SAC4003Q3

GaAs MMIC Low Noise Amplifier
500KHz~3GHz

Rev 1.0

Features

- Frequency：500KHz~3GHz
- Gain：26dB
- Noise Figure：1.6dB@f=3GHz
- Output P_{-1}dB：20dBm@+5V Biased
- Power Supply：+3~+5V/70~130mA
- Package Size：3mmx3mmx1.1mm
- Bare die size：1.25mmx1.25mmx0.1mm

Typical Applications

- Wideband Communication Systems

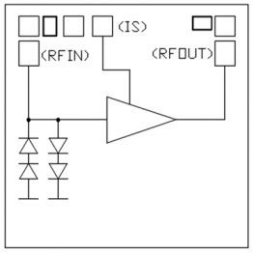
General Description

SAC4003Q3 is a GaAs MMIC Low Noise Amplifier in QFN air cavity surface mount package, which operates between in 500KHz~3GHz.

The amplifier can provide 26dB of gain, 20dBm of output P_{-1}dB and 1.2dB(typ.) noise figure and from a 130mA supply current.

SAC4003Q3 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=130*mA, Z_0=50Ω)

Parameter	Min.	Typ.	Max.	Units
Frequency Range	0.0005~3.5			GHz
Gain	22	26	—	dB
Gain Flatness	—	±1	±2	dB
Input VSWR/ Output VSWR	—	1.5	2.5	:1
Noise Figure	—	1.2	2	dB
Reverse Isolation	—	-33	—	dB
Output P_{-1}dB	18	20	—	dBm
Output IP_3	—	38	—	dBm
Supply Current (I_D)	—	130	155	mA

***IS pin set to floating**

Absolute Maximum Ratings

Maximum Input Power	+27dBm,CW 30s,f>30MHz	Operating Temperature	-55℃~+85℃
Channel Temperature	+150℃	Storage Temperature	-55℃~+150℃
Supply Voltage	+6.5V		

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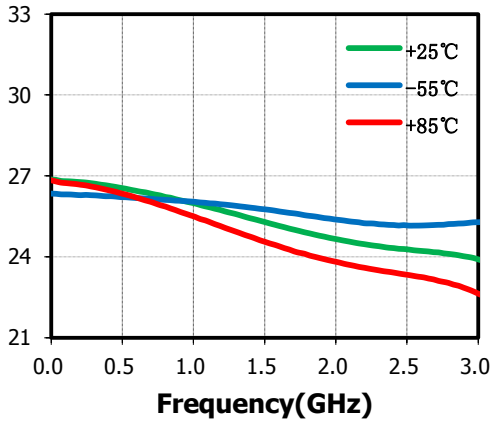
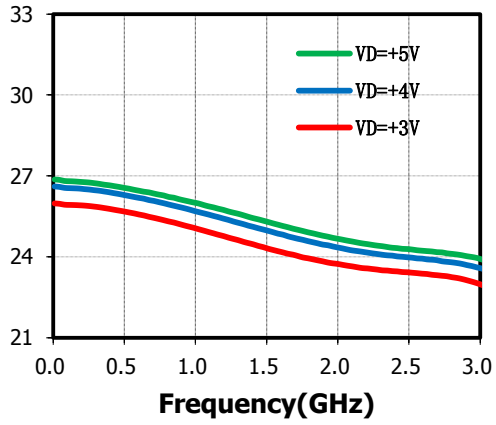
Typical Performance Curve

V_D=+5V,I_{DQ}=70mA, The following curves are taken from SAC4003Q3 evaluation board, VNA Biased

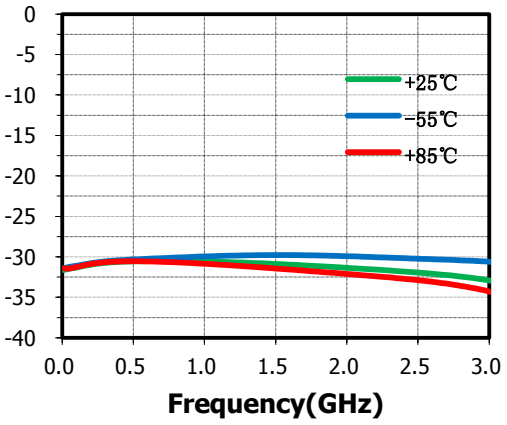
Small Signal Gain(dB) vs.Temperature



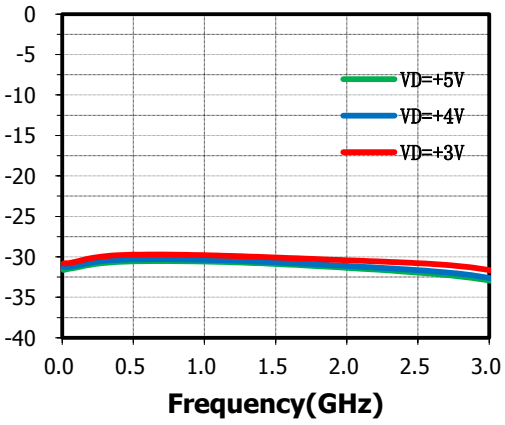
Small Signal Gain(dB) vs.V_D,T_A=+25 ℃



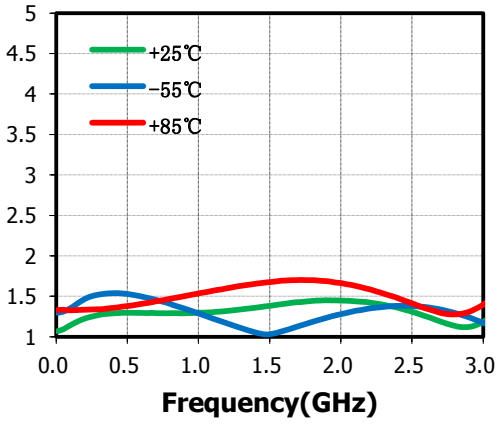
Reverse Isolation(dB) vs.Temperature



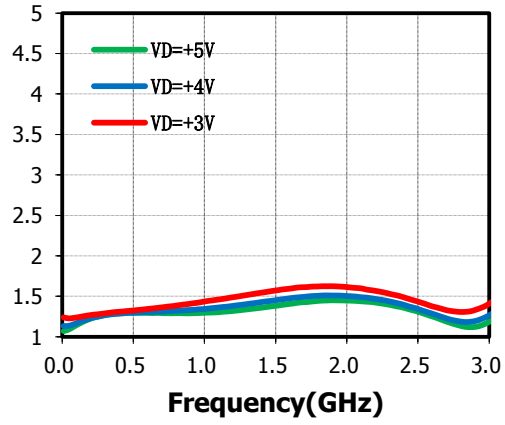
Reverse Isolation(dB) vs.V_D,T_A=+25 ℃



Input VSWR(:1) vs.Temperature



Input VSWR(:1) vs.V_D,T_A=+25 ℃



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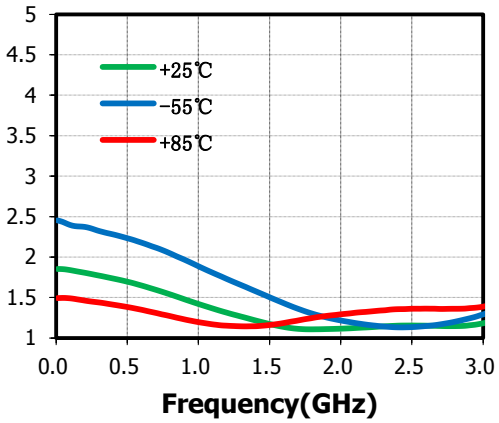
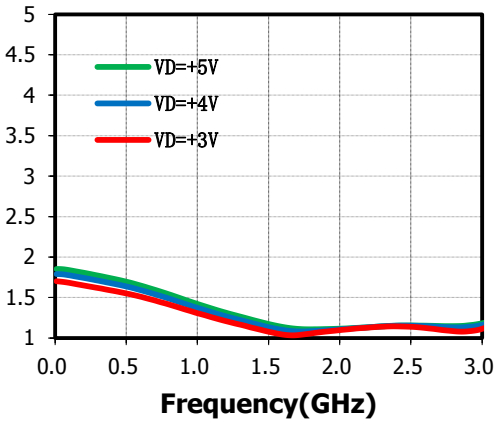
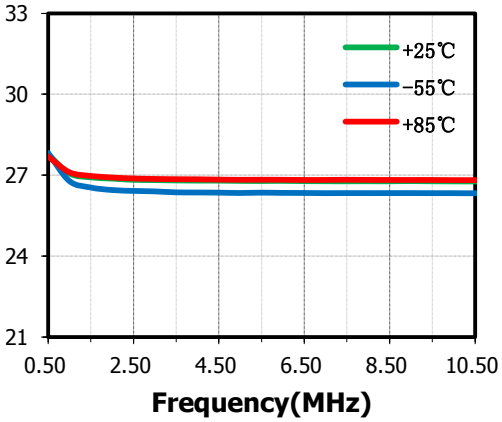
Output VSWR(:1) vs.Temperature



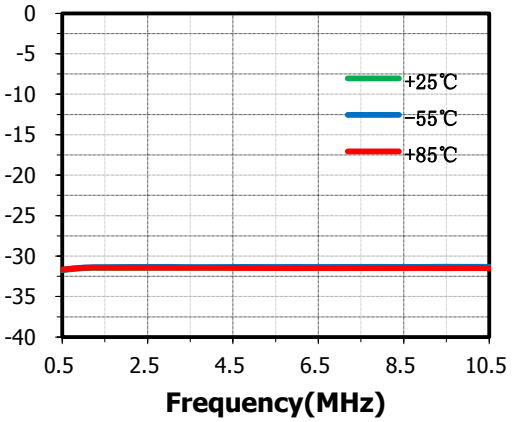
Output VSWR(:1) vs.V_D,T_A=+25 ℃



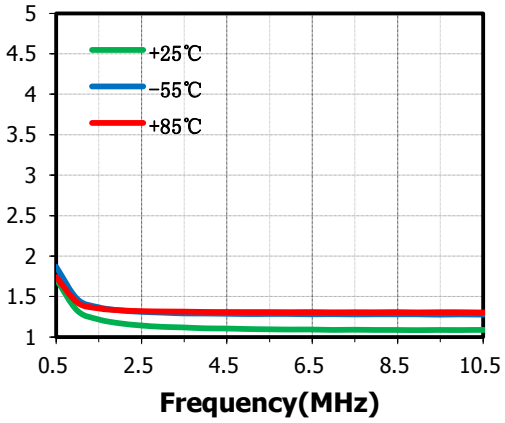
Small Signal Gain(dB) vs.Temperature



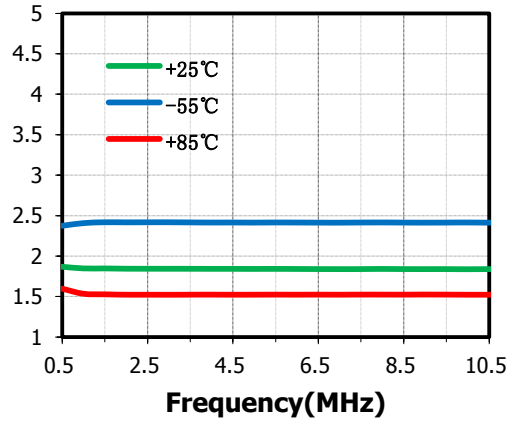
Reverse Isolation(dB) vs.Temperature



Input VSWR(:1) vs.Temperature



Output VSWR(:1) vs.Temperature



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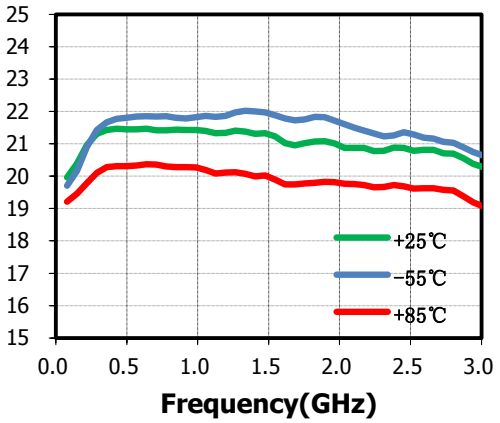
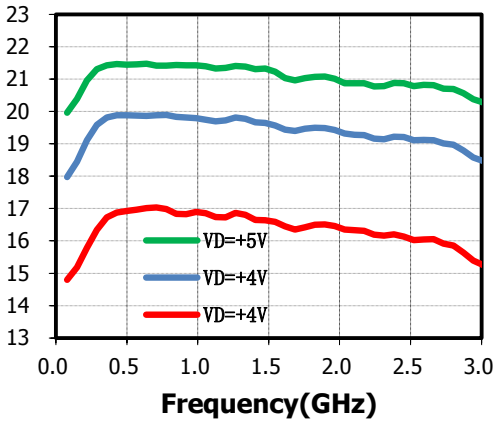
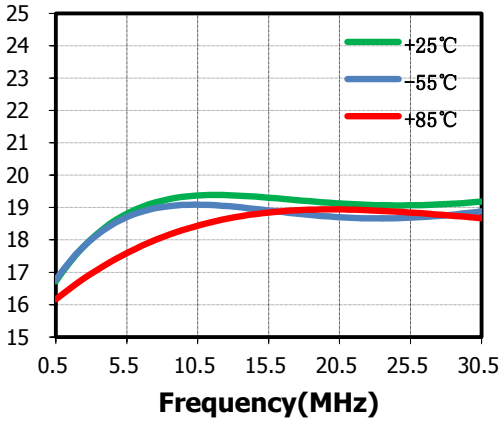
Output P-1dB(dBm) vs.Temperature



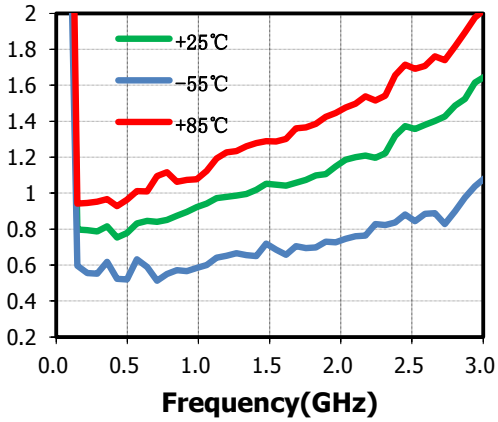
Output P-1dB(dBm) vs.V_D,T_A=+25 ℃



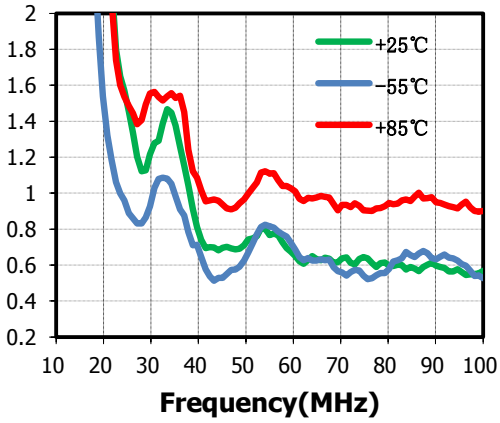
Output P-1dB(dBm) vs.Temperature



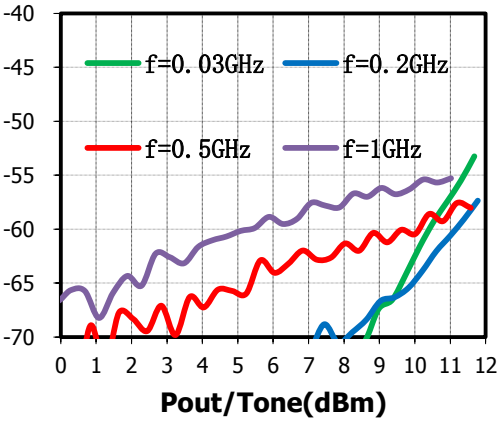
Noise Figure(dB) vs.Temperature



Noise Figure(dB) vs.Temperature



IM_3(dBc)vs.Pout/Tone,T_A=+25℃



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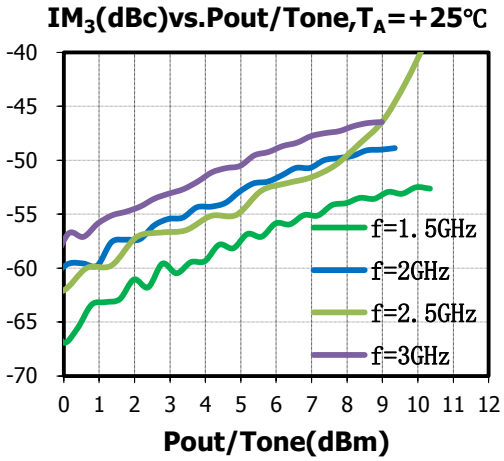

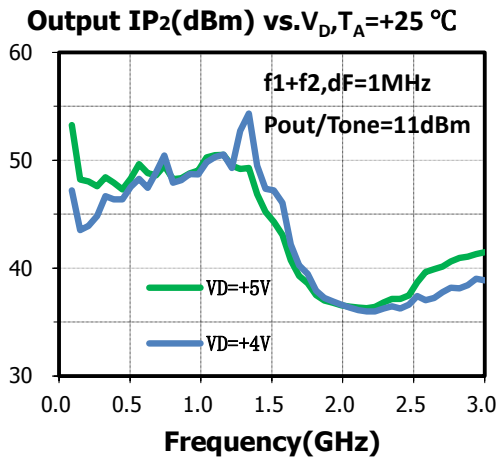

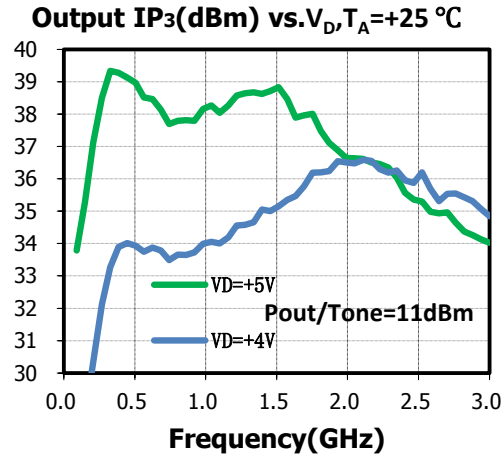

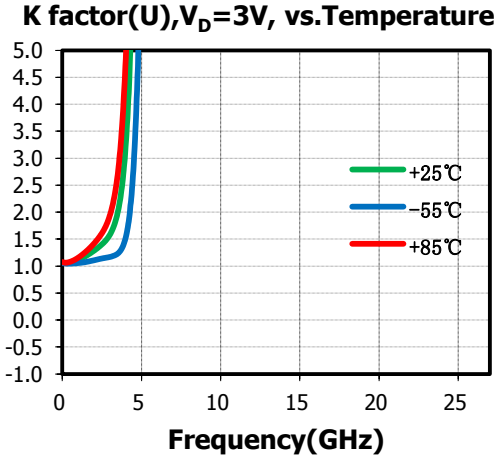

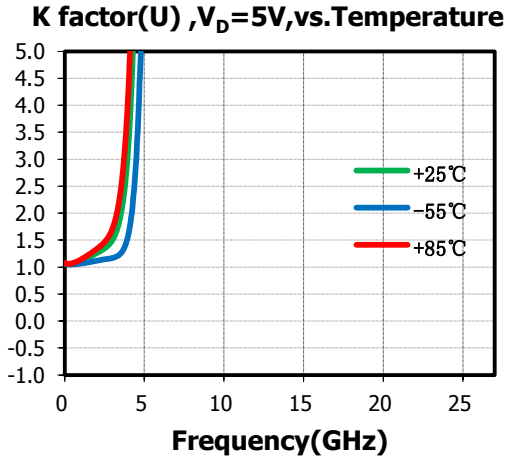

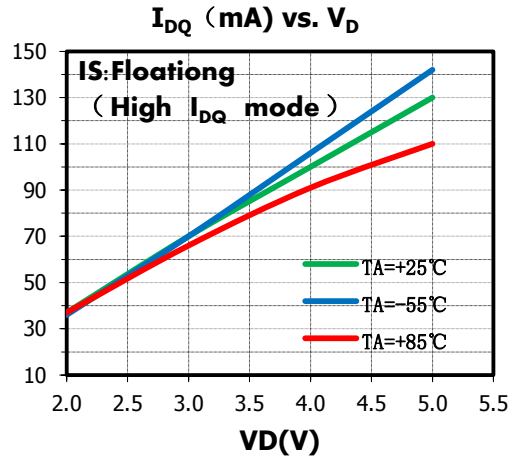

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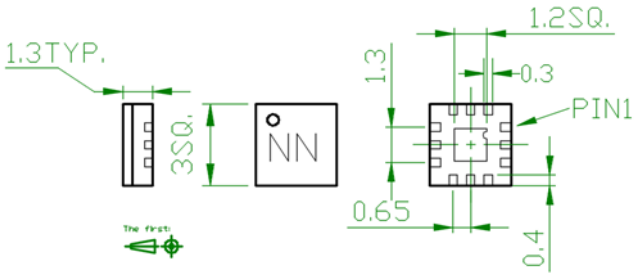
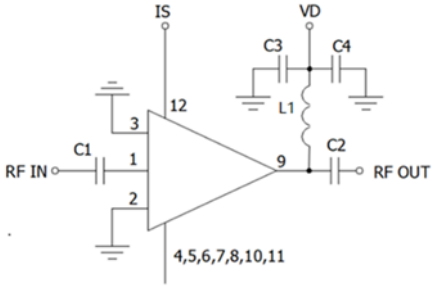
Outline Drawing
(All dimensions in mm)



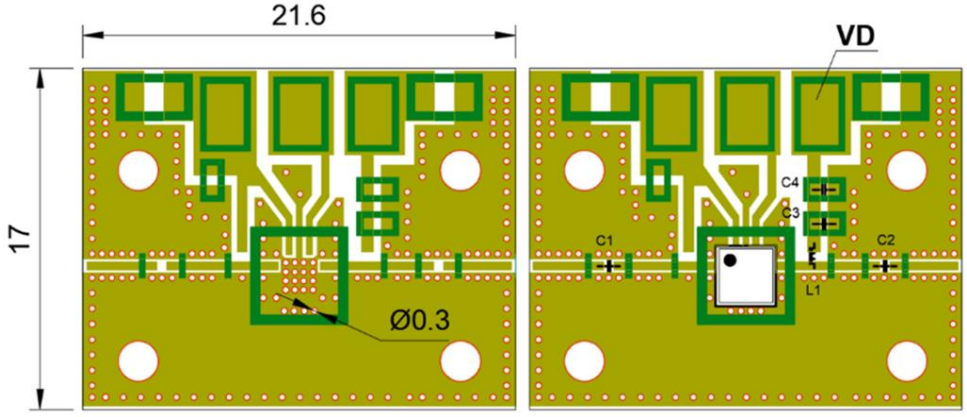
Application Circuit



Pin Function

Pin No.	Description	Pin No.	Description
1	RF input, DC Coupled	7	Connect to ground
2	Connect to ground	8	Connect to ground
3	Connect to ground	9	RF output, DC Coupled
4	Connect to ground	10	Connect to ground
5	Connect to ground	11	NC or connect to ground
6	Connect to ground	12	IS, I_{DQ} selecting

SAC4003Q3 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.

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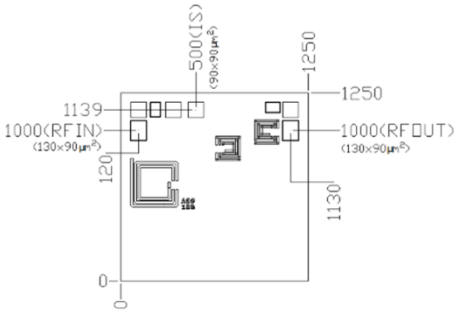
Components List

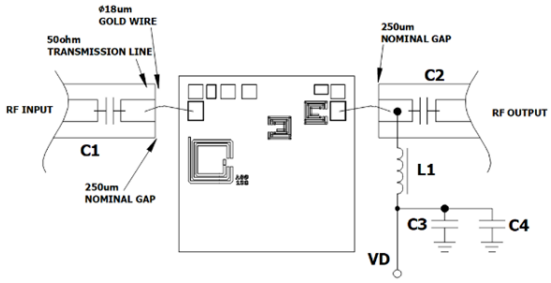
LF operation frequency	C1	C2	C3	C4	L1
500KHz	20nF	20nF	20nF	0.22μF	51μH
30MHz	360pF	360pF	360pF	0.22μF	1μH
100MHz	100pF	100pF	100pF	0.22μF	0.27μH

Bare Die Outline (μm)



t=100 μm

Assembly Diagram



Attention:

1. The moisture resistant grade of SAC4003Q3 is 2a, the storage environment ≤30° C/60% 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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