

# GSR2501

## 2.4 GHz BT/IOT Front End Module



### Product Description

The GSR2501 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 GSR2501 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 GSR2501 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 GSR2501 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

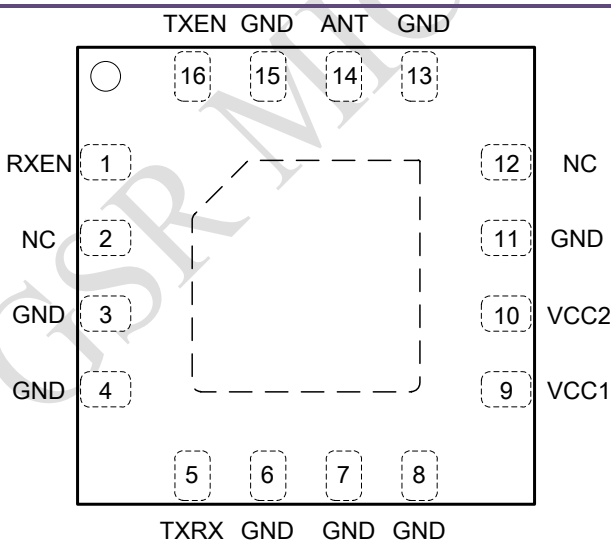


Figure 1 GSR2501 Pin Map (Top View)

### Functional Block Diagram

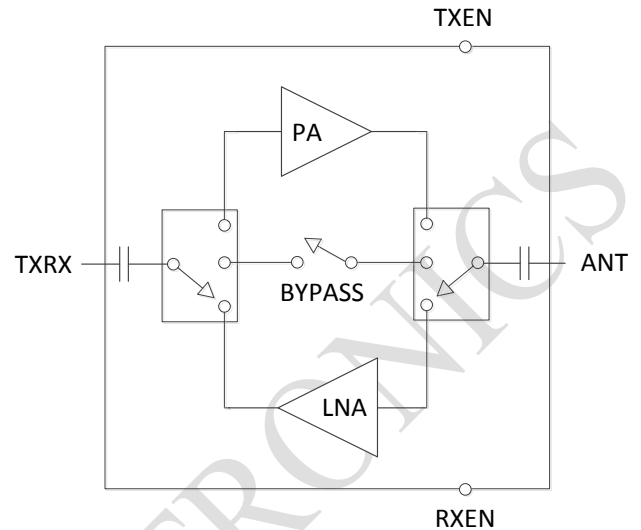


Figure 2 Block Diagram

### Key Features

- Saturated output power: 23.5 dBm@3.3 V
- EDR power up to 14 dBm
- Integrated LNA (1.5 dB noise figure)
- Low Insertion Loss Bypass Mode
- 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

### Pin Description

Pin	Name	Description
1	RXEN	Control voltage for the LNA
2	NC	Not connected
3	GND	Ground
4	GND	Ground
5	TXRX	RF signal to/from the transceiver
6	GND	Ground
7	GND	Ground
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 +5.2V
Control Voltage (TXEN, RXEN,)		-0.5 to +3.6 V
Storage Temperature		-40 to 150 °C
Junction Temperature		Max 150 °C
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.

### 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
Operating temperature	-20	25	85	°C

### 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=+25°C, TXEN=High, RXEN=Low				
BT EDR output power	BT EDR 3DH5 PRBS9		14		dBm
Saturated output power	Pin = 8 dBm		23.5		dBm
Small signal gain	Pin = -20 dBm		15.5		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		25		mA
Operating Current	Pout=20 dBm, CW		87		mA
	Pout=14 dBm, CW		50		mA
	Pout=10 dBm, CW		35		mA
Second Harmonics	Pout= 20 dBm, BT BR 1DH5 PRBS9		-15		dBm/MHz
Third Harmonics	Pout= 20 dBm, BT BR 1DH5 PRBS9		-27		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			

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Receive Mode	Unless otherwise noted: VCC1, VCC2=3.3 V, Temp=+25°C, TXEN=Low, RXEN= High				
Noise Figure			1.5		dB
Gain			14		dB
Out of Band Gain	f = 5000 ~ 6000 MHz		-15		dB
RX Port Return Loss			8		dB
ANT Port Return Loss			9		dB
Quiescent Current			15		mA
Input P1dB			-4		dBm
Switching Time	From 50% of RXEN edge to 90% of final RF output power		400		nS
Bypass Mode	Unless otherwise noted: VCC1, VCC2= 3.3 V, Temp=+25°C, TXEN=0 V, RXEN=0 V				
Insertion Loss			-6		dB
IP0.1dB	Input 0.1 dB Compression Point		23		dBm
TXRX Port Return Loss			10		dB
ANT Port Return Loss			10		dB
Quiescent Current	RF OFF		40		uA

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### Application Schematic

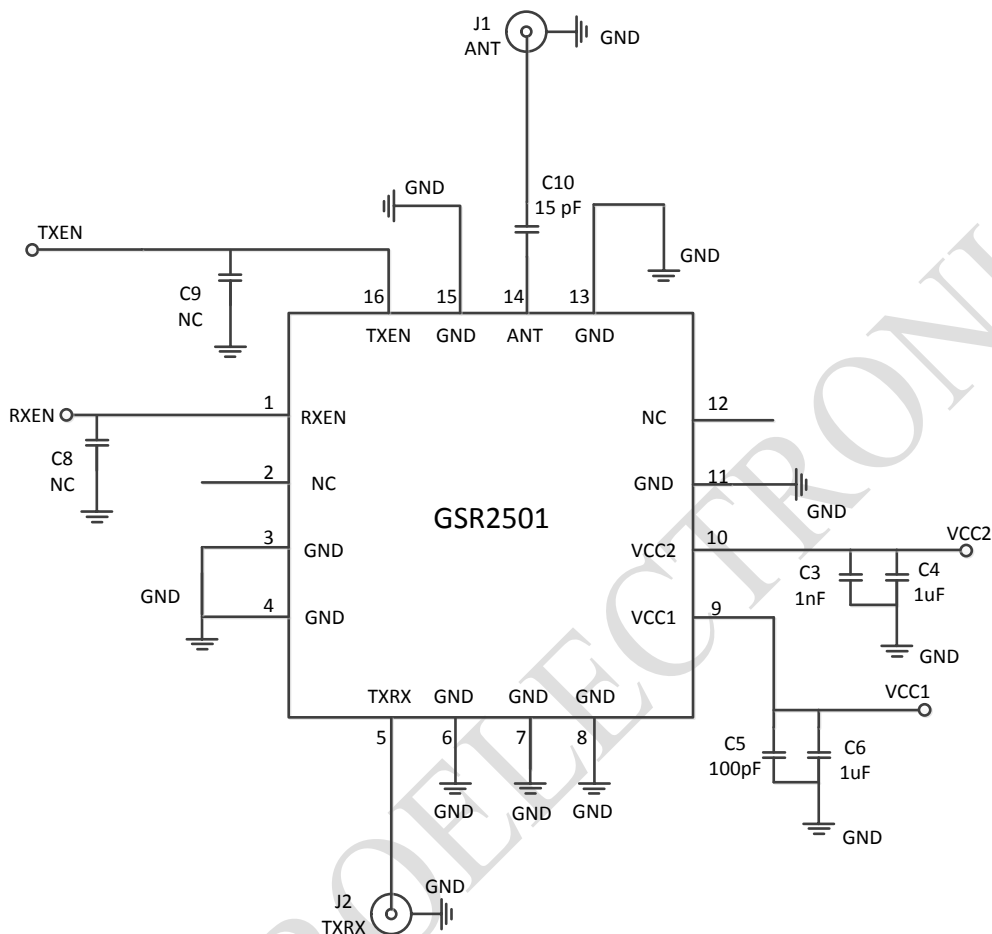


Figure 3 GSR2501 Application Schematic

### Part Marking

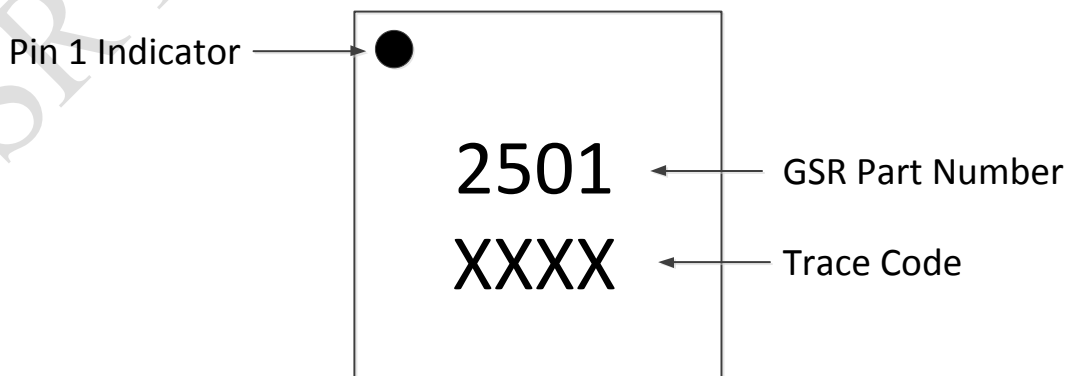


Figure 4 GSR2501 Marking

### Package Outline

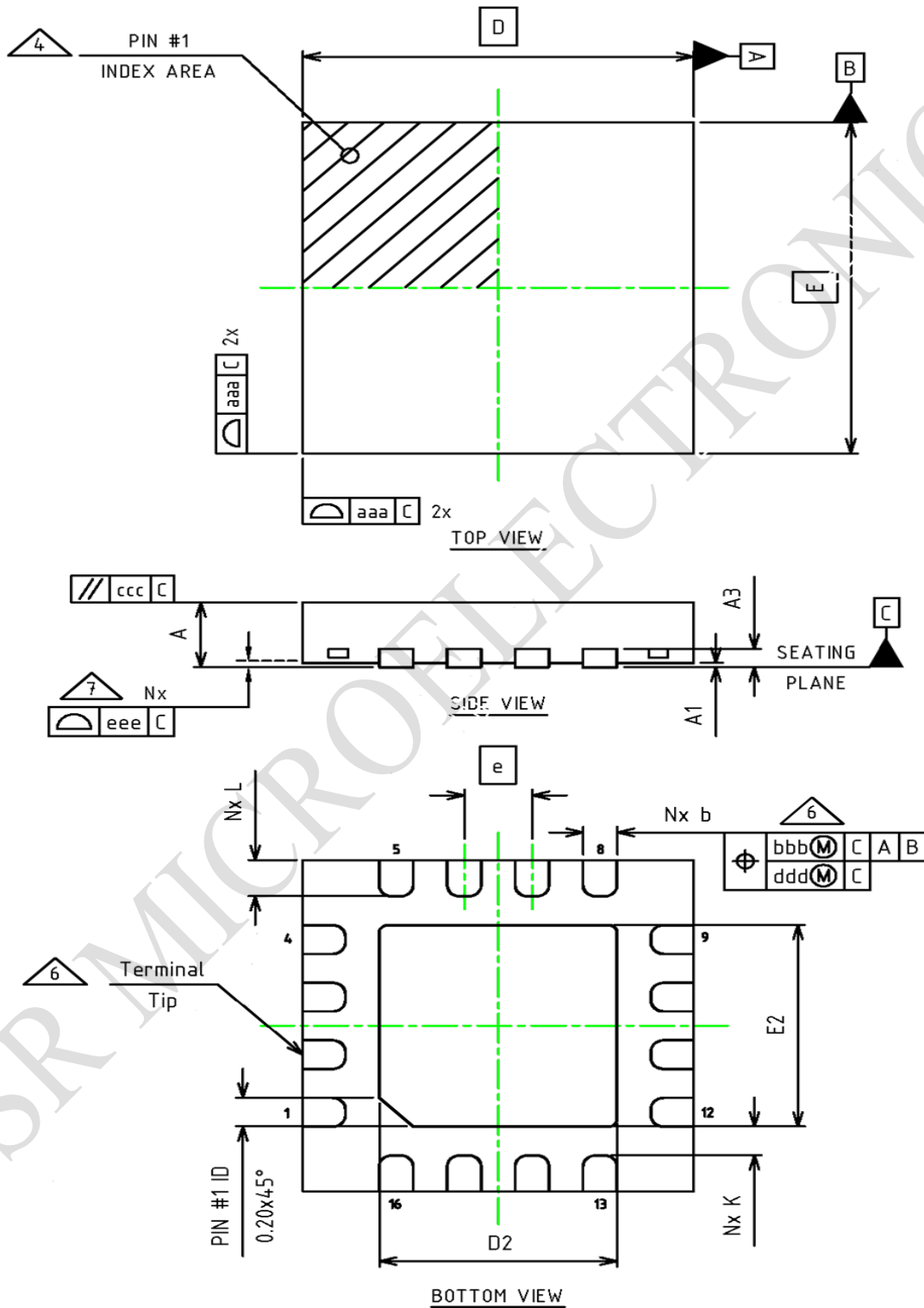


Figure 5 GSR2501 Package Outline

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## 2.4 GHz BT/IOT Front End Module



Dimension Table				
	MINIMUM	NOMINAL	MAXIMUM	NOTE
A	0.31	0.38	0.4	
b	0.15	0.20	0.25	
D		2.3		
E		2.3		
e		0.4		
D2	1.25	1.40	1.50	
E2	1.25	1.40	1.50	
K	0.15			
L	0.15	0.25	0.35	
N		16		

Notes: All dimensions are in millimeters.

### Contact Information

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