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 +22dBm output power
- Integrated LNA with 3dB noise figure
- Integrated Bandpass filter for Power saving TX or low RX gain applications.
- Transmit/receive switch circuitry
- ESD protection circuitry on all ports
- QFN 16 (3 x 3 x 0.75 mm) package with exposed ground pad. (MSL3)

2. Appllcations

- Internet of Things (IoT) devices
- Extended Range Devices
- Home and Industrial appliances
- ZigBee Systems
- Bluetooth Systems
- RF4CE Remote Control
- Custom 2.4GHz Radio Systems

3. Product Highlights

- ESD(HBM)>+8000V
- Sleep current<0.5uA

4. Description

The GC1103 is a fully integrated, single-chip RF Front-end IC which incorporates all the RF functionality needed for IEEE 802.15.4, ZigBee, Bluetooth, wireless sensor network, and any other wireless systems in the 2.4 GHz ISM band. The GC1103 integrates the PA, LNA, Bandpass filter, 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, GC1103 is the perfect solution for applications requiring extended range and bandwidth. GC1103 has simple and low-voltage CMOS control logic, and requires minimal external components for system implementation.

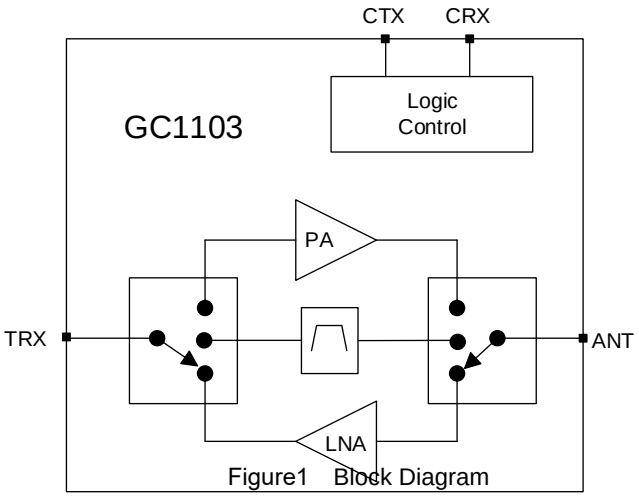

Figure1 Block Diagram

CONTENTS

5. Absolute Maximum Ratings

Parameter	Range	Unit	Condition
Supply Voltage VDD	0~4	V	
DC control voltage	0~3.6	V	Through 1kOhm resistor
DC VDD current consumption	250	mA	Through VDD pins when MODE1 is on
Sleep current consumption	0.5	uA	
RF input power	5	dBm	
ESD (HBM)	+8000	V	
ESD (CDM)	+2000	V	
Junction Temperature	+150	°C	

Table 1

6. Pin Description

Name	Pin	Description
TRX	4	RF signal to/from the transceiver
MODE1	5	CMOS input to control TX enable
MODE2	6	CMOS input to control RX enable
ANT	10	Connect to 50 Ω antenna
VDD	14,16	Voltage supply connection
GND	7,11,17	Ground
NC	1,2,3, 8,9,12,15	Not connected
DNC	13	Do not connect

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.

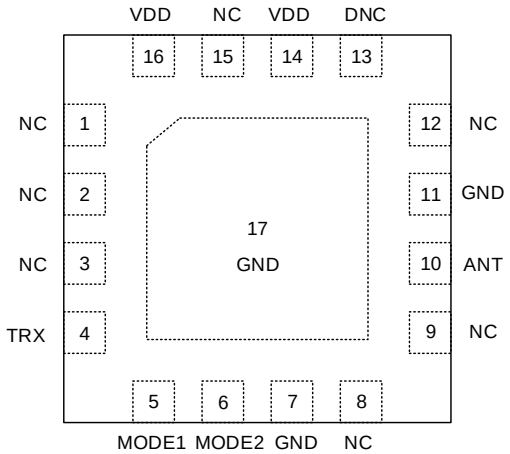

Figure 2 GC1103 Pinout

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
Ambient Temperature	-40	25	+125	°C	

Table 3

8. Control Logic

Mode	MODE1	MODE2
TX Mode	1	0
RX Mode	0	1
Bypass Mode	1	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	24	25.5	27	dB	
Quiescent Current		21		mA	
Saturated Output Power		22		dBm	
Output Current		110		mA	Pout=20 dBm at ANT
Input Return Loss		-14		dB	
Output Return Loss		-6		dB	
Input / output impedance		50		Ω	Single-ended
Second Harmonic		-20		dBm/MHz	Pout=20 dBm at ANT
Third Harmonic		-18		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	12	12.5	13	dB	
Noise Figure		3.2		dB	
Input P1dB		-4		dBm	
Input Return Loss		-14		dB	
Output Return Loss		-13		dB	
RF port impedance		50		Ω	
Quiescent Current		7.5		mA	
Bypass Mode					
Insertion Loss		2.3		dB	
Total Current Consumption		0.29		mA	
Input P1dB		11		dBm	

Table 5

10. Standby Mode Technical Parameters

Parameter	Min	Typ	Max	Unit	Condition
DC shutdown current		0.05		μA	
TRX-ANT insertion loss		-50		dB	Pin<-20dBm
ANT-TRX insertion loss		-50		dB	
Transmit-receive switching time			1	μsec	
Shutdown and “ON” State switching Time			1	μsec	

Table 6

11. Application Schematic

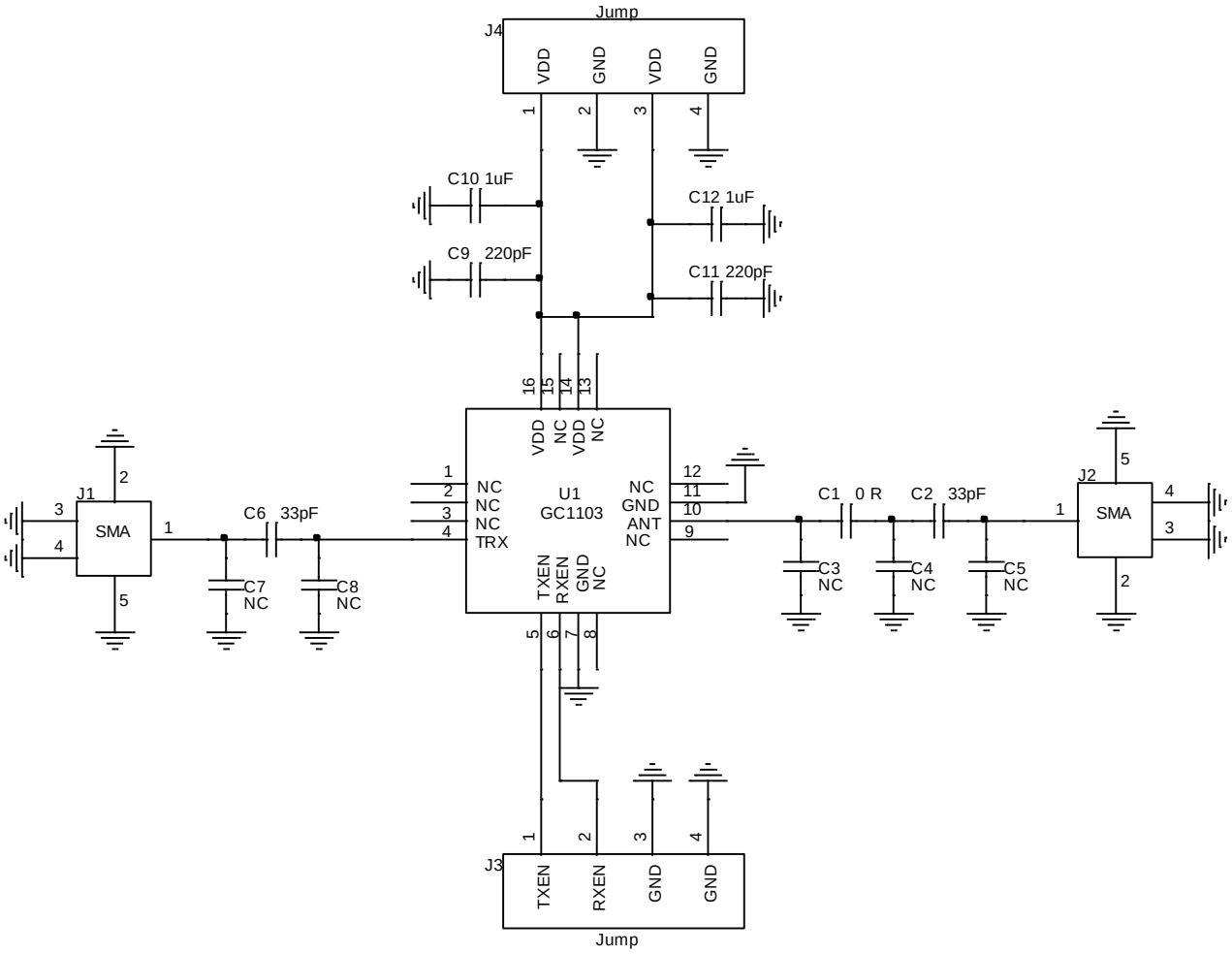

Figure 3

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 GC1103.
- The ground pad of the GC1103 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, 12, 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 GC1103.

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

13. Package Dimensions

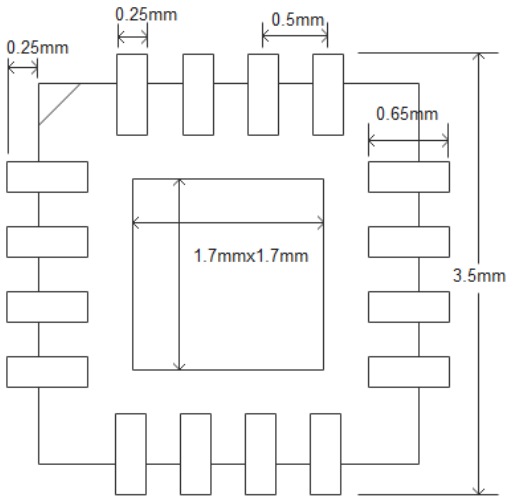

Figure 4 Layout Footprint (Top View)

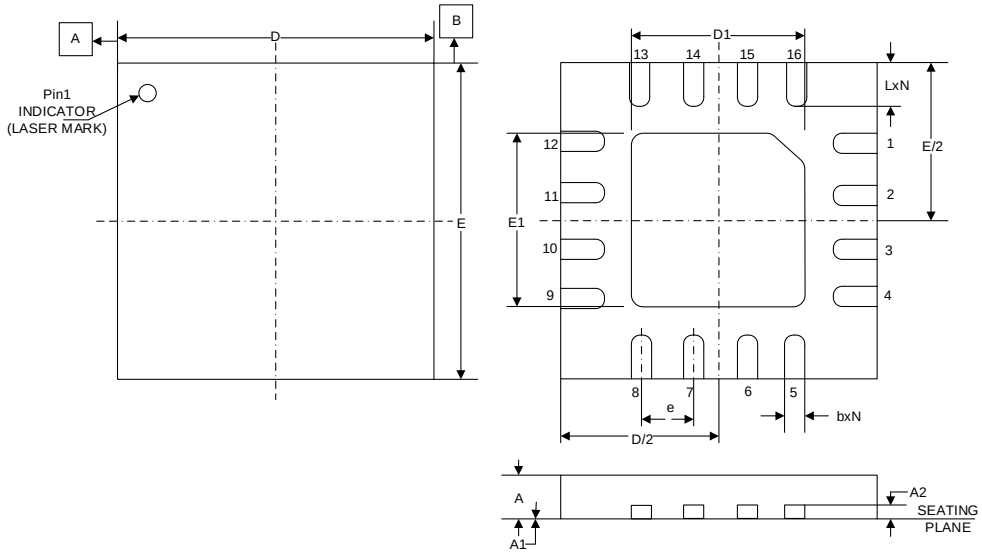

Figure 5 16-Pin QFN Package Dimensions

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

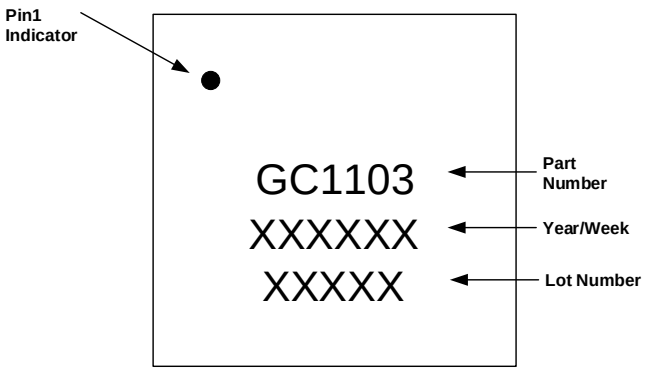

Figure 6 Typical Part Markings（Top View）

15. Packaging Information

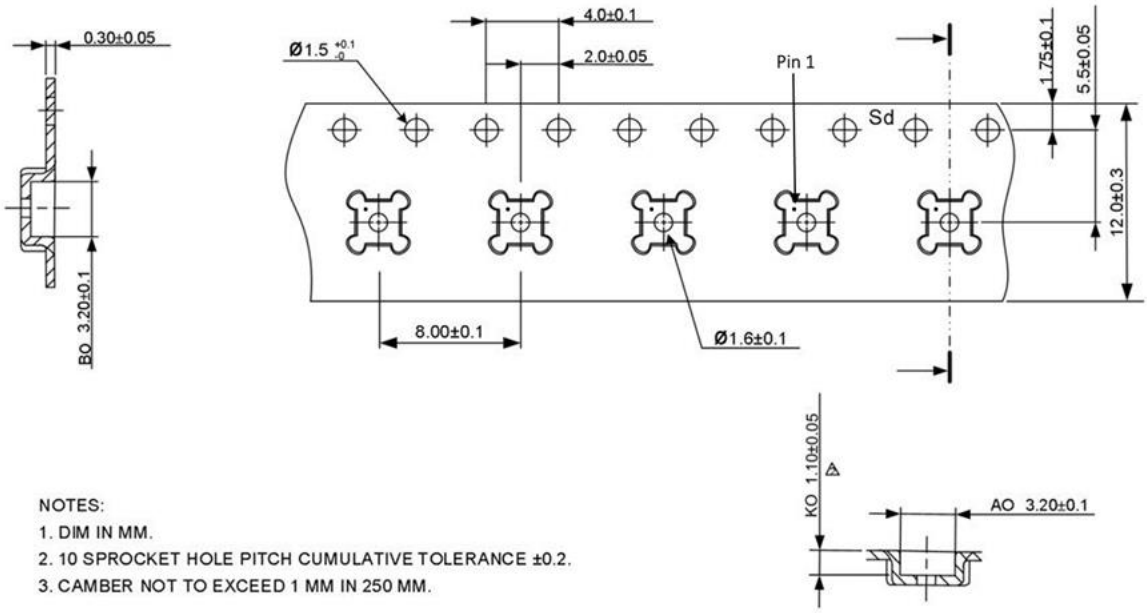

Figure 7. GC1103 Packaging Information

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17. Ordering Information

Model	Package	Packaging Form	Minimum Order Quantity
GC1103	QFN16 3*3	Tape&Reel	3000

18. Revision Record

Version	Date	Description
0.91	2022/3	CS release
0.92	2022/7	1. Removed description and relevant information of HL 2. Changed the PIN “HL” to “GND” 3. Updated Min/Max Spec, according to test results of all corners
1.0	2024/11	Update the minimum of “Supply voltage” to 1.8V