SAC5009CR12

GaN MMIC Power Amplifier
7.9GHz~12GHz 47dBm

Rev 1.2

Features

- Frequency: 7.9GHz~12GHz
- Small Signal Gain: 26dB
- CW Output Power: 47dBm
- PAE: 24%
- Package: Flange (CR12)
- Supply Voltage: +28V/-Vg

Typical Applications

- Point-to-Point Radios

General Description

SAC5009CR12 is an X-band power amplifier in a ceramic frame package with a flange and straight RF and DC leads for drop-in assembly that delivering 47dBm with 24% power added efficiency from 7.9GHz to 12GHz. No external matching is required to achieve full band operation.

Picture

Electrical Performance

T_{BASE}=28℃, V_D=+28V, I_{DQ}=2A, Z_0=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	7.9	—	12	GHz
Small Signal Gain	—	26	—	dB
Power Gain	—	17	—	dB
Reverse Isolation	—	45	—	dB
RF Input Port VSWR	—	2	—	:1
Output Power	46	47	—	dBm
Drain Voltage (V_D)	—	28	30	V
Gate Current	—	2	23	mA
Supply Current (I_D)*	—	—	16	A

*Adjust Vg between -2.7V to -1.8V to achieve I_{DQ}= 2A, and typical Vg voltage is -2.3V

Absolute Maximum Ratings

Maximum Input Power	+33dBm	Operating Temperature (T_{BASE})	-55℃~+85℃
Channel Temperature	230℃	Storage Temperature	-55℃~+165℃
Maximum V_D	+32V	V_G Range	-8V~-1.5 V
ESD Tolerance Level	Class 1B， HBM		

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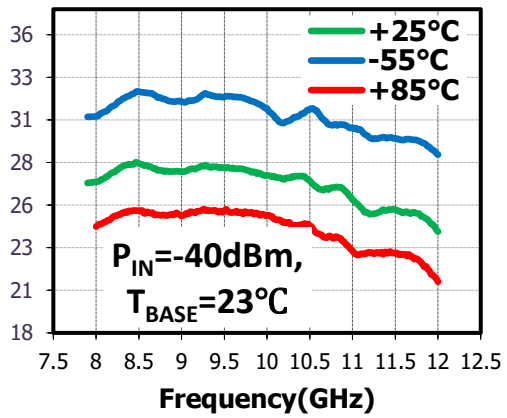
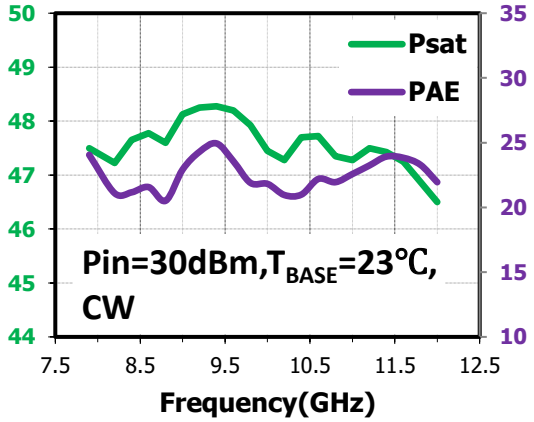
Typical Performance Curve

The following curves are taken from SAC5009CR12 evaluation board. De-embedding operation has been Implemented. V_D=+28V, I_{DQ}=2A, T_{BASE}=+23℃

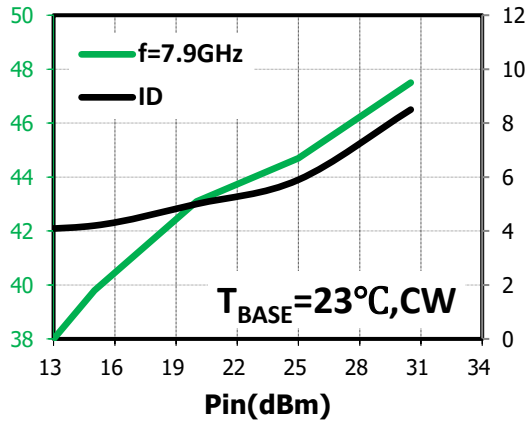
Small Signal Gain vs. Frequency



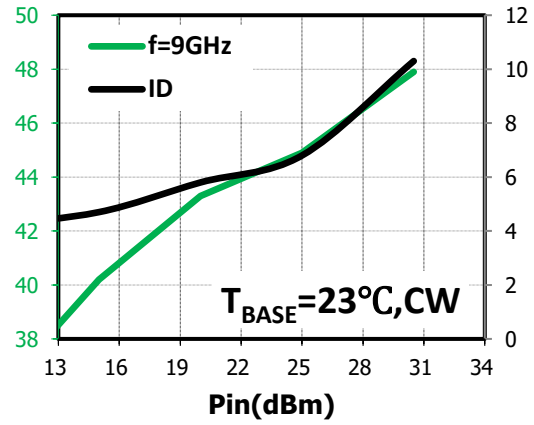
Output Power(dBm)、PAE(%) vs.Frequency



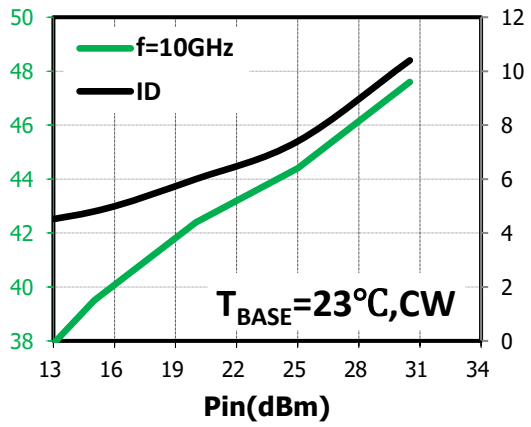
Output Power(dBm) vs.Pin,f=7.9GHz



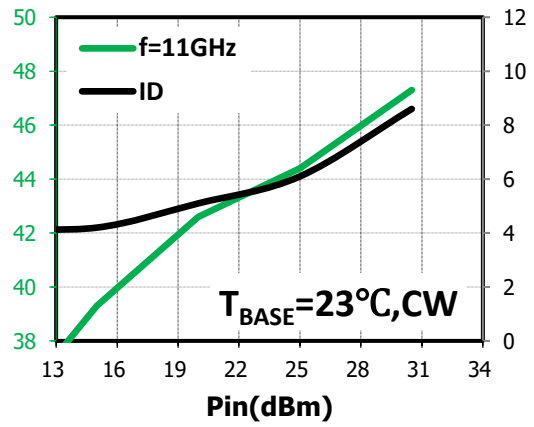
Output Power(dBm) vs.Pin,f=9GHz



Output Power(dBm) vs.Pin,f=10GHz



Output Power(dBm) vs.Pin,f=11GHz



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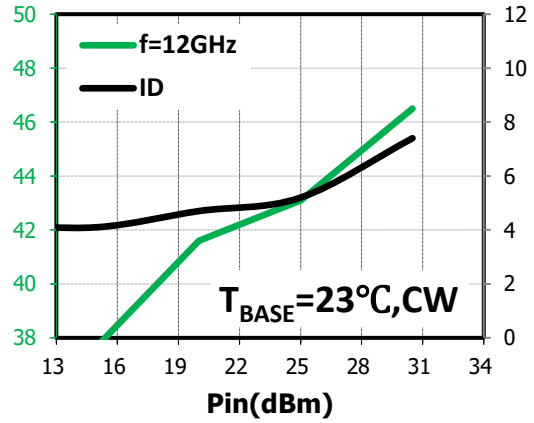
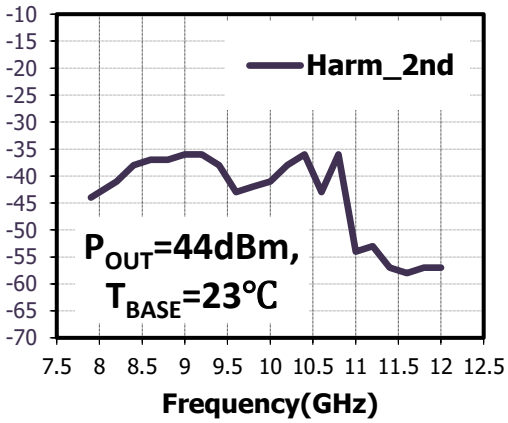
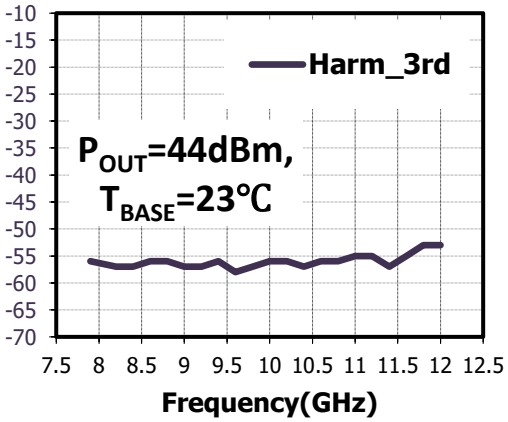
Output Power(dBm) vs.Pin,f=12GHz



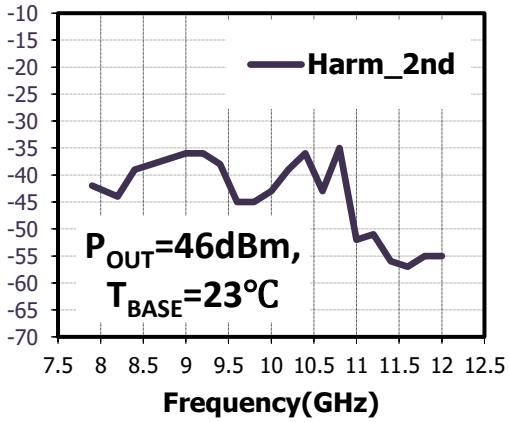
2nd Harmonic（dBc) vs. Frequency



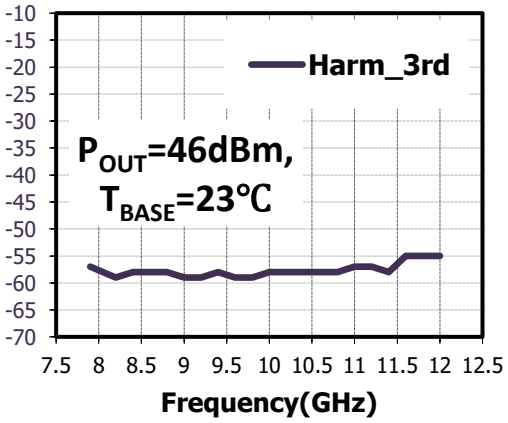
3rd Harmonic（dBc) vs. Frequency



2nd Harmonic（dBc) vs. Frequency



3rd Harmonic（dBc) vs. Frequency

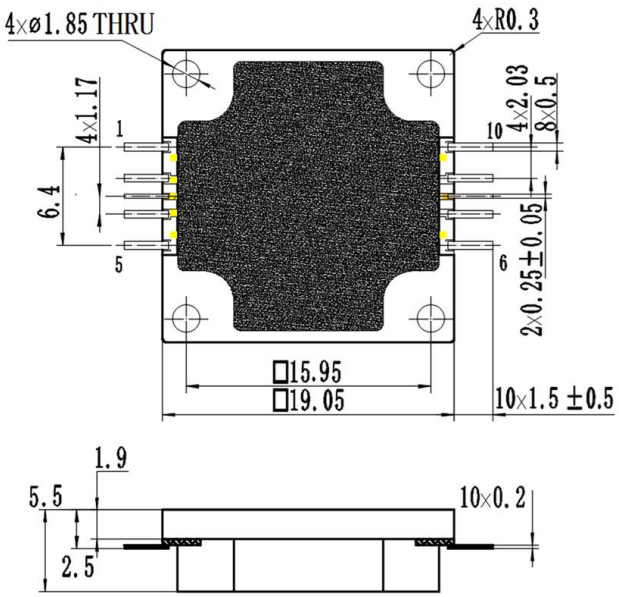


Thermal Resistance

Parameter	Conditions	Value	Unit
θ_{JC}	VD=+28V, T_{BASE}=+70℃, Pin=+30dBm, CW, f=10.5GHz	0.44	℃/W

Package Outline

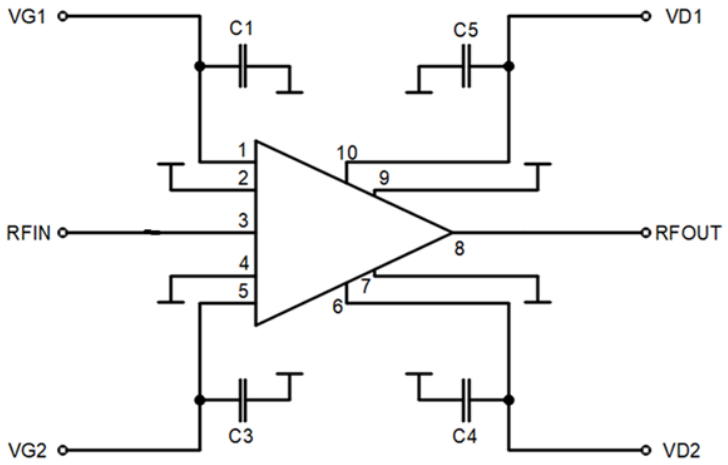
(All dimensions in mm)



Pin Descriptions

Pin No.	Function	Pin No.	Function
1	VG1	6	VD2
2	GND	7	GND
3	RFIN	8	RFOUT
4	GND	9	GND
5	VG2	10	VD1

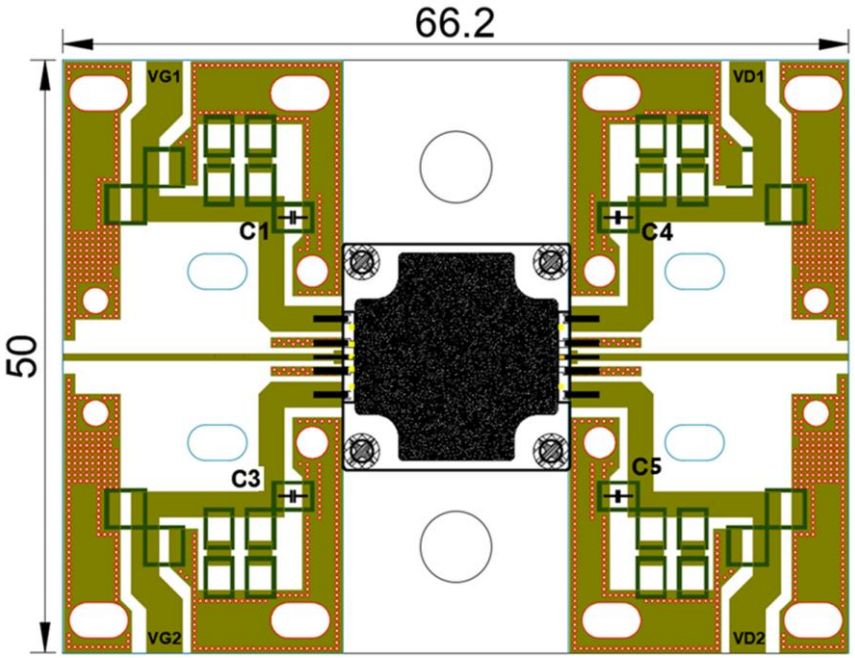
Application Circuit



BOM

Reference Des.	Value	Part Number	Manuf.	Size
C1, C3	1000pF	—	—	0805
C4, C5	10μF	—	—	0805
C2	39pF	—	—	0603

Evaluation Board



1. PCB is made from Rogers 4350b dielectric, 0.254mm thick, 0.5 oz. copper both sides,
2. Both Top and Bottom VD and VG must be biased.

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Notes

1. SAC5009CR12 requires a bias of drain positive voltage (VDx) and gate negative voltage (VGx). Before applying drain positive voltage, it is necessary to ensure that the gate negative voltage has been applied. When turning off, the drain positive voltage should be turned off first and then the gate negative voltage should be turned off;
2. For best RF performance we recommend using 0.1mm indium shim between MMIC package and heatsink, the surface finish of the heat sink should be better than 0.8μm, and the surface flatness must be better than 10μm;
3. The flange of package may be attached using screws. Torque conditions are 6N-cm for M1.6 screw;
4. Because of high DC power dissipation, good heat sinking is required;
5. This chip is an electrostatic sensitive device;
6. The maximum soldering temperature for device pins is 400 ℃/3s.

Revision History

Revision	Date	Comment
1.0	Jan. 21, 2025	First Release
1.1	Aug. 09, 2025	Updated Package Outline
1.2	Sept. 10, 2025	Modified evaluation board PCB thickness

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