SAC3140A

GaAs MMIC Power Amplifier
27.5GHz~31GHz 39dBm

Rev1.0

Features

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

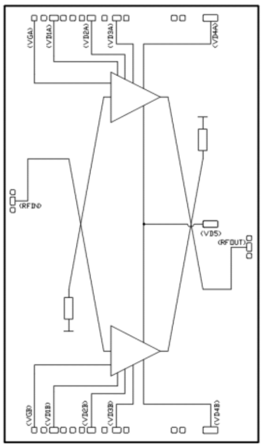
Typical Applications

- Microwave radio
- Telecommunication
- SatCom

General Description

SAC3140A is a Ka-band GaAs MMIC power amplifier, which operates between in 27.5GHz~31GHz. The 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℃,V_D=+6V,I_D=4.5A,Z_0=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_{-1}dB)	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	—	TBD	—	℃/W

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

Absolute Maximum Ratings

Maximum Input Power	+20dBm,CW 30s	Operating Temperature	-55℃~+85℃
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	

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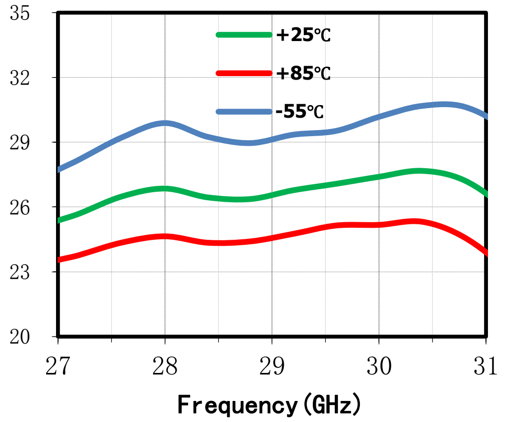
Typical Performance Curve

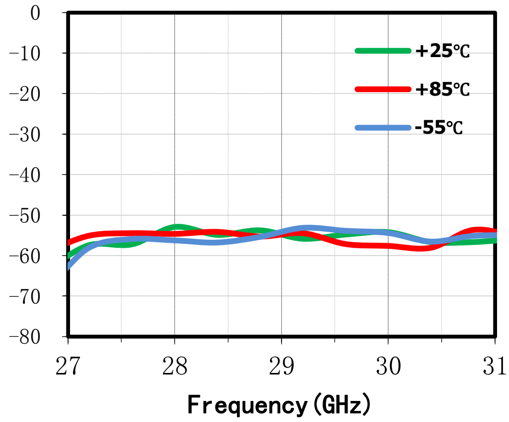
The results captured in the test-jig environment

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

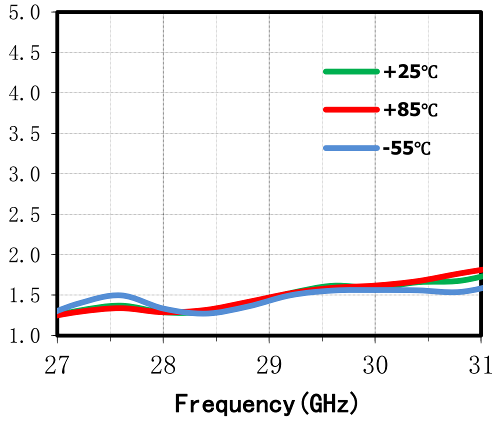
Small Signal Gain(dB) vs.Temperature



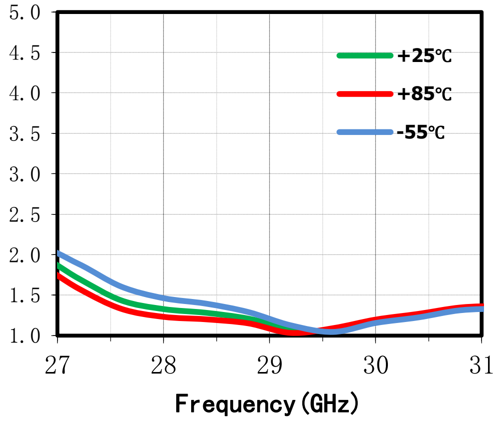
Isolation(dB) vs.Temperature



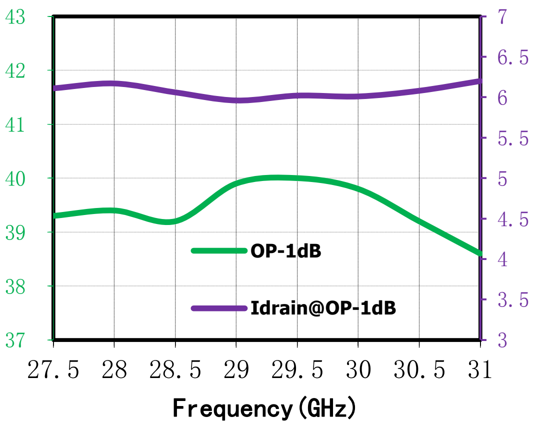
Input VSRW(:1) vs.Temperature



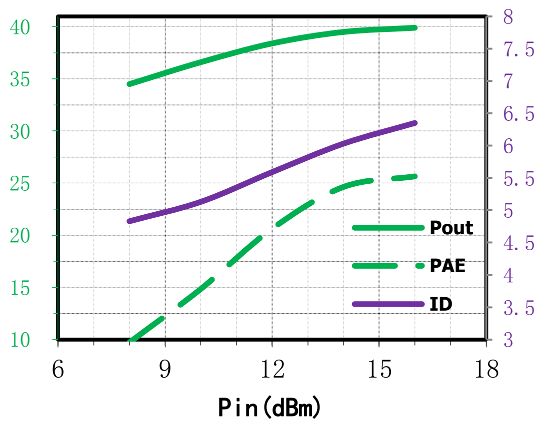
Output VSWR(:1) vs.Temperature



Output P-1dB (dBm) vs. Frequency



I_D(A)、PAE(%) vs. Pout,f=27.5GHz



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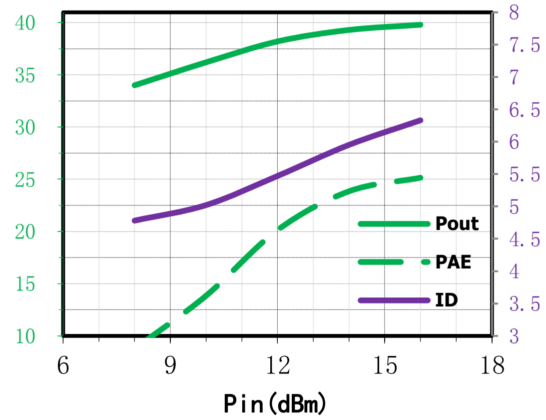
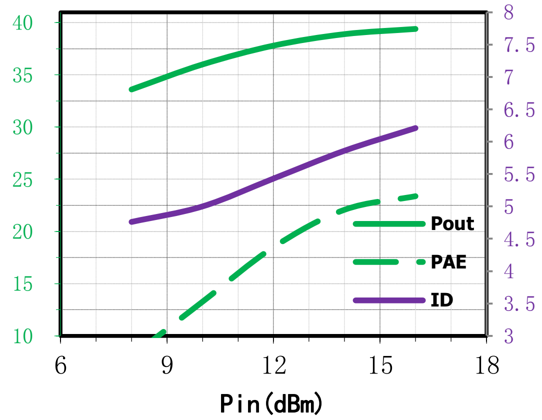
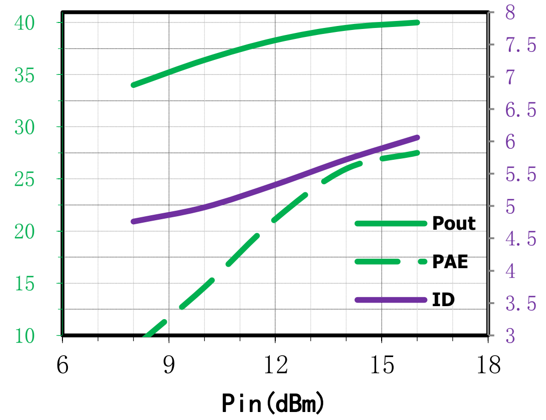
I_D(A)、PAE(%) vs. Pout,f=28GHz



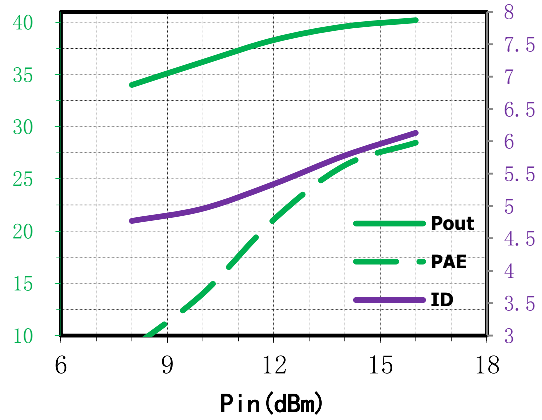
I_D(A)、PAE(%) vs. Pout,f=28.5GHz



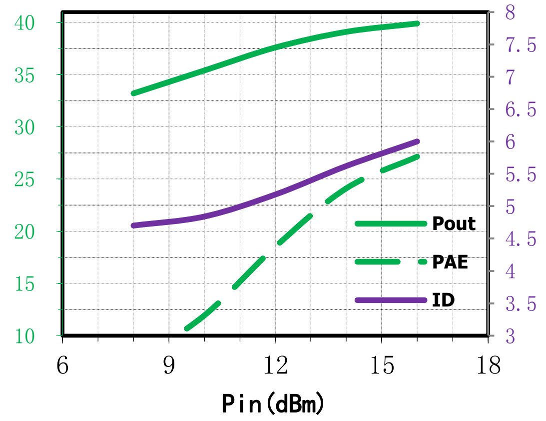
I_D(A)、PAE(%) vs. Pout,f=29GHz



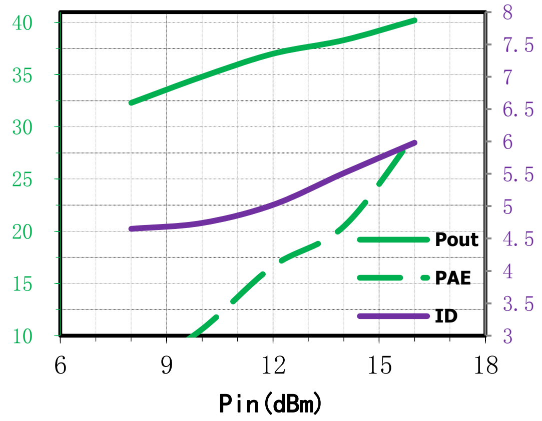
I_D(A)、PAE(%) vs. Pout,f=29.5GHz

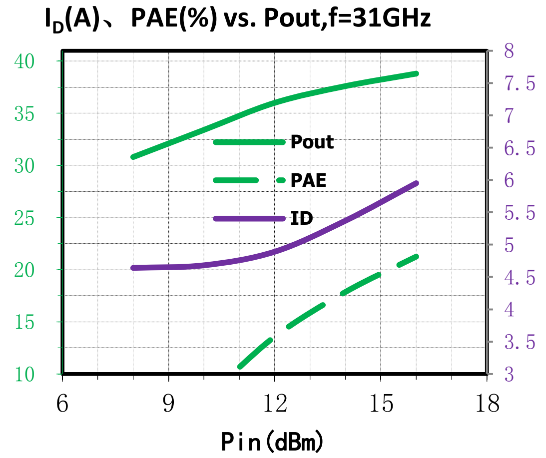


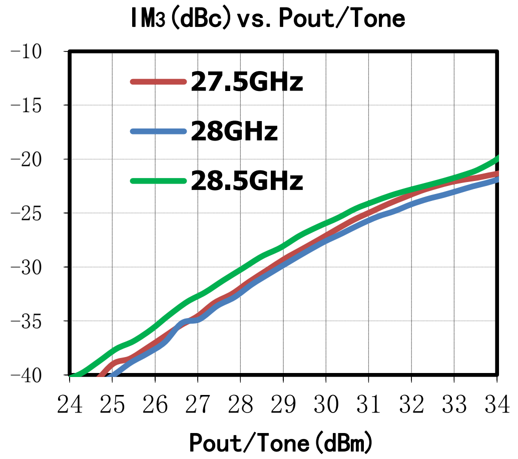
I_D(A)、PAE(%) vs. Pout,f=30GHz

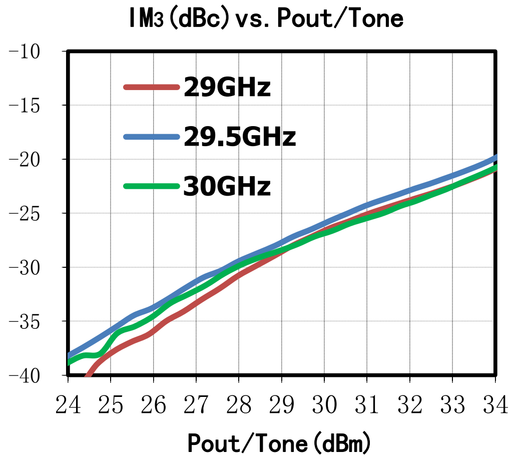


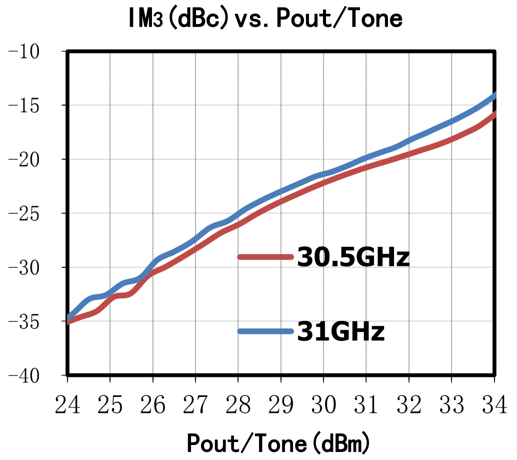
I_D(A)、PAE(%) vs. Pout,f=30.5GHz

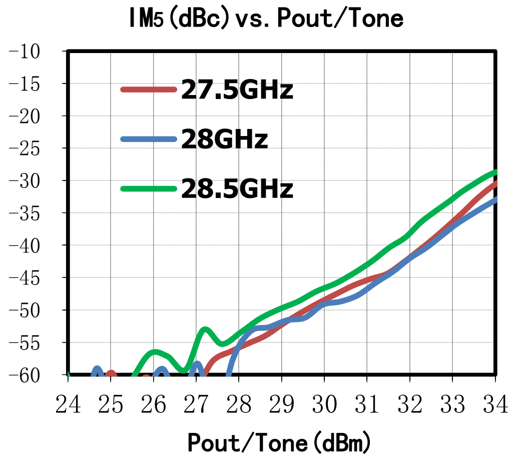


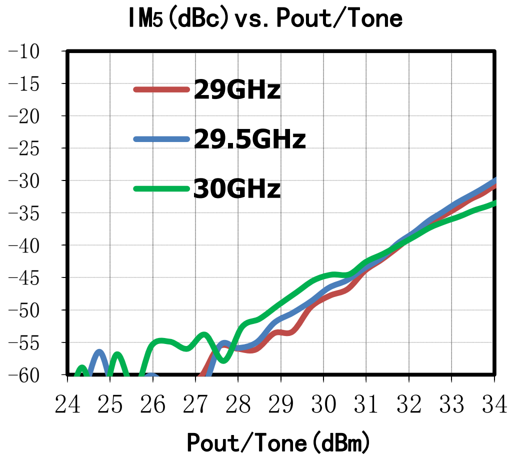












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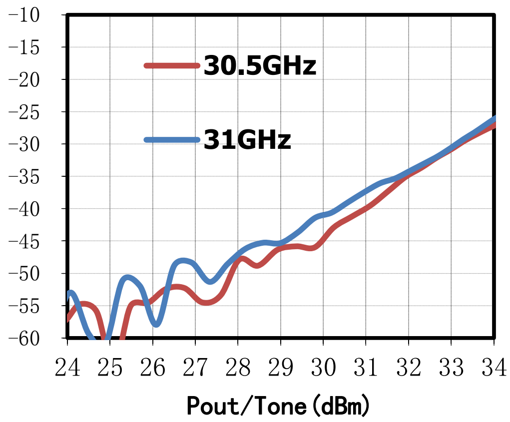
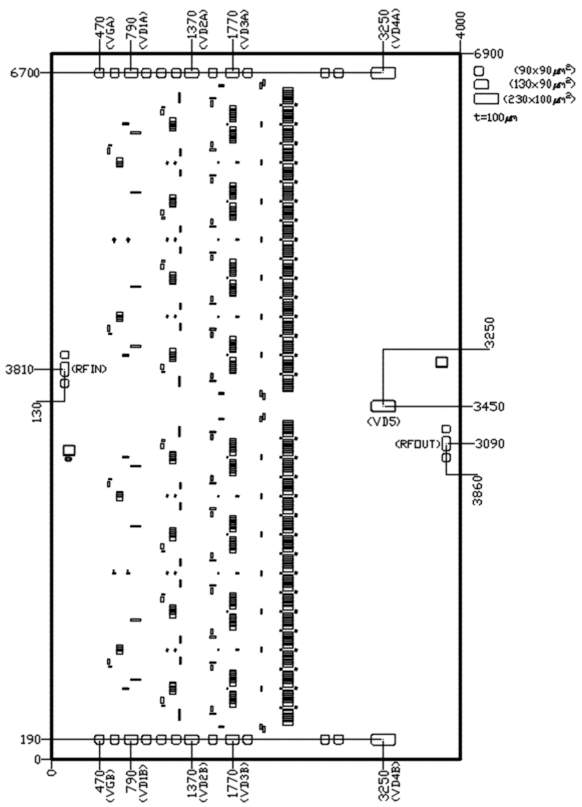
IM5 (dBc) vs. Pout/Tone

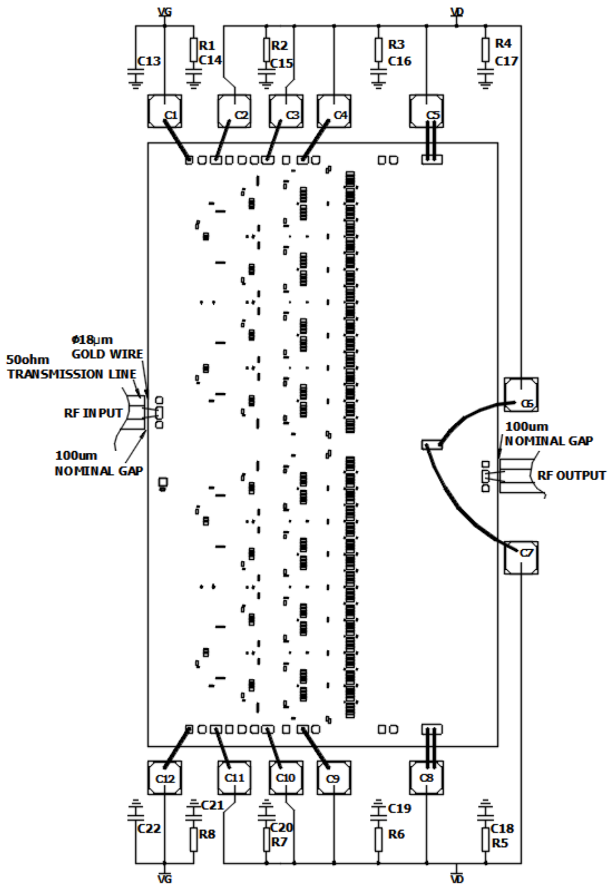


Die Outline

(all dimensions in µm)



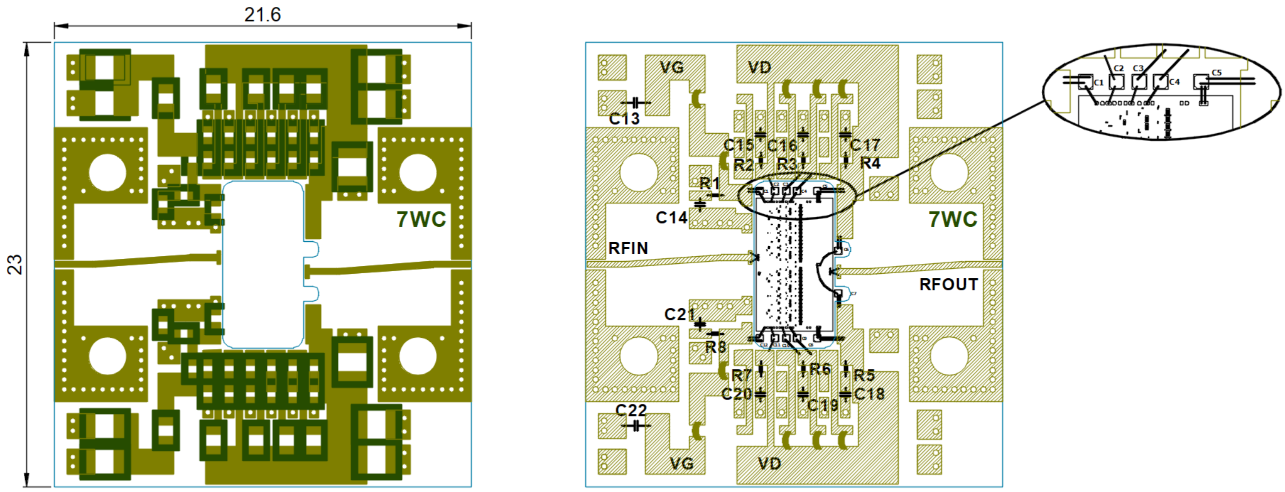
Assembly Diagram



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	10Ω	—	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~-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 accordance with the manufacturers 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.

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5. Specifications are derived from measurements in a 50 Ω test environment. Aspects of the amplifier performance may be improved over a more narrow bandwidth by application of additional conjugate, linearity, or power matching.

6. The chip is 100μm 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