SAC3116A

GaAs MMIC Power Amplifier
13.5GHz~14.5GHz 38dBm

Rev 1.0

Features

- Frequency: 13.5GHz~14.5GHz
- Small Signal Gain: 30dB
- Output P_{-1}dB: 38dBm
- Power-Added Efficiency: 32%@OP_{-1}dB,f=14.25GHz
- IM_3: -25dBc, 30dBm/Tone@14.25GHz
- Die Size: 4mm×3.5mm×0.1mm
- Supply Voltage: +7V/-Vg
- Packaged: Bare Die

Typical Applications

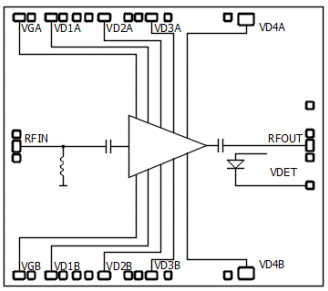
- Microwave radio
- Telecommunication
- SatCom

General Description

SAC3116A is a Ku-band GaAs MMIC power amplifier. SAC3116A provides 30 dB of gain, and 38dBm of output power for 1 dB compression and more than 32%PAE from a +7V supply.

The chip has surface passivation for protection and backside via holes and gold metallization to allow a conductive epoxy die attach process.

Functional Diagram



Electrical Performance

T_A=25℃, V_D=+7V, I_{DQ}=2.5A, Z_0=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	13.5	—	14.5	GHz
Small Signal Gain	27	30	—	dB
Small Signal Gain Flatness	—	±0.5	±1	dB
Reverse Isolation	—	-70	—	dB
VSWR of RF input port	—	1.5	2	:1
Power-Added Efficiency	—	32	—	%
Output P_{-1}dB	37.4	38	—	dBm
IM_3*	—	25	—	dBc
Drain Voltage (V_D)	7	—	8	V
Gate Current	—	4	30	mA
Supply Current (I_D)***	—	—	4.5	A
Thermal Resistance **	—	2.44	—	℃/W

* Pout/Tone=30dBm, fc=14.25GHz, Δf=4MHz.

** Measurement taken at Pout = OP_{-1}dB, IR method. 100% DC power is dissipated on the device the thermal resistance is 3.57 ℃/W.

*** Adjust Vg between -1V to -0.6V to achieve I_{DQ}= 2.5A typical. In low RF out power operation, the quiescent current can be set to 1.4Amps.

Absolute Maximum Ratings

Maximum Input Power	+16dBm	Operating Temperature (Chip back temperature)	-55℃~+85℃
Channel Temperature	150℃	Storage Temperature	-55℃~+150℃
Maximum V_D	+8.5V	V_G Bias	-1.5V~-0.4V

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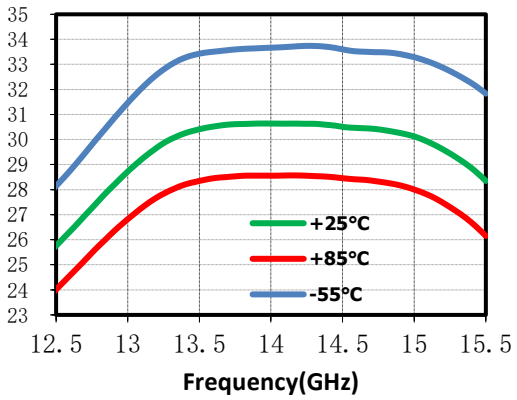
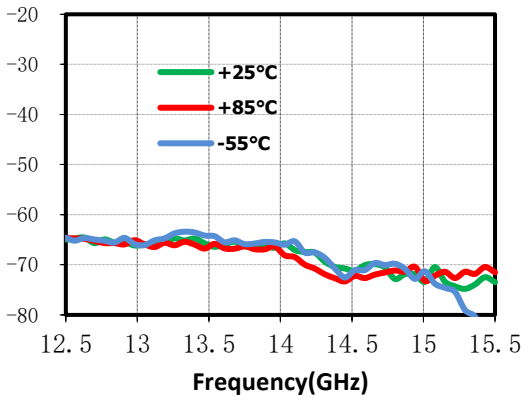
Typical Small Signal Performance Curve

The following data are obtained by SAC3116A evaluation board, V_D = + 7V, I_{DQ} = 2.5A, CW, T_A = +25℃

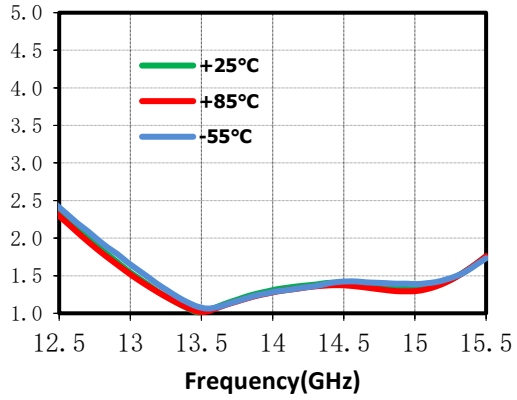
Small Signal Gain(dB) vs.Temperature



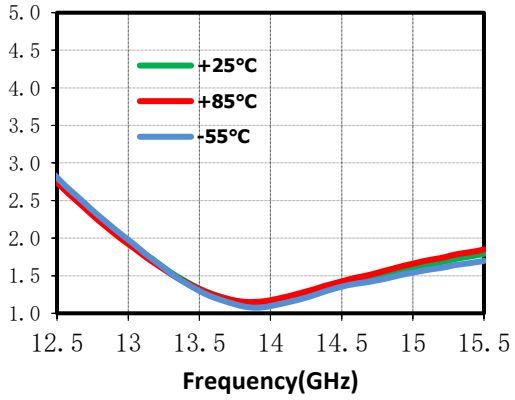
Isolation(dB) vs.Temperature



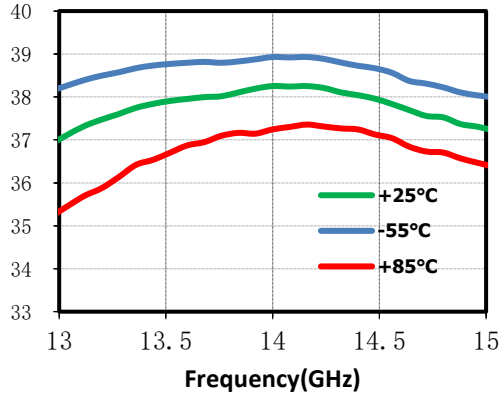
Input VSWR(:1) vs.Temperature



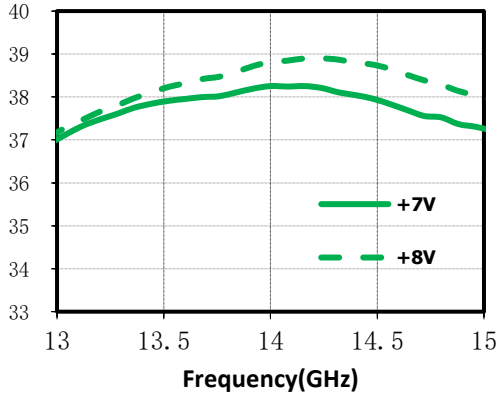
Output VSWR(:1) vs.Temperature



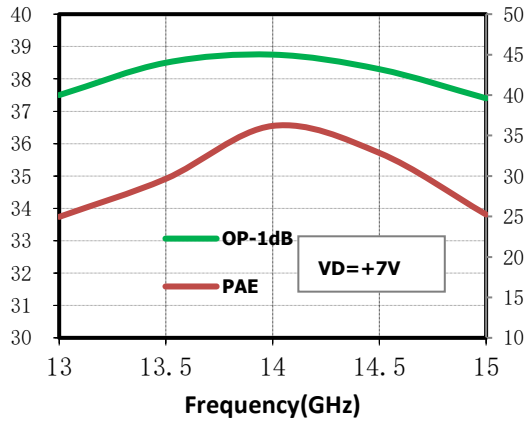
OP-1dB(dBm)vs.Temperature



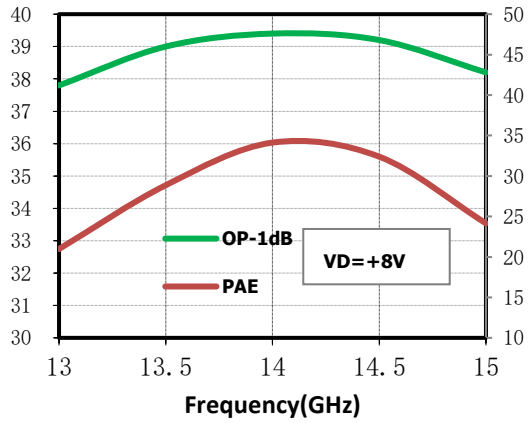
OP-1dB(dBm)vs.VD



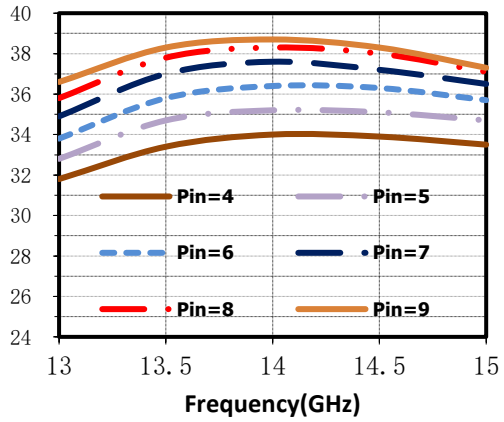
OP-1dB(dBm),PAE(%)vs.Frequency



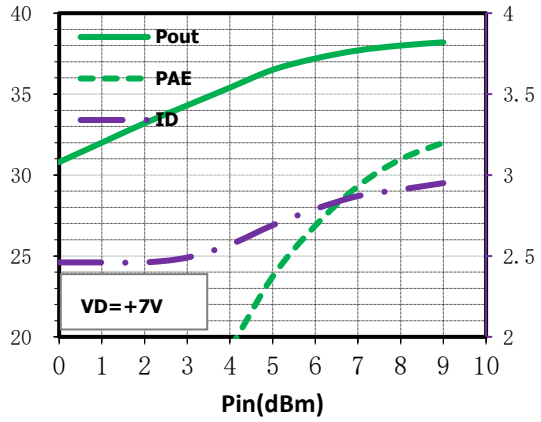
OP-1dB(dBm),PAE(%)vs.Frequency



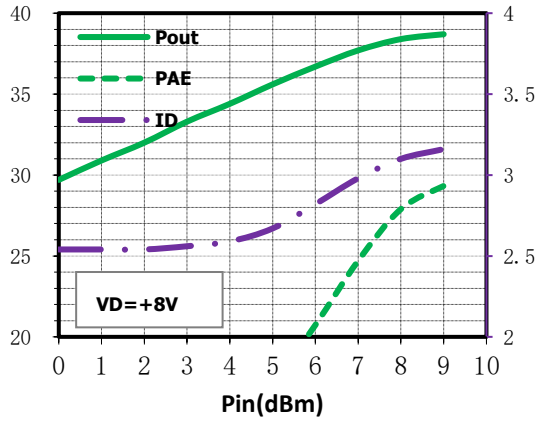
Pout(dBm)vs. Pin(dBm)



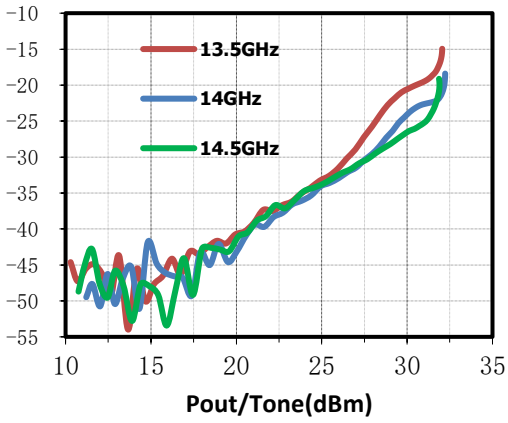
Pout(dBm)、PAE(%)、ID(A) vs. Pin,f=14GHz



Pout(dBm)、PAE(%)、ID(A) vs. Pin,f=14GHz



IM3(dBc)vs.Pout/Tone



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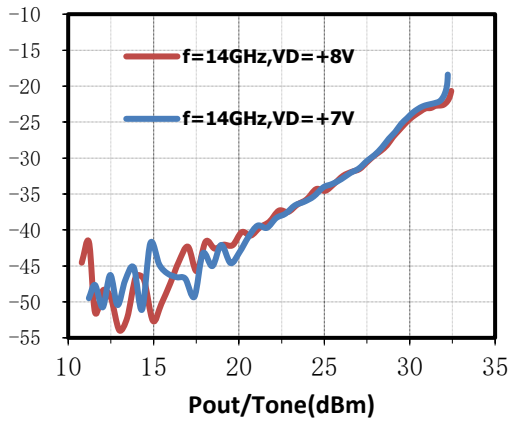
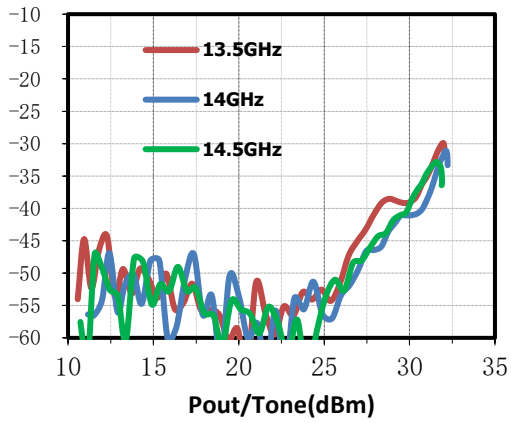
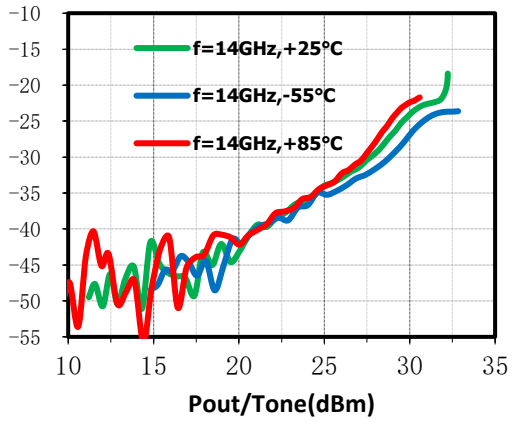
IM3(dBc)vs.VD(V)



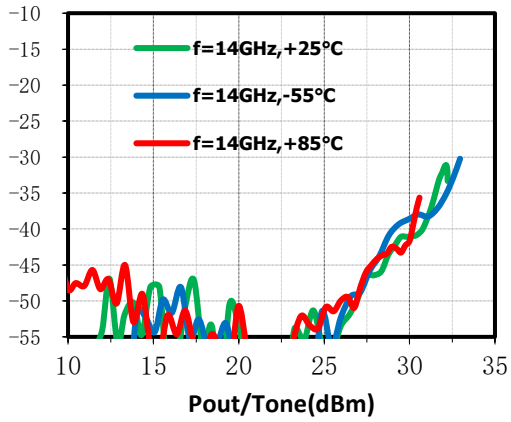
IM5(dBc)vs.Pout/Tone



IM3(dBc)vs.Temperature

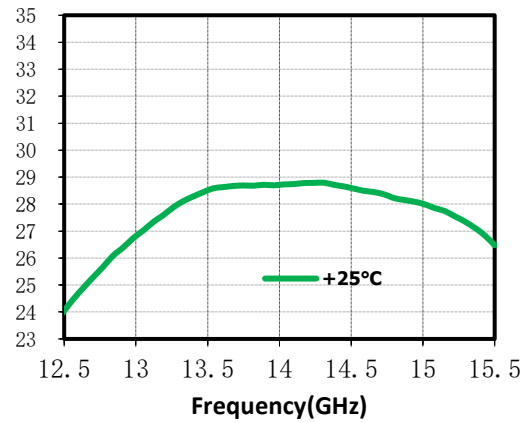


IM5(dBc)vs.Temperature

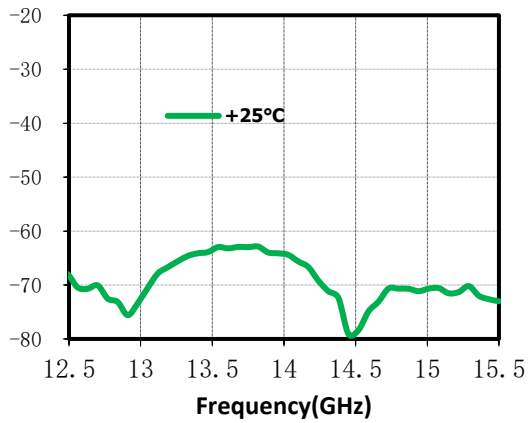


The following data are obtained by SAC3116A evaluation board, V_D = +7V, I_{DQ} = 1.4A, CW, T_A = +25℃

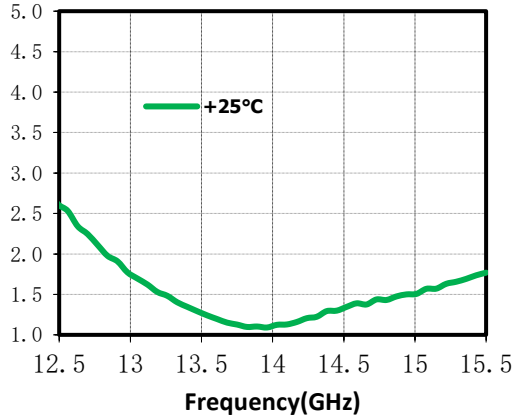
Small Signal Gain(dB) vs.Temperature



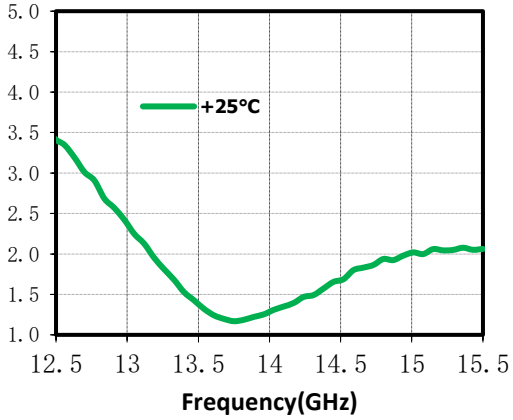
Isolation(dB) vs.Temperature



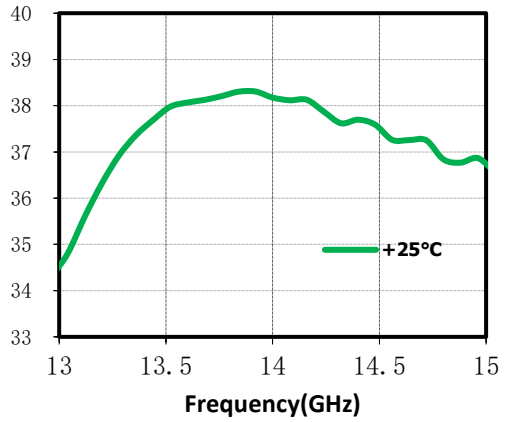
Input VSWR(:1) vs.Temperature



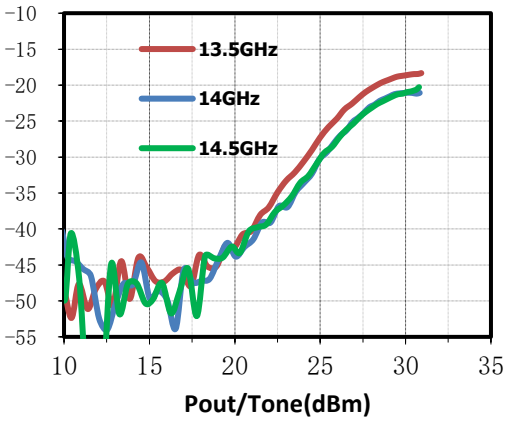
Output VSWR(:1) vs.Temperature



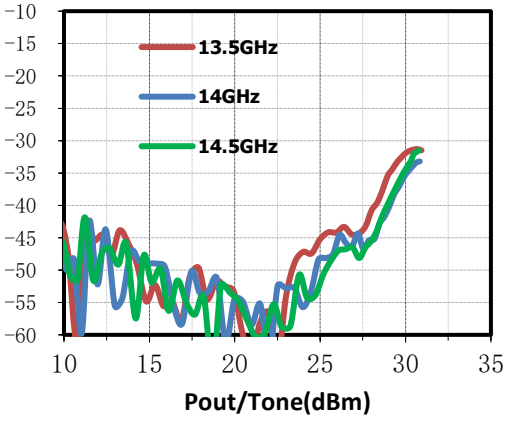
OP-1dB(dBm)vs.Temperature



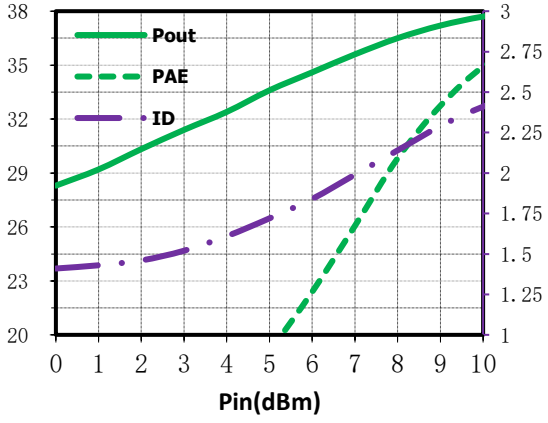
IM3(dBc)vs.Pout/Tone



IM5(dBc)vs.Pout/Tone

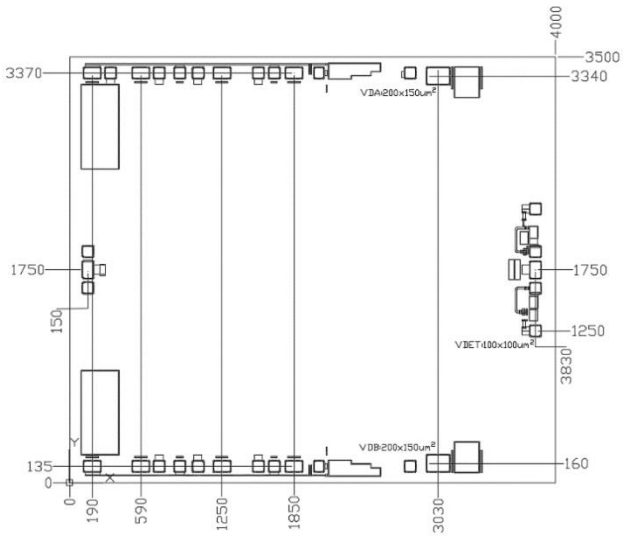


Pout(dBm)、PAE(%)、ID(A) vs. Pin,f=14GHz

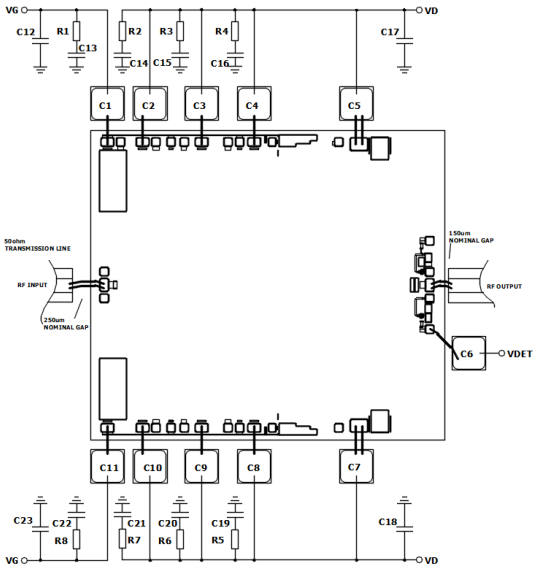


Die Outline

(All dimensions in μm)



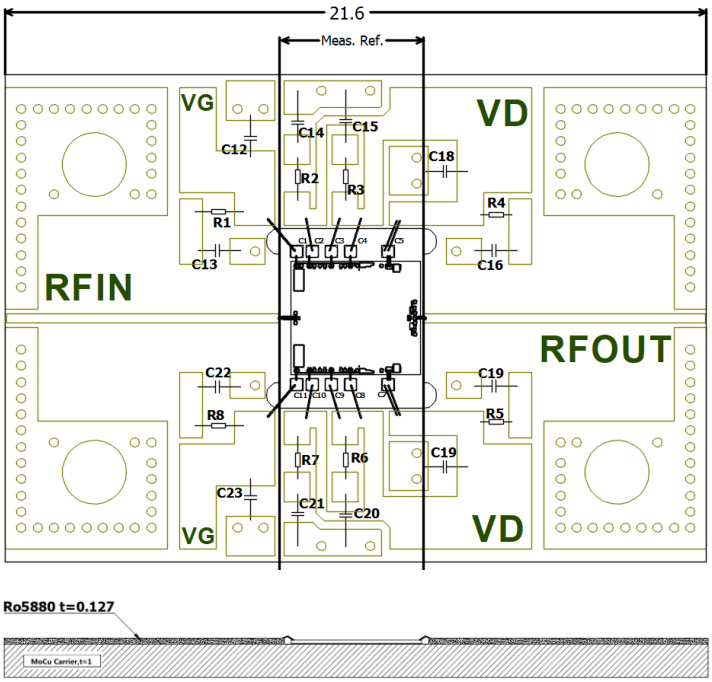
Assembly Diagram



Components List

Reference Des.	Value	Part Number	Manuf.	Size
C12、C17、C18、C23	10μF	—	—	0805
C1~C11	100pF	—	ANY	SLC
C13~C16, C19~C22	0.47μF	—	—	0603
R1~R8	2R2	—	—	0603

SAC3116A EVB



Attention:

1. SAC3116A is biased with a positive drain supply and negative gate supply. The recommended gate voltage is set to -0.6 to -1V when the drain voltage is set to 7V;

2. The back of chip is RF ground;

3. 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;

4. Bypass SLCs should be placed as close as possible to the chip;

5. GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test;

6. The maximum spike voltage at drains (VDxx) should not exceed 8.75v.

Revision History

Revision	Date	Comment
1.0	March 15, 2021	First Release

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