

Features

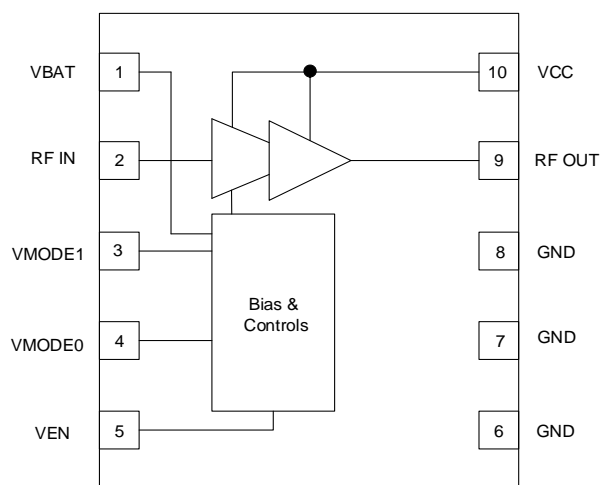
- Optimized for 800–960 MHz operation
- 4.0V nominal operating voltage
- Output power greater than 30dBm
- High PAE at maximum output power
- High/Low power mode control
- Low leakage current
- Single-ended 50 Ω input and output ports
- Fully on-chip matching circuitry

Applications

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

Product Highlights

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



Block Diagram

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.

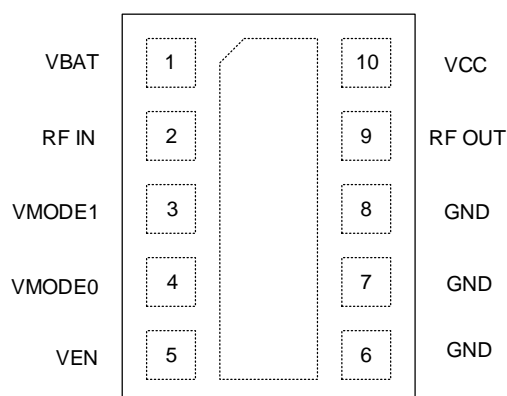
Packaged in a compact LGA 2.5mm x 2mm x 0.75mm, the GC0609 is a 10-pad PA, exhibits high efficiency, low temperature variation, strong reliability and robust ruggedness.



Geo-chip Green™ products are compliant with all applicable legislation and are halogen-free.

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



GC0609 Pinout (Top view)

Absolute Maximum Ratings

Parameters	Symbol	Maximum	Unit
RF Input Power	Pin	5	dBm
Supply Voltage	VBAT	4.5	Volts
Supply Voltage	VCC	5	Volts
Enable Control Voltage	VEN	3.6	Volts
Mode Control Voltage	VMODE	3.6	Volts
Operating Temperature	Tcase	-40~125	°C
Storage Temperature	Tstg	-55~150	°C
ESD (HBM)		+2000	Volts
ESD (CDM)		+750	Volts

Recommended Operating Condition

Parameters	Symbol	Minimum	Nominal	Maximum	Unit
Operating Frequency	f	800	----	960	MHz
Supply Voltage	VBAT	2.1	3.3	3.6	Volts
Supply Voltage	VCC	0.3	4	4.2	Volts
Enable Control Voltage High	VEN_High	1.2	----	3.3	Volts
Enable Control Voltage Low	VEN_Low	0	----	0.3	Volts
Mode Control Voltage High	VMODE_High	1.2	----	3.3	Volts
Mode Control Voltage Low	VMODE_Low	0	----	0.3	Volts
Operating Temperature	Tcase	-40	+25	+105	°C

Note: 1. VEN/VMODE voltage level must not exceed VBAT voltage

2. VBAT must be prior to VEN for the power on sequence.

GC0609 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

"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.

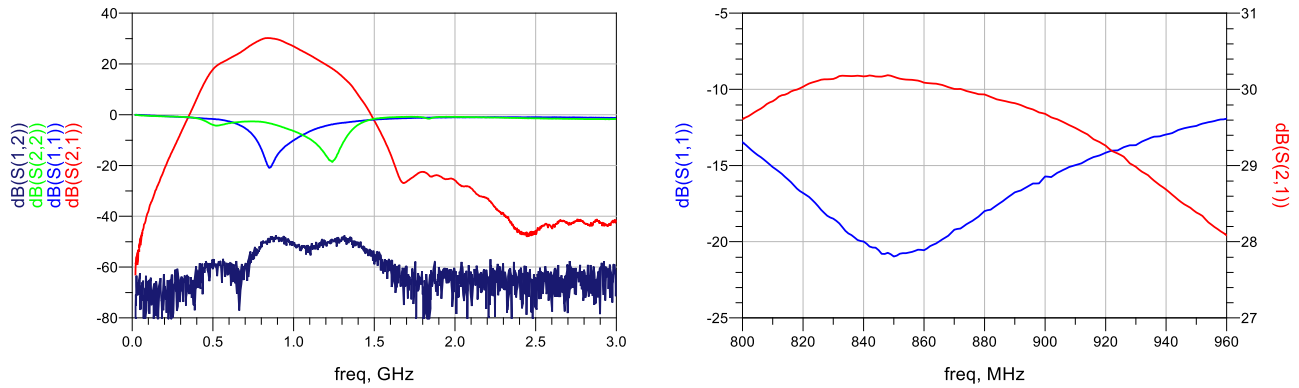
Electrical Specifications (VBAT=3.3V, VCC=4V, Temp=25°C, CW Test)

Parameters	Symbol	Conditions	Min	Typ	Max	Units
Frequency range	f		800	880	960	MHz
High bias mode Gain	IS21I	Small signal Gain @ 880MHz		30.5		dB
Low bias mode Gain				29		dB
Low Bias Mode_Temp Gain				29.5		
Gain variation over frequency	ΔS21I	Small signal		1.5	2	dB
Input return loss	IS11I	Small signal		-12		dB
Output return loss	IS22I	Small signal		-6		dB
Quiescent current	ICQ	High bias mode		68		mA
		Low bias mode		55		mA
		Low Bias Mode_Temp		58		mA
Current consumption @30dBm,880MHz	ICC	High bias mode		550		mA
		Low bias mode		535		mA
		Low Bias Mode_Temp		540		mA
Saturated power	PSAT	High bias mode	31	31.5		dBm
		Low bias mode	31	31.5		dBm
		Low Bias Mode_Temp	31	31.5		dBm
Power added efficiency @Psat, 880MHz	PAE	High bias mode		53		%
		Low bias mode		55		%
		Low Bias Mode_Temp		55		%
Second harmonic	F2	High bias mode @ 30dBm			-10	dBm
		Low bias mode @ 30dBm			-10	
		Low bias Temp @ 30dBm			-10	
Third harmonic	F3	High bias mode @ 30dBm			-15	dBm
		Low bias mode @ 30dBm			-15	
		Low bias Temp @ 30dBm			-15	
Power down mode current					1	uA
DC Enable time*1					3	us
Mode switching time*2					3	us
Ruggedness		Output VSWR = 8:1All phase angles, RF IN = 3 dBm	No damage or permanent performance degradation			
Stability		Output VSWR = 6:1All phase angles				

Typical Performance Curves

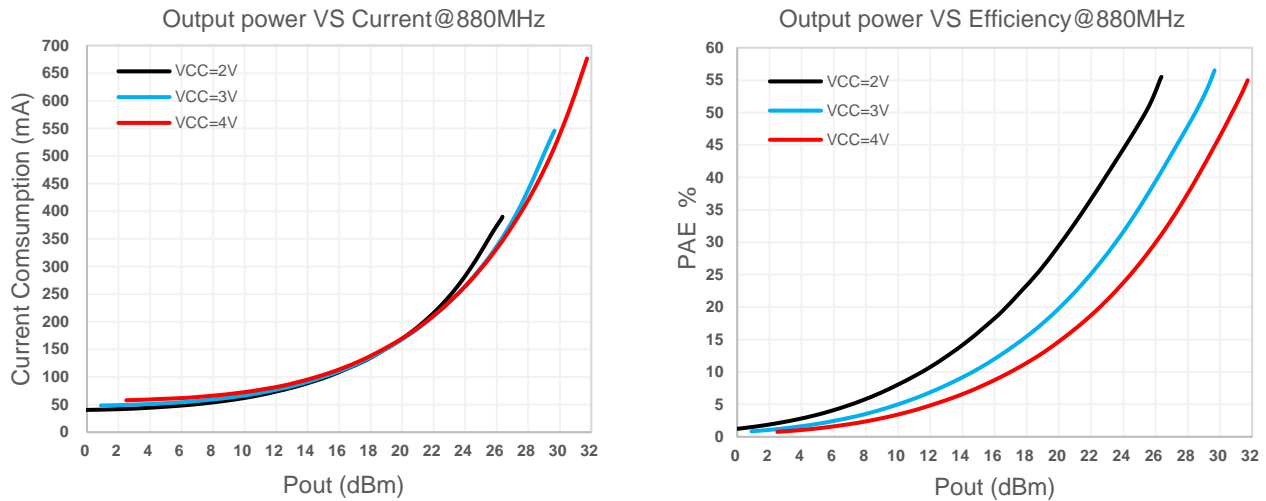
1. S Parameters @ Low Bias Temp Mode

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



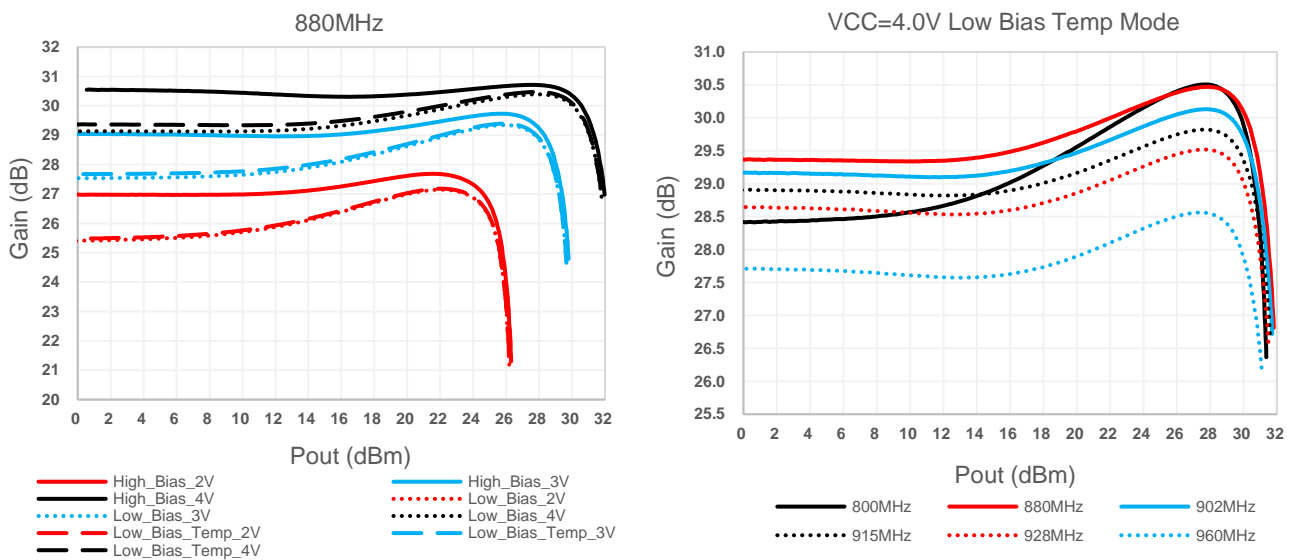
2. Efficiency & Current @ Low Bias Temp Mode

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

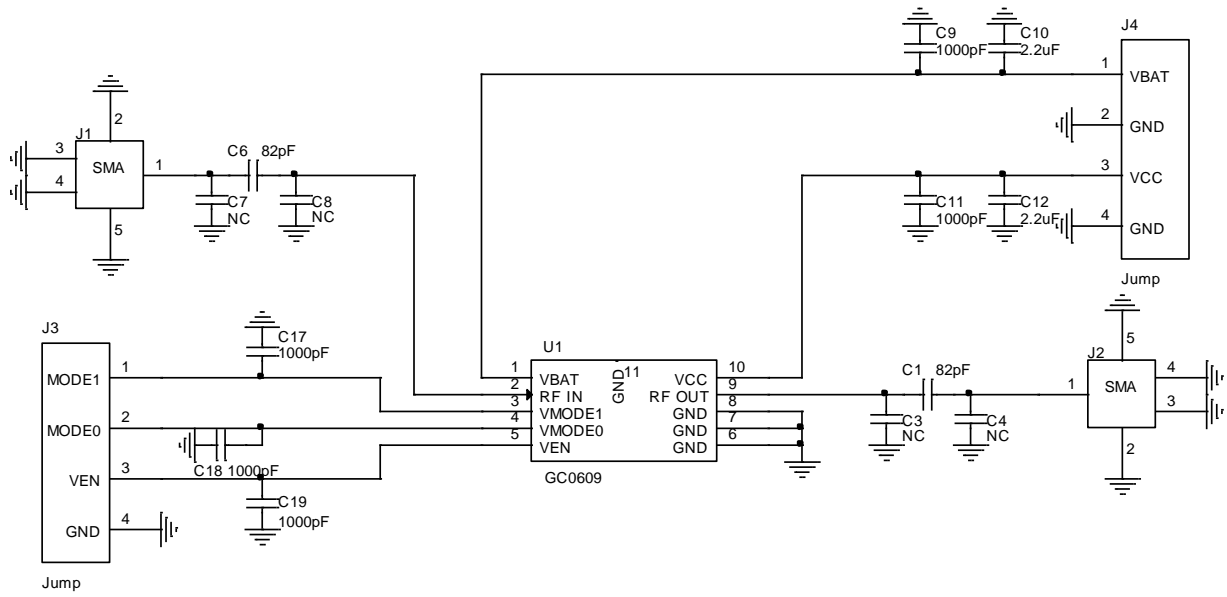


3. Gain vs Pout

(Conditions: VBAT=VEN =3.3V, Temp=25°C)

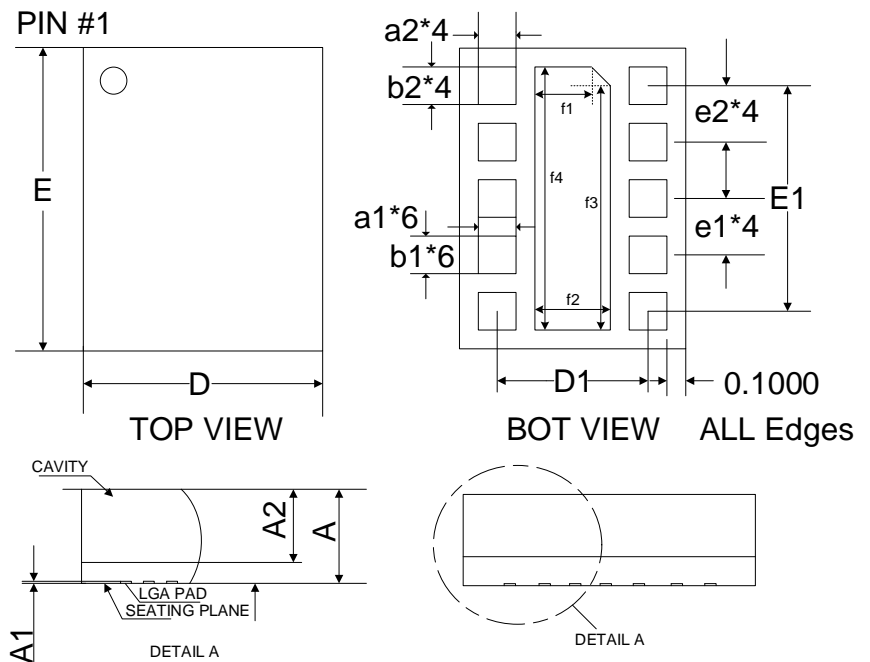


Application Schematic

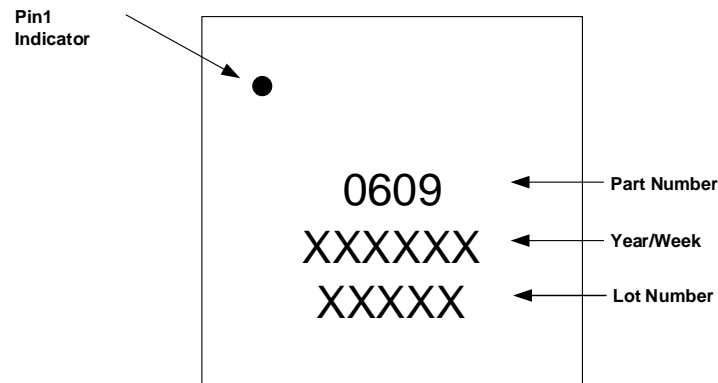


Package Dimensions

Symbol	Dimension in mm		
	MIN	NOM	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	---

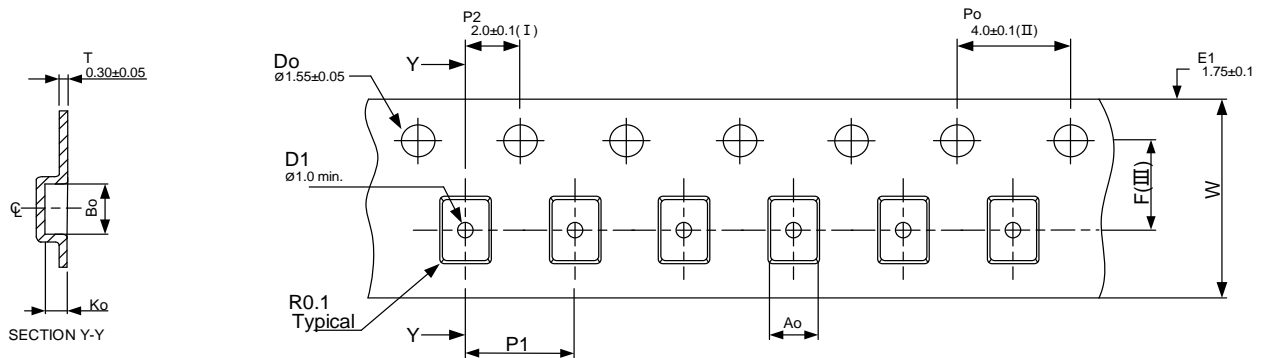


Part Marking



GC0609 Typical Part Markings (Top View)

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

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