

# GSR2401

## 2.4 GHz BT/IOT Front End Modul



### Product Description

The GSR2401 is a high performance, fully integrated RF front end module (FEM) designed for Bluetooth, 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 GSR2401 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 current bypass mode decrease the power consumption when working in a good signal environment. The GSR2401 also includes digital enable control pins for power ramp on/off control.

The device is provided in a compact, 16-pin 3.0 x 3.0 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

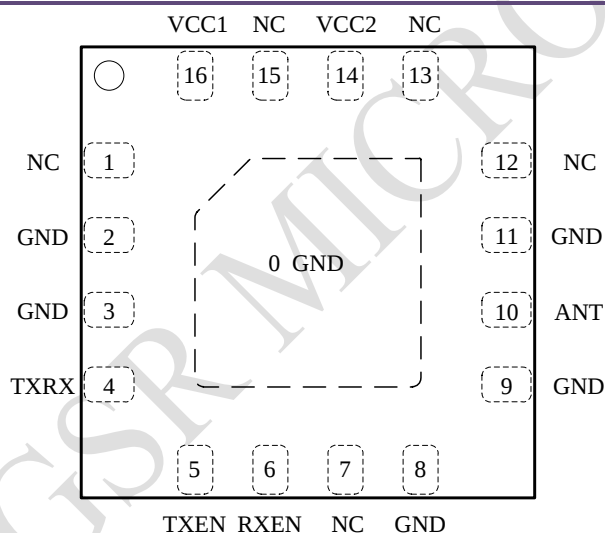


Figure 1 GSR2401 Pin Map (Top View)

### Functional Block Diagram

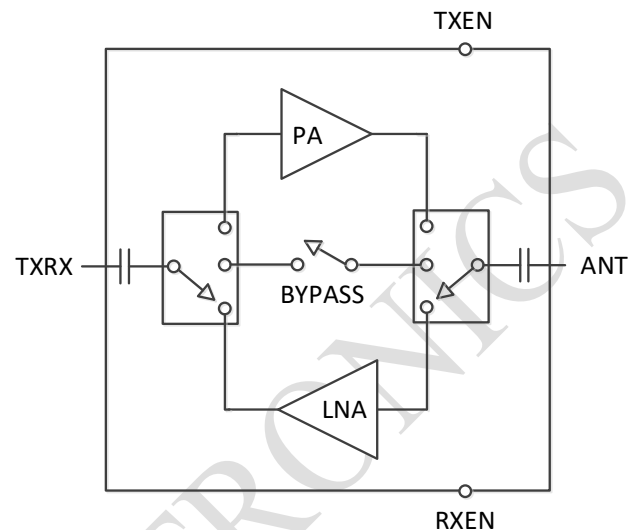


Figure 2 Block Diagram

### Key Features

- Saturated output power: 23 dBm@3.3 V
- Integrated LNA (1.8 dB noise figure)
- Single ended transmit/receive interface
- Input and output matched to 50 ohm
- 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                       |
|-----|------|-----------------------------------|
| 0   | GND  | Ground                            |
| 1   | NC   | Not connected or Ground           |
| 2   | GND  | Ground                            |
| 3   | GND  | Ground                            |
| 4   | TXRX | RF signal to/from the transceiver |
| 5   | TXEN | Control voltage for the PA        |
| 6   | RXEN | Control voltage for the LNA       |
| 7   | NC   | Not connected or Ground           |
| 8   | GND  | Ground                            |
| 9   | GND  | Ground                            |
| 10  | ANT  | Antenna                           |
| 11  | GND  | Ground                            |
| 12  | NC   | Not connected or Ground           |
| 13  | NC   | Not connected or Ground           |
| 14  | VCC2 | Supply voltage                    |
| 15  | GND  | Not connected                     |
| 16  | VCC1 | Supply voltage                    |

## 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 °C  |
| Junction Temperature                  |                               | Max 150 °C     |
| RF Input Power at TXRX, Transmit Mode | ANT connect 50 $\Omega$ Load  | +20 dBm        |
| RF Input Power at ANT, Receive Mode   | TXRX connect 50 $\Omega$ 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 | 3.7  | V     |
| Control Voltage – High | 1.2  | -   | 3.6  | V     |
| Control Voltage – Low  | 0    | -   | 0.4  | V     |
| Operating temperature  | -40  | 25  | 125  | °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  |                                                   |      |     |         |
| Saturated output power | Pin = 10 dBm                                                               |                                                   | 23.0 |     | 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                                                            |                                                   | 58   |     | mA      |
| Second Harmonics       | Pout= 20 dBm                                                               |                                                   | -12  |     | dBm/MHz |
| Third Harmonics        | Pout= 20 dBm                                                               |                                                   | -27  |     | dBm/MHz |
| Switching Time         | From 50% of TXEN edge to 90% of final RF output power                      |                                                   | 200  |     | 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 V, Temp=+25°C, TXEN=Low, RXEN= High |                                                   |      |     |         |
| Noise Figure           |                                                                            |                                                   | 1.8  |     | 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                     |  | 200 |  | nS  |
| Bypass Mode           | Unless otherwise noted: VCC1, VCC2= 3.3 V, Temp=+25°C, TXEN=0 V, RXEN=0 V |  |     |  |     |
| Insertion Loss        |                                                                           |  | -3  |  | 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 (Sleep supply current)                                             |  | 40  |  | uA  |

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### Application Schematic

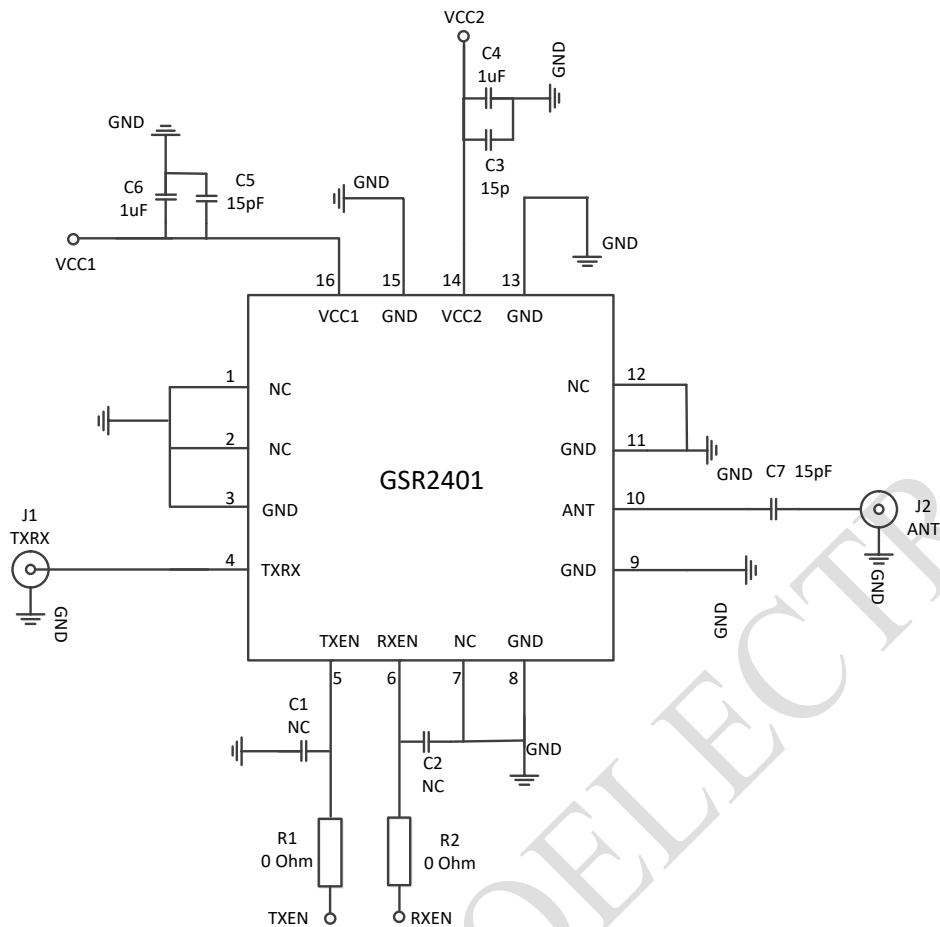


Figure 3

GSR2401 Application Schematic

### Note:

1. PCB layout refer to GSR2401 Application Note for Details

### Part Marking

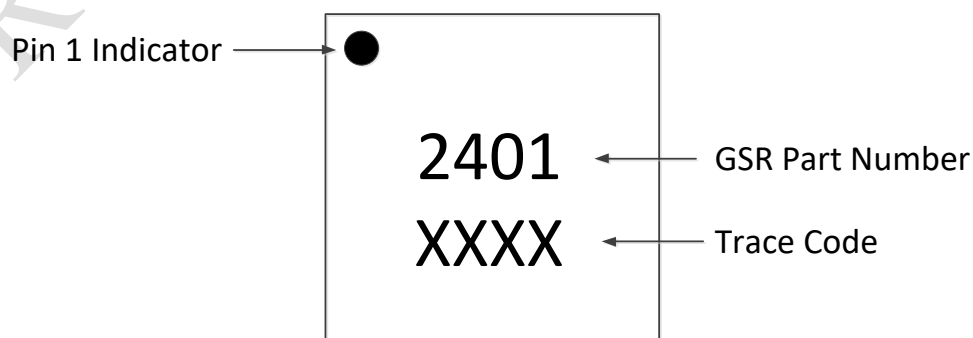
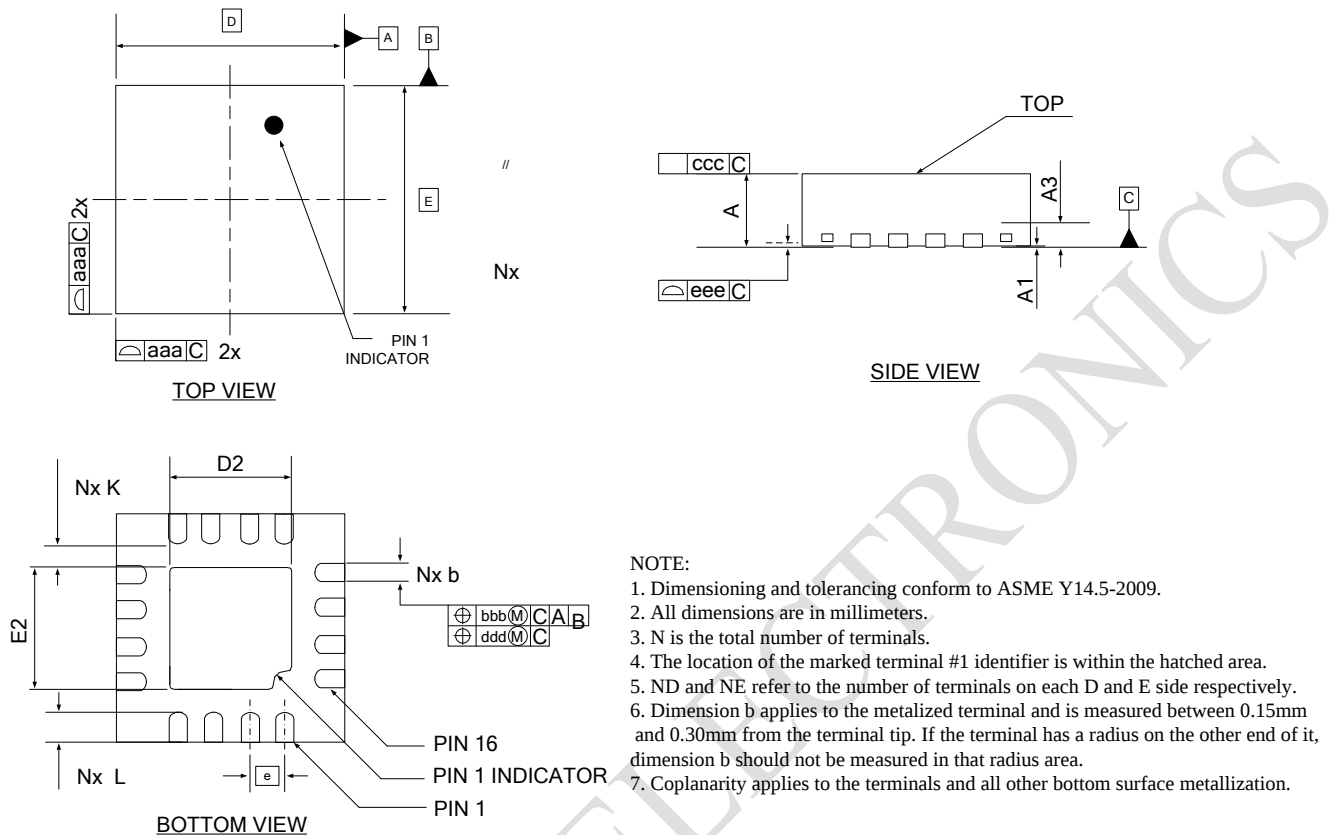


Figure 4 GSR2401 Marking

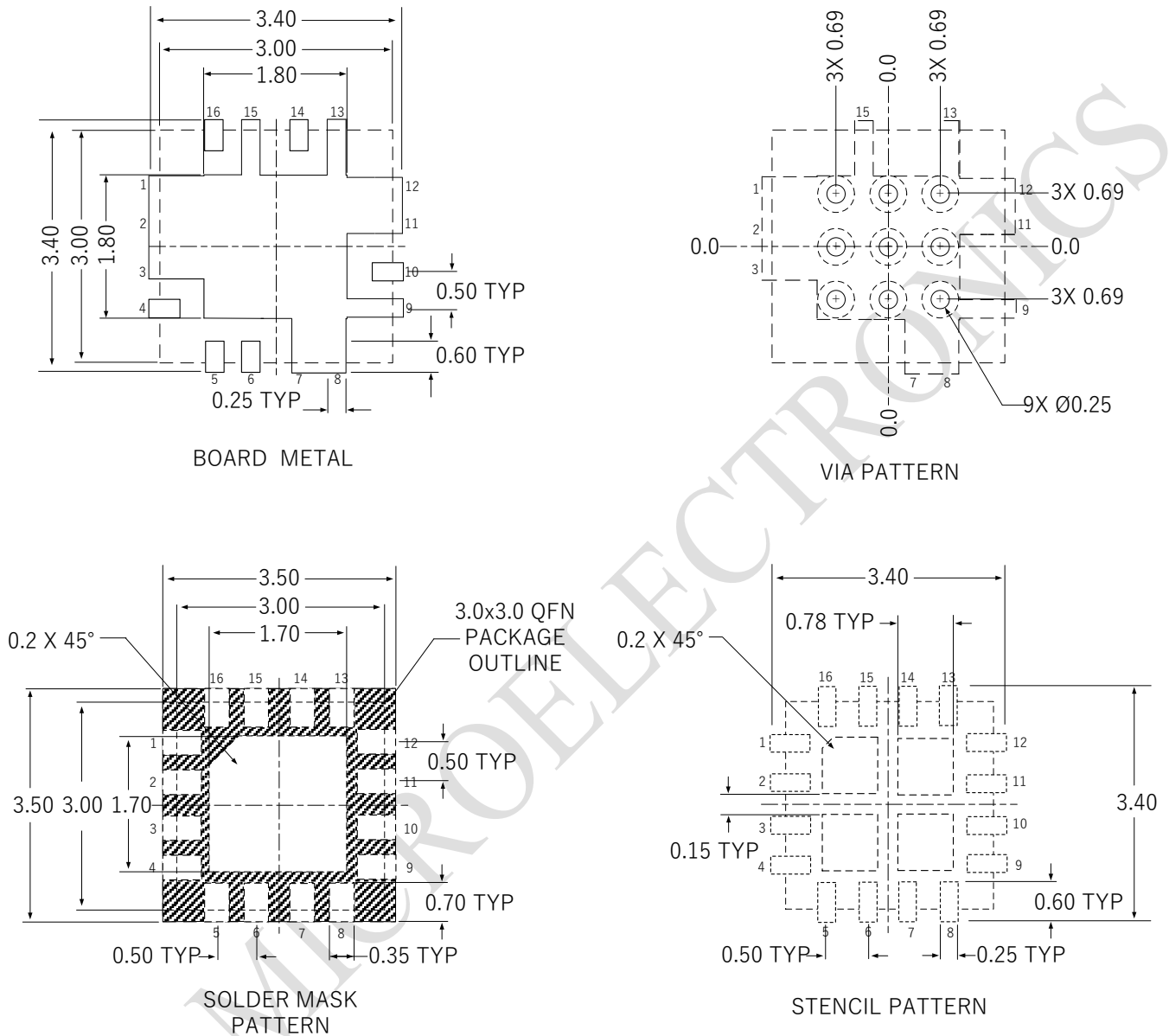
### Package Outline



| Dimension Table |         |         |         |      |
|-----------------|---------|---------|---------|------|
|                 | MINIMUM | NOMINAL | MAXIMUM | NOTE |
| A               | 0.7     | 0.75    | 0.80    |      |
| b               | 0.2     | 0.25    | 0.3     |      |
| D               |         | 3.0     |         |      |
| E               |         | 3.0     |         |      |
| e               |         | 0.5     |         |      |
| D2              | 1.6     | 1.70    | 1.80    |      |
| E2              | 1.6     | 1.70    | 1.80    |      |
| K               | 0.2     |         |         |      |
| L               | 0.3     | 0.4     | 0.5     |      |
| N               |         | 16      |         |      |
| aaa             | 0.05    |         |         |      |
| bbb             | 0.10    |         |         |      |
| ccc             | 0.10    |         |         |      |
| ddd             | 0.05    |         |         |      |
| eee             | 0.08    |         |         |      |
| N               | 16      | 3       |         |      |
| ND              | 4       | 5       |         |      |
| NE              | 4       | 5       |         |      |

Figure 4 GSR2401 Package Outline

### PCB Layout Print



#### Notes:

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

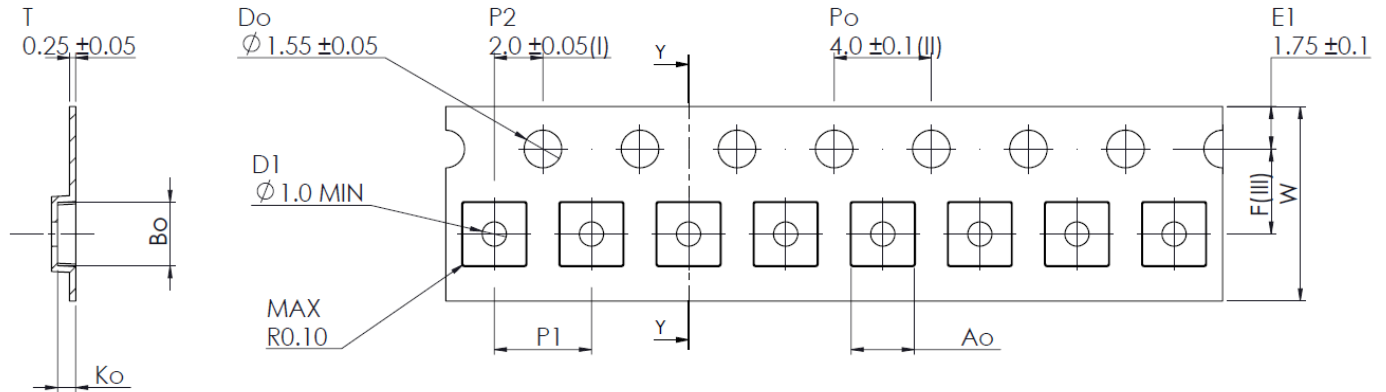
Figure 6 GSR2401 Recommended PCB Footprint

# GSR2401

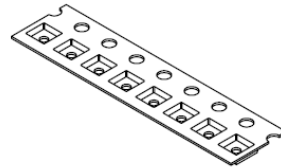
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### Tape and Reel Information



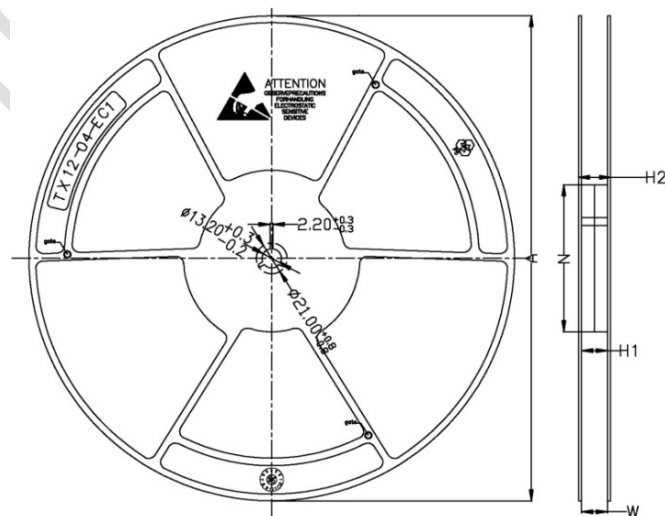
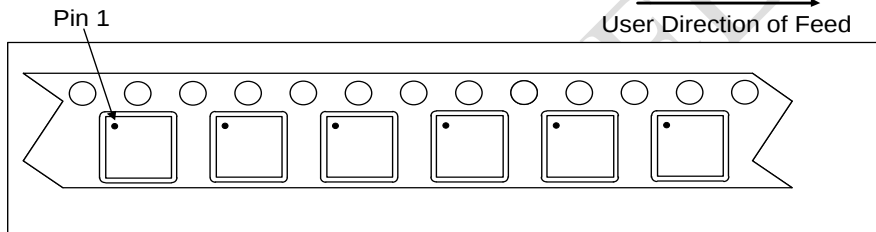
SECTION Y-Y



|    |                 |
|----|-----------------|
| 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.



| PRODUCT SPECIFICATIONS |     |     |      |      |      |
|------------------------|-----|-----|------|------|------|
| TAPE WIDTH             | #A  | #N  | H1   | H2   | W    |
| 12MM                   | 330 | 100 | 12.4 | 16.6 | 12.4 |

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### Ordering Information

| Part Number | Product Description     | Package Type      | Package Quantity |
|-------------|-------------------------|-------------------|------------------|
| GSR2401     | 2.4GHz Front-End Module | 13" tape and reel | 3000 pcs / real  |

### Handling Precautions

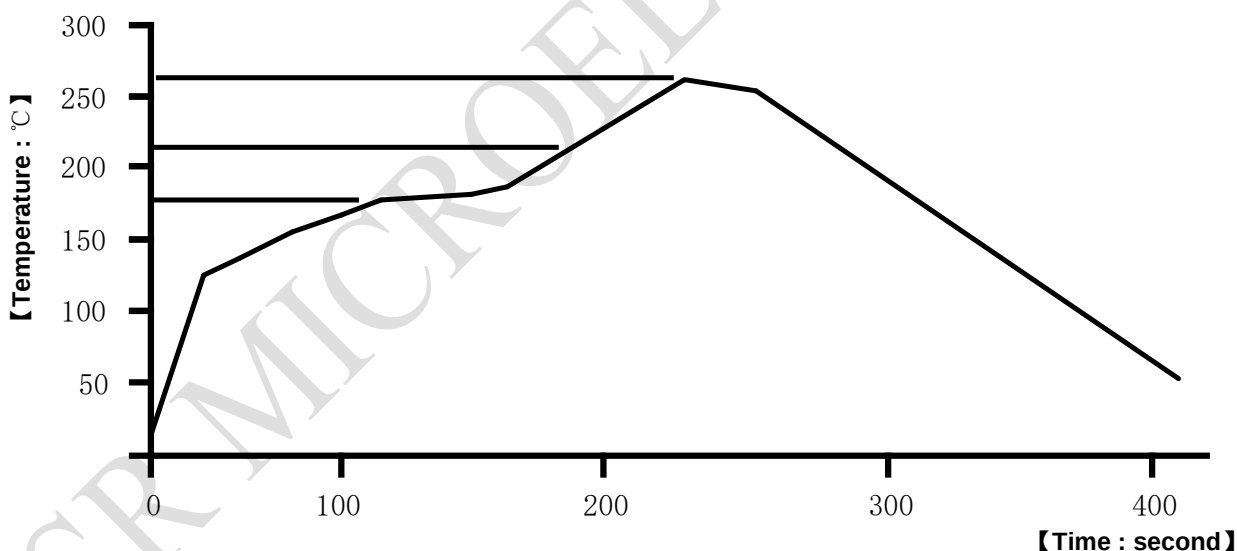
| Test Model                 | ESD Rating | Value         | Standard                |
|----------------------------|------------|---------------|-------------------------|
| Human Body Model (HBM)     | Class 1C   | $\geq 1200$ V | ESDA /JEDEC JS-001-2017 |
| Charged Device Model (CDM) | Class C3   | $\geq 2000$ 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°C to peak)       | 3°C/second max. |
| Preheat temperature (175±25)°C             | 60~120 secs     |
| Temperature maintained above 217°C         | 60~150 secs     |
| Time within 5°C of actual peak temperature | 30 seconds min. |
| Peak temperature range                     | ( 260±2 )°C     |
| Ramp down rate                             | 6°C/second max. |
| Time 25°C 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        | Updated Electrical Specification |
| C        | Updated Electrical Specification |
|          |                                  |
|          |                                  |
|          |                                  |

### Contact Information

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