SAC3947QP3

GaAs MMIC Driver Amplifier
0.03GHz~2GHz 27dBm

Rev 1.1

Features

- Frequency: 0.03GHz~2GHz
- Gain: 17dB
- Output P_{-1}dB: 27dBm
- Single Supply Voltage: +8V/270mA
- Output IP_2: 50dBm@1GHz
- Output IP_3: 40dBm@1GHz
- Noise Figure: 1.7dB@1GHz
- Integrated gain temperature compensation circuit
- Packaged: 3mm×3mm×0.75(Typ.) mm

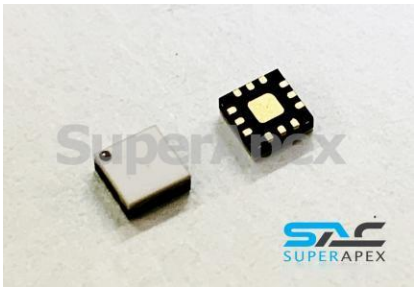
Typical Applications

- SDR
- Point-to-Point Radios
- Satcom

General Description

SAC3947QP3 is a GaAs MMIC driver amplifier. SAC3947QP3 provides 17dB of gain, and 27dBm of output power for 1 dB compression a +8V supply.

Picture



Electrical Performance

T_A=25℃, V_D=+8V, I_D=270mA, Z_0=50Ω

Parameter	Min.	Typ.	Max.	Units
Frequency Range		0.03~2		GHz
Small Signal Gain	14	17	21	dB
Small Signal Gain Flatness	—	±0.75	±1.5	dB
Isolation	—	-24	—	dB
Input/Output VSWR	—	1.6	2.3	:1
Noise Figure	—	1.7**	—	dB
Output P_{-1}dB	26	27	—	dBm
Output IP_3	—	40*	—	dBm
Supply current (I_D)	—	270	320	mA
Supply Voltage (V_D)	8	—	8.5	V

* Pout/Tone=17dBm fc=1GHz, △f=1MHz

** f=1GHz

Absolute Maximum Ratings

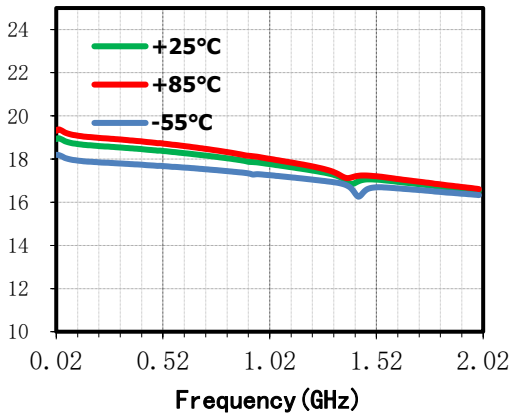
Maximum Input Power	+20dBm, CW 1min	Operating Temperature	-55℃~+85℃
Channel temperature	150℃	Storage Temperature	-55℃~+150℃
V_D supply	+8.5V		

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

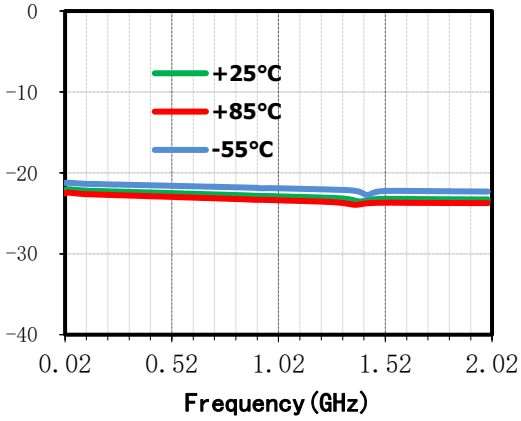
Typical Performance Curve

The following data are obtained by SAC3947QP3 evaluation board, V_D=+8V, I_{DQ} = 270mA

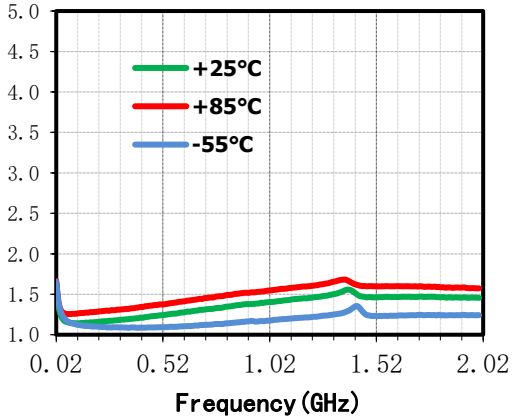
Small Signal Gain(dB) vs.Temperature



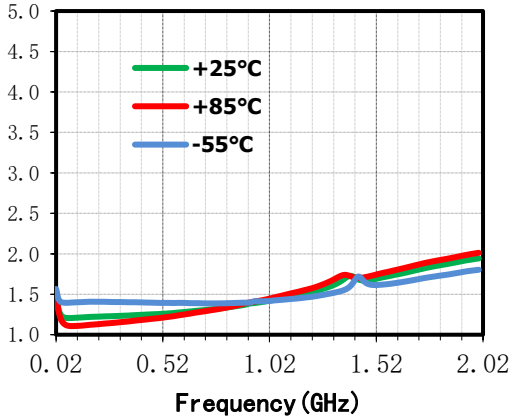
Isolation(dB) vs.Temperature



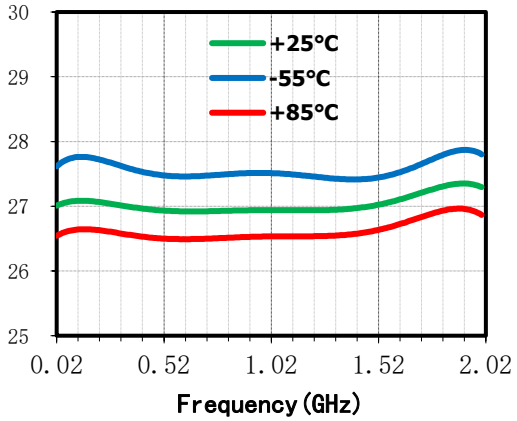
Input VSWR(:1) vs.Temperature



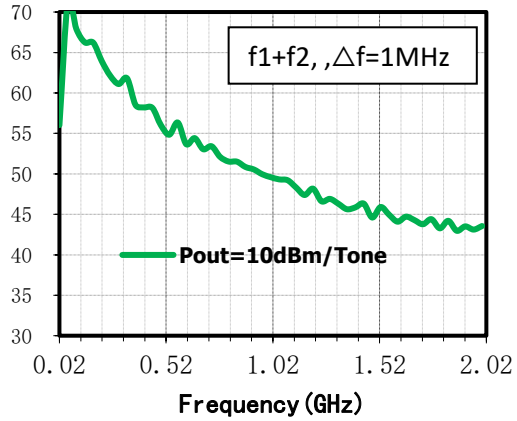
Output VSWR(:1) vs.Temperature



OP-1dB (dBm) vs. Temperature

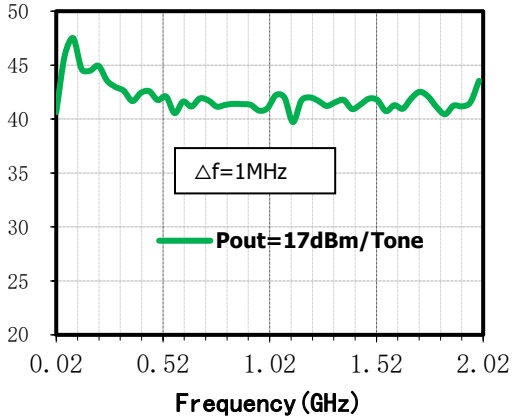


Output IP2 (dBm) vs. Frequency

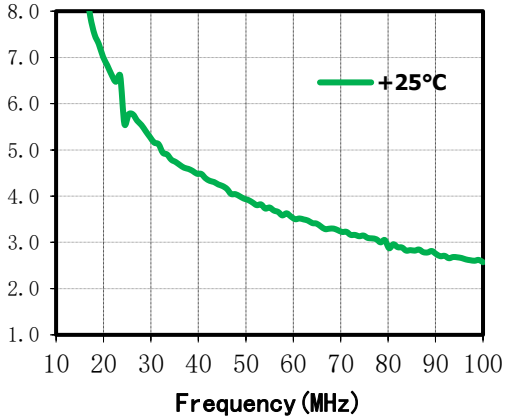


SuperApex,LLC
1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

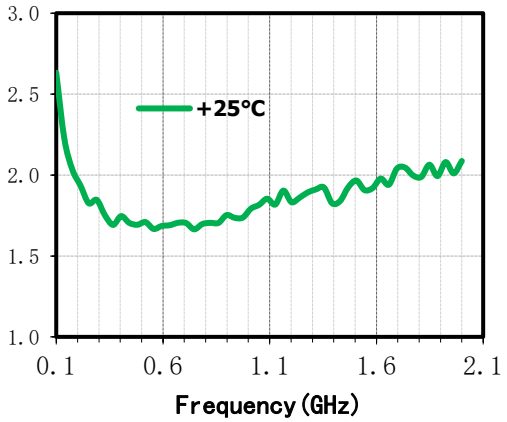
Output IP3 (dBm) vs. Frequency



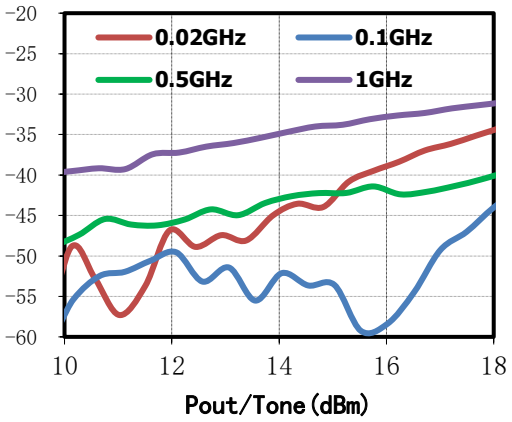
Noise Figure(dB) vs.Frequency



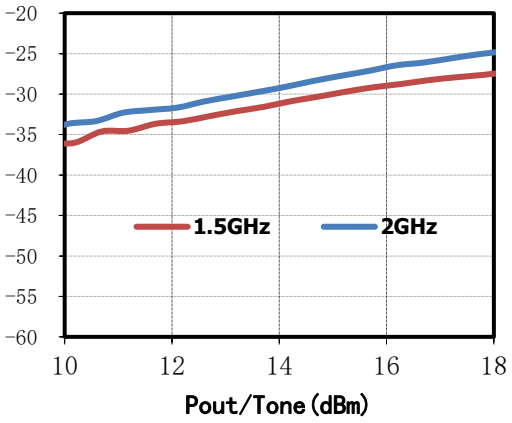
Noise Figure(dB) vs.Frequency



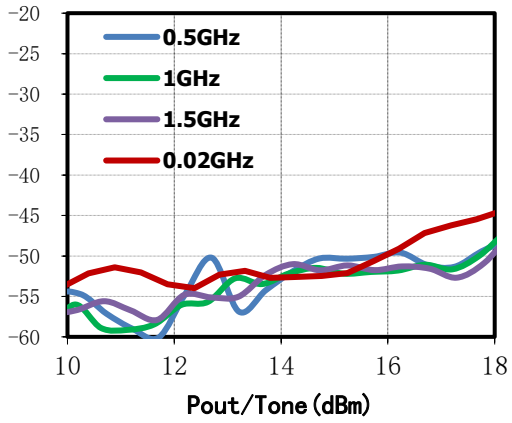
IM2 (dBc) vs. Pout/Tone



IM2 (dBc) vs. Pout/Tone

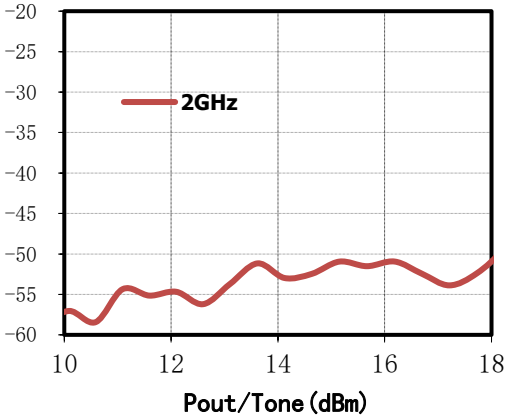


IM3 (dBc) vs. Pout/Tone

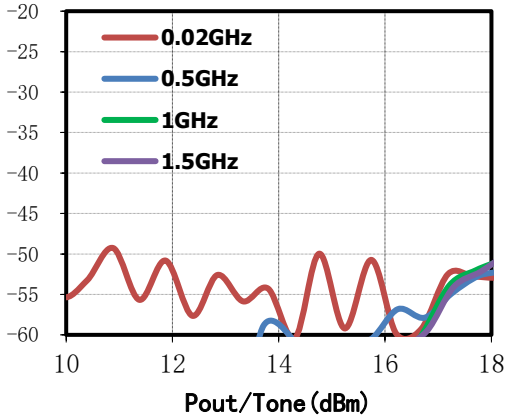


SuperApex,LLC
1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

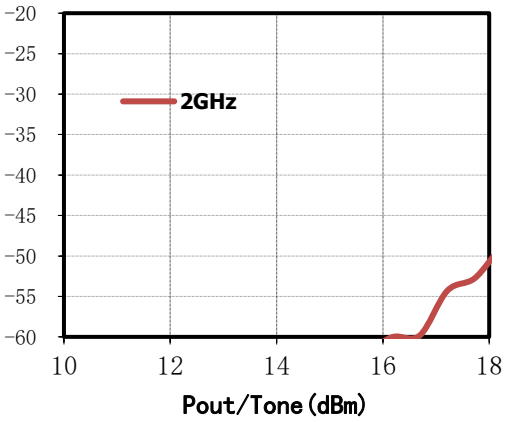
IM3 (dBc) vs. Pout/Tone



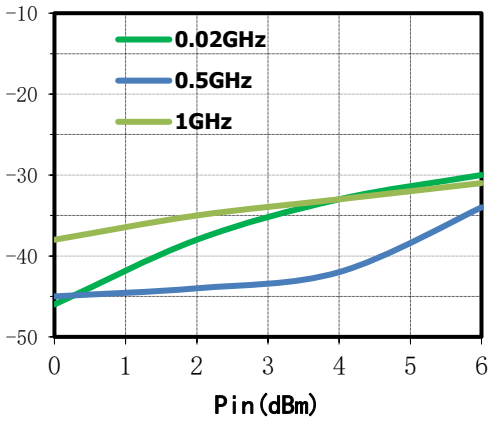
IM5 (dBc) vs. Pout/Tone



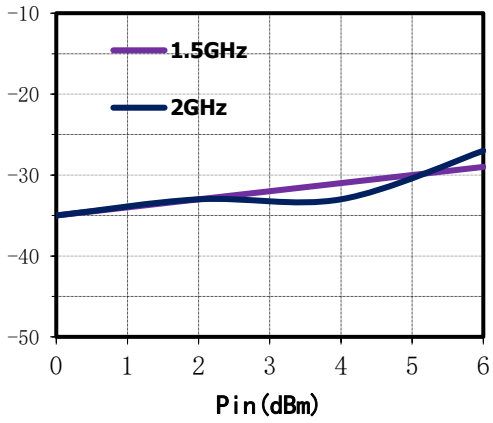
IM5 (dBc) vs. Pout/Tone



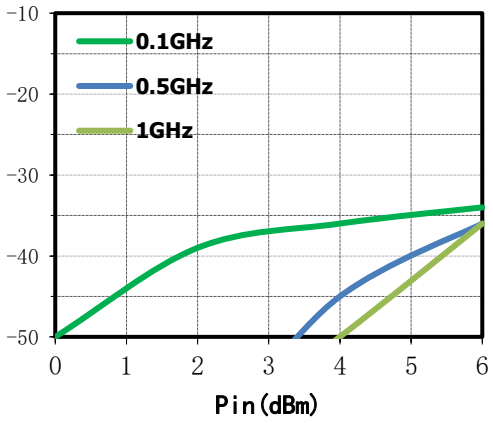
2nd Harmonic(dBc) vs.Pin



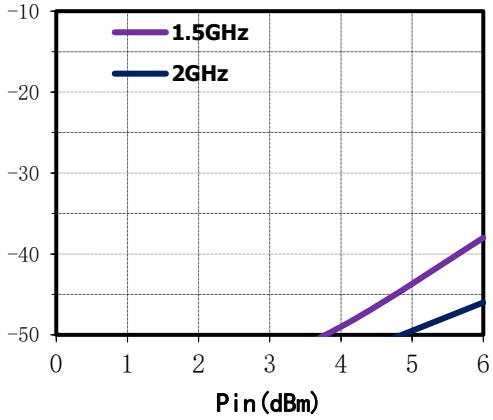
2nd Harmonic(dBc) vs.Pin



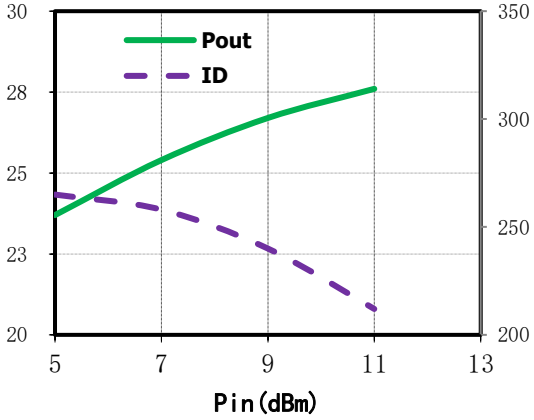
3rd Harmonic(dBc) vs.Pin



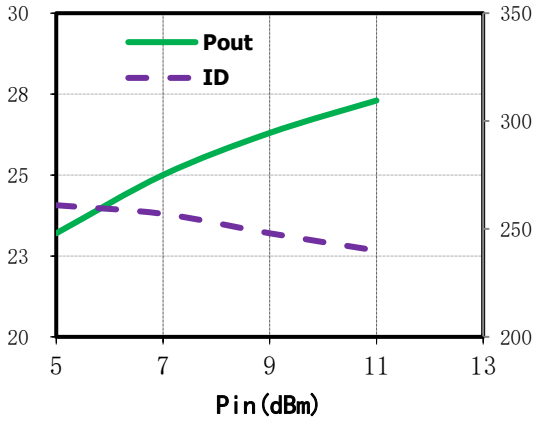
3rd Harmonic(dBc) vs.Pin



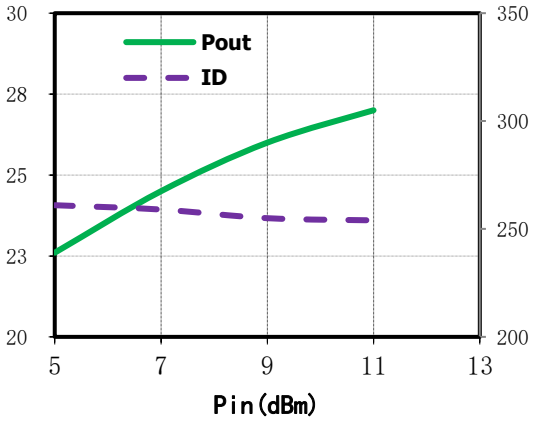
ID (mA) vs.Pout (dBm), f=0.02GHz



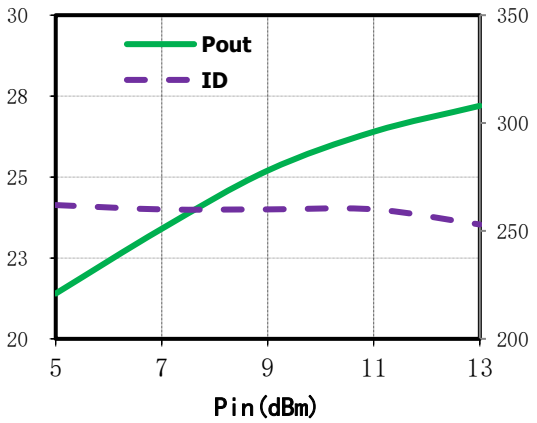
ID (mA) vs.Pout (dBm), f=0.5GHz



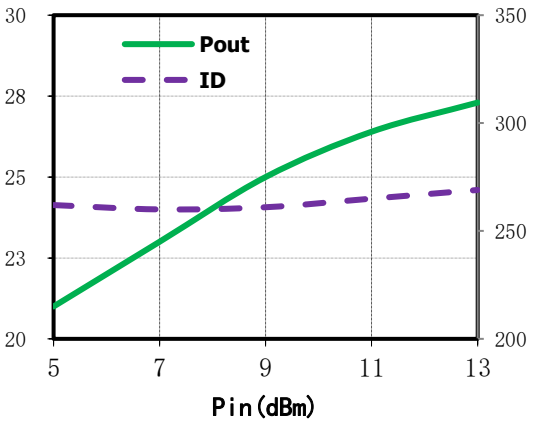
ID (mA) vs.Pout (dBm), f=1GHz



ID (mA) vs.Pout (dBm), f=1.5GHz



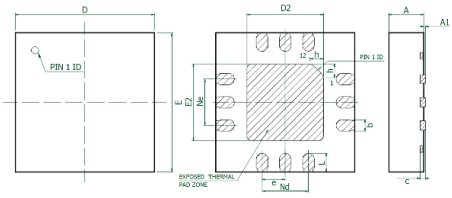
ID (mA) vs.Pout (dBm), f=2GHz



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

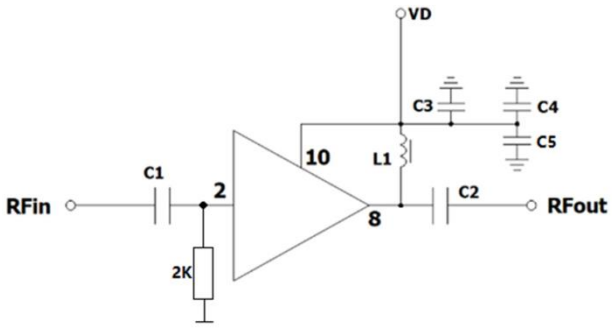
Outline Drawing

(All dimensions in mm)



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

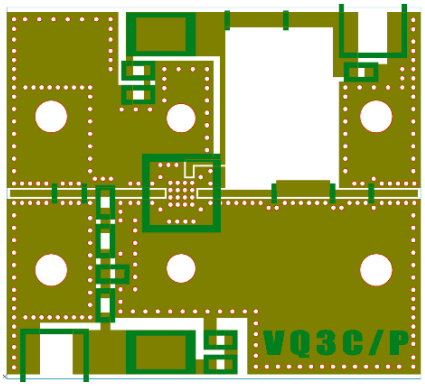
Application Circuit



BOM

Reference Des.	Value	Part Number	Manuf.	Size
C1,C2,C3	0.22μF	—	—	0402
C4,C5	22μF	—	—	0805
L1	1.3μH	4310LC-132	Coilcraft	—

SAC3947QP3 Evaluation Board

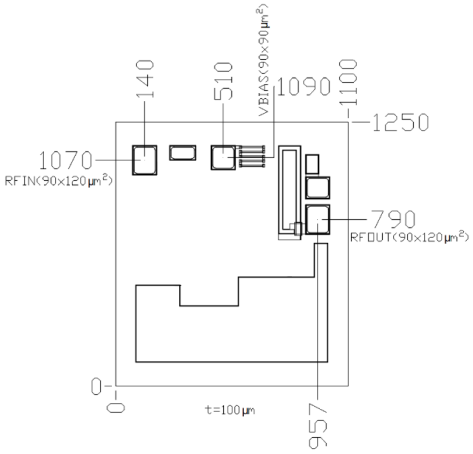


The Evaluation board is a 2-layer board fabricated using Rogers 4350b t=0.254 and using best practices for high frequency RF design. The RF input and RF output traces have a 50 Ω characteristic impedance.

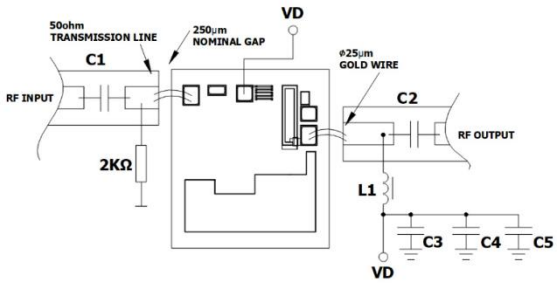
SAC3947QP3 package bottom center pad is used for RF grounding and heat dissipation. It is recommended that the vias in the pad area be made by copper filling process so that the heat can be smoothly transmitted to the cold side.

As shown in the figure above, the two screws and copper foil around the chip are used for auxiliary heat dissipation, and thin substrates with excellent thermal conductivity should be used as far as possible. Insufficient number of vias under the central pad, too small diameter (<0.4mm), too thin copper plating on the inner wall of the hole (<0.05mm), or insufficient solder filling will significantly affect the heat dissipation process of the device, thereby reducing its performance or even damaging it.

Die Outline



Die Assembly Diagram



Attention:

1. The moisture resistant grade of products is 2a, the storage environment ≤30℃/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°environment before soldering;
3. If bare chips are used, they should be stored in a dry and nitrogen environment and used in an ultra-clean environment;
4. The bare chip is made of GaAs material, which is relatively brittle, so it cannot touch the chip surface. Be careful when using it;
5. The bare chip can be sintered with high thermal conductivity conductive adhesive or alloy (the alloy temperature cannot exceed 300 ℃, and the time cannot exceed 30 seconds) to make it fully grounded;
6. 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	October 15, 2021	First Release
1.1	February 8, 2022	Add 2KΩ resistance to the ground at the RF input end in the application circuit diagram; Correction of inductance L1 model; Update the picture of evaluation board; Add description of bare chip.