

SAC3140A



GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.1

Features

- Frequency: 27.5GHz~31GHz
- Gain: 24dB
- Output P_{-1dB}: 39dBm
- Supply Voltage: +6V/-VG
- Power-Added Efficiency: 25%@P_{-1dB},f=29GHz
- Die Size: 4mm×6.9mm×0.1mm

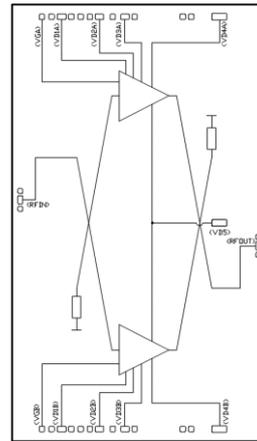
Typical Applications

- Microwave radio
- Telecommunication
- SatCom

General Description

SAC3140A is a Ka-band GaAs MMIC power amplifier, which operates in between 27.5GHz and 31GHz. SAC3140A provides 24 dB of gain, and 39dBm of output power for 1 dB compression and nominal 25%PAE from a +6V supply.

Functional Diagram



Electrical Performance

T_A=25°C, V_D=+6V, I_D=4.5A, Z₀=50Ω, CW

Parameter	Min.	Typ.	Max.	Units
Frequency Range	27.5~31			GHz
Small Signal Gain	22	24	—	dB
Small Signal Gain Flatness	—	±1	±2	dB
Reverse Isolation	—	-55	—	dB
Input VSWR	—	1.5	2.2	:1
Power-Added Efficiency*	—	25	—	%
Output Power for 1 dB Compression (OP _{-1dB})	38.5	39	—	dBm
Drain Voltage(V _D)	—	6	6.5	V
Gate Current(I _G)	—	5	60	mA
Supply Current(I _D)	—	6	7.5	A
Thermal Resistance	—	2.33	—	°C/W

*At Output P_{-1dB}, f=29GHz

Absolute Maximum Ratings

Maximum Input Power	+20dBm, CW 30s	Operating Temperature	-55°C~+85°C
Channel Temperature	+150°C	Storage Temperature	-65°C~+150°C
Maximum V _D	+6.5V	Maximum V _G	-1.8V(MUTE)
Maximum RFOUT Port Mismatch	2.5:1, T _A =+25°C		

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

SAC3140A



GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

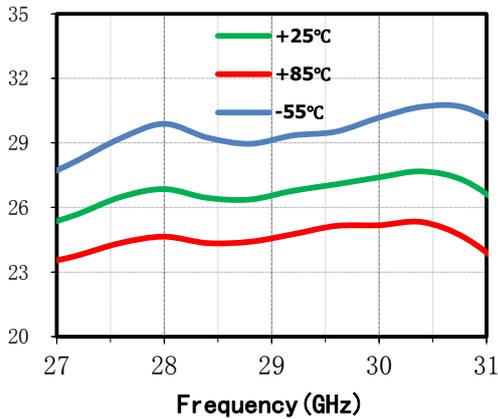
Rev1.1

Typical Performance Curve

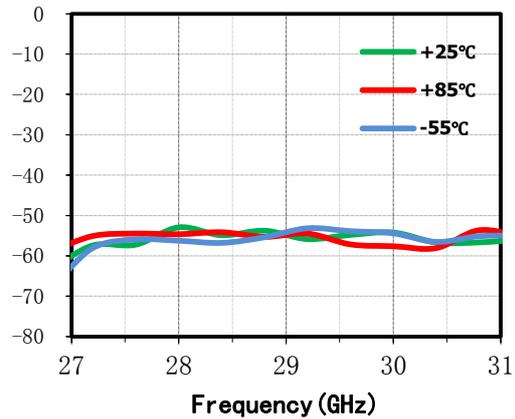
The results captured in the test-jig environment

$V_D=+6V$ $I_{DQ}=4.5A$ CW

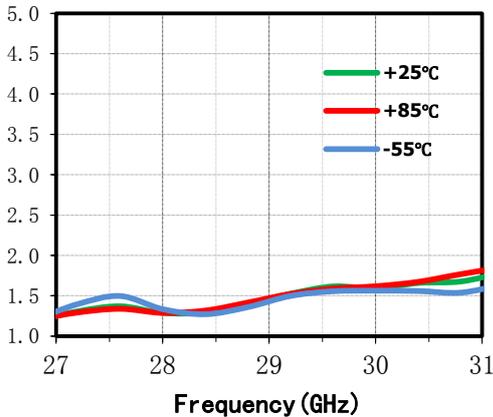
Small Signal Gain(dB) vs. Temperature



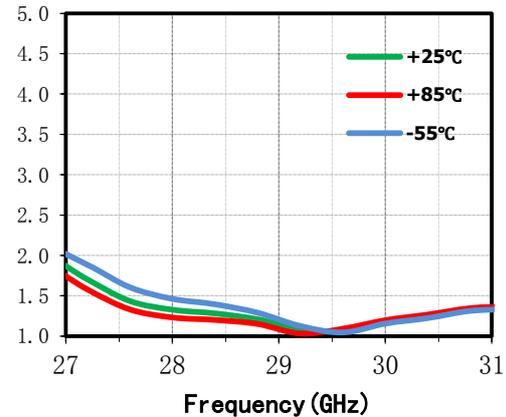
Isolation(dB) vs. Temperature



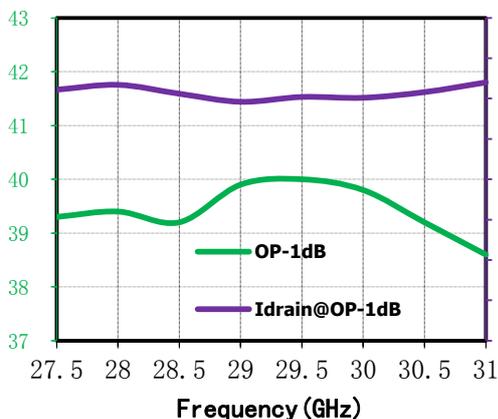
Input VSWR(:1) vs. Temperature



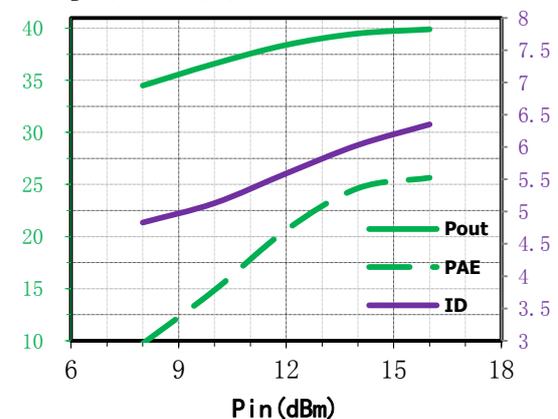
Output VSWR(:1) vs. Temperature



Output P-1dB (dBm) vs. Frequency



$I_D(A)$ 、PAE(%) vs. P_{out} , $f=27.5GHz$



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

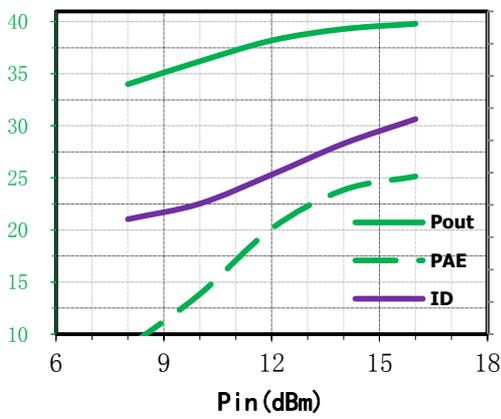
SAC3140A



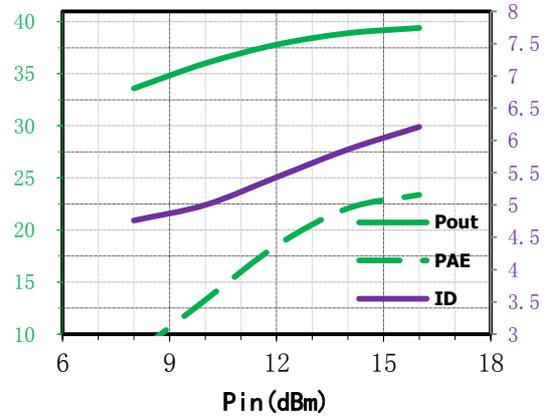
GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.1

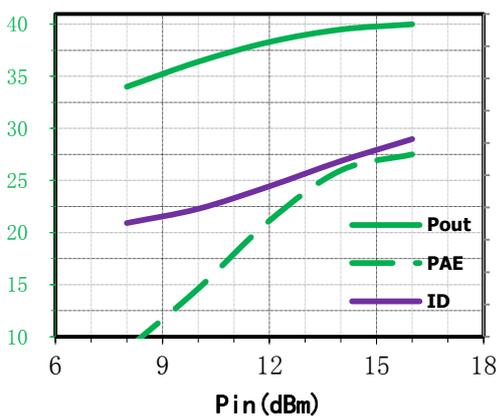
I_D (A)、PAE(%) vs. Pout, f=28GHz



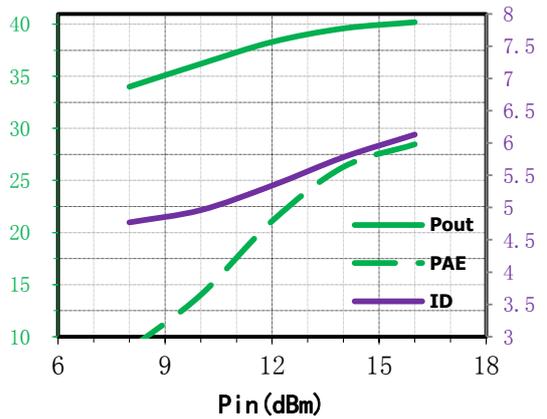
I_D (A)、PAE(%) vs. Pout, f=28.5GHz



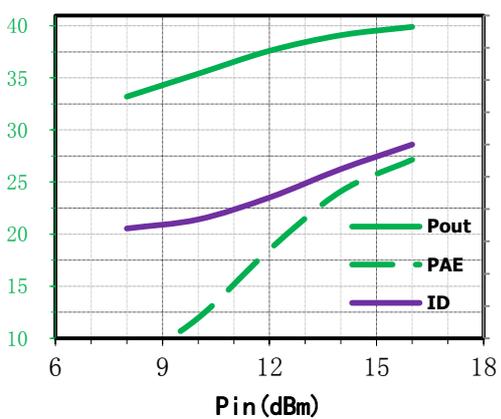
I_D (A)、PAE(%) vs. Pout, f=29GHz



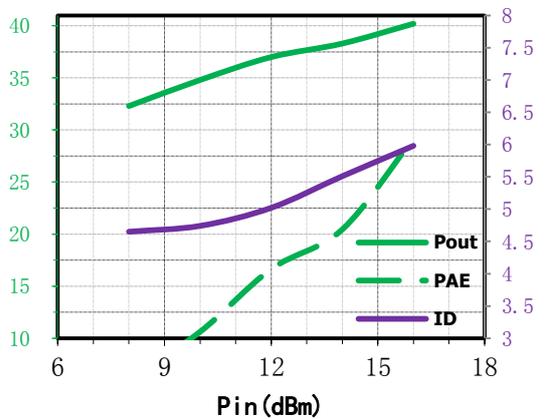
I_D (A)、PAE(%) vs. Pout, f=29.5GHz



I_D (A)、PAE(%) vs. Pout, f=30GHz



I_D (A)、PAE(%) vs. Pout, f=30.5GHz



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

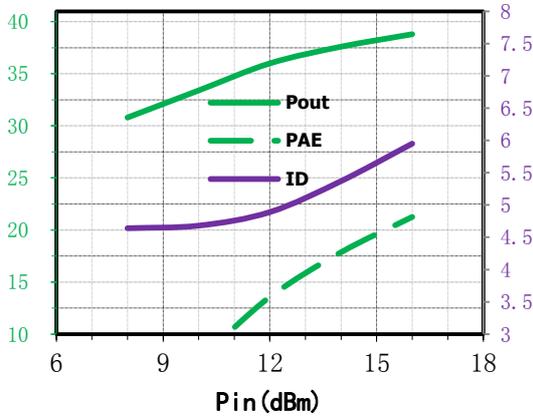
SAC3140A



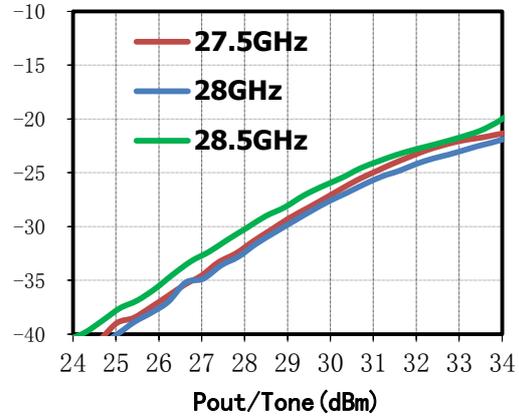
GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.1

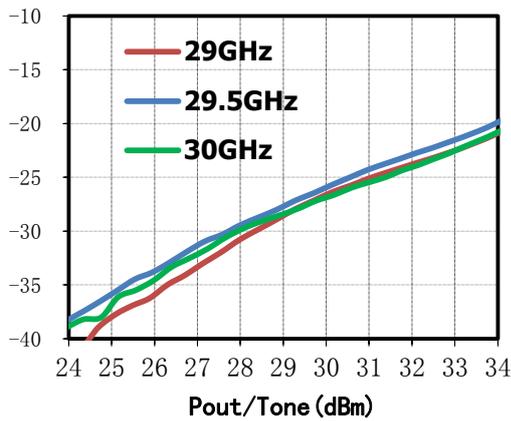
I_D (A)、PAE(%) vs. P_{out} , f=31GHz



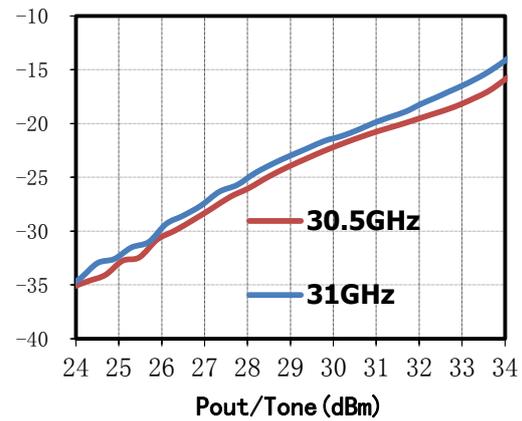
IM₃ (dBc) vs. P_{out} /Tone



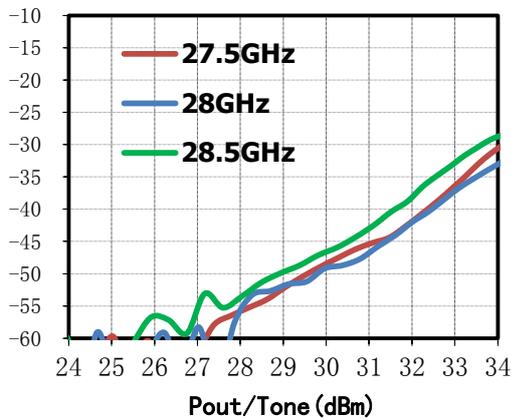
IM₃ (dBc) vs. P_{out} /Tone



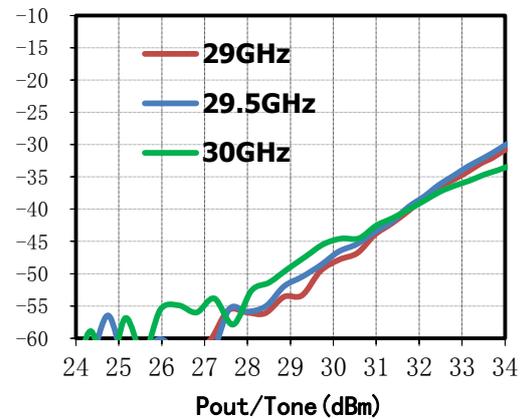
IM₃ (dBc) vs. P_{out} /Tone



IM₅ (dBc) vs. P_{out} /Tone



IM₅ (dBc) vs. P_{out} /Tone



SuperApex, LLC

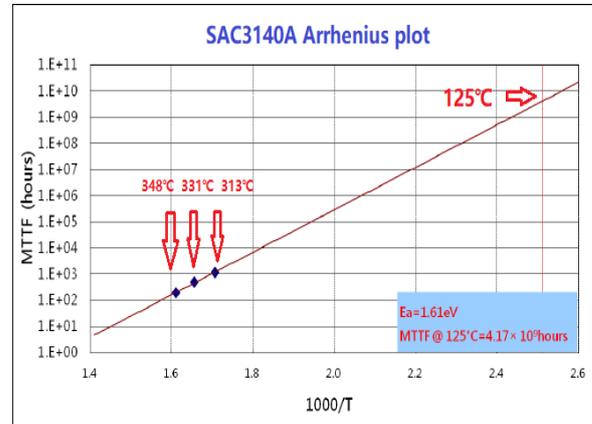
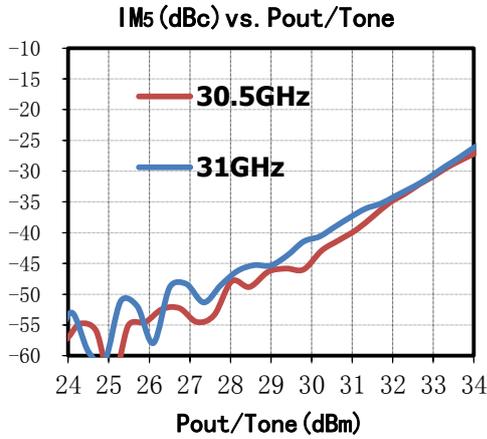
1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

SAC3140A

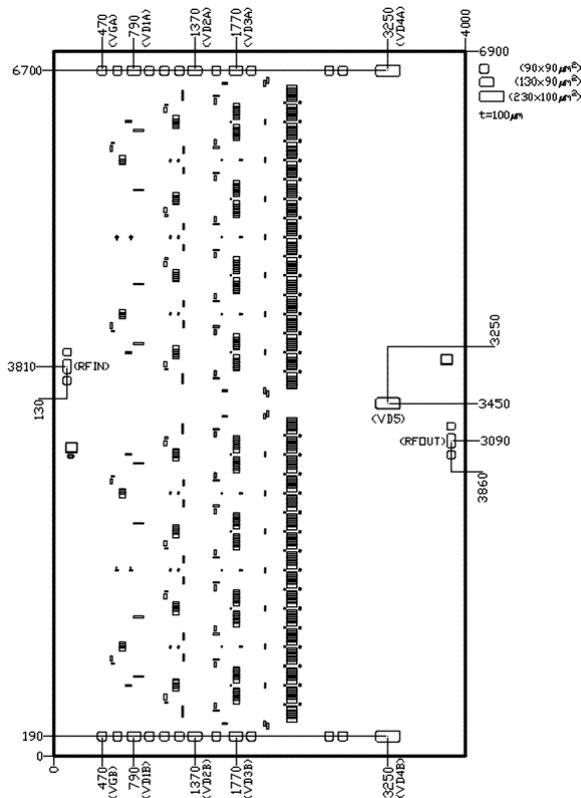


GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

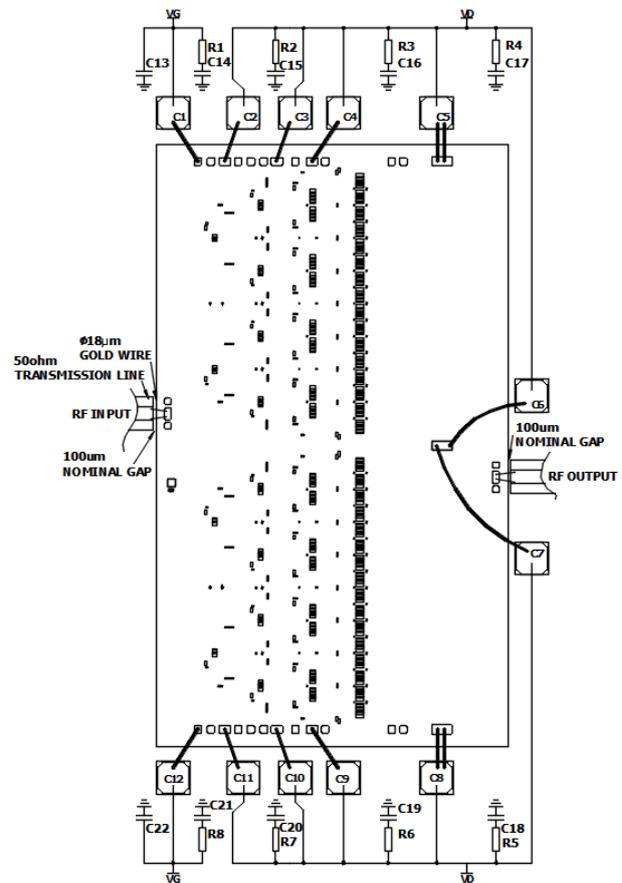
Rev1.1



Die Outline
(All dimensions in μm)



Assembly Diagram



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

SAC3140A

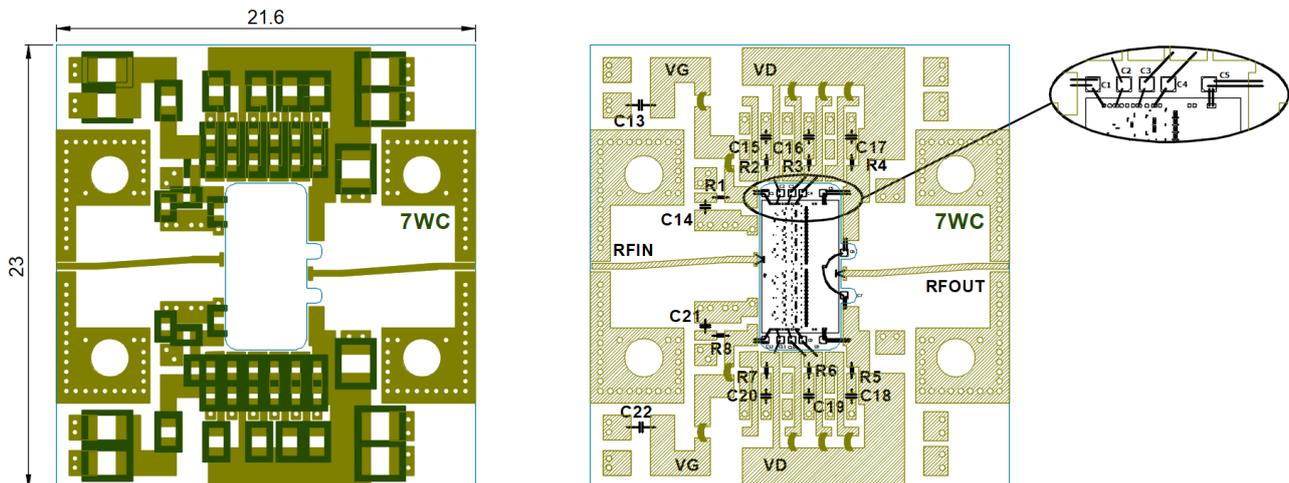
GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.1

Components List

Reference Des.	Value	Part Number	Manuf.	Size
C1~C12	22pF	—	ANY	SLC
C13、C22	22 μ F	—	ANY	0805
C14~C21	0.1 μ F	—	ANY	0603
R1~R8	10 Ω	—	ANY	0603

SAC3140A Evaluation Board



The evaluation board is a 2-layer board fabricated using Rogers 5880 $t=0.127$ and using best practices for high frequency RF design. The RF input and RF output traces have a 50 Ω characteristic impedance.

Notes

1. SAC3140A is biased with a positive drain supply and negative gate supply. The recommended gate voltage is set to $-0.6 \sim -0.9$ V, User must apply negative bias to VG before applying positive bias to VD to prevent damage to the amplifier.
2. 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. The RF input and output require a double bond wire as shown.
3. The backside of SAC3140A is RF ground. Eutectic mounting is preferred, if using conductive epoxy, recommended epoxies is CT2700R7S cured per the manufacturer's cure schedule. Epoxy should be applied in

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

SAC3140A



GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.1

accordance with the manufacturer specifications and should avoid contact with the top surface of the die. An epoxy fillet should be visible around the total die periphery.

4. Bypass caps C1~C12 should be placed no farther than 0.3mm from the amplifier.
5. Specifications are derived from measurements in a 50 Ω test environment. Aspects of the amplifier performance may be improved over a narrower bandwidth by application of additional conjugate, linearity, or power matching.
6. The chip is 100 μ m thick and should be handled with care. This MMIC has exposed air bridges on the top surface and should be handled by the edges or with a custom collet (do not pick up the die with a vacuum on die center).

Revision History

Revision	Date	Comment
1.0	Apr. 14,2022	Preliminary
1.1	Nov.20 2022	Added thermal resistance information

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