SAC4000Q3

GaAs MMIC Low Noise Amplifier
0.7~3.5GHz

Rev 1.0

Features

- Frequency: 0.7 ~ 3.5GHz
- Gain: 22dB
- Noise Figure: 0.7dB Typ., 1dB Max.
- Output P_{-1}dB: 19dBm@+5V
- Power Supply: +3~+5V/30~80mA
- Package Size: 3mm×3mm×1.1mm
- Bare die size: 1.1mm×1.3mm×0.1mm

Typical Applications

- Wideband Communication Systems

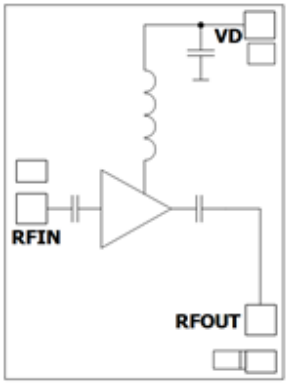
General Description

SAC4000Q3 is a GaAs MMIC Low Noise Amplifier in QFN air cavity surface mount package, which operates from 0.7GHz to 3.5GHz.

The amplifier can provide 22dB of gain, 19dBm of output P_{-1}dB and 0.7dB noise figure and from an 80mA supply current.

SAC4000Q3 is assembled in a 3mm x 3mm x 1.1mm QFN plastic package.

Functional Diagram



Electrical Performance (T_A=25℃, V_D=+5V, I_D=80mA, Z_0=50Ω)

Parameter	Min.	Typ.	Max.	Units
Frequency Range		0.7 ~ 3.5		GHz
Gain	19	21	—	dB
Gain Flatness	—	±1	±1.5	dB
Input VSWR/ Output VSWR	—	1.5	2.2	:1
Noise Figure	—	0.5	1	dB
Reverse Isolation	—	-28	—	dB
Output P_{-1}dB	17	19	—	dBm
Output IP_3	—	30	—	dBm
Supply Current (I_D)	—	80	100	mA

Absolute Maximum Ratings

Maximum Input Power	+16dBm, CW 30s	Operating Temperature	-55°C ~ +85°C
Channel Temperature	+150°C	Storage Temperature	-55°C ~ +150°C
Supply Voltage	+5.5V		

RoHS

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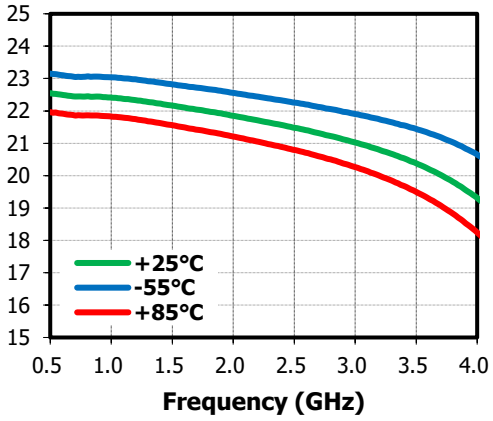
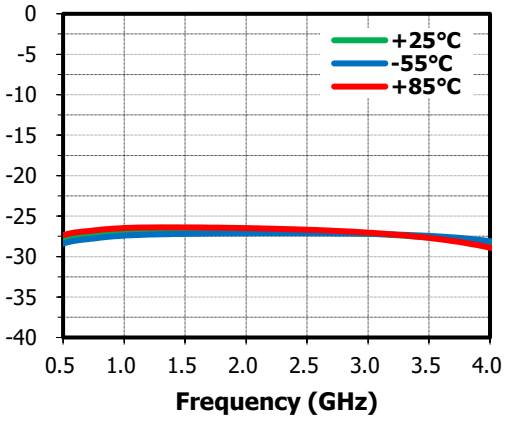
Typical Performance Curve

V_D=+5V, I_{DQ}=80mA, the following curves are taken from SAC4000Q3 evaluation board.

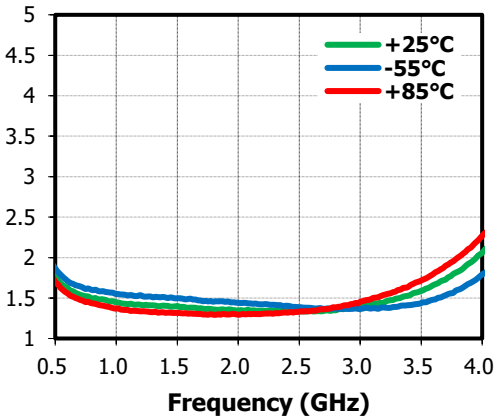
Small Signal Gain (dB) vs. Temperature



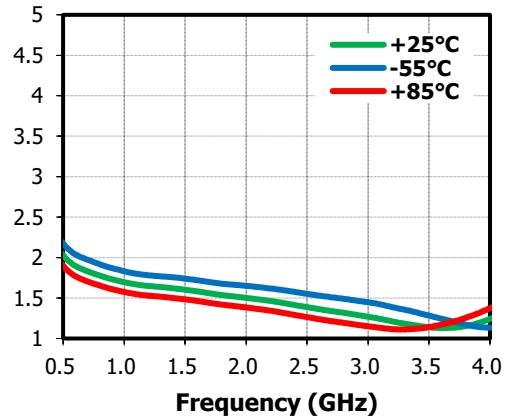
Reverse Isolation (dB) vs. Temperature



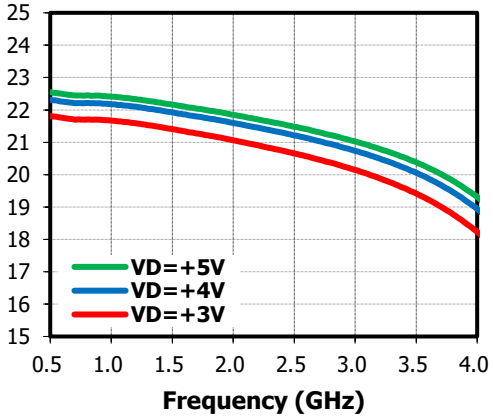
Input VSWR (:1) vs. Temperature



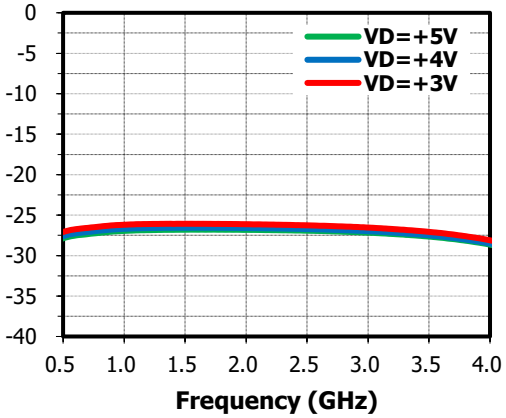
Output VSWR (:1) vs. Temperature



Small Signal Gain (dB) vs. V_D, T_A=+25°C



Reverse Isolation (dB) vs. V_D, T_A=+25°C



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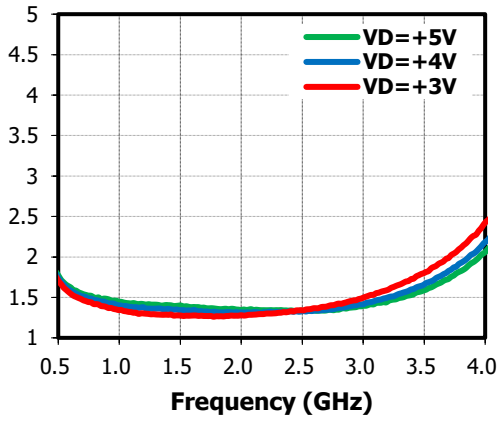
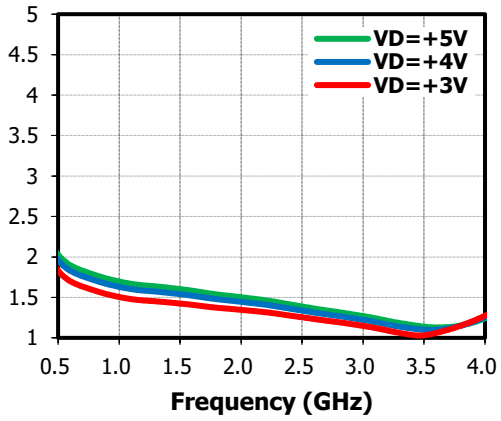
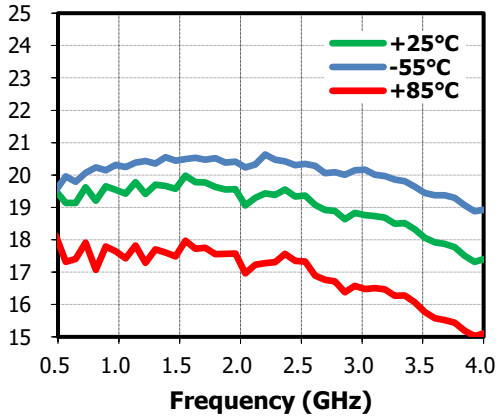
Input VSWR (:1) vs. V_D, T_A=+25°C



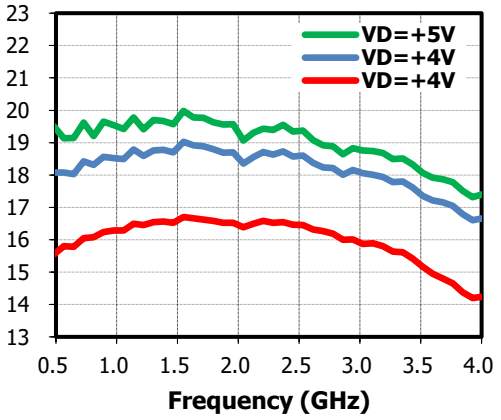
Output VSWR (:1) vs. V_D, T_A=+25°C



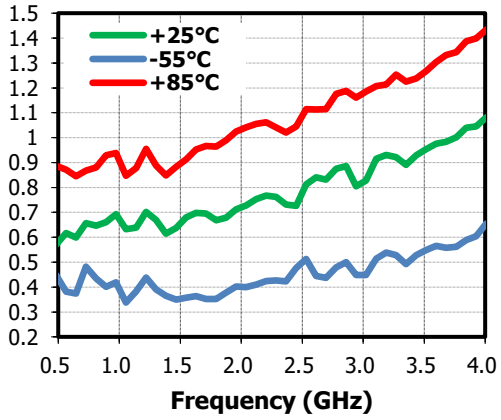
Output P_{-1}dB (dBm) vs. Temperature



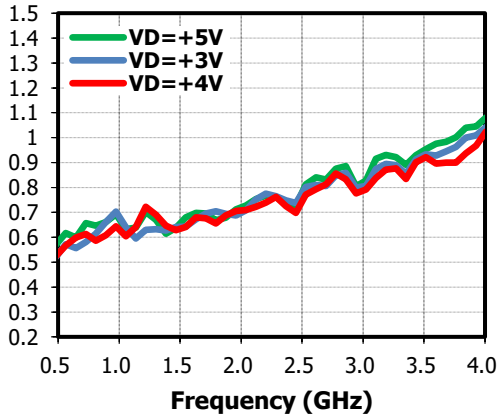
Output P_{-1}dB (dBm) vs. V_D, T_A=+25°C

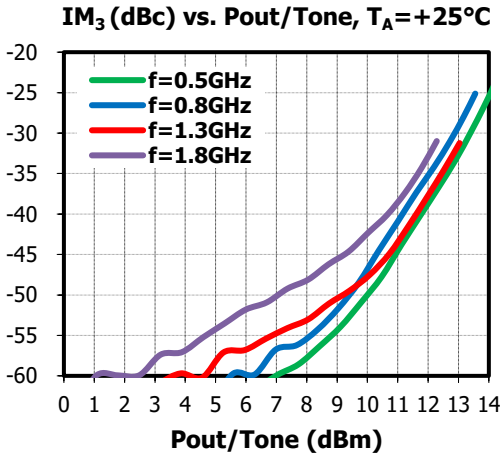


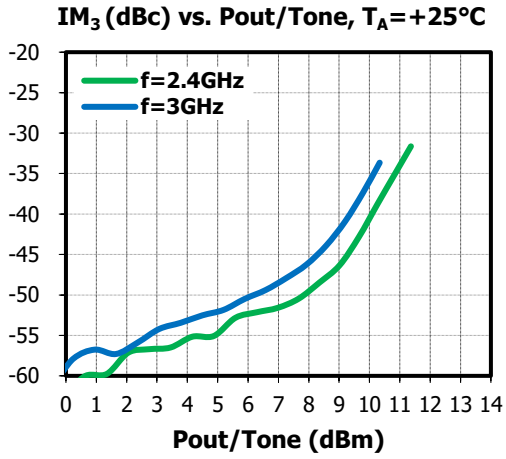
Noise Figure (dB) vs. Temperature

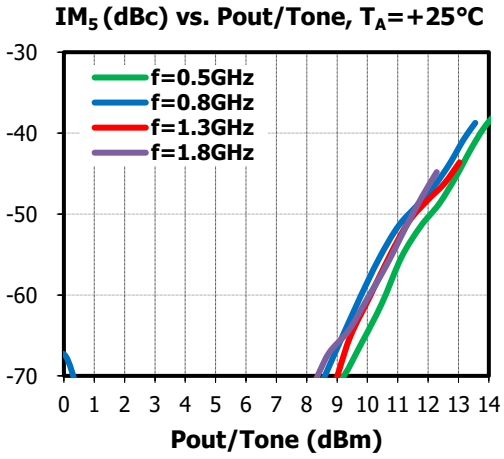


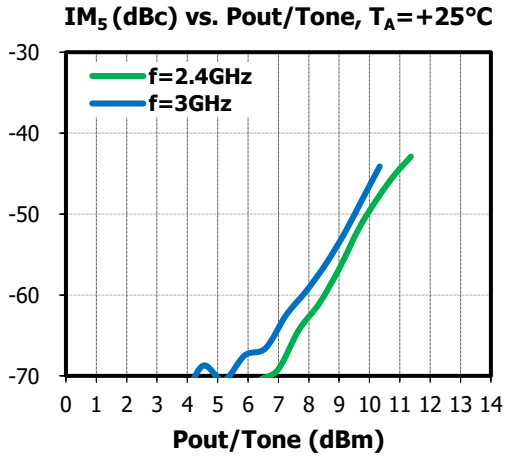
Noise Figure (dB) vs. V_D, T_A=+25°C

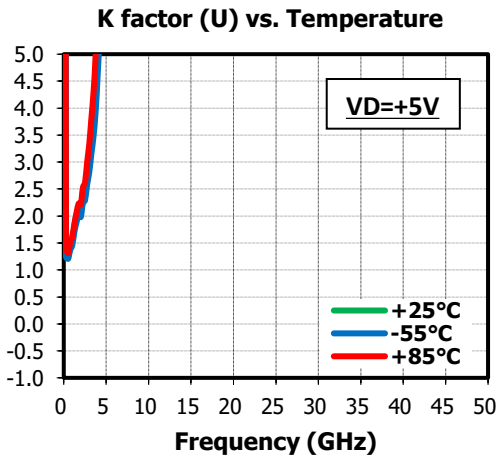


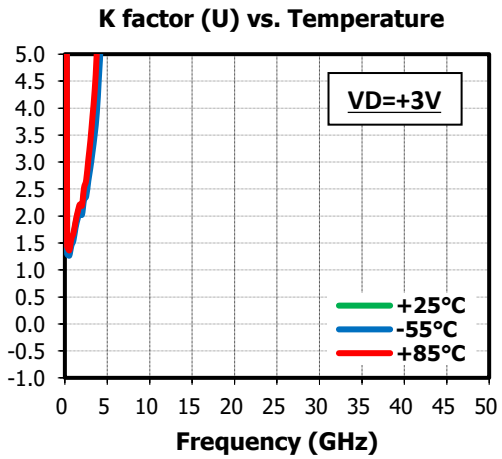

IM3 (dBc) vs. Pout/Tone, TA=+25°C
f=0.5GHz
f=0.8GHz
f=1.3GHz
f=1.8GHz
-20
-25
-30
-35
-40
-45
-50
-55
-60
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Pout/Tone (dBm)

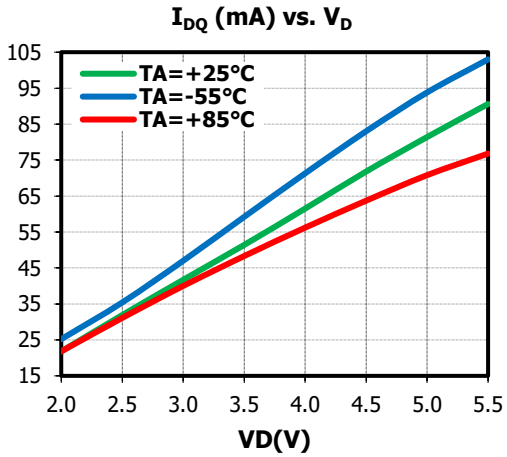

IM3 (dBc) vs. Pout/Tone, TA=+25°C
f=2.4GHz
f=3GHz
-20
-25
-30
-35
-40
-45
-50
-55
-60
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Pout/Tone (dBm)


IM5 (dBc) vs. Pout/Tone, TA=+25°C
f=0.5GHz
f=0.8GHz
f=1.3GHz
f=1.8GHz
-30
-40
-50
-60
-70
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Pout/Tone (dBm)

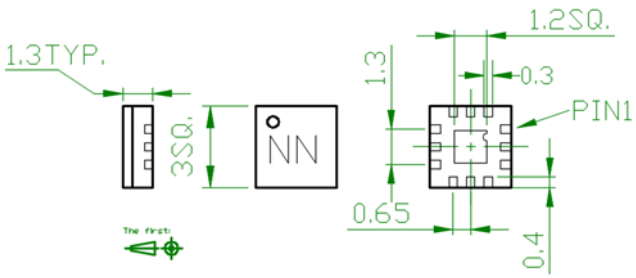

IM5 (dBc) vs. Pout/Tone, TA=+25°C
f=2.4GHz
f=3GHz
-30
-40
-50
-60
-70
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Pout/Tone (dBm)


K factor (U) vs. Temperature
VD=+5V
+25°C
-55°C
+85°C
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
0 5 10 15 20 25 30 35 40 45 50
Frequency (GHz)

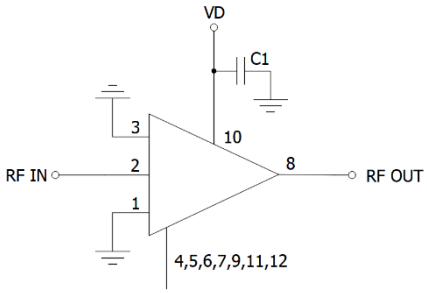

K factor (U) vs. Temperature
VD=+3V
+25°C
-55°C
+85°C
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
0 5 10 15 20 25 30 35 40 45 50
Frequency (GHz)



Outline Drawing
(All dimensions in mm)



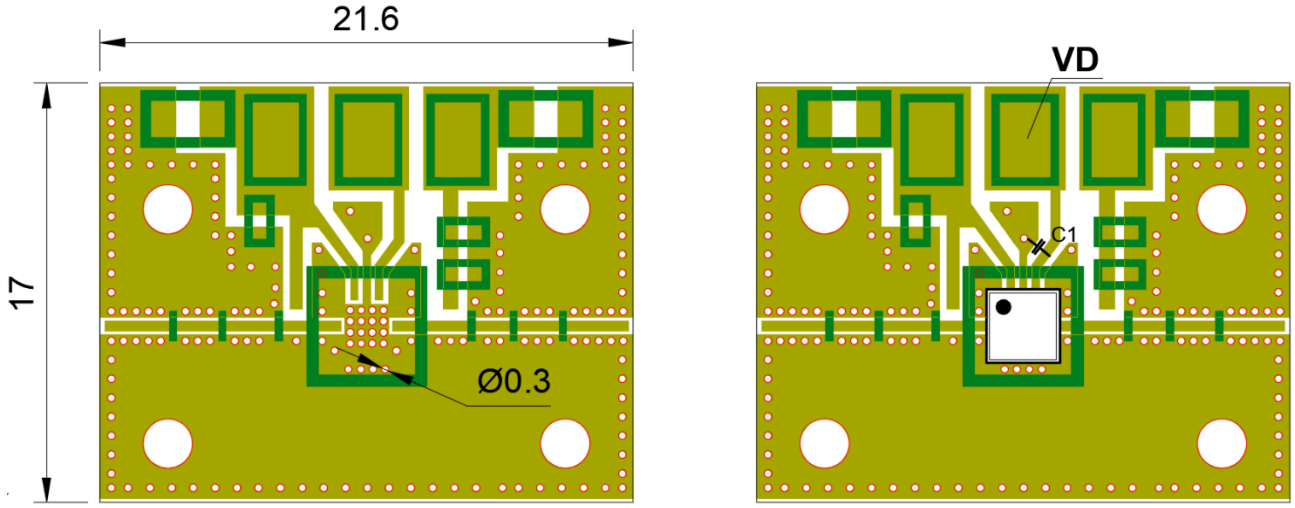
Application Circuit



Pin Function

Pin No.	Description	Pin No.	Description
1	Connect to ground	7	Connect to ground
2	RF input, AC Coupled	8	RF output, AC Coupled
3	Connect to ground	9	Connect to ground
4	Connect to ground	10	VD
5	Connect to ground	11	NC or connect to ground
6	Connect to ground	12	NC or connect to ground

SAC4000Q3 Evaluation Board

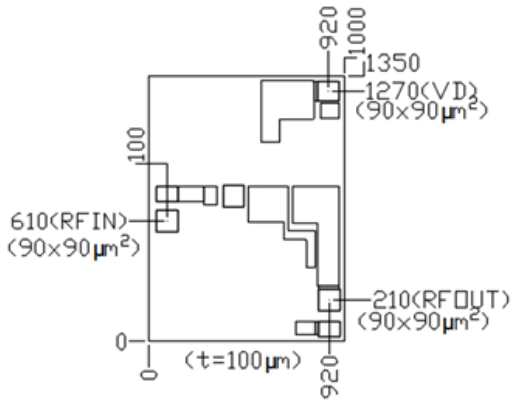


The Evaluation board is a 2-layer board fabricated using Rogers 4350 t=0.254 and using best practices for high frequency RF design. The RF input and RF output traces have a 50 Ω characteristic impedance.

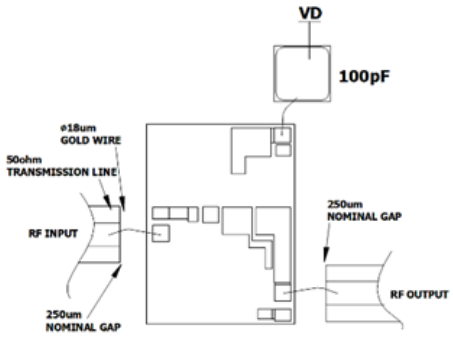
Components List

Reference Des.	Value	Part Number	Manuf.
C1	0.01µF	GRM0336R61A103KE	Murata

Bare Die Outline (µm)



Assembly Diagram



Attention:

1. The moisture resistant grade of SAC4000Q3 is 2a, the storage environment ≤30°C/60% RH, and the surrounding workshop life is 4 weeks.
2. After un-packing, it is necessary to bake the parts for 6 hours in 125+/-5-degree environment before soldering.
3. GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.
4. The back of bare chip is RF and DC ground.
5. RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 1 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized.

Revision History

Revision	Date	Comment
1.0	Mar 30, 2022	First Release

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