GSR2502

2.4 GHz BT/IOT Front End Module

Product Description

The GSR2502 is a high performance, fully integrated RF front end module (FEM) designed for Bluetooth (including EDR), Zigbee applications. The device provides all the functionality of a fully matched power amplifier (PA), low-noise amplifier (LNA), and two single-pole, triple-throw (SP3T) switches.

The GSR2502 provides a complete 2.4 GHz WLAN RF solution from the output of the transceiver to the antenna, and from the antenna to the input of the transceiver. The LNA increases the receive sensitivity of embedded solutions to improve range. The low insertion loss and low current bypass mode decrease the power consumption when working in a good signal environment. The GSR2502 also includes digital enable control pins for power ramp on/off control.

The RF blocks operate over a wide supply voltage range from 3.0 V to 5.2 V that allows the GSR2502 to be used in lithium battery powered applications.

The device is provided in a compact, 16-pin 2.3 x 2.3 mm Quad Flat No-Lead (QFN) package. Pin map is shown in Figure 1. A functional block diagram is shown in Figure 2.

Pin Map

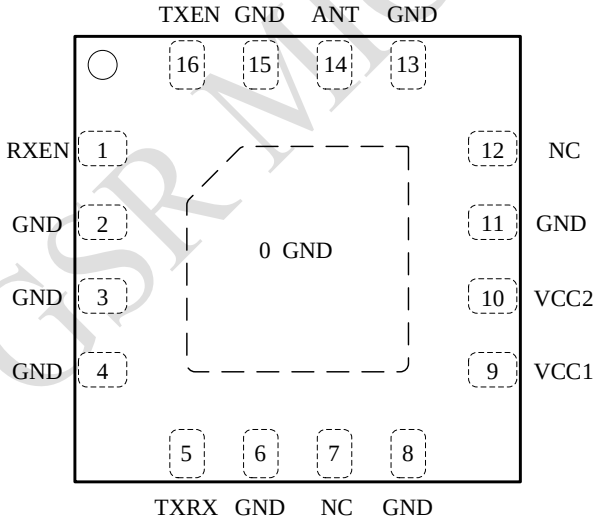


Figure 1 GSR2502 Pin Map (Top View)

Functional Block Diagram

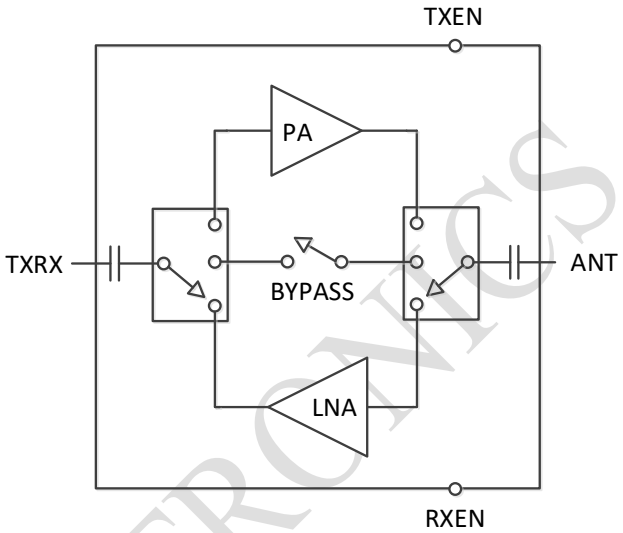


Figure 2 Block Diagram

Key Features

- Saturated output power: 24.5 dBm@3.3 V
- Saturated output power: 28 dBm@5 V
- Integrated LNA (1.6 dB noise figure)
- Single ended transmit/receive interface
- Input and output matched to 50 ohm
- Wide supply range (3.0 V to 5.2 V)
- No external bias resistor is required
- High Impedance Control Pin

Applications

- Range extender
- Wireless sound and audio systems
- Custom 2.4 GHz radio systems
- Wireless sensor networks
- Zigbee smart power
- Zigbee extended range devices

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Pin Description

Pin	Name	Description
0	GND	Ground
1	RXEN	Control voltage for the LNA
2	GND	Ground
3	GND	Ground
4	GND	Ground
5	TXRX	RF signal to/from the transceiver
6	GND	Ground
7	NC	Not connected
8	GND	Ground
9	VCC1	Supply voltage for LNA and logic circuit
10	VCC2	Supply voltage for PA
11	GND	Ground
12	NC	Not connected
13	GND	Ground
14	ANT	RF bidirectional antenna port
15	GND	Ground
16	TXEN	Control voltage for the PA

Absolute Maximum Ratings

Parameter	Conditions	Rating
DC Supply Voltage		-0.5 to +6 V
Control Voltage (TXEN, RXEN,)		-0.5 to +3.6 V
Storage Temperature		-40 to 150 ℃
Junction Temperature		Max 150 ℃
RF Input Power at TXRX, Transmit Mode	ANT connect 50 Ω Load	+20 dBm
RF Input Power at ANT, Receive Mode	TXRX connect 50 Ω Load	+20 dBm

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

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Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Operating Frequency	2400	-	2500	MHz
DC Supply Voltage	3.0	3.3	5.2	V
Control Voltage – High	1.2	-	3.6	V
Control Voltage – Low	0	-	0.4	V
DC shutdown current		700		nA
Operating temperature	-40	25	105	℃

Logic Truth Table

Mode	TXEN	RXEN
Transmit Mode	High	Low
Receive Mode	Low	High
Bypass Mode	Low	Low
Bypass Mode	High	High

Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Transmit Mode	Unless otherwise noted: VCC1, VCC2=3.3 V, Temp=+25ºC, TXEN=High, RXEN=Low				
Saturated output power			24.5		dBm
Small signal gain	Pin = -20 dBm		25		dB
Out of Band Gain	f = 5000 ~ 6000 MHz		-12		dB
TXRX Port Return Loss			20		dB
ANT Port Return Loss			6		dB
Quiescent Current	RF OFF		30		mA
Operating Current	Pout=20 dBm, CW		97		mA
	Pout=14 dBm, CW		55		mA
Second Harmonics	Pout= 20 dBm, BT BR 1DH5 PRBS9		-15		dBm/MHz
Third Harmonics	Pout= 20 dBm, BT BR 1DH5 PRBS9		-25		dBm/MHz
Switching Time	From 50% of TXEN edge to 90% of final RF output power		400		nS
Stability	CW, Pin= 0 dBm, 0.1 GHz to 20 GHz, load VSWR= 10:1	All non-harmonically related outputs< -42 dBm/MHz			
Ruggedness	Rated power = 20 dBm, load VSWR 10:1	No damage			
Transmit Mode	Unless otherwise noted: VCC1, VCC2=5 V, Temp=+25ºC, TXEN=High, RXEN=Low				

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Saturated output power			28		dBm
Small signal gain	Pin = -20 dBm		26		dB
Out of Band Gain	f = 5000 ~ 6000 MHz		-12		dB
TXRX Port Return Loss			20		dB
ANT Port Return Loss			8		dB
Quiescent Current	RF OFF		32		mA
Operating Current	Pout=27 dBm, CW		230		mA
	Pout=24 dBm, CW		135		mA
Second Harmonics	Pout= 24 dBm, BT BR 1DH5 PRBS9		-15		dBm/MHz
Third Harmonics	Pout= 24 dBm, BT BR 1DH5 PRBS9		-25		dBm/MHz
Switching Time	From 50% of TXEN edge to 90% of final RF output power		400		nS
Stability	CW, Pin= 0 dBm, 0.1 GHz to 20 GHz, load VSWR= 10:1	All non-harmonically related outputs< -42 dBm/MHz			
Ruggedness	Rated power = 20 dBm, load VSWR 10:1	No damage			
Receive Mode	Unless otherwise noted: VCC1, VCC2=3.3&5 V, Temp=+25ºC, TXEN=Low, RXEN= High				
Noise Figure			1.6		dB
Gain			14		dB
Out of Band Gain	f = 5000 ~ 6000 MHz		-15		dB
RX Port Return Loss			10		dB
ANT Port Return Loss			10		dB
Quiescent Current			7.5		mA
Input P1dB			-4		dBm
Switching Time	From 50% of RXEN edge to 90% of final RF output power		300		nS
Bypass Mode	Unless otherwise noted: VCC1, VCC2= 3.3 V, Temp=+25ºC, TXEN=0 V, RXEN=0 V				
Insertion Loss			-3		dB
$IP_{0.1dB}$	Input 0.1 dB Compression Point		23		dBm
TXRX Port Return Loss			10		dB
ANT Port Return Loss			10		dB
Quiescent Current	RF OFF		700		nA

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Application Schematic

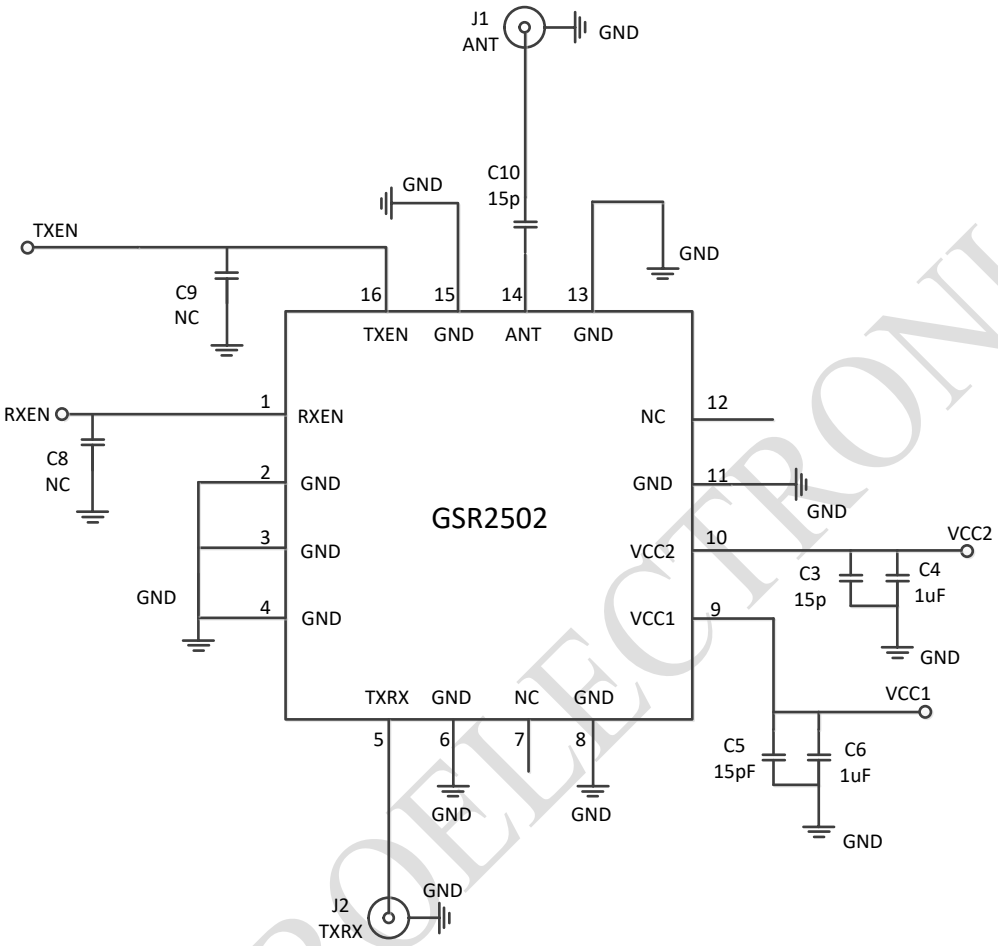


Figure 3 GSR2502 Application Schematic

Part Marking

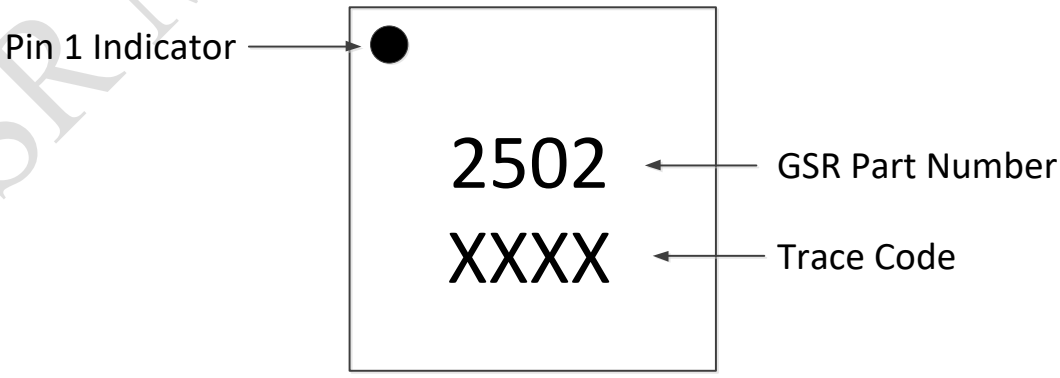
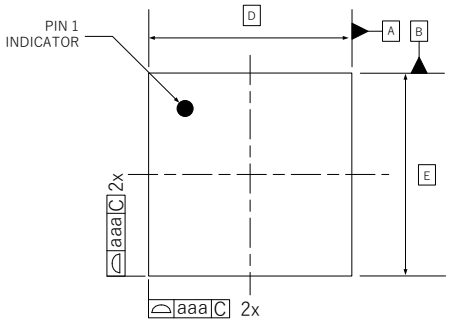


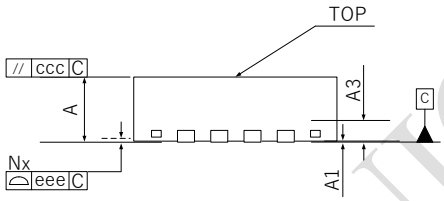
Figure 4 GSR2502 Marking

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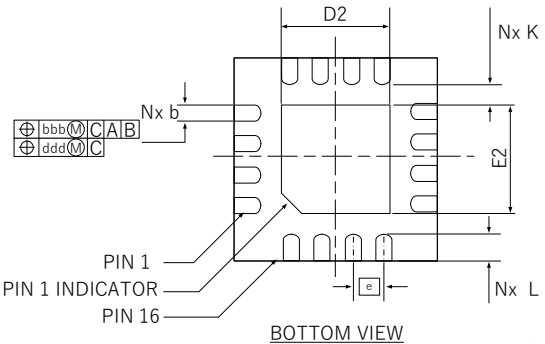
Package Outline



TOP VIEW



SIDE VIEW



BOTTOM VIEW

NOTE:
1. Dimensioning and tolerancing conform to ASME Y14.5-2009.
2. All dimensions are in millimeters.
3. N is the total number of terminals.
4. The location of the marked terminal #1 identifier is within the hatched area.
5. ND and NE refer to the number of terminals on each D and E side respectively.
6. Dimension b applies to the metalized terminal and is measured between 0.15mm and 0.30mm from the terminal tip. If the terminal has a radius on the other end of it, dimension b should not be measured in that radius area.
7. Coplanarity applies to the terminals and all other bottom surface metallization.

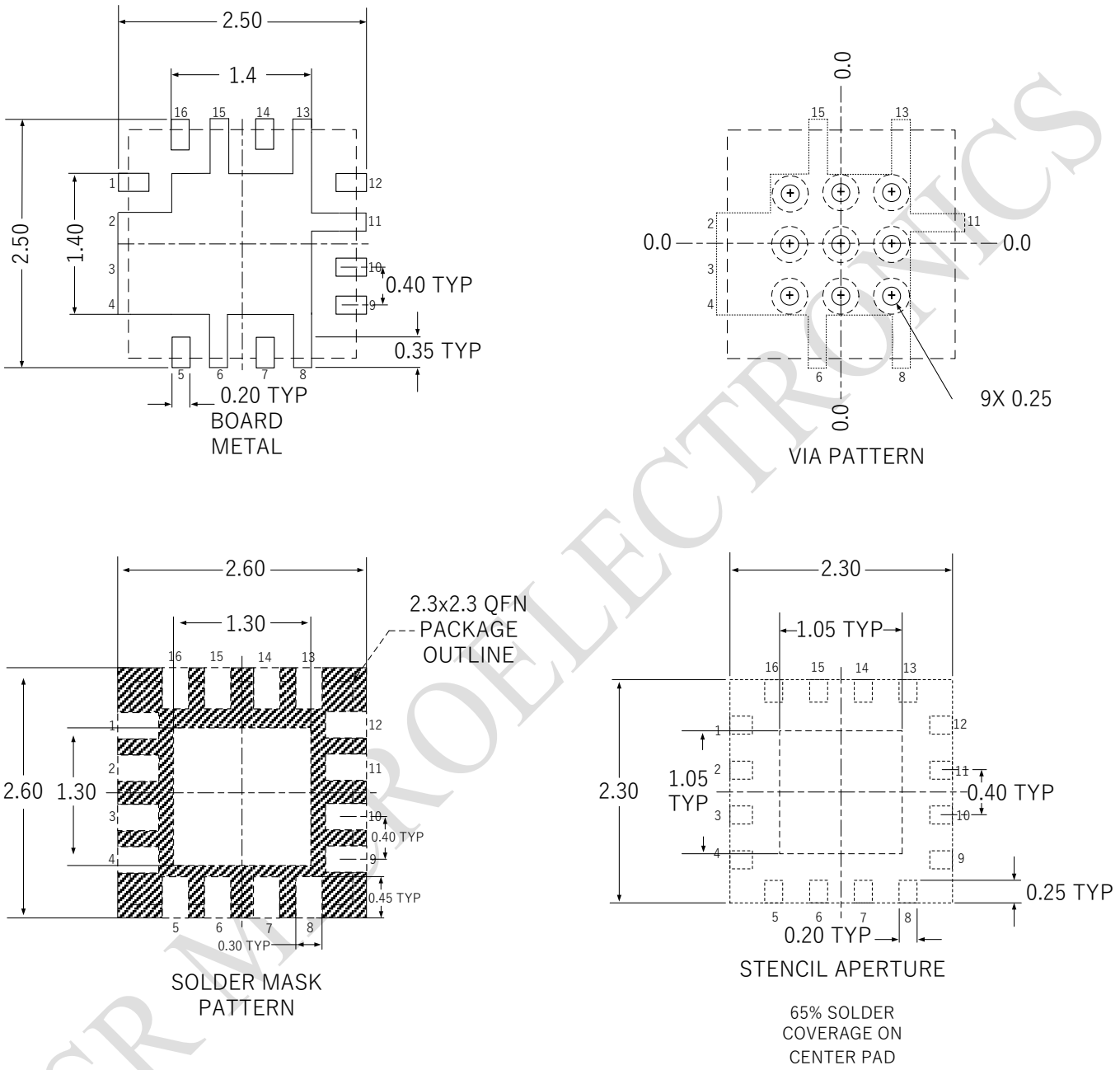
Dimension Table

	MINIMUM	NOMINAL	MAXIMUM	NOTE
A	0.45	0.5	0.55	
A1	0.00	0.02	0.05	8
A3	---	0.127 Ref	---	
b	0.15	0.20	0.25	6
D	2.30 BSC			
E	2.30 BSC			
e	0.40 BSC			
D2	1.25	1.40	1.50	
E2	1.25	1.40	1.50	
K	0.15	---	---	
L	0.15	0.25	0.35	
aaa	0.05			
bbb	0.07			
ccc	0.10			
ddd	0.05			
eee	0.08			
N	16			3
ND	4			5
NE	4			5
NOTES	1,2			

Figure 5 GSR2502 Package Outline

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PCB Layout Print



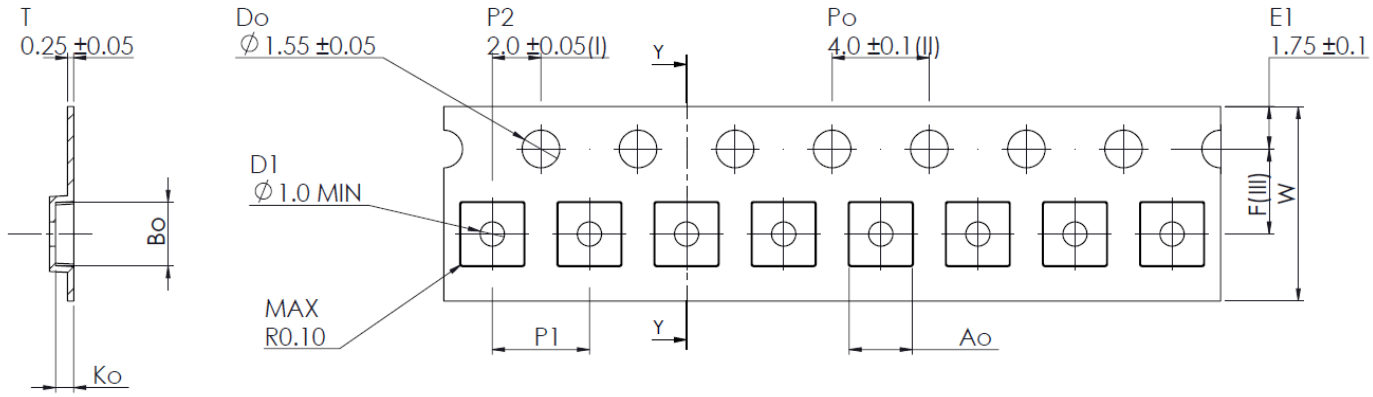
Notes:

1. All dimensions are in millimeters.
2. Unless specified, dimensions are symmetrical about center lines.

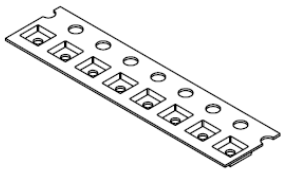
Figure 6 GSR2502 Recommended PCB Footprint

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Tape and Reel Information



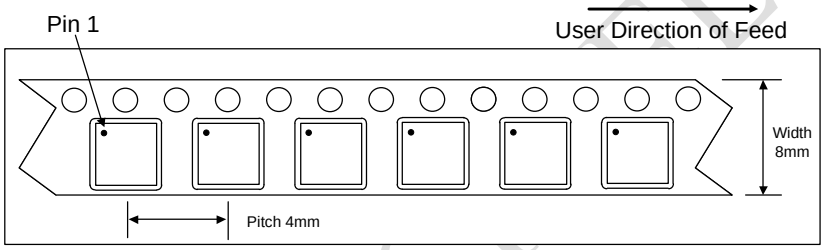
SECTION Y-Y

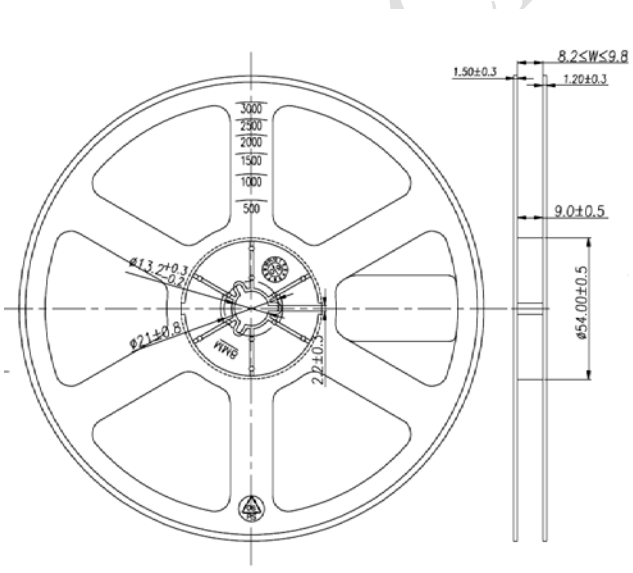


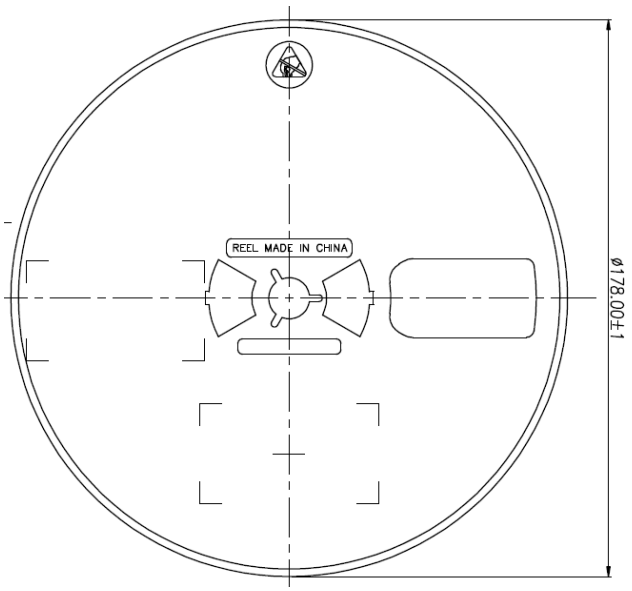
Ao	2.60	+/- 0.1
Bo	2.60	+/- 0.1
Ko	0.75	+/- 0.1
F	3.50	+/- 0.05
P1	4.00	+/- 0.1
W	8.00	+0.3/- 0.1

(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.







Notes: All dimensions are in millimeters.

Ordering Information

Part Number	Product Description	Package Type	Package Quantity
GSR2502	2.4GHz Front-End Module	7” tape and reel	3000 pcs / real

Handling Precautions

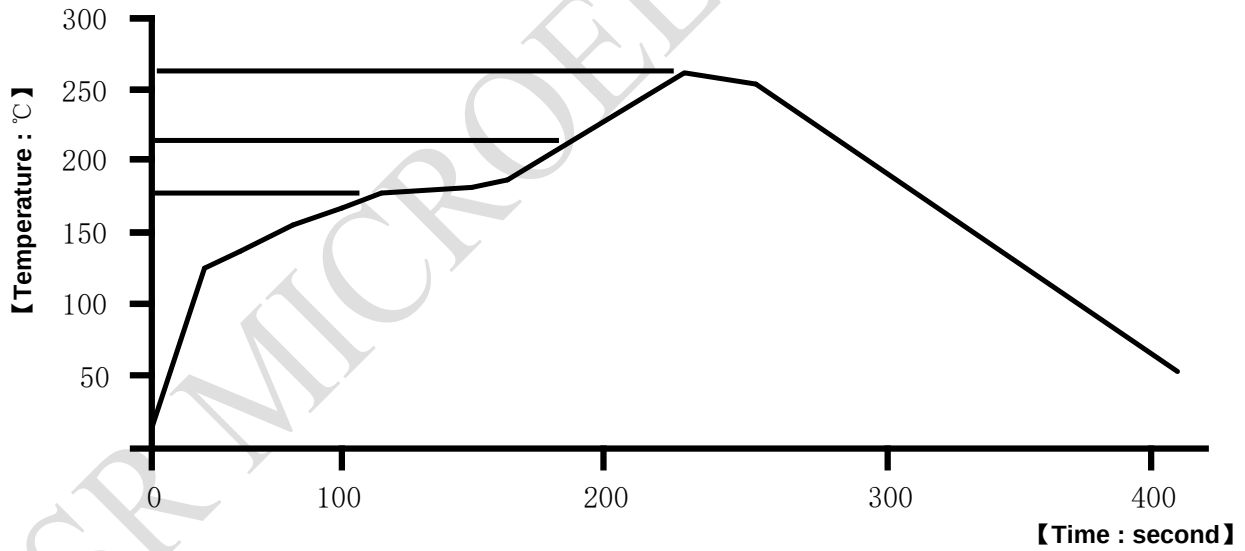
Test Model	ESD Rating	Value	Standard
Human Body Model (HBM)	Class 1C	≥ 1200 V	ESDA /JEDEC JS-001-2017
Charged Device Model (CDM)	Class C3	≥ 2000 V	ESDA /JEDEC JS-002-2018

Caution: Industry-standard ESD precautions should be used at all times.

MSL Rating

MSL Rating	Standard
3	JEDEC Standard IPC/JEDEC J-STD-020

Recommended IR Reflow Profile



Average ramp-up rate (200℃ to peak)	3°C/second max.
Preheat temperature (175±25)℃	60~120 secs
Temperature maintained above 217℃	60~150 secs
Time within 5℃ of actual peak temperature	30 seconds min.
Peak temperature range	(260±2)℃
Ramp down rate	6°C/second max.
Time 25℃ to peak temperature	8 minutes max.

Follow JEDEC spec J-STD-020D

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RoHS Compliant

The product does not contain lead, mercury, cadmium, hexavalent chromium, poly brominated biphenyls (PBB) or poly brominated diphenyl ethers (PBDE), and are therefore considered RoHS compliant.

Version History

Revision	Description
A	Initial release
B	Update Electrical Specifications
C	Update 5V electrical specifications

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Contact Information

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