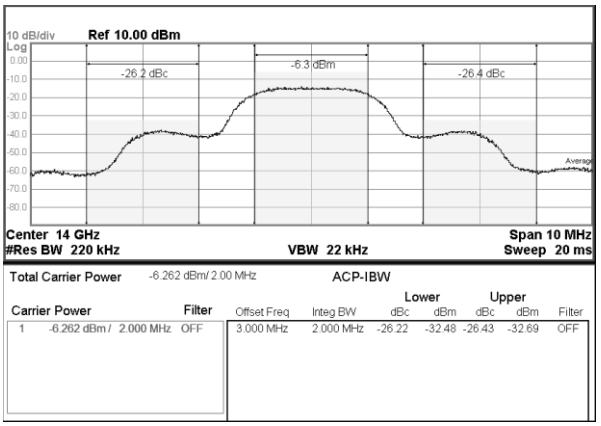


Fc=14GHz Pout=39dBm

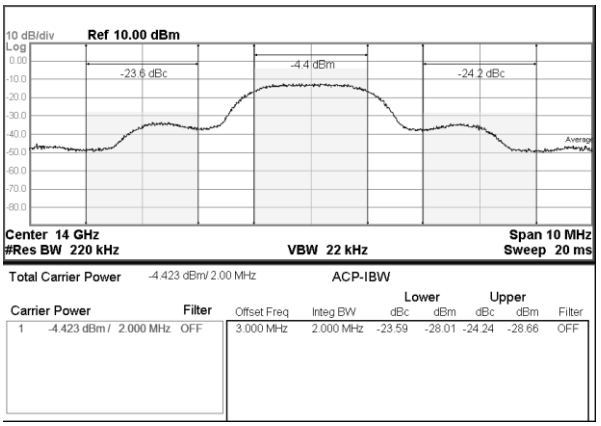


8PSK Symbol Rate=2M Filterα =0.5

Fc=14GHz Pout=37dBm



Fc=14GHz Pout=39dBm



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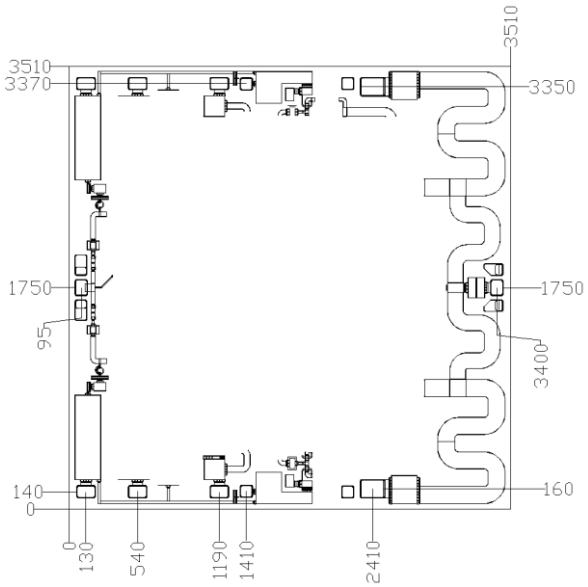
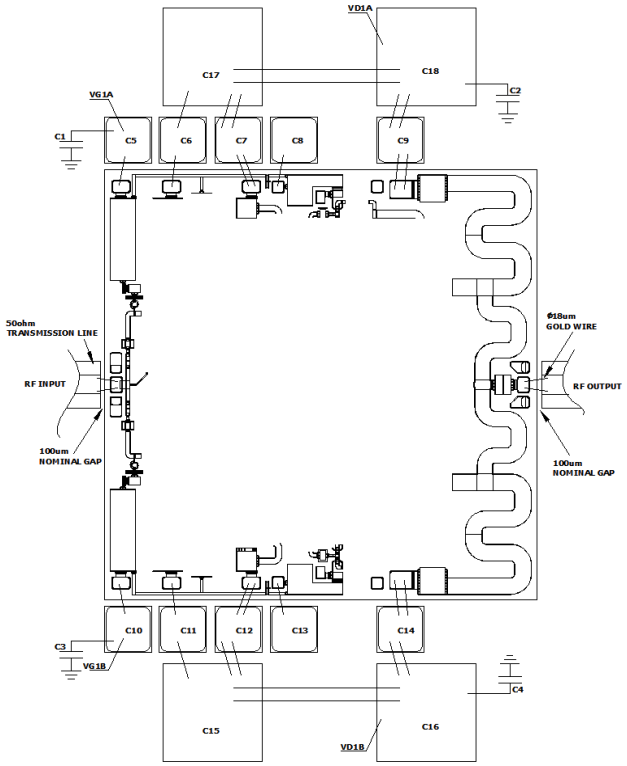
Die Outline

(all dimensions in um)



Assembly Diagram



Bonding pad size:120x90um VG、VD1～VD2、RF IN、RFOUT pads
90x90um VG3 pads
200x140um VD3 pads

Components List

Reference Des.	Value	Part Number	Manuf.	Size
C1～C4	2.2uF	GRM155R61A225KE15D	Murata	0402
C5～C14	300pF	—	ANY	SLC
C15～C18	1000pF	—	ANY	SLC

Notes

1. The SAC3115 is biased with a positive drain supply and negative gate supply.The recommended gate voltage is set to -0.7~-0.8 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 the SAC3115 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 manufacturers 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~C4 should be placed no farther than 1.5mm from the amplifier.

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