SAC3094QP3

GaAs MMIC Low Noise Amplifier
7~13GHz

Rev 1.0

Features

- Frequency: 7 ~ 13GHz
- Gain: 23dB
- Noise Figure: 0.7dB Typ., 1dB Max.
- $OP_{-1}dB$: 14dBm
- Supply Voltage: +3V@20mA, +5V@40mA
- Package Size: 3mm×3mm×1.1mm

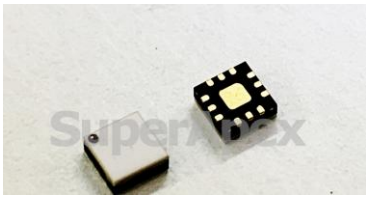
Typical Applications

- Radar and ECM
- RF/ Microwave radio
- Military and Space

General Description

SAC3094QP3 is a GaAs MMIC Low Noise Amplifier in QFN surface mount package, which operates from 7GHz to 13GHz.
The amplifier can provide 23dB of gain, 14dBm of output $P_{-1}dB$ and 0.7dB noise figure and from a 20mA supply current.
SAC3094QP3 is assembled in a 3mm×3mm QFN plastic package.

Picture



Electrical Performance 1 (T_A=25℃, V_D=+3V, I_D=20mA, Z_0=50Ω)

Parameter	Min	Typ.	Max	Units
Frequency Range		7 ~ 13		GHz
Gain	18	21	25	dB
Gain Flatness	—	±1	±1. 5	dB
Input/Output VSWR	—	1.5	2.2	:1
Noise Figure	—	0.7	1	dB
Reserve Isolation	—	-37	—	dB
Output Power for 1 dB Compression ($OP_{-1}dB$)	5	8	—	dBm
Output Third Order Intercept (OIP_3)	—	20	—	dBm
Supply Current (I_D)	—	20	30	mA

Electrical Performance 1 (T_A=25℃, V_D=+5V, I_D=40mA, Z_0=50Ω)

Parameter	Min	Typ.	Max	Units
Frequency Range		7 ~ 13		GHz
Gain	19	23	26	dB
Gain Flatness	—	±1	±1.5	dB
Input/Output VSWR	—	1.5	2.2	:1
Noise Figure	—	0.7	1	dB
Reserve Isolation	—	-37	—	dB
Output Power for 1 dB Compression ($OP_{-1}dB$)	13	15	—	dBm
Output Third Order Intercept (OIP_3)	—	28	—	dBm
Supply Current (I_D)	—	40	52	mA

RoHS

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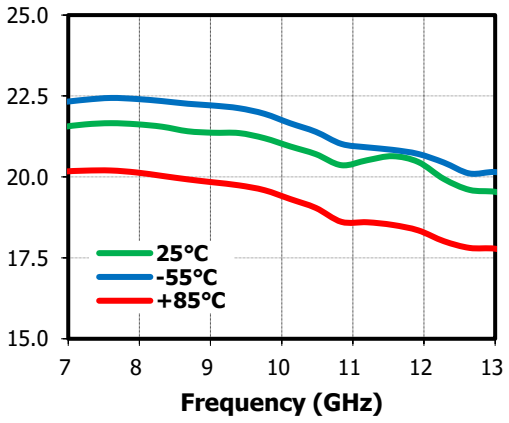
Absolute Maximum Ratings

Maximum Input Power	+18dBm, CW 30s	Operating Temperature	-55°C ~ +85°C
Channel Temperature	+150°C	Storage Temperature	-65°C ~ +150°C
Supply Voltage	+7V		

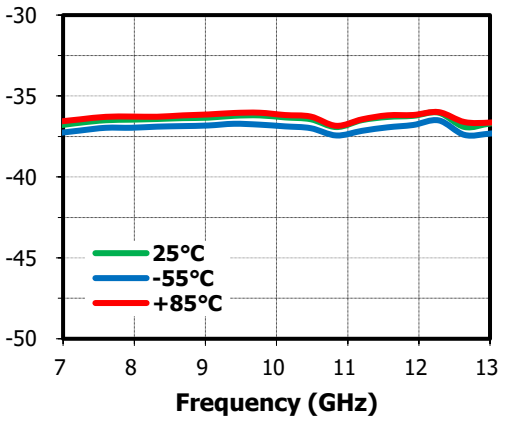
Typical Performance Curve

V_D=+3V, I_{DQ}=20mA, the following curves are taken from SAC3094QP3 evaluation board. De-embedding operation has been Implemented.

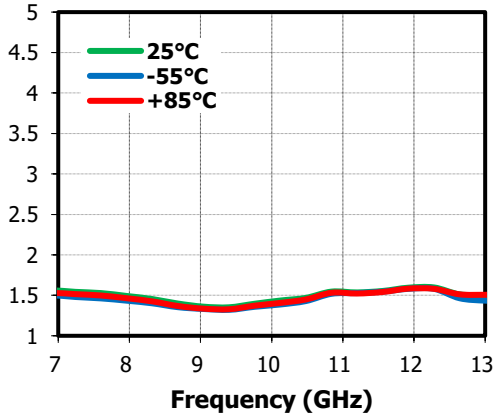
Small Signal Gain (dB) vs. Temperature



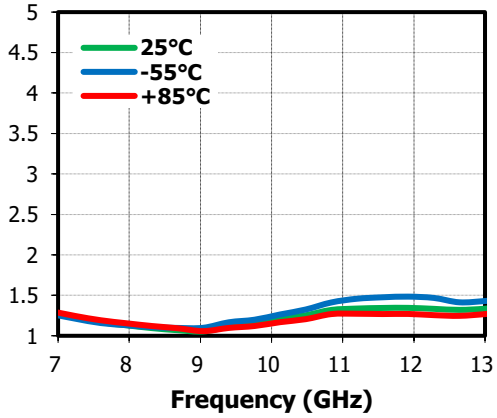
Reverse Isolation (dB) vs. Temperature



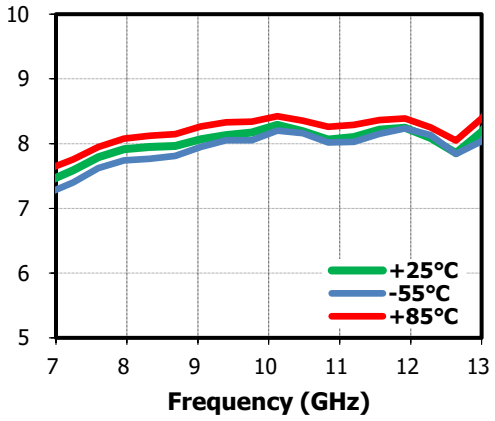
Input VSWR (:1) vs. Temperature



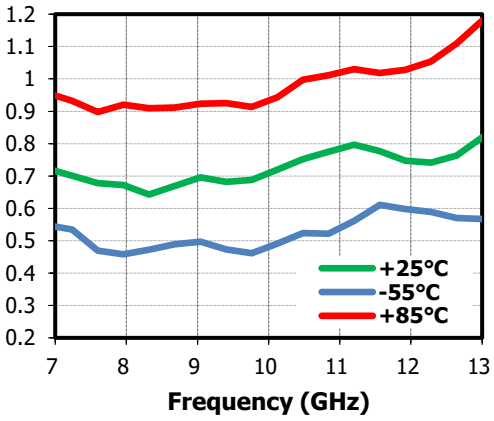
Output VSWR (:1) vs. Temperature



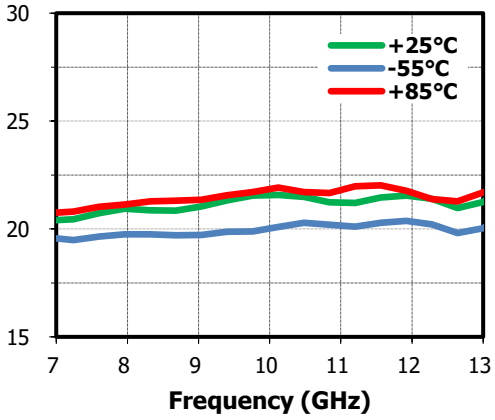
Output P_{-1}dB (dBm) vs. Temperature



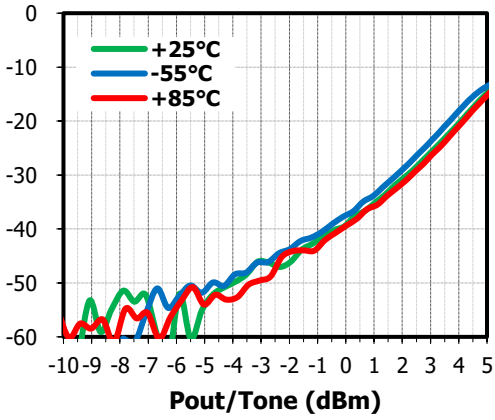
Noise Figure (dB) vs. Temperature



Output IP_3 (dBm) vs. Temperature

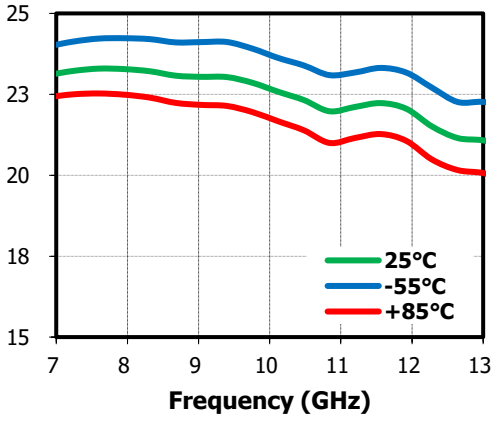


IM_3 (dBc) vs. Pout/Tone, f=9GHz

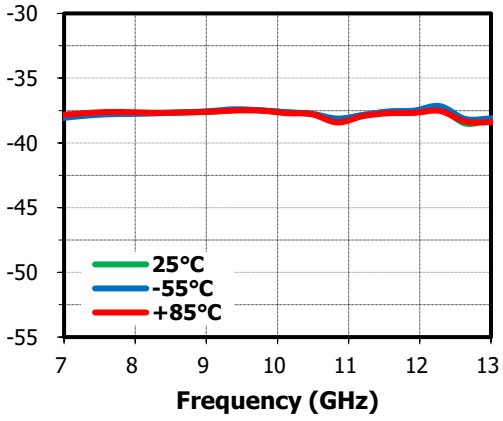


V_D=+5V, I_{DQ}=40mA, the following curves are taken from SAC3094QP3 evaluation board. De-embedding operation has been Implemented.

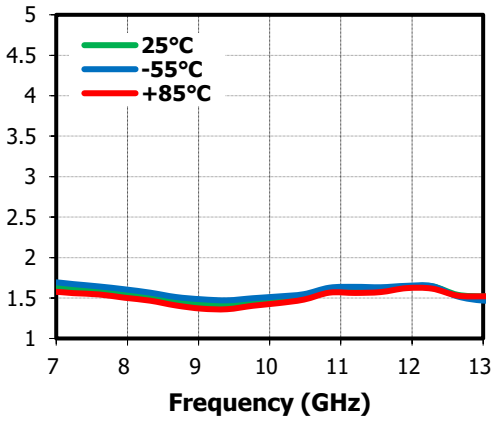
Small Signal Gain (dB) vs. Temperature



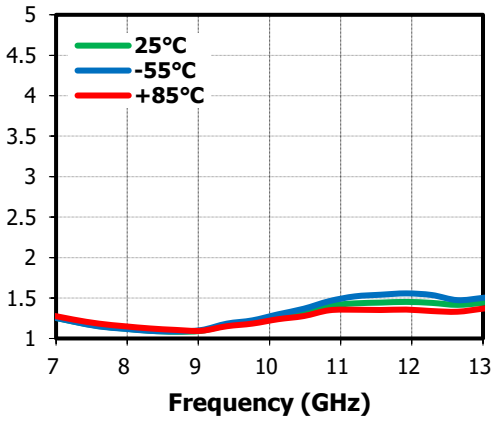
Reverse Isolation (dB) vs. Temperature



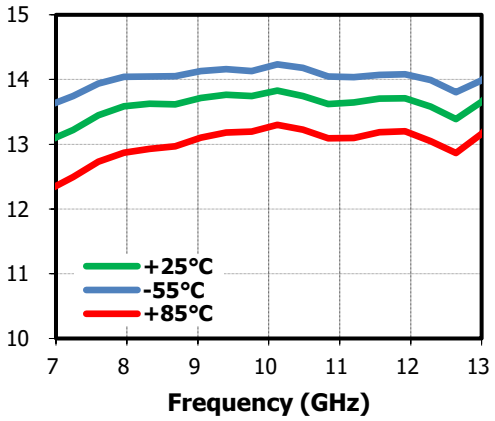
Input VSWR (:1) vs. Temperature



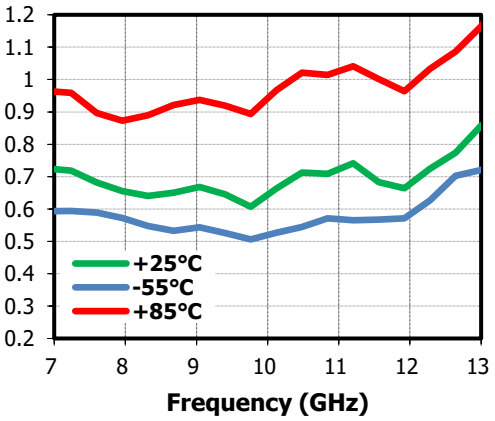
Output VSWR (:1) vs. Temperature



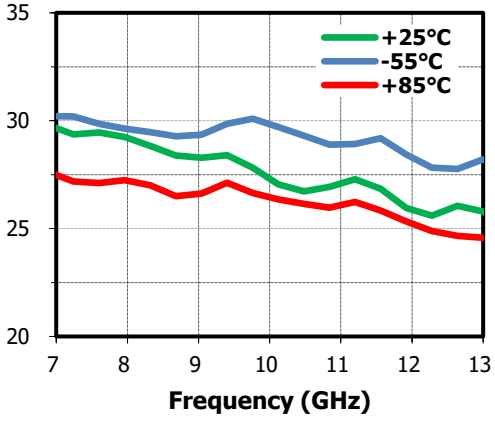
Output P_{-1}dB (dBm) vs. Temperature



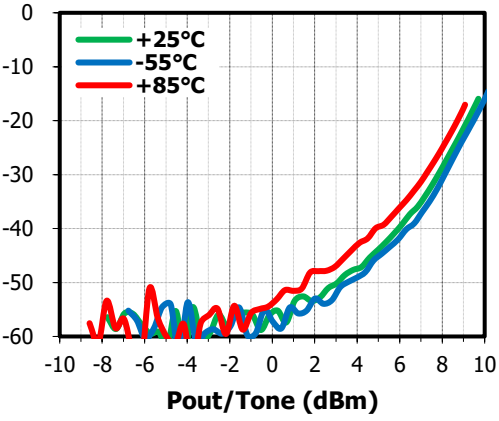
Noise Figure (dB) vs. Temperature



Output IP_3 (dBm) vs. Temperature



IM_3 (dBc) vs. Pout/Tone, f=9GHz



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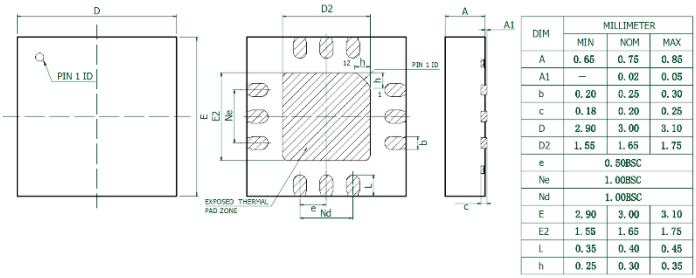
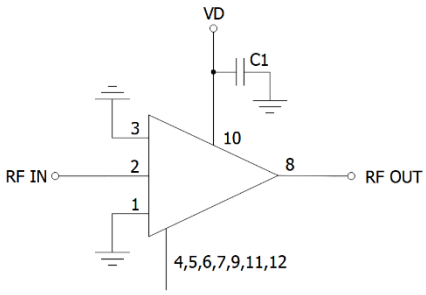
Outline Drawing



DIM	MILLIMETER		
	MIN	NOM	MAX
A	0.65	0.75	0.85
A1	–	0.02	0.05
b	0.20	0.25	0.30
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	1.55	1.65	1.75
e	0.50BSC		
Ne	1.00BSC		
Nd	1.00BSC		
E	2.90	3.00	3.10
E2	1.55	1.65	1.75
L	0.35	0.40	0.45
h	0.25	0.30	0.35

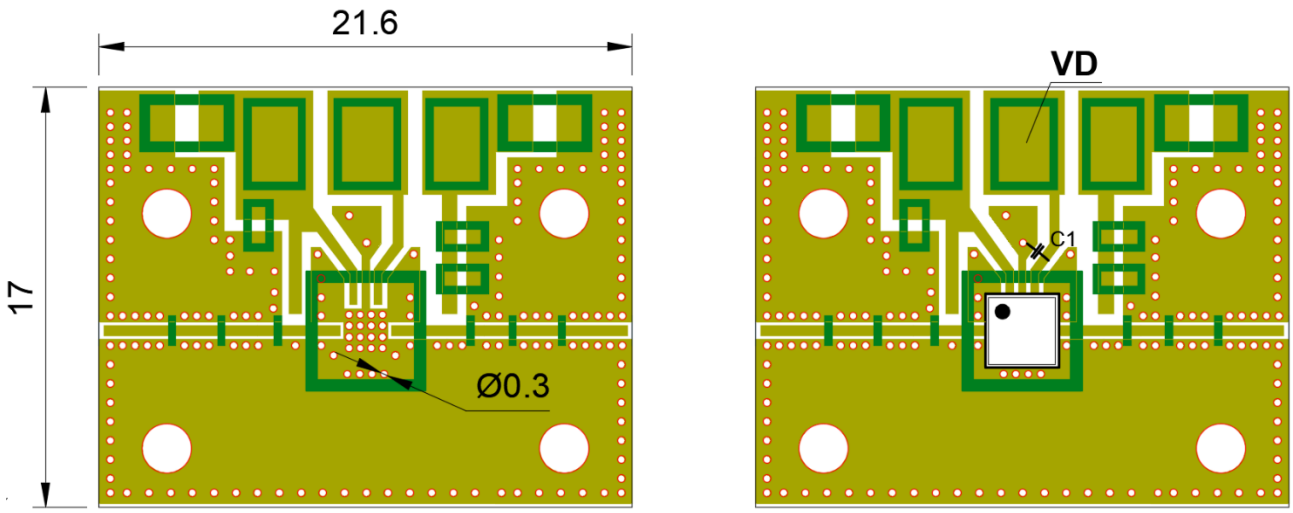
Application Circuit



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	Drain (VD)
5	Connect to ground	11	NC or connect to ground
6	Connect to ground	12	NC or connect to ground

SAC3094QP3 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	0.01uF	GRM0336R61A103KE	Murata

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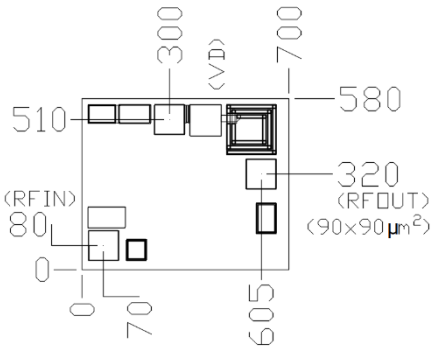
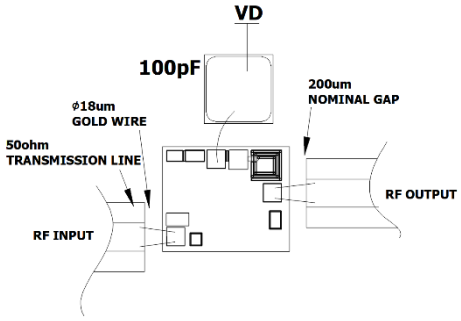
Die Outline (µm)



t=100 µm

Assembly Diagram



Notes:

1. The back of chip is RF ground.
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.
3. Bypass SLCs should be placed as close as possible to the chip.
4. GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.
5. The MSL level of products is 2a, the storage environment ≤30°C/60% RH, and the surrounding workshop life is 4 weeks.

Revision History

Revision	Date	Comment
1.0	Feb 10, 2022	First Release