SAC3116AQP6

GaAs MMIC Power Amplifier
13.5GHz~14.5GHz 38dBm

Rev 1.1

Features

- Frequency: 13.5GHz~14.5GHz
- Small Signal Gain: 29dB
- Output P_{-1}dB: 38dBm
- PAE: 30%@OP-1dB, f=14.25GHz
- IM_3: -25dBc, 30dBm/Tone@14.25GHz
- Package Size: 6mm×6mm×0.75mm
- Integrated forward and reverse output power detector
- Supply Voltage: +7V/-Vg

Typical Applications

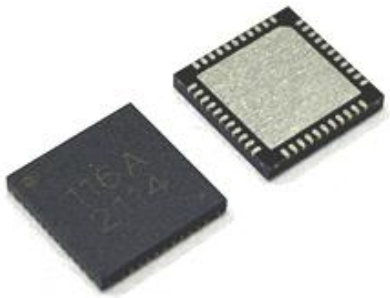
- Microwave radio
- Telecommunication
- SatCom

General Description

SAC3116AQP6 is a Ku-band GaAs MMIC power amplifier. SAC3116AQP6 provides 29 dB of gain, and 38dBm of output P_{-1}dB and more than 30%PAE from a +7V supply.

SAC3116AQP6 is packaged with low stress injection molding QFN that meets ROHS standard. Its inner chip is the package model of SAC3116AQP6 bare chip. The surface of bare chip is protected by dielectric layer, which has good environmental adaptability and stability.

Picture



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	26	29	—	dB
Small Signal Gain Flatness	—	±0.5	±1	dB
Reverse Isolation	—	-70	—	dB
VSWR of RF input port	—	1.5	2	:1
PAE	—	30	—	%
Output P_{-1}dB	37.2	38	—	dBm
IM_3*	—	25	—	dBc
Drain Voltage (V_D)	7	—	8	V
Gate Current	—	3	14	mA
Supply Current (I_D)***	—	—	4.5	A
Thermal Resistance **	—	2.48	—	℃/W

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

** When Pout=OP_{-1}dB, the thermal resistance is 3.72 ℃/W without RF power output (100% DC power is dissipated in the device)

*** Adjust Vg voltage (- 1~- 0.6V) to achieve I_{DQ} about 2.5A, and the typical Vg voltage is - 0.75V. For low output power (low current consumption) applications, I_{DQ} can be reduced to 1.4A. The device characteristics after reducing I_{DQ} are shown in the "V_D = + 7V, I_{DQ} = 1.4A" curve

Absolute Maximum Ratings

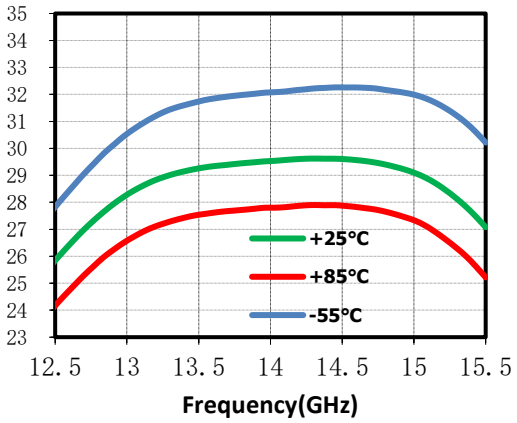
Maximum Input Power	+15dBm	Operating Temperature (Package bottom temperature)	-55℃~+85℃
Channel Temperature	150℃	Storage Temperature	-55℃~+150℃
Maximum V_D Supply	+8.5V	V_G Range	-1.5V~-0.6V

SuperApex, LLC
1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

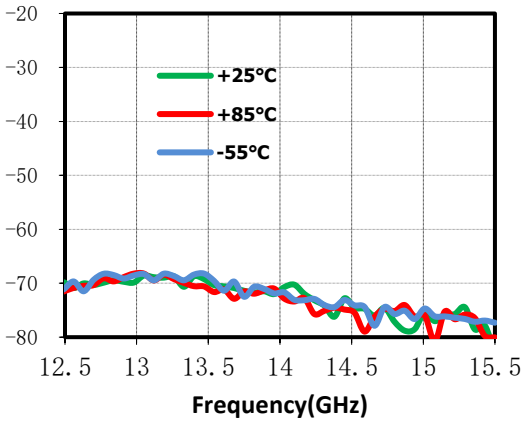
Typical Performance Curve

The following data are obtained from SAC3116AQP6 evaluation board,V_D=+7V, I_{DQ}=2.5A, Working mode CW, T_A=+25℃

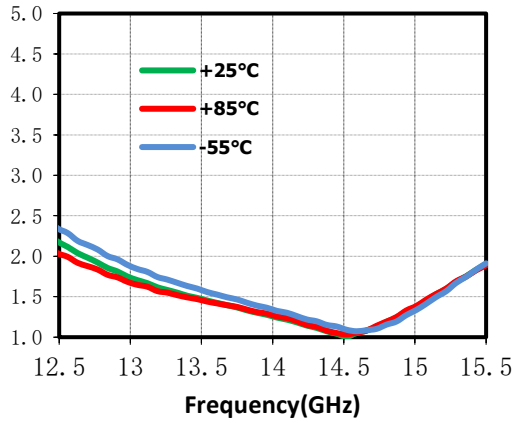
Small Signal Gain(dB) vs.Temperature



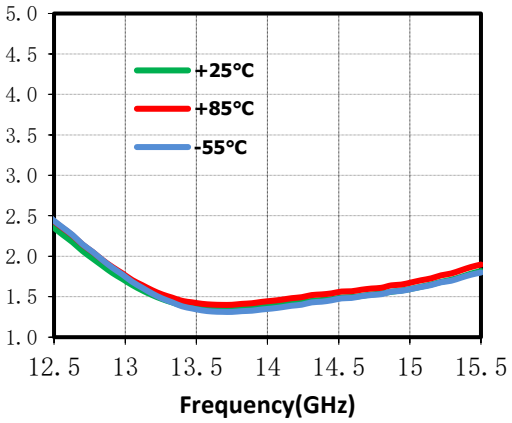
Isolation(dB) vs.Temperature



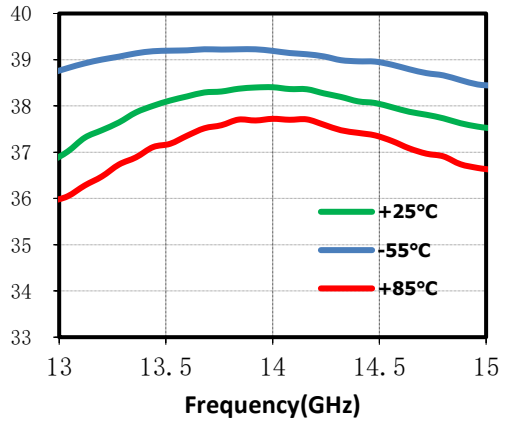
Input VSWR(:1) vs.Temperature



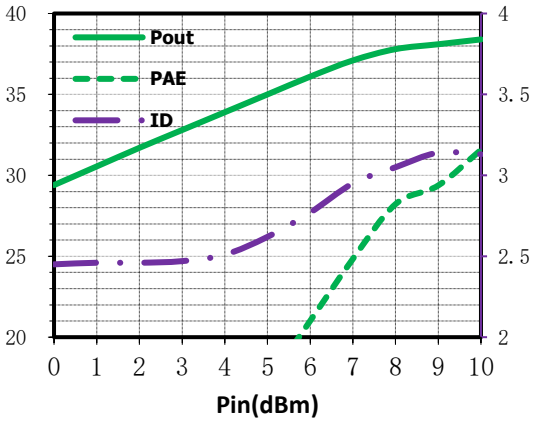
Output VSWR(:1) vs.Temperature



OP_{-1}dB(dBm)vs.Temperature

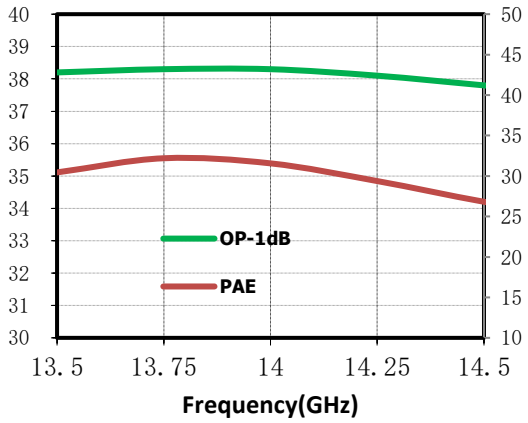


Pout(dBm)、PAE(%)、ID(A) vs. Pin,f=14GHz

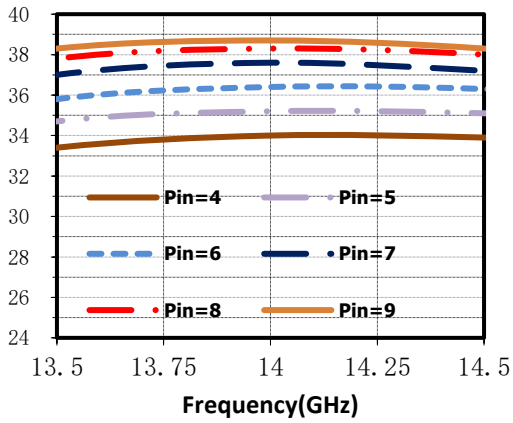


SuperApex, LLC
1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

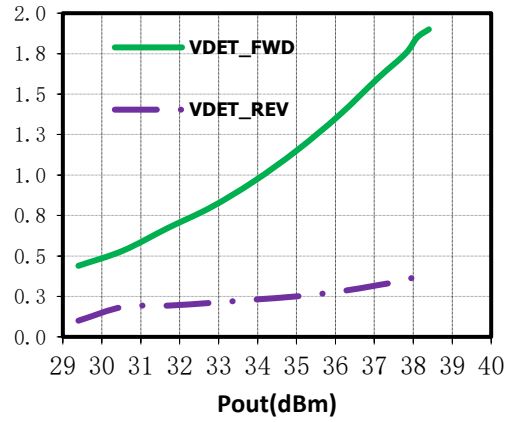
OP-1dB(dBm),PAE(%)vs.Frequency



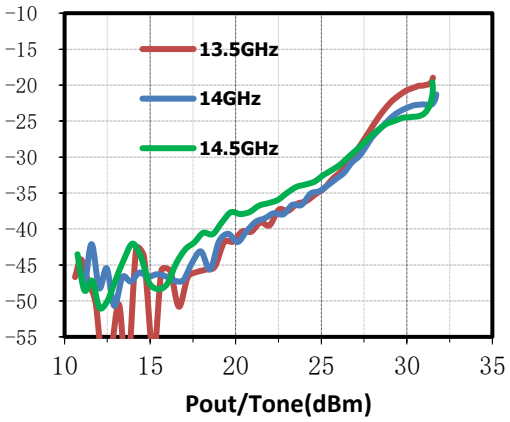
Pout(dBm)vs. Pin(dBm)



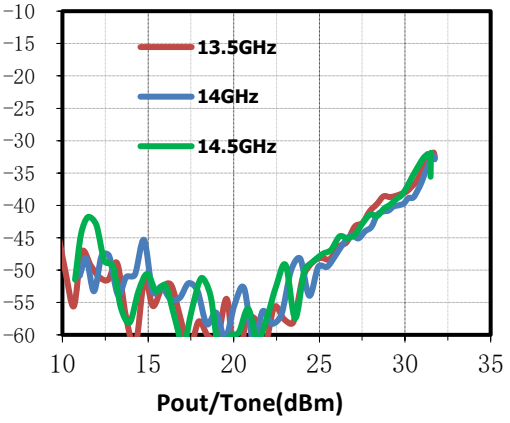
VDET_FWD(V)、VDET_REV(V)vs. Pout,f=14GHz



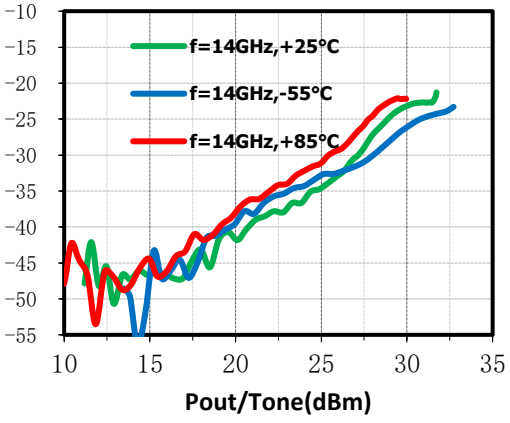
IM3(dBc)vs.Pout/Tone



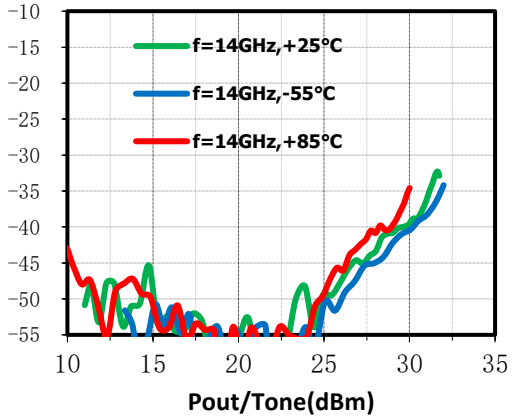
IM5(dBc)vs.Pout/Tone



IM3(dBc)vs.Temperature

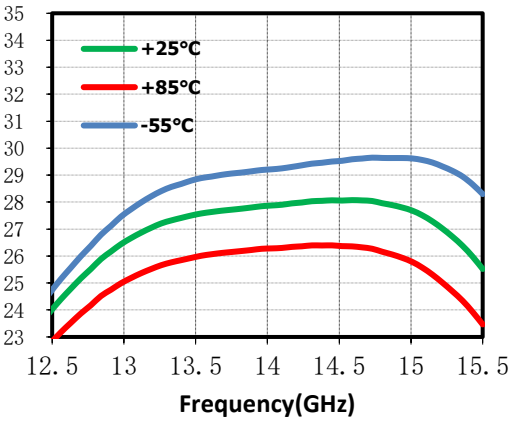


IM5(dBc)vs.Temperature

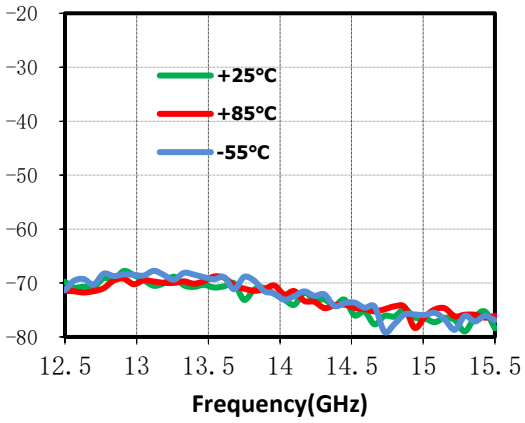


The following data are obtained from SAC3116AQP6 evaluation board,V_D=+7V, I_{DQ}=1.4A, Working mode CW, T_A=+25℃

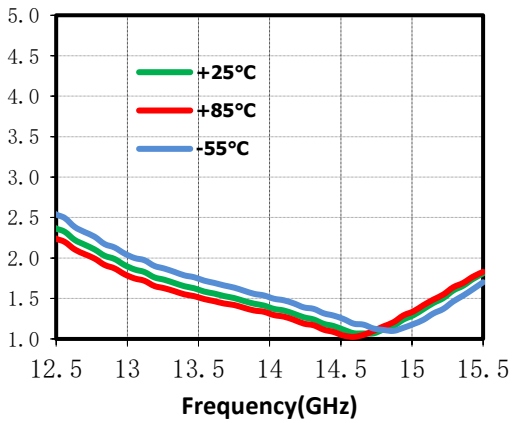
Small Signal Gain(dB) vs.Temperature



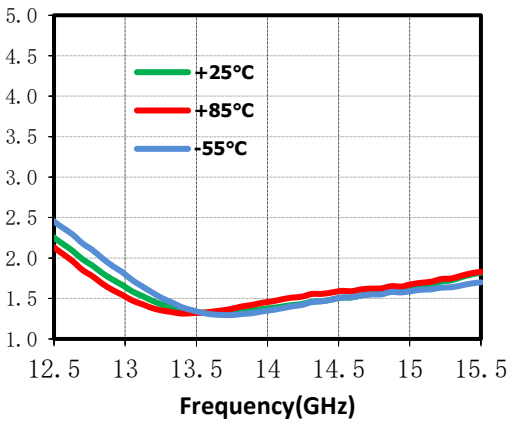
Isolation(dB) vs.Temperature



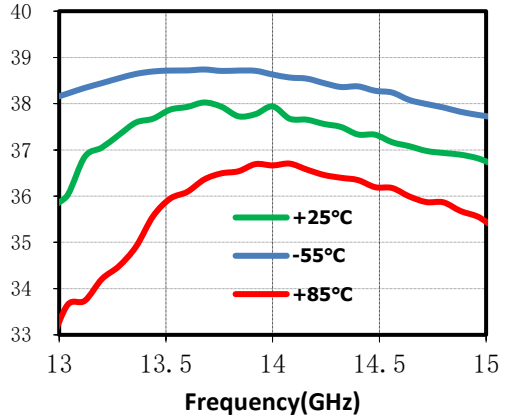
Input VSWR(:1) vs.Temperature



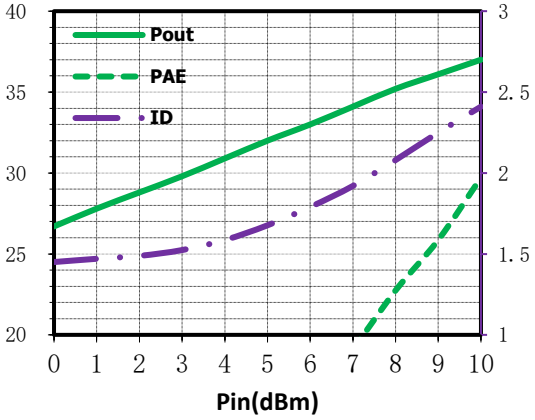
Output VSWR(:1) vs.Temperature



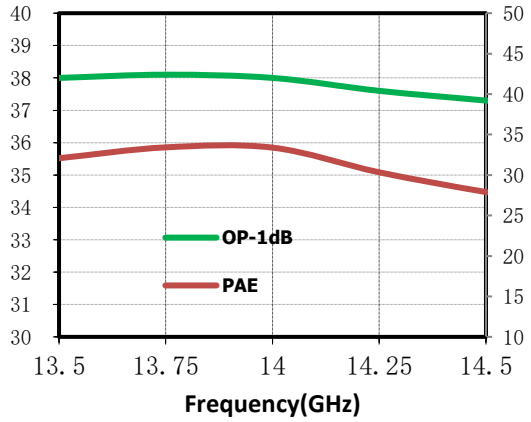
OP-1dB(dBm)vs.Temperature



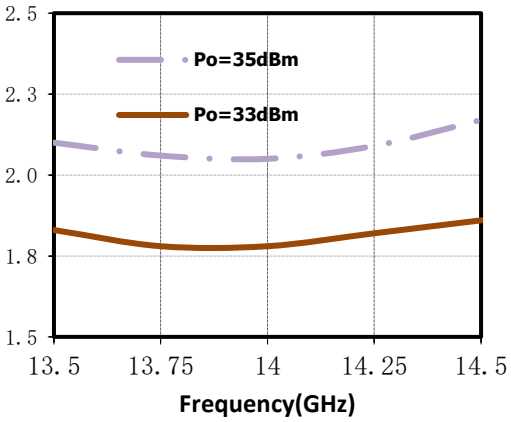
Pout(dBm)、PAE(%)、ID(A) vs. Pin,f=14GHz



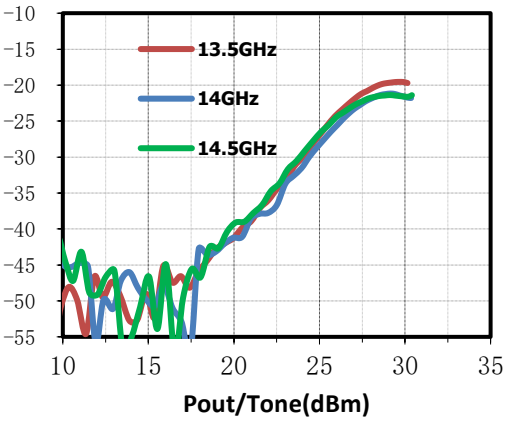
OP-1dB(dBm),PAE(%)vs.Frequency



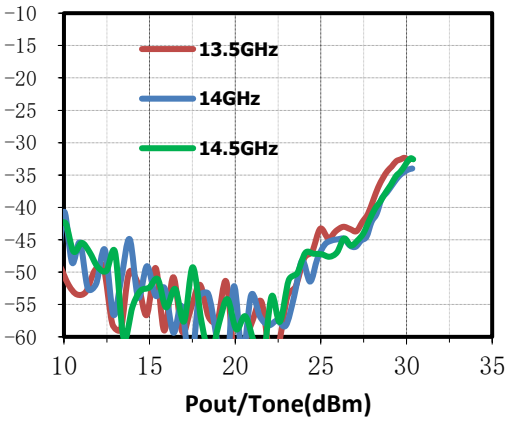
Pout(dBm)vs. ID(A)



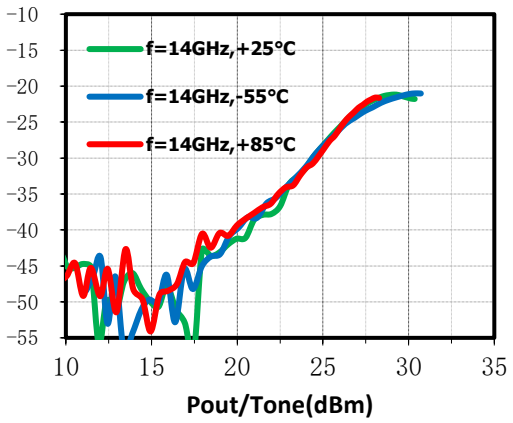
IM3(dBc)vs.Pout/Tone



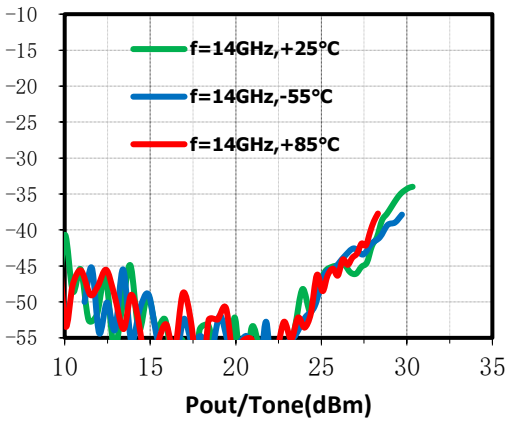
IM5(dBc)vs.Pout/Tone



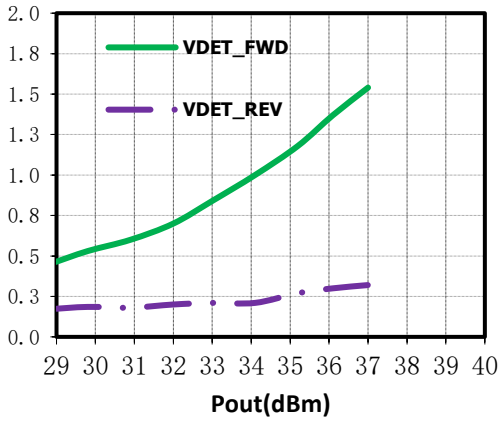
IM3(dBc)vs.Temperature



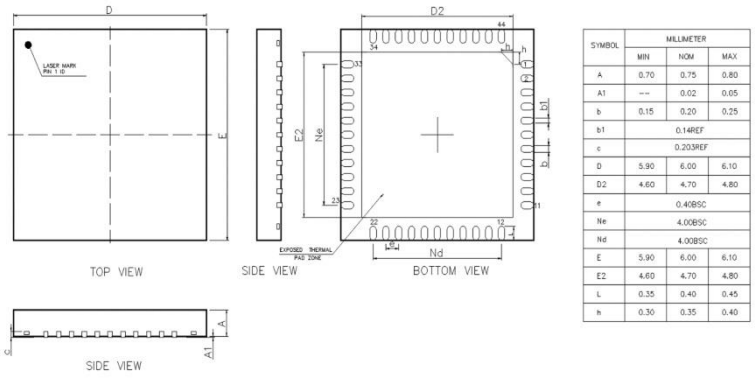
IM5(dBc)vs.Temperature



VDET_FWD(V)、VDET_REV(V)vs. Pout,f=14GHz

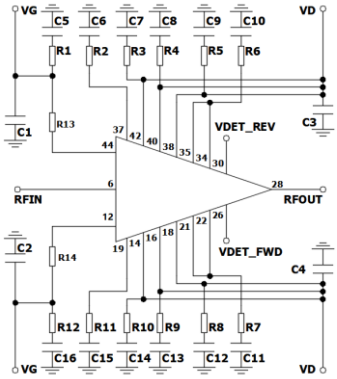


Outline Drawing



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	---	0.02	0.05
b	0.15	0.20	0.25
b1		0.14REF	
c		0.203REF	
D	5.90	6.00	6.10
D2	4.60	4.70	4.80
e		0.40BSC	
Ne		4.00BSC	
Nd		4.00BSC	
E	5.90	6.00	6.10
E2	4.60	4.70	4.80
L	0.35	0.40	0.45
h	0.30	0.35	0.40

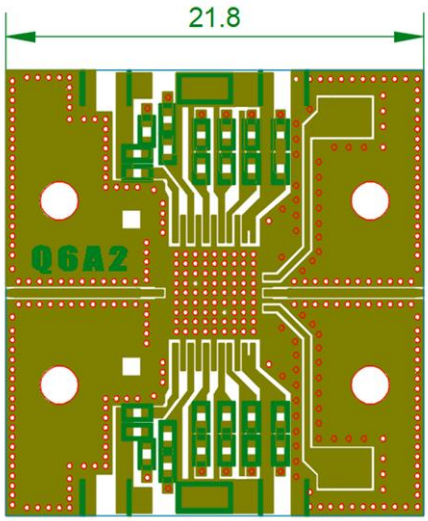
Application Circuit



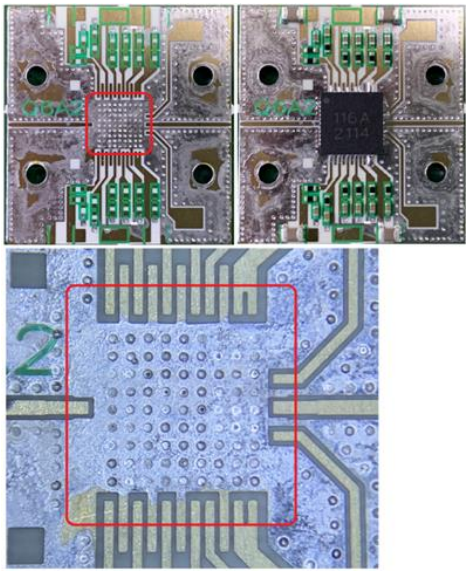
Components List

Reference Des.	Value	Part Number	Manuf.	Size
C1~C2	47μF	—	—	0805
C3~C4	10μF	—	—	0805
C5~C16	0.47μF	—	—	0402
R1~R14	1R	—	—	0402

SAC3116AQP6 Evaluation Board



Assembly Instructions



Ro4350b, t=0.254, design impedance of input and output transmission lines is 50 Ω.

The bottom center pad of SAC3116AQP6 chip package is used for RF grounding and heat dissipation. As shown in the figure above, it is necessary to ensure that there is solder filling in the vias after welding. Insufficient number of vias or insufficient solder filling will significantly affect the heat dissipation process of the device, and then reduce the performance or even damage the device.

Attention:

1. SAC3116AQP6 needs VDx and VGx bias. Before applying the positive drain voltage, make sure that the negative grid voltage has been applied.

2. The moisture resistant grade of products is 2a, the storage environment ≤30℃/60% RH,the surrounding workshop life is 4 weeks.

3. After un-packing, it is necessary to bake the parts for 6 hours in 125+/-5° degree environment before soldering.

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

Revision History

Revision	Date	Comment
1.0	April 17, 2021	First Release
1.1	January 18, 2023	1. Revise typo. 2. Revise application circuit