1. Features

- 2.4 GHz high-power single-chip, single-die RF front-end IC
- Single-ended 50 Ω input and output ports
- Integrated PA with +22.5dBm output power
- Integrated LNA with 2.9dB noise figure
- Transmit/receive switch circuitry
- ESD protection circuitry on all ports
- Full on-chip, matching and decoupling circuitry
- Market proven CMOS technology
- QFN 16 (3 x 3 x 0.75 mm) package with exposed ground pad. (MSL1)

2. Appllcations

- ZigBee Extender Range Devices
- Home and Industrial Automation
- ZigBee Smart Power
- RF4CE Remote Control
- Mobile and Battery ZigBee Systems
- Custom 2.4GHz Radio Systems

3. Product Highlights

- ESD(HBM) 8KV
- Sleep current<0.5uA

4. Description

The GC1101 is a fully integrated, single-chip RF Front-end IC which incorporates all the RF functionality needed for IEEE 802.15.4 / ZigBee, wireless sensor network, and any other wireless systems in the 2.4 GHz ISM band. The GC1101 integrates the PA, LNA Transmit and Receive switching circuitry in one CMOS single-chip device.

Typical high power applications include home and industrial automation, smart power, and RF4CE among others. Combining superior performance, high sensitivity and efficiency, low noise, small form factor, and low cost, GC1101 is the perfect solution for applications requiring extended range and bandwidth. GC1101 has simple and low-voltage CMOS control logic, and requires minimal external components for system implementation.

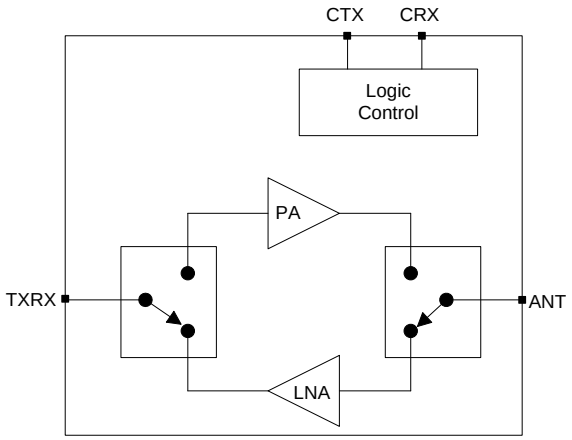

Figure1 Block Diagram

CONTENTS

5. Absolute Maximum Ratings

Parameter	Range	Unit	Condition
Supply Voltage VDD	0~4	V	
DC control voltage	0~3.6	V	
DC VDD current consumption	350	mA	Through VDD pins when TXEN is on
Sleep current consumption	0.5	uA	
RF input power	8	dBm	
ESD (HBM)	+8000	V	
ESD (CDM)	+2000	V	
Junction Temperature	+150	°C	

Table 1

6. Pin Description

Name	Pin	Description
TXRX	4	RF signal to/from the transceiver
TXEN	5	CMOS input to control TX enable
RXEN	6	CMOS input to control RX enable
ANT	10	Connect to 50 Ω antenna
VDD	14,16	Voltage supply connection
GND	11,17	Ground
NC	1,2,3, 7,8,9,12,13,15	Not connected

Table 2

Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device. All maximum RF input power ratings assume 50 Ω terminal impedance.

ESD HANDLING: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

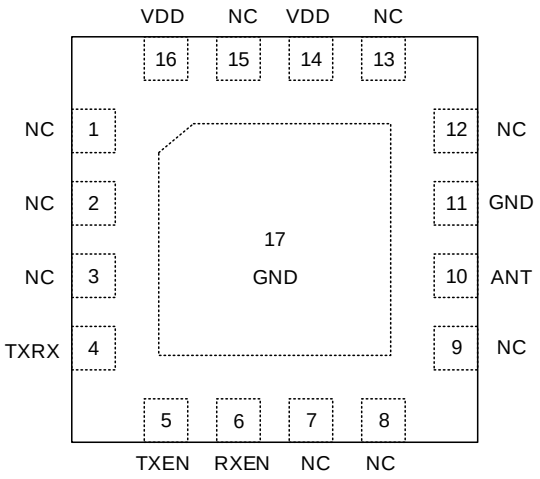

Figure 2 GC1101 Pinout(Top view)

7. Recommended Operating Condition

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Supply voltage VDD	1.8	3.3	3.6	V	All VDD pins
Control voltage “high”	1.2		VDD		Through 1kOhm resistor
Control voltage “low”	0		0.3		Through 1kOhm resistor
Operating Temperature	-40	25	+125	°C	
Storage Temperature	-55	25	+150	°C	

Table 3

8. Control Logic

Mode	TXEN	RXEN
TX Active	1	X
RX Active	0	1
Shut down	0	0
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		

Table 4

9. Electrical Specifications

VDD=3.3V, All Unused Ports Terminated with 50Ω, Temp=25°C, Unless Otherwise Noted.

Parameter	Min	Typ	Max	Unit	Condition
Frequency range	2.4		2.525	GHz	
Transmit Mode					
Small-signal Gain	23	24.5	26	dB	
Quiescent Current	19	21	24	mA	
Saturated Output Power	22	+22.5	23	dBm	
Output Current		97		mA	Pout=20 dBm at ANT
Input Return Loss		-13		dB	
Output Return Loss		-7		dB	
Input / output impedance		50		Ω	Single-ended
Second Harmonic		-12		dBm/MHz	Pout=20 dBm at ANT
Third Harmonic		-22		dBm/MHz	Pout=20 dBm at ANT
Load VSWR for stability (Pout= +20 dBm)		6:1		N/A	All non-harmonically related spurs less than –43 dBm/MHz
Load VSWR for ruggedness (Pout= +20 dBm)		10:1		N/A	No damage
Receive Mode					
Gain	15	16	17	dB	
Noise Figure		2.9		dB	
Input P1dB		-4		dBm	
Input Return Loss		-15		dB	
Output Return Loss		-15		dB	
RF port impedance		50		Ω	
Quiescent Current		8		mA	

Table 5

10. Standby Mode Technical Parameters

Parameter	Min	Typ	Max	Unit	Condition
DC shutdown current				μA	
TXRX-ANT insertion loss		-40		dB	Pin<-20dBm
ANT-TXRX insertion loss		-40		dB	
Return Loss		-2		dB	From TXRX port
Transmit-receive switching time		800		nsec	
Shutdown and “ON” State switching Time		800		nsec	

Table 6

11. Application Schematic

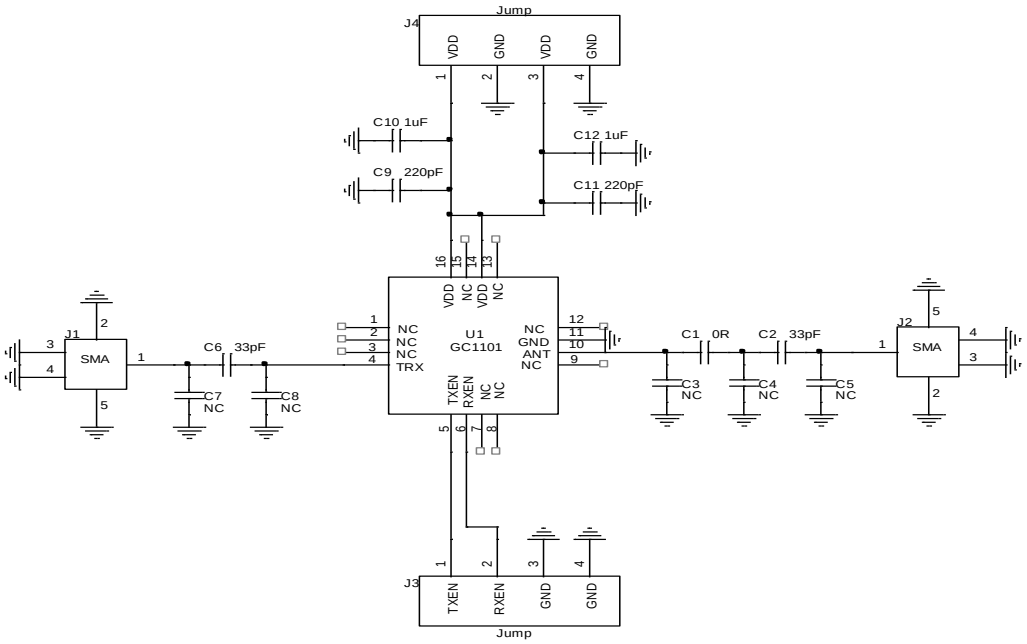

Figure 3

12. Circuit Design Considerations

The following design considerations are general in nature and must be followed regardless of final use or configuration:

- Paths to ground should be made as short as possible.
- If the transceiver TRX port has DC present, use a capacitor to block this voltage from reaching the GC1101.
- The ground pad of the GC1101 has special electrical and thermal grounding requirements. This pad is the main thermal conduit for heat dissipation. Because the circuit board acts as the heat sink, it must shunt as much heat as possible from the device. Multiple vias to the grounding layer are required. Use thermal vias to assure efficient heat dissipation.
- Locate the bypass capacitors as close as possible to the ground pad. Use two ground vias.
- The VDD (pin 14) is an optional VDD pin, internally connected to pin 16.
- The N/C pins 1, 2, 3, 7, 8, 9, 12, 13, and 15 may be left open or connected to GND.
- If the antenna circuits have DC present, use a capacitor to block this voltage from reaching the GC1101.

NOTE: A poor connection between the ground pad and ground increases junction temperature (TJ), which reduces the life of the device.

13. Package Dimensions

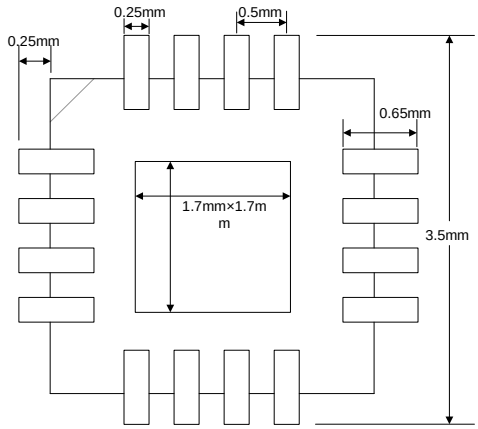

Figure 4 Layout Footprint (Top View)

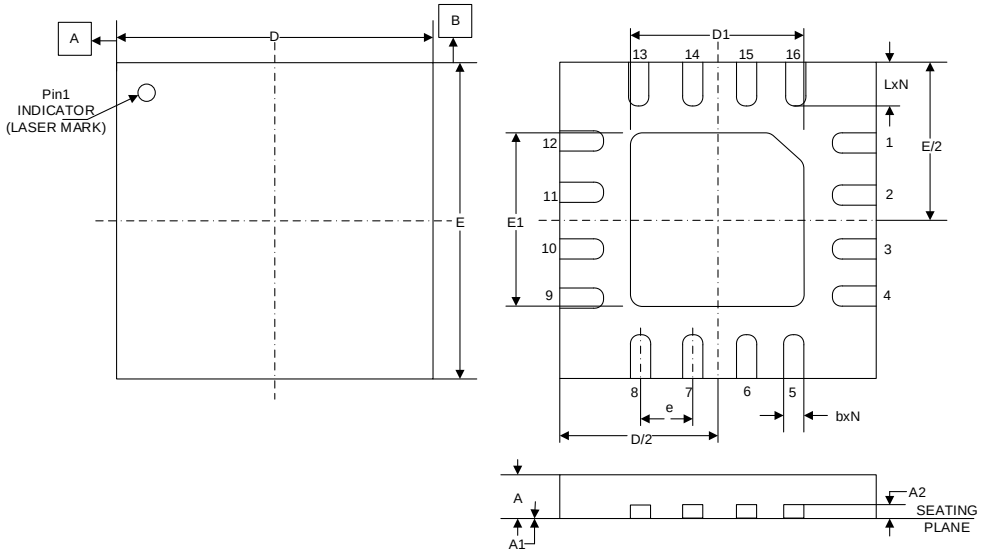

Figure 5 16-Pin QFN Package Dimensions

Symbol	Min	Typ	Max	Unit
A	0.70	0.75	0.80	mm
A1	0.00	0.02	0.05	
A2		0.20		
b	0.18	0.25	0.30	
D	2.90	3.00	3.10	
D1	1.55	1.70	1.80	
E	2.90	3.00	3.10	
E1	1.55	1.70	1.80	
e		0.5BSC		
L	0.30	0.40	0.50	
N		16		

Table 7

14. Part Marking

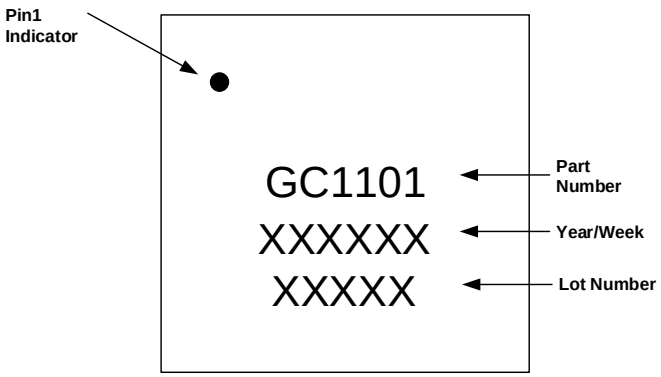

Figure 6 Typical Part Markings（Top View）

15. Packaging Information

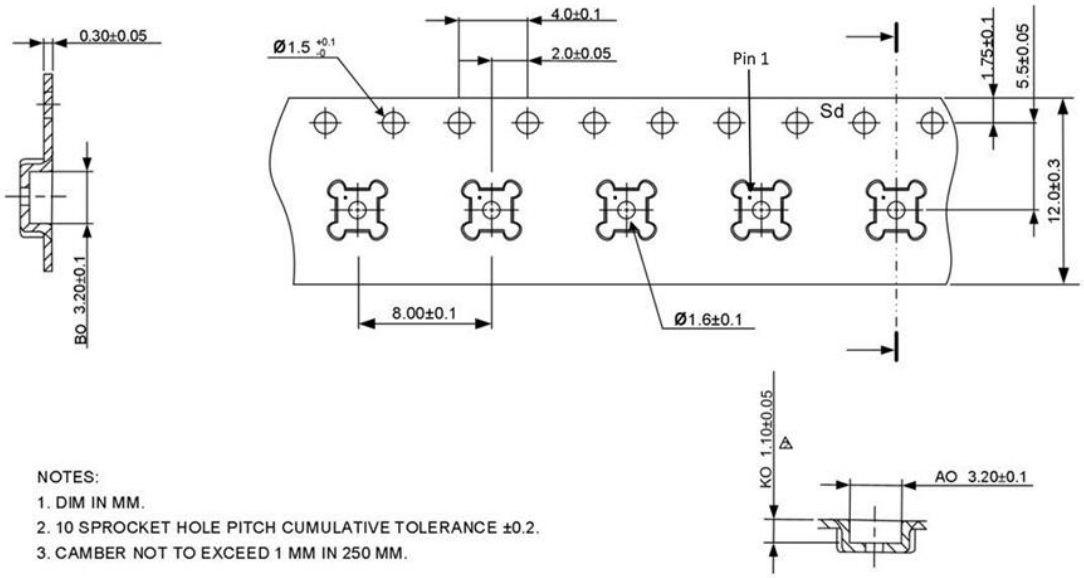

Figure 7. GC1101 Packaging Information

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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

17. Ordering Information

Model	Package	Packaging Type	Minimum Order Quantity
GC1101	QFN16 3*3	Tape&Reel	3000

18. Revision Record

Version	Date	Description
2.0	03/2022	MP release
2.1	12/2022	Update product highlights
2.2	11/2024	Update the minimum of “Supply voltage” to 1.8V