SAC5004CR5

GaN MMIC Power Amplifier
5GHz~8GHz 46dBm

Rev 1.1

Features

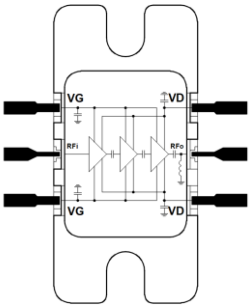
- Frequency: 5GHz~8GHz
- Small Signal Gain: 31dB
- Output Power: 46dBm
- PAE: 30%
- Package: Metal-Ceramic-Package (CR5)
- Supply Voltage: +28V/-Vg

Typical Applications

- Point-to-Point Radios
- SATCOM

General Description

SAC5004CR5 is a broadband power amplifier delivering 46dBm with 30% power added efficiency from 5GHz to 8GHz. No external matching is required to achieve full-band operation.



Electrical Performance

T_{BASE}=23℃, V_D=+28V, I_{DQ}=0.6A, Z_0=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	5	—	8	GHz
Small Signal Gain	—	31	—	dB
Power Gain**	—	21	—	dB
Reverse Isolation	—	45	—	dB
RF Input Port VSWR	—	1.8	—	:1
Output Power	—	46	—	dBm
Drain Voltage (V_D)	—	28	—	V
Gate Current	—	2	22	mA
Supply Current (I_D)*	—	—	6	A

*Adjust Vg between -2.5V to -1.5V to achieve I_{DQ}= 0.6A, and typical Vg voltage is -2.1V

Absolute Maximum Ratings

Maximum Input Power	+31dBm	Operating Temperature (T_{BASE})	-55℃~+85℃
Channel Temperature	230℃	Storage Temperature	-55℃~+180℃
Maximum V_D	+32V	V_G Range	-7V~-1V
Mounting Temperature	310℃,50s		

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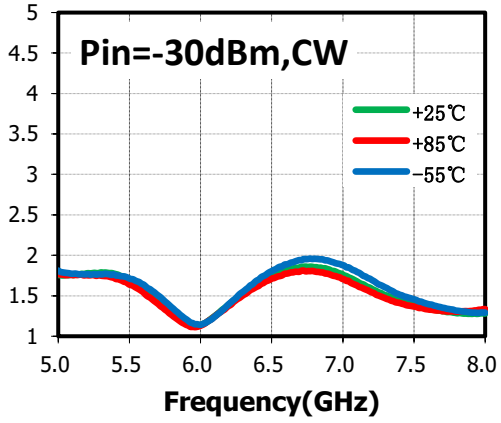
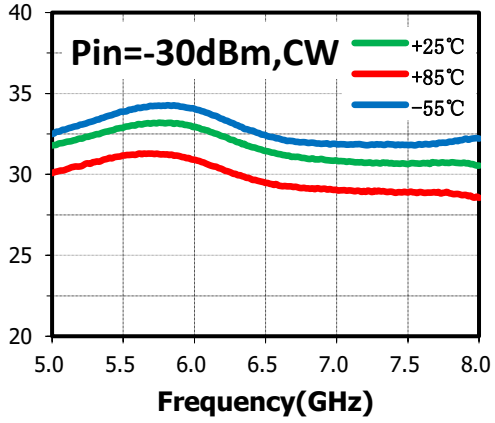
Typical Performance Curve

The following curves are taken from SAC5004CR5 evaluation board. De-embedding operation has been Implemented, VD = + 28V, I_{DQ} = 0.6A, T_{BASE} = + 23℃

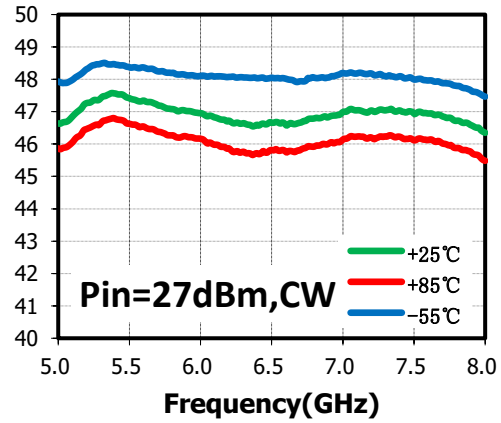
RF Input VSWR(:1) vs.Frequency



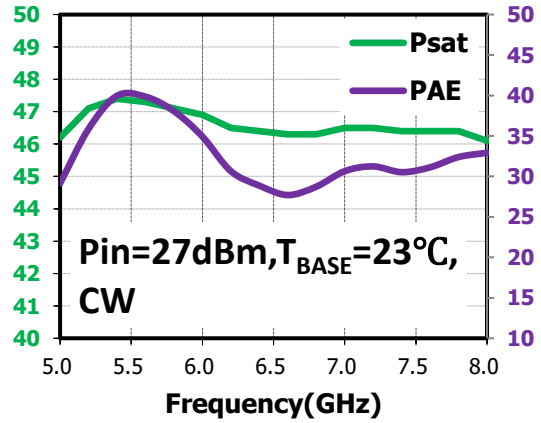
Small Signal Gain(dB) vs.Frequency



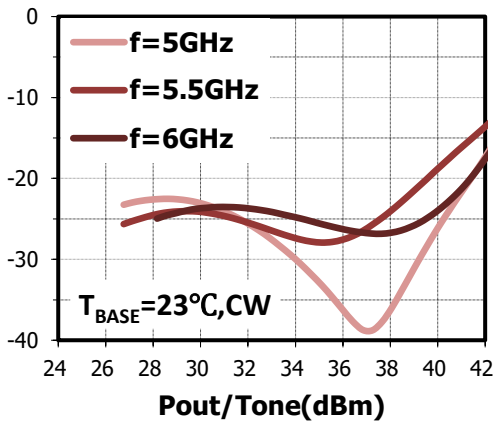
Output Power(dBm) vs.Temperature



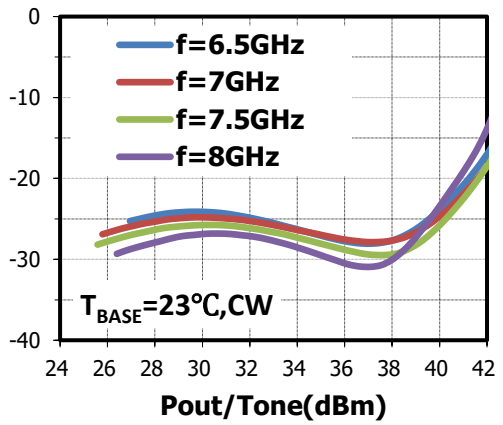
Output Power(dBm)、PAE(%) vs.Frequency

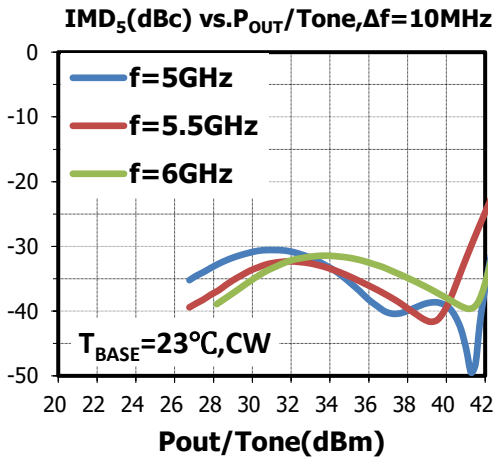


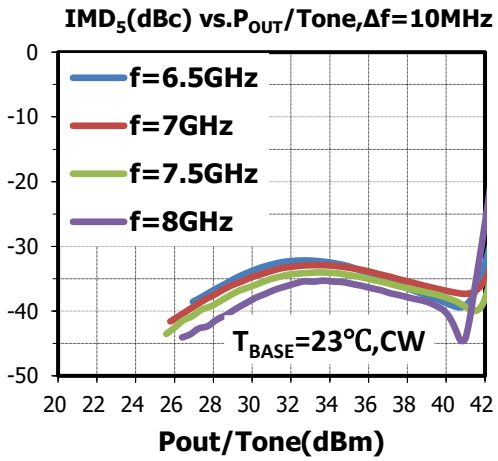
IMD_3(dBc) vs.P_{OUT}/Tone,Δf=10MHz

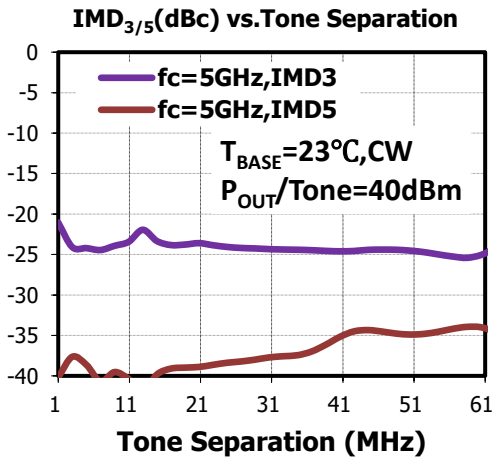


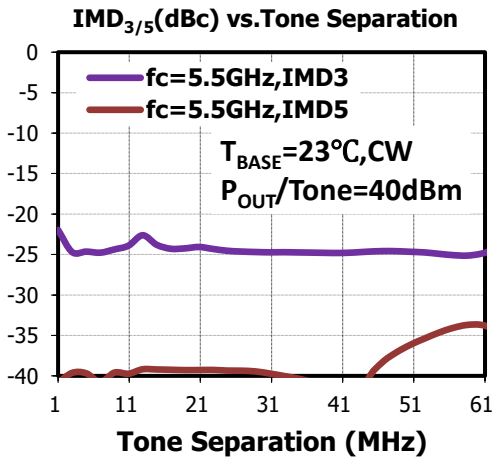
IMD_3(dBc) vs.P_{OUT}/Tone,Δf=10MHz

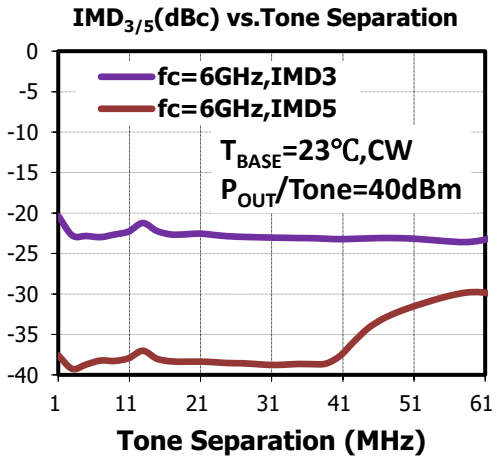


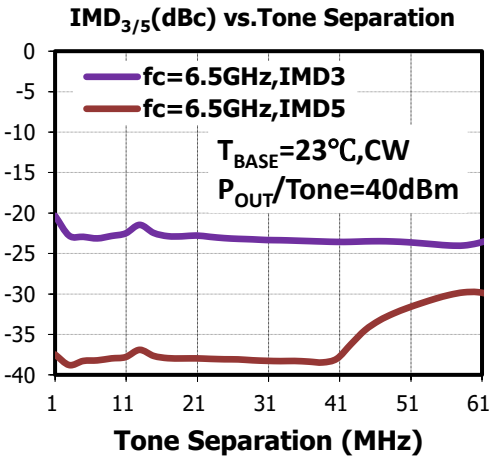

IMD5(dBc) vs.POUT/Tone,Δf=10MHz
f=5GHz
f=5.5GHz
f=6GHz
TBASE=23℃,CW
Pout/Tone(dBm)

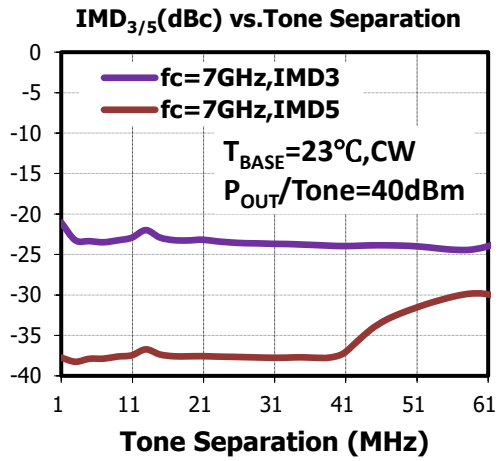

IMD5(dBc) vs.POUT/Tone,Δf=10MHz
f=6.5GHz
f=7GHz
f=7.5GHz
f=8GHz
TBASE=23℃,CW
Pout/Tone(dBm)

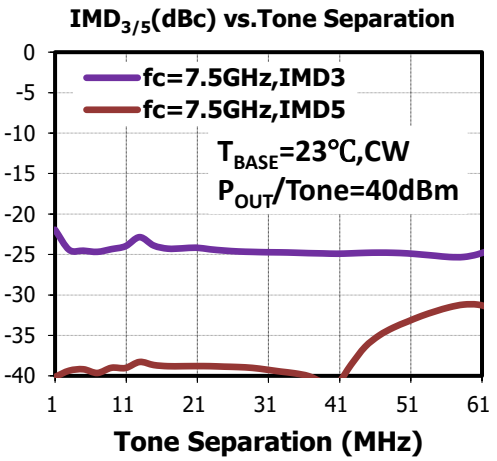

IMD3/5(dBc) vs.Tone Separation
fc=5GHz,IMD3
fc=5GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
Tone Separation (MHz)

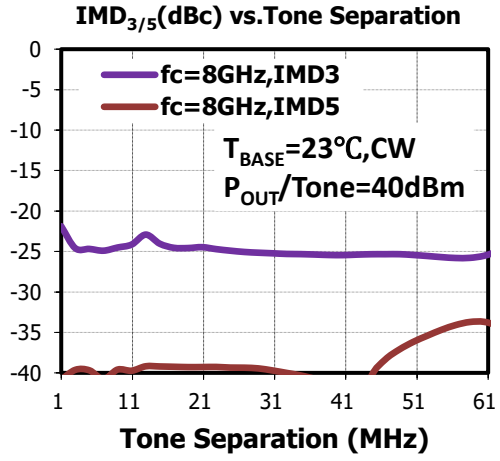

IMD3/5(dBc) vs.Tone Separation
fc=5.5GHz,IMD3
fc=5.5GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
Tone Separation (MHz)

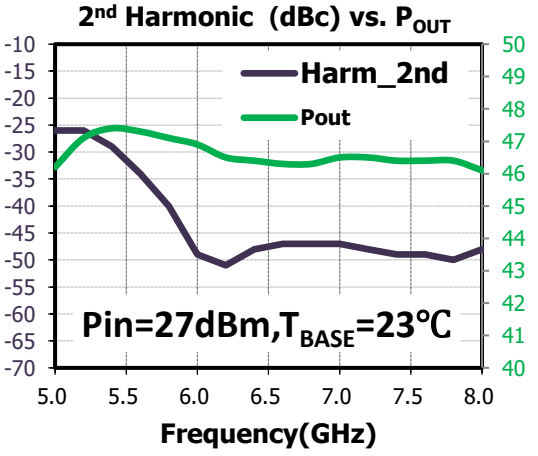

IMD3/5(dBc) vs.Tone Separation
fc=6GHz,IMD3
fc=6GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
Tone Separation (MHz)

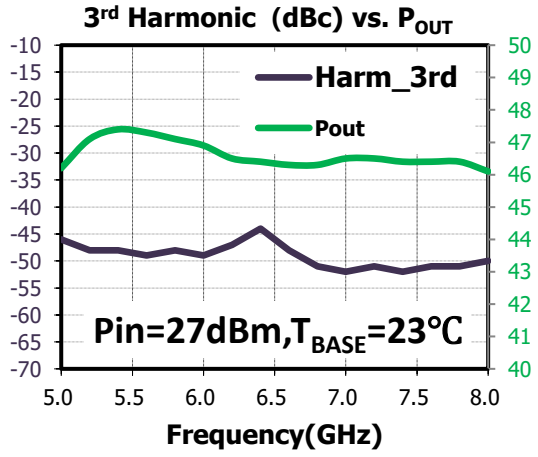

IMD3/5(dBc) vs.Tone Separation
fc=6.5GHz,IMD3
fc=6.5GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
Tone Separation (MHz)

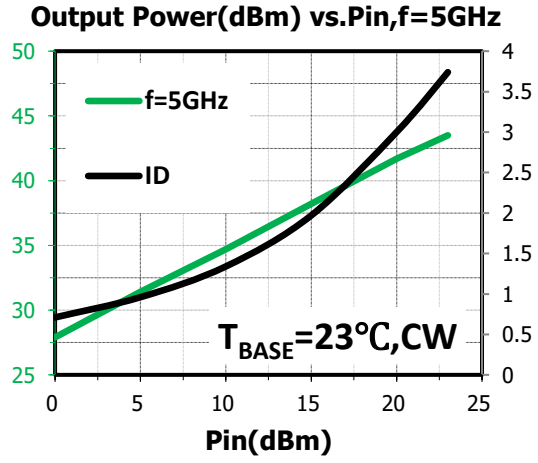

IMD3/5(dBc) vs.Tone Separation
fc=7GHz,IMD3
fc=7GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
0
-5
-10
-15
-20
-25
-30
-35
-40
1
11
21
31
41
51
61
Tone Separation (MHz)


IMD3/5(dBc) vs.Tone Separation
fc=7.5GHz,IMD3
fc=7.5GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
0
-5
-10
-15
-20
-25
-30
-35
-40
1
11
21
31
41
51
61
Tone Separation (MHz)

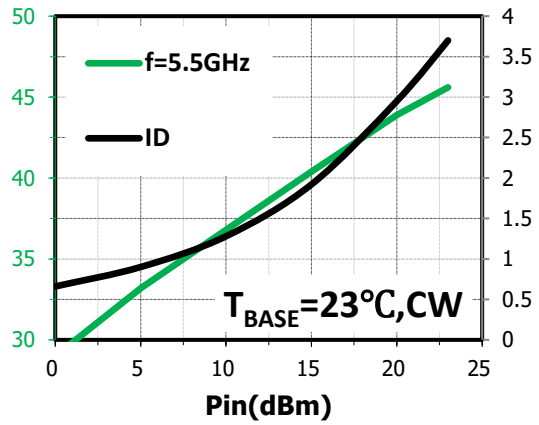

IMD3/5(dBc) vs.Tone Separation
fc=8GHz,IMD3
fc=8GHz,IMD5
TBASE=23℃,CW
POUT/Tone=40dBm
0
-5
-10
-15
-20
-25
-30
-35
-40
1
11
21
31
41
51
61
Tone Separation (MHz)


2nd Harmonic (dBc) vs. POUT
Harm_2nd
Pout
Pin=27dBm,TBASE=23℃
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
50
49
48
47
46
45
44
43
42
41
40
5.0
5.5
6.0
6.5
7.0
7.5
8.0
Frequency(GHz)

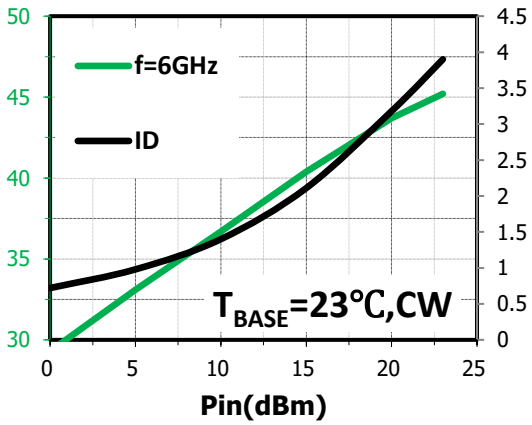

3rd Harmonic (dBc) vs. POUT
Harm_3rd
Pout
Pin=27dBm,TBASE=23℃
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
50
49
48
47
46
45
44
43
42
41
40
5.0
5.5
6.0
6.5
7.0
7.5
8.0
Frequency(GHz)


Output Power(dBm) vs.Pin,f=5GHz
f=5GHz
ID
TBASE=23℃,CW
50
45
40
35
30
25
4
3.5
3
2.5
2
1.5
1
0.5
0
0
5
10
15
20
25
Pin(dBm)

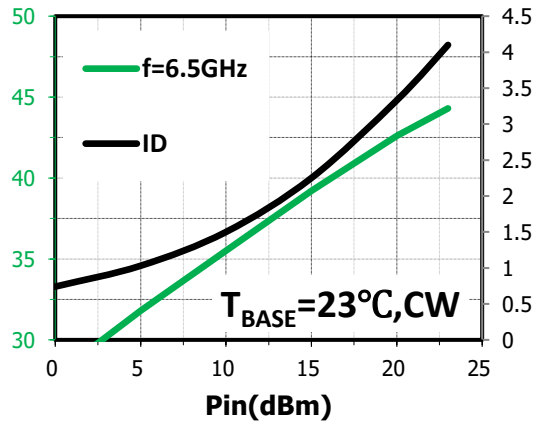
Output Power(dBm) vs.Pin,f=5.5GHz



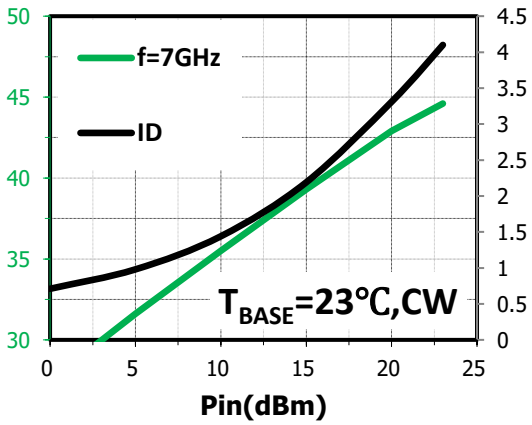
Output Power(dBm) vs.Pin,f=6GHz



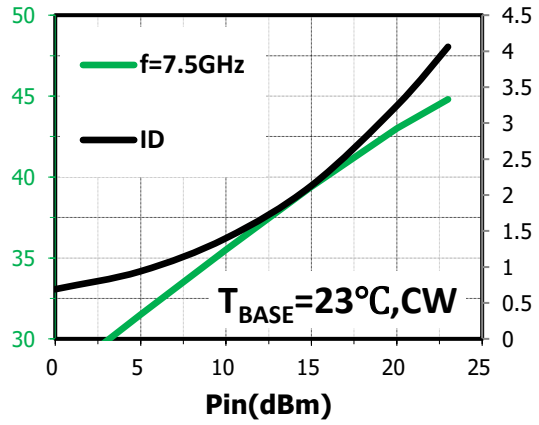
Output Power(dBm) vs.Pin,f=6.5GHz



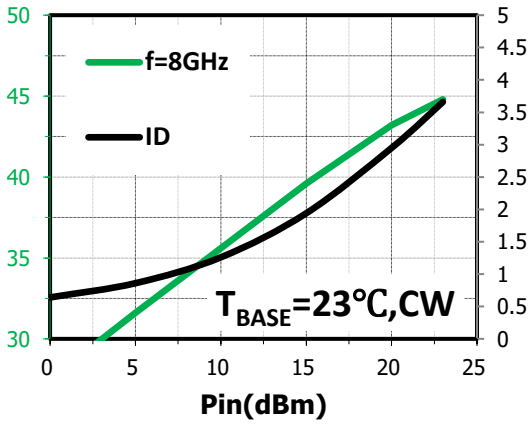
Output Power(dBm) vs.Pin,f=7GHz



Output Power(dBm) vs.Pin,f=7.5GHz



Output Power(dBm) vs.Pin,f=8GHz



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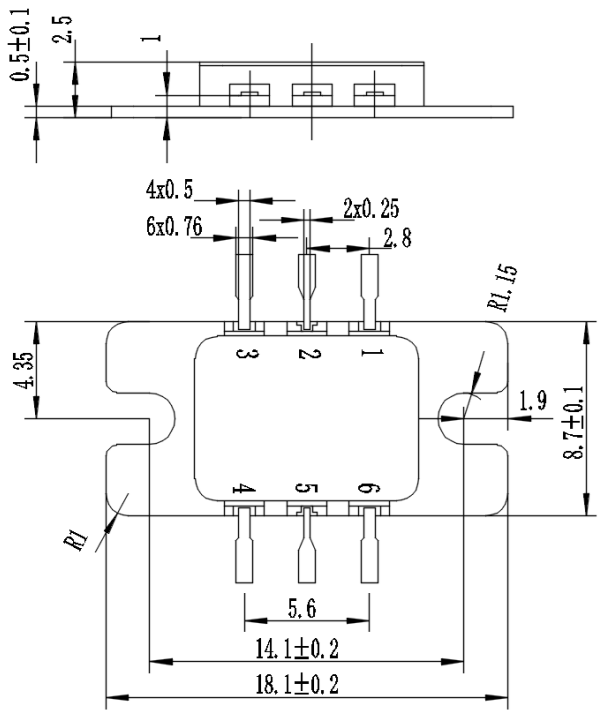
Thermal Resistance

Parameter	Conditions	Value	Unit
θ_{JC1}	VD=+28V， T_{BASE}=+70℃， Pin=+27dBm, CW, f=5.5GHz	1.14	℃/W
θ_{JC2}	VD=+28V， T_{BASE}=+70℃， Pin=+27dBm, CW, f=7.5GHz	1.34	℃/W

Package Outline

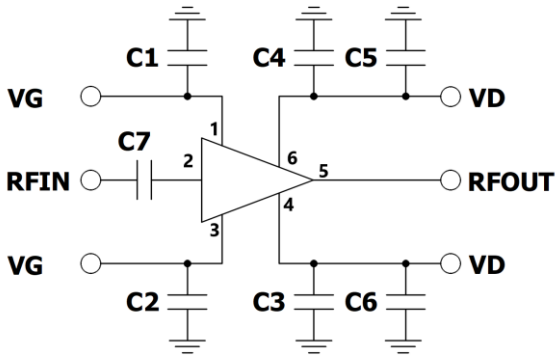
(All dimensions in mm)



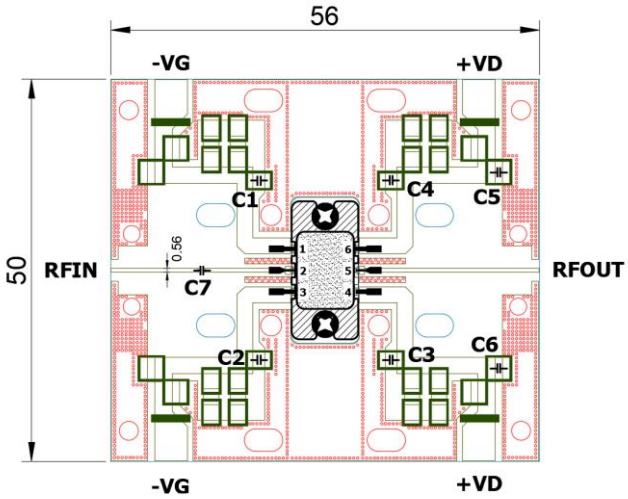
Pin Descriptions

Pin No.	Function	Pin No.	Function
1	Gate	4	Drain
2	RF input, DC Coupled	5	RF Output, AC Coupled
3	Gate	6	Drain

Application Circuit



Evaluation Board



BOM

Reference Des.	Value	Part Number	Manuf.	Size
C1, C2, C3, C4	0.1μF	—	—	0805
C5, C6	1μF	—	—	0805
C7	39pF	—	—	0603

Notes

1. SAC5004CR5 requires VDx and VGx bias.
   Turn-on: Apply VGx, Apply VDx, Apply RFIN signal.
   Turn-off: Remove RFIN signal, Decrease VG to -5V(pinch-off), Decrease VD to 0 V；
2. The flange of package may be attached using screws, recommended torque for screw mounting is 10N-cm；
3. The surface finish of the heat sink should be better than 0.8μm, and the surface flatness must be better than 10 μm;
4. Silicon based heat sink compounds should not be used for the thermal conductive grease. They cause poor grounding of the source flange. contamination and long-term degradation of thermal resistance between the FET package and heat sink;

5. The 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. 6, 2025	First Release
1.1	Jan.13,2025	Revise typo on “Tone Separation” axis title

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