

1. Features

- Optimized for 800–960 MHz operation
- 4.0V nominal operating voltage
- Output power greater than 30dBm
- High PAE at maximum output power
- High/Low power mode control
- Low leakage current
- Single-ended 50 Ω input and output ports
- Fully on-chip matching circuitry

2. Applications

- Wi-SUN
- LoRa
- RFID
- Industrial IOT
- Connected Homes
- Automatic meter readers

3. Product Highlights

- Small package size
- Support low voltage vbat
- High Efficiency

4. Description

The Geo-Chip GC0609 is a high-performance, high-power PA (Power Amplifier), which is mainly designed for 800-960MHz ISM band applications such as Wi-SUN, LoRa, automatic meter readers and RFID.

Packaged in a compact LGA 2.5mm x 2mm x 0.75mm, the GC0609 is a 10-pad PA, exhibits high efficiency, low temperature variation, strong reliability and robust ruggedness.

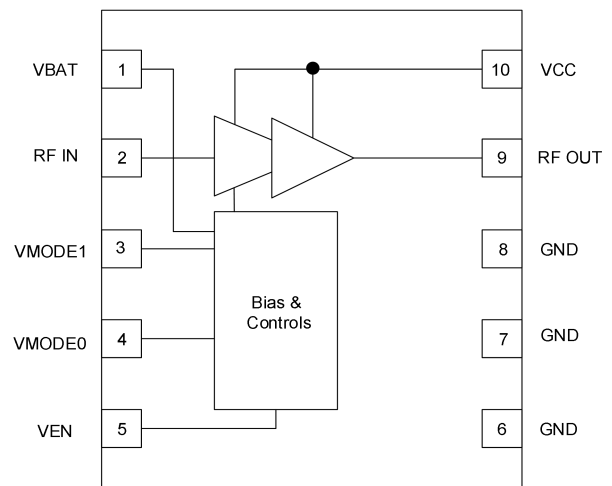


Figure 1 Block Diagram

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5. Absolute Maximum Ratings

Parameter	Range	Unit	Condition
RF Input Power	5	dBm	
Supply Voltage	4.5	Volts	
Supply Voltage	5	Volts	
Enable Control Voltage	3.6	Volts	
Mode Control Voltage	3.6	Volts	
Operating Temperature	-40~125	°C	
Storage Temperature	-55~150	°C	
ESD (HBM)	+2000	Volts	
ESD (CDM)	+750	Volts	

Table 1

6. Pin Description

Name	Pin	Description
RF IN	2	RF signal input
RF OUT	9	RF signal output
VBAT	1	Power supply for digital and internal drive PA
VCC	10	Power supply for last stage PA
VMODE	3,4	Digital Control signal input for mode selection
VEN	5	PA Enable Control signal
GND	6,7,8	Ground

Table 2

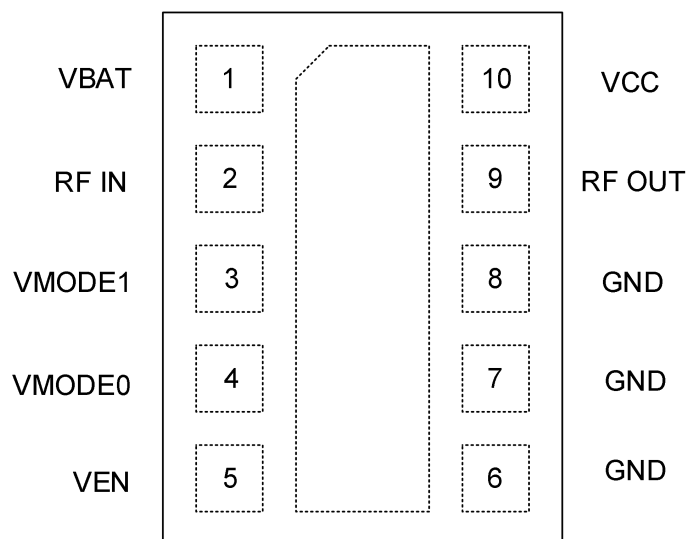


Figure 2 GC0609 Pinout (Top view)

7. Recommended Operating Condition

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Operating Frequency	800	----	960	MHz	800
Supply Voltage	2.1	3.3	3.6	Volts	2.1
Supply Voltage	0.3	4	4.2	Volts	0.3
Enable Control Voltage High	1.2	----	3.3	Volts	1.2
Enable Control Voltage Low	0	----	0.3	Volts	0
Mode Control Voltage High	1.2	----	3.3	Volts	1.2
Mode Control Voltage Low	0	----	0.3	Volts	0
Operating Temperature	-40	+25	+105	°C	-40

Table 3

8. Control Logic

Mode	VEN	VMODE0	VMODE1	VBAT & VCC
High Bias Mode	1	0	0	ON
Low Bias Mode	1	1	1	ON
Low Bias Mode_Temp	1	1	0	ON
Power down mode	0	X	X	ON

Note: "1" denotes high voltage state (> 1.2 V)
 "0" denotes low voltage stage (< 0.3 V) at control pins
 "X" denotes do not care: either "1" or "0" can be applied
 "Low Bias Mode_Temp" The quiescent current and small signal gain is less sensitive to temperature.

Table 4

9. Electrical Specifications

VBAT=3.3V, VCC=4V, Temp=25°C, CW Test

Parameters	Min	Typ	Max	Units	Conditions
Frequency range	800	880	960	MHz	
High bias mode Gain		30.5		dB	Small signal Gain @ 880MHz
Low bias mode Gain		29		dB	
Low Bias Mode_Temp Gain		29.5			
Gain variation over frequency		1.5	2	dB	Small signal
Input return loss		-12		dB	Small signal
Output return loss		-6		dB	Small signal
Quiescent current		68		mA	High bias mode
		55		mA	Low bias mode
		58		mA	Low Bias Mode_Temp
Current consumption @30dBm,880MHz		550		mA	High bias mode
		535		mA	Low bias mode
		540		mA	Low Bias Mode_Temp
Saturated power	31	31.5		dBm	High bias mode
	31	31.5		dBm	Low bias mode
	31	31.5		dBm	Low Bias Mode_Temp
Power added efficiency @Psat, 880MHz		53		%	High bias mode
		55		%	Low bias mode
		55		%	Low Bias Mode_Temp
Second harmonic			-10	dBm	High bias mode @ 30dBm
			-10		Low bias mode @ 30dBm
			-10		Low bias Temp @ 30dBm
Third harmonic			-15	dBm	High bias mode @ 30dBm
			-15		Low bias mode @ 30dBm
			-15		Low bias Temp @ 30dBm
Power down mode current			1	uA	
DC Enable time*1			3	us	
Mode switching time*2			3	us	
Ruggedness	No damage or permanent performance degradation				Output VSWR = 8:1All phase angles, RF IN = 3 dBm
Stability					Output VSWR = 6:1All phase angles

Table 5

10. Typical Performance Curves

10.1 S Parameters @ Low Bias Temp Mode

Conditions: VCC=4.0V, VBAT=VEN=VMODE0=3.3V, VMODE1=0V, Temp=25°C

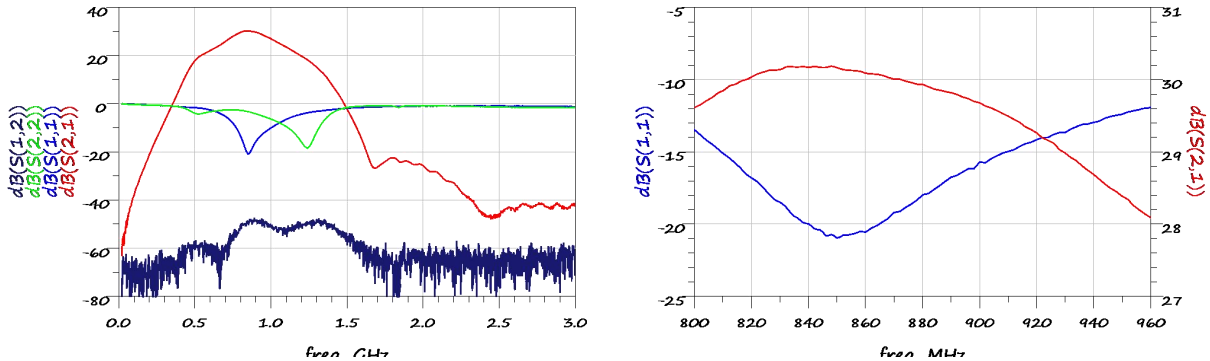


Figure 3

10.2 Efficiency & Current @ Low Bias Temp Mode

Conditions: VCC=4.0V, VBAT=VEN=VMODE0=3.3V, VMODE1=0V, Temp=25°C

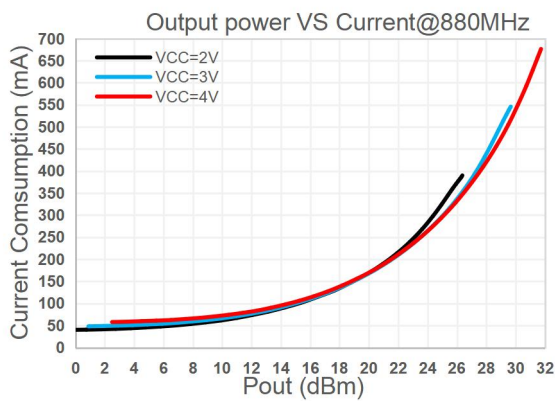


Figure 4

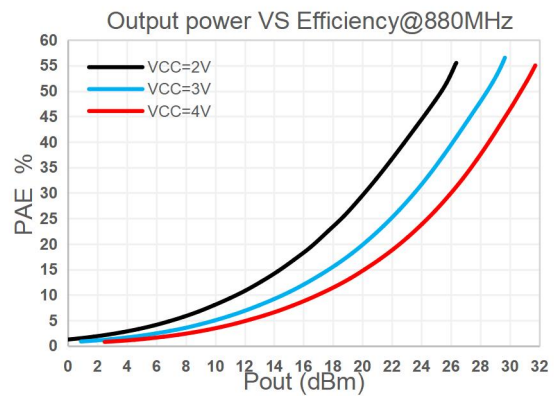


Figure 5

10.3 Gain vs Pout

Conditions: VBAT=VEN =3.3V, Temp=25°C

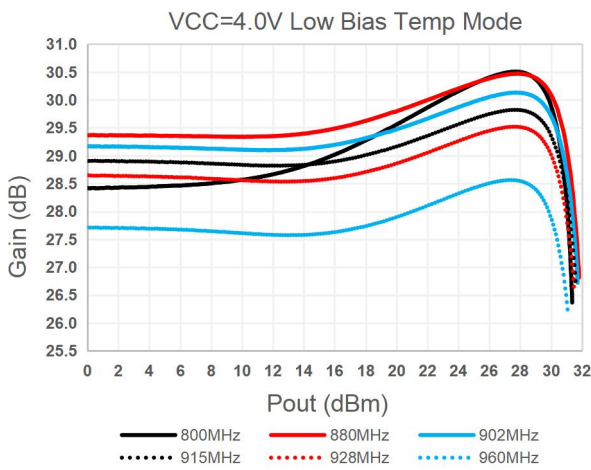


Figure 6

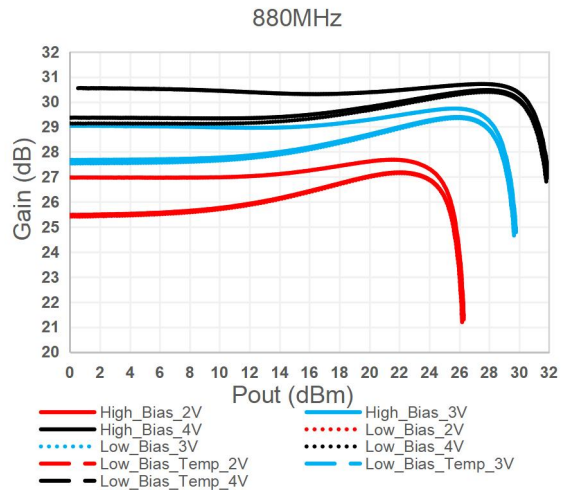


Figure 7

11. Application Schematic

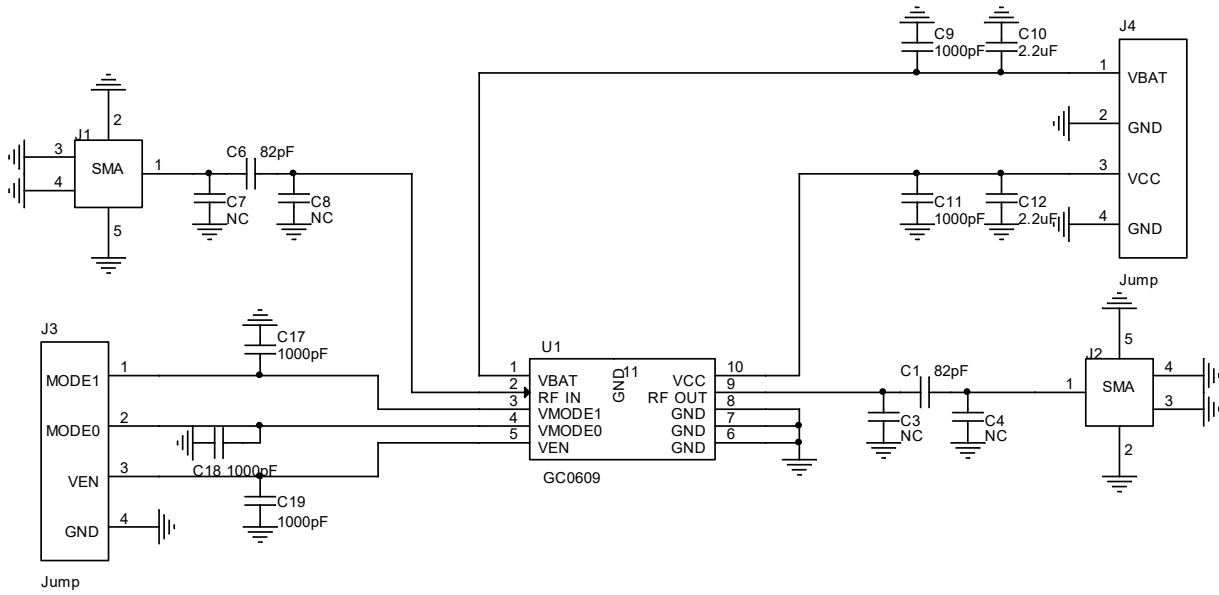


Figure 8

12. Package Dimensions

Symbol	Dimension in mm		
	Min	Typ	Max
A	0.67	0.75	0.81
A1	0.00	---	0.03
A2	---	---	0.78
D	1.90	2.00	2.10
E	2.40	2.50	2.60
D1	---	1.55	---
E1	---	2.031	---
e1	---	0.505	---
e2	---	0.5105	---
a1	0.20	0.25	0.30
b1	0.205	0.255	0.305
a2	0.20	0.25	0.30
b2	0.2175	0.2675	0.3175
f1	---	0.50	---
f2	---	0.70	---
f3	---	2.10	---
f4	---	2.30	---

Table 6

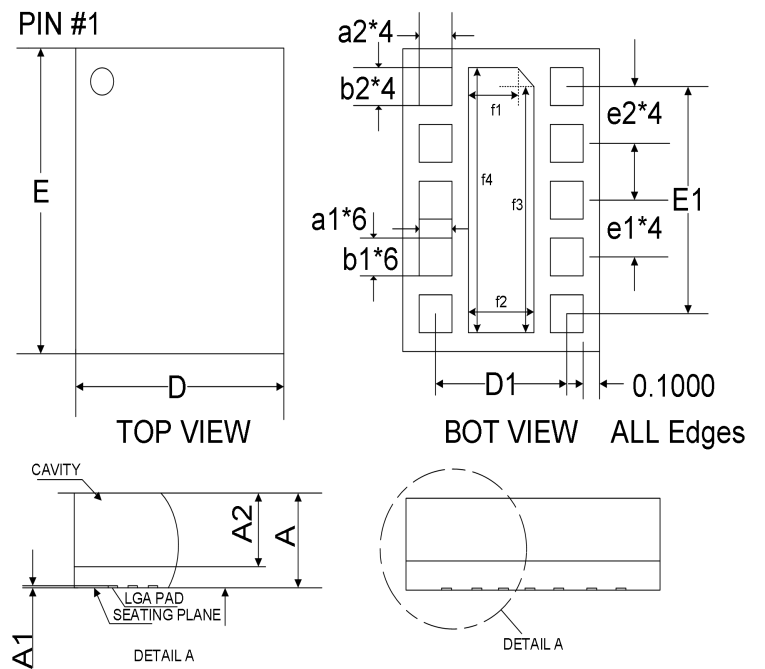


Figure 9

13. Part Marking

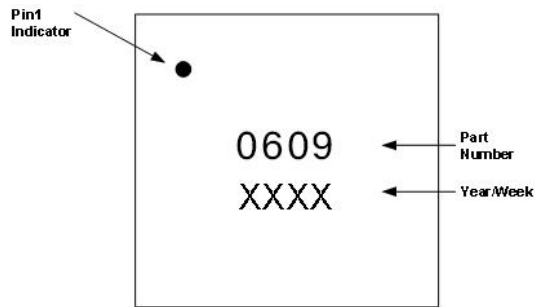


Figure 10 Typical Part Markings (Top View)

14. Packaging Information

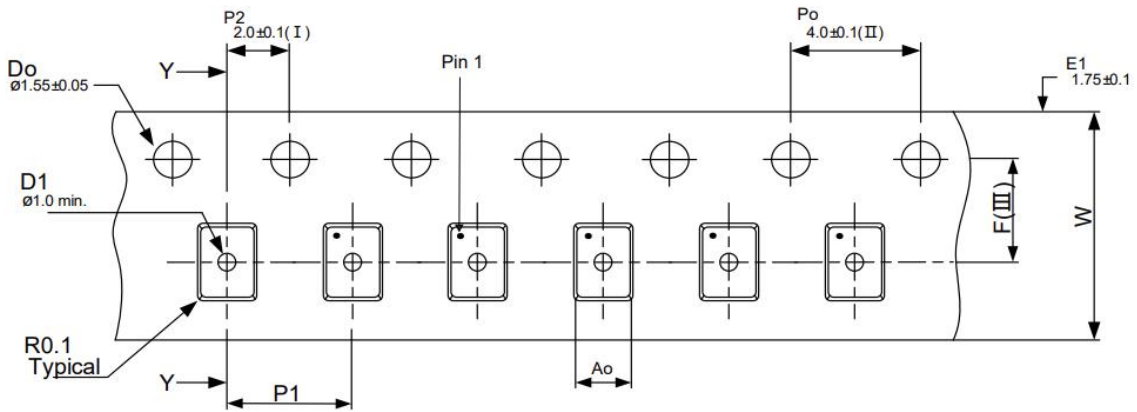


Figure 11 Packaging Information

Ao	2.25 +/-0.05
Bo	2.80 +/-0.05
Ko	1.10 +/-0.1
F	3.50 +/-0.05
P1	4.00 +/-0.1
W	8.00 +0.3/-0.1

- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Package Type	Unit Size	Max Reel Diameter	Type Width	Pocket Pitch	Reel Capacity
Tape and Reel	2.5mm x 2mm x 0.75mm	13"	8mm	4mm	3000

15. Disclaimer

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For technical questions and additional information about Hangzhou Geo-chip Technology Co., Ltd.

Website: www.geochipinc.com

China Tel: + 86-571 26283530

16. Ordering Information

Model	Package	Packaging Form	Minimum Order Quantity

17. Revision Record

Version	Date	Description
1.91	2022/3	V1.91
1.92	2022/10	Updated Figure 10 and Figure 11