

SAC4001Q3

GaAs MMIC Low Noise Amplifier
0.9~3GHz

Rev 1.0

Features

- Frequency: 0.9~3GHz
- Gain: 33dB
- Noise Figure: 0.4dB Typ. 0.6dB Max
- Output P_{1dB}: 16dBm@+5V
- Power Supply: +5V/55mA
- Package Size: 3mmx3mmx1.1mm
- Bare die size: 1.25mmx1.5mmx0.1mm

Typical Applications

- Wideband Communication Systems

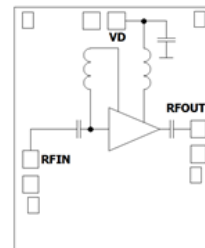
General Description

SAC4001Q3 is a GaAs MMIC Low Noise Amplifier in QFN air cavity surface mount package, which operates between in 0.9~3GHz.

The amplifier can provide 33dB of gain, 16dBm of output P_{1dB} and 0.4dB noise figure and from a 55mA supply current.

SAC4001Q3 is assembled in a 3mm x 3mm x 1.1mm QFN plastic package

Functional Diagram



Electrical Performance (T_A=25°C, V_D=+5V, I_D=55mA, Z₀=50Ω)

Parameter	Min.	Typ.	Max.	Units
Frequency Range	0.9~3			GHz
Gain	30	33	—	dB
Gain Flatness	—	±1	—	dB
Input VSWR/ Output VSWR	—	1.5	2.0	:1
Noise Figure	—	0.3	0.6	dB
Reverse Isolation	—	-45	—	dB
Output P _{1dB}	14	16	—	dBm
Output IP ₃	—	30	—	dBm
Supply Current (I _D)	—	55	75	mA

Absolute Maximum Ratings

Maximum Input Power	+17dBm,CW 30s	Operating Temperature	-55°C~+85°C
Channel Temperature	+150°C	Storage Temperature	-55°C~+150°C
Supply Voltage	+7V		

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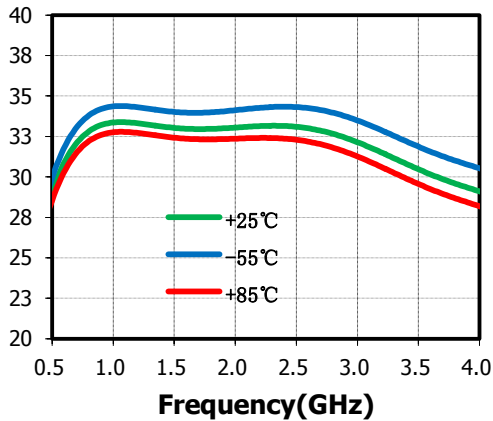
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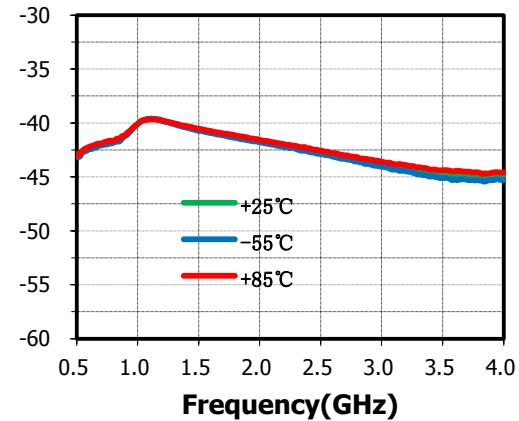
Typical Performance Curve

$V_D=+5V, I_{DQ}=55mA$, The following curves are taken from SAC4001Q3 evaluation board.

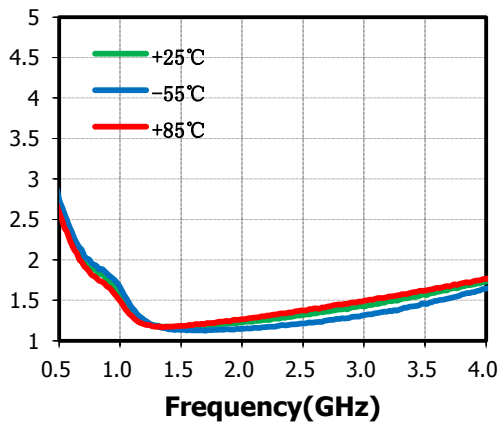
Small Signal Gain(dB) vs.Temperature



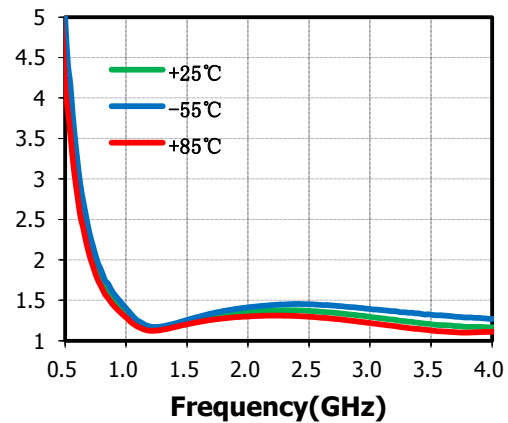
Reverse Isolation(dB) vs.Temperature



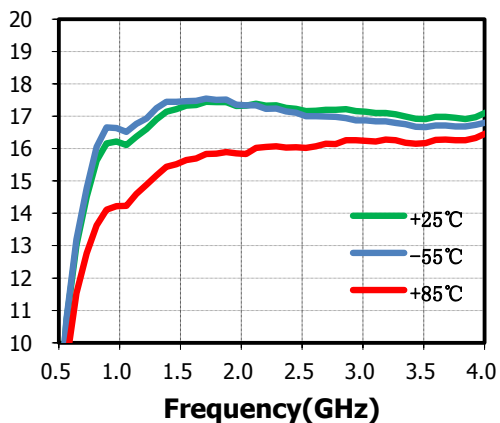
Input VSWR(:1) vs.Temperature



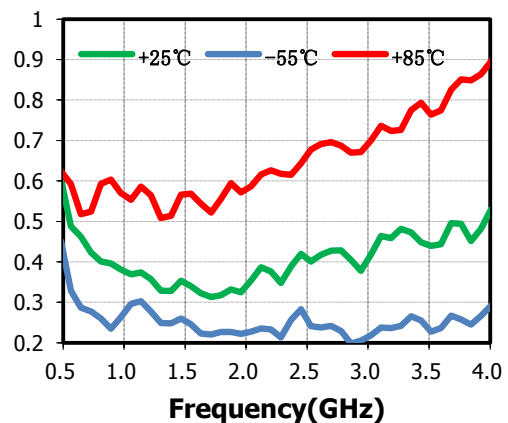
Output VSWR(:1) vs.Temperature



Output P-1dB(dBm) vs.Temperature



Noise Figure(dB) vs.Temperature



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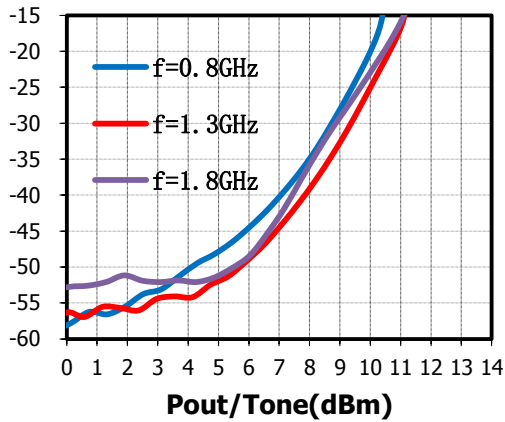
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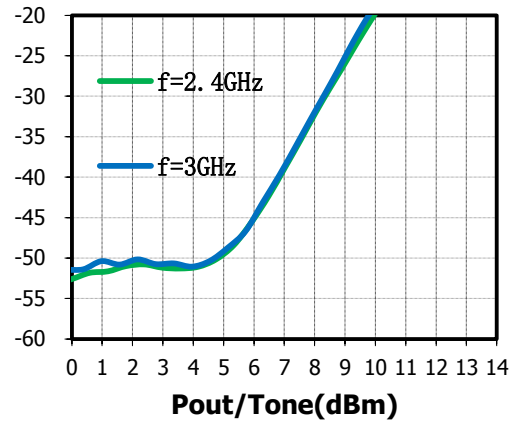
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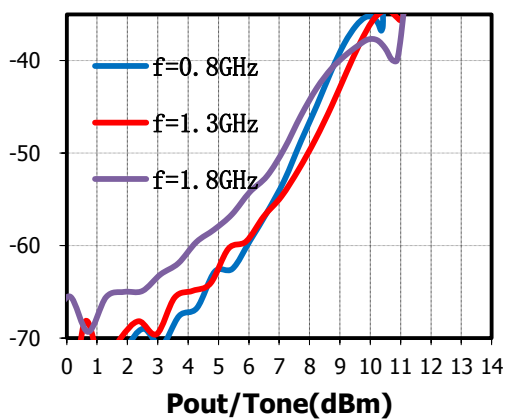
IM₃(dBc) vs. Pout/Tone, T_A = +25°C



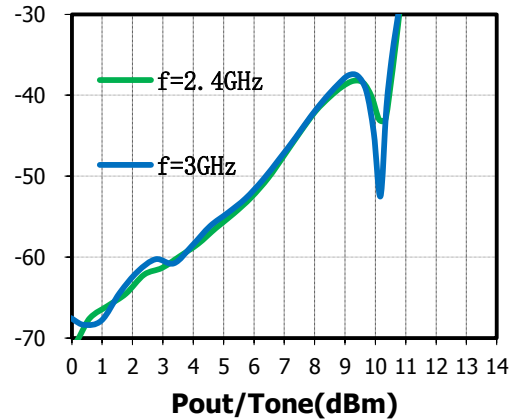
IM₃(dBc) vs. Pout/Tone, T_A = +25°C



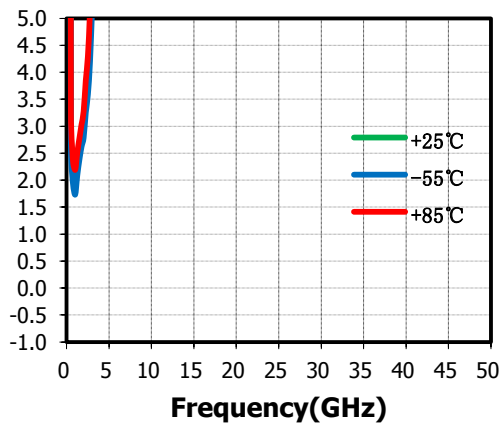
IM₅(dBc) vs. Pout/Tone, T_A = +25°C



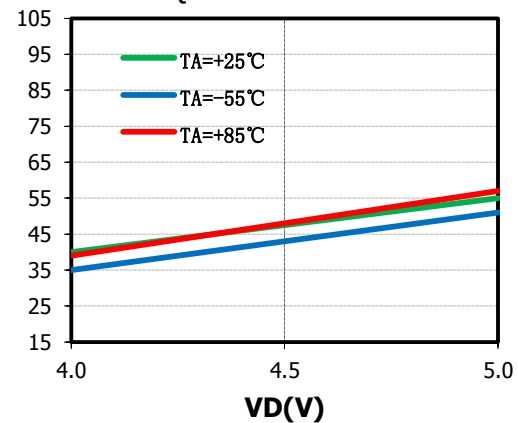
IM₅(dBc) vs. Pout/Tone, T_A = +25°C



K factor(U) vs. Temperature



I_{DQ} (mA) vs. V_D



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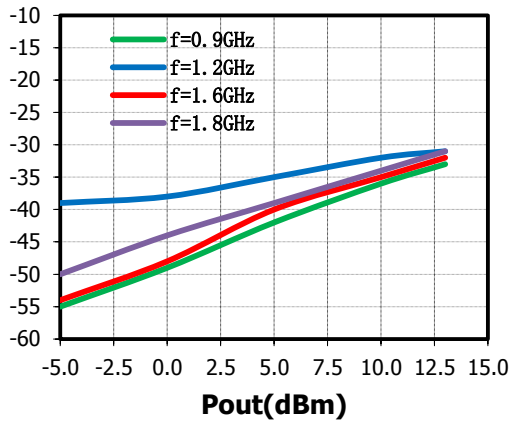
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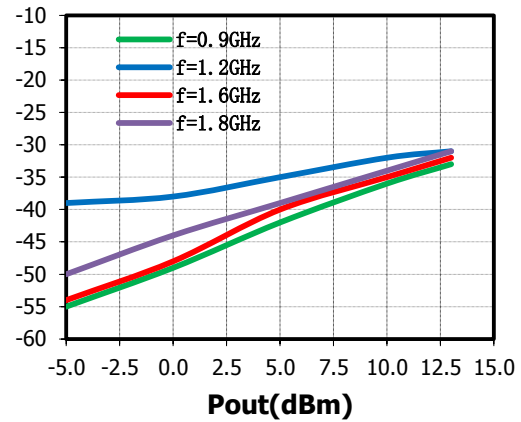
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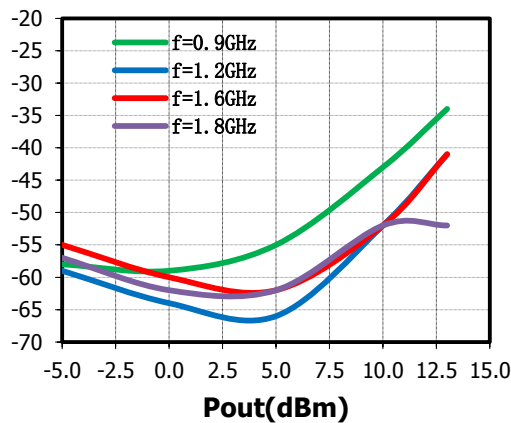
2ND Harmonic vs. Pout, T_A = +25°C



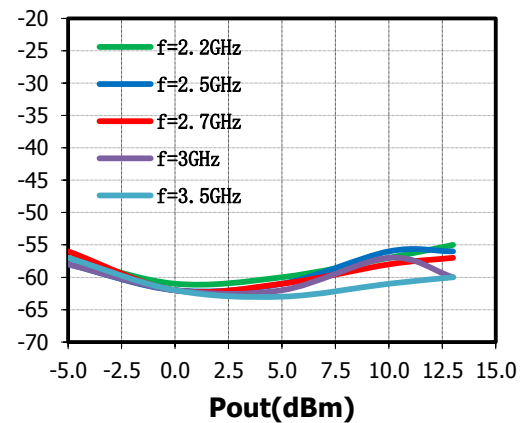
2ND Harmonic vs. Pout, T_A = +25°C



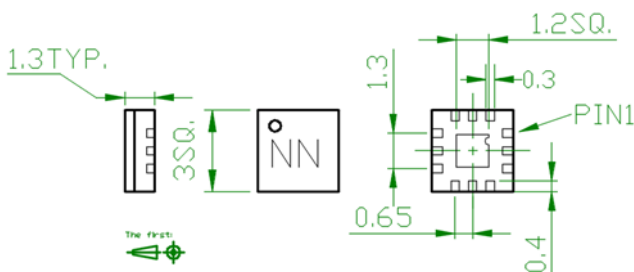
3RD Harmonic vs. Pout, T_A = +25°C



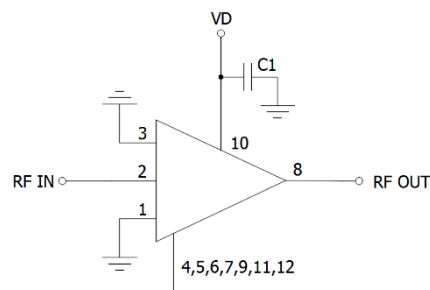
3RD Harmonic vs. Pout, T_A = +25°C



Outline Drawing (All dimensions in mm)



Application Circuit



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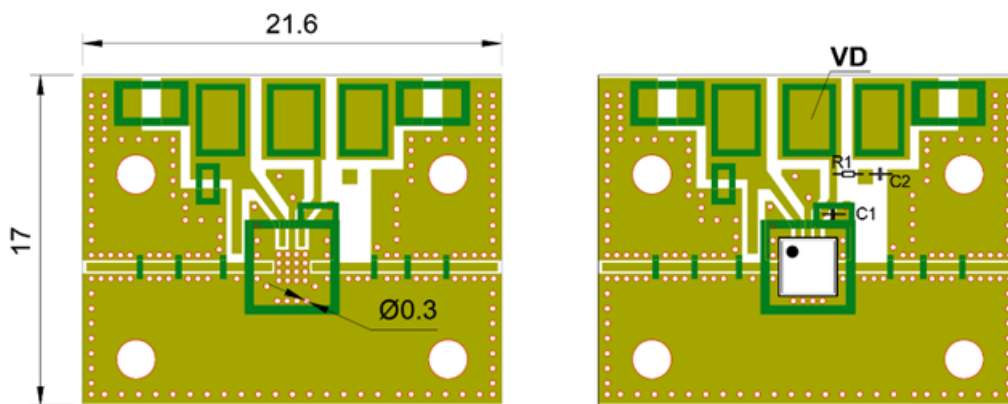
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Pin Function

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

SAC4001Q3 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 $50\ \Omega$ characteristic impedance.

Components List

Reference Des.	Value	Part Number	Manuf.
C1	0.01 μ F	GRM0336R61A103KE	Murata

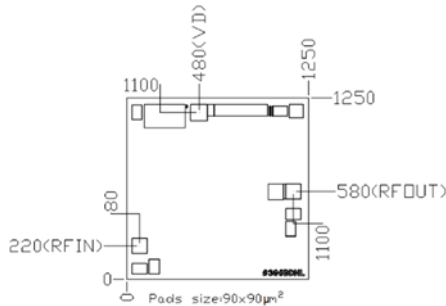
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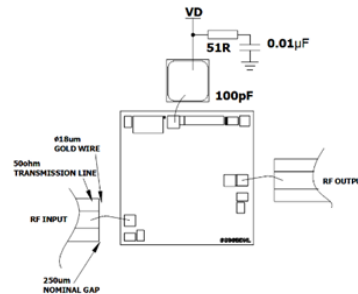
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Bare Die Outline (μm)



t=100 μm

Assembly Diagram



Attention:

1. The moisture resistant grade of SAC4001Q3 is 2a, the storage environment $\leq 30^{\circ}\text{C}/60\% \text{RH}$, 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 29, 2022	First Release

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