a module solution provider

**WG2250** **WLAN Module**

**MTK IEEE 802.11b/g solution**

# WG2250 Specification

# Revision 0.2

Revision

| Revision | Date | Description |
|---|---|---|
| R 0.1 | 2009/03/02 | New release for Brief |
| R 0.2 | 2009/05/21 | Adding Chapter 4, 5 & 6 |

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# 1. OVERVIEW

WG2250, an 802.11b/g WLAN module with ultra small size, is the best solution for cell phones and other handheld devices to have IEEE802.11b and 802.11g functionality. This module is the perfect way to offer high-speed, worldwide wireless connectivity in handheld devices of all kinds.
WG2250 module supports SDIO, SPI and E-HPI interfaces makes it easy to be implemented into various platforms with great WiFi performance.

**Features**

- **Host interface**
  - SDIO/ eHPI

- **MAC**
  - Hardware MAC state machine
  - Support ad-hoc and infrastructure modes
  - Support 32 multicast address filters
  - Programmable TX/RX FIFO size
  - 802.1H packet format translation
  - 802.11 auto rate control
  - Support BT co-existence
  - Up to 12 pair-wise keyed peers
  - 802.11 a/b/g/e/i/h/k/w compatible
  - TX/RX on-the-fly encryption/decryption
  - 64/128-bit Wired Equivalent Privacy (WEP), Encryption Standard (AES-CCMP)
  - Support low power consumption sleep mode via 32KHz clock
  - Support 802.11 IBSS and infrastructure power save
  - Support hardware scan
  - Background scan for specific SSID networks
  - Support 802.11e optional U-APSD, Admission Control Procedure, and DLS
  - TCP/UDP/IP checksum generation/verification
  - TX MPDU lifetime record
  - Wakeup by specific packet (pattern search)
  - Support CCX5

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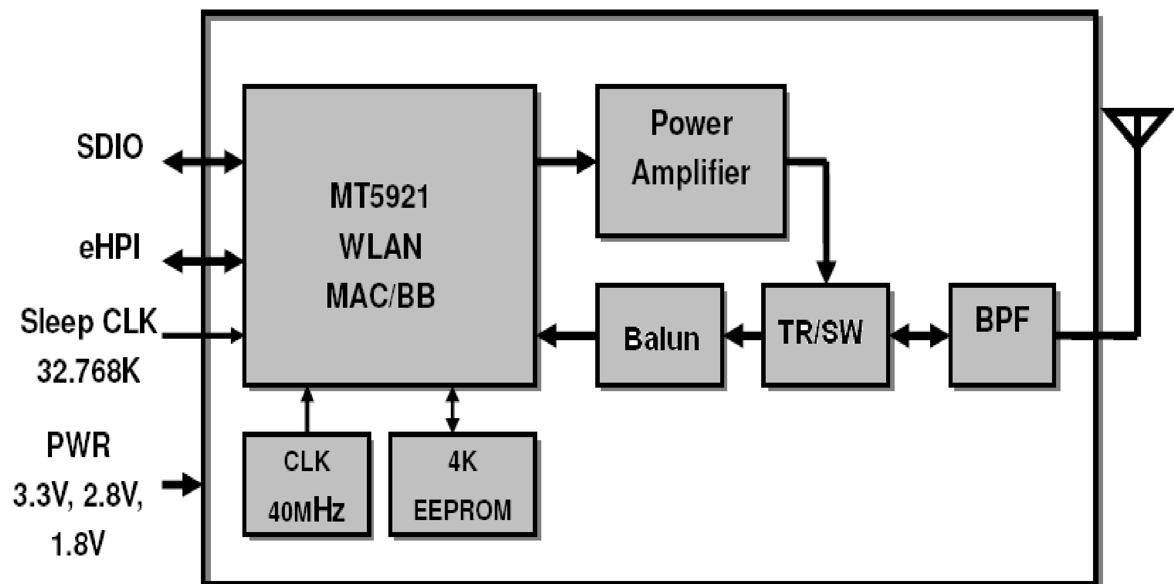
- Support internal/external thermo-sensor to resist temperature change

- **Baseband**
  - Support Orthogonal Frequency Division Multiplexing (OFDM), Complementary Code Keying (CCK) and Direct Sequence Spread Spectrum (DSSS) to provide a variety of data rates

## 2. BLOCK DIAGRAM

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# 3. MODULE SPECIFICATION

## 3.1. General Specification

| Item | | Specification |
|---|---|---|
| Module Type | Pin outs | 48 pins LGA Type (GND Pads: pin51 ~ 57) |
| | Dimension | 9.0 x 9.0 x 1.6mm (with shielding case) |
| Chipset | MAC/BB | MTK MT5921 |
| Interface | | SDIO, E-HPI |
| Antenna Port | | 1 Pin out connected to external Antenna |
| Standard | | IEEE 802.11b/g |
| Protocol | | CSMA/CA with ACK |
| Frequency (MHz) | | 2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462, 2467, 2472, 2484 |
| Modulation | | DBPSK (1Mbps), DQPSK(2Mbps), CCK (5.5, 11Mbps), OFDM (6, 9, 12, 24,36,48,54Mbps) |
| Channel | | 1~11 Channels for USA<br>1~13 Channels for Europe<br>1~14 Channels for Japan |
| Spurious Emission | | FCC Part 15 Class B/C, 15.247, 15.249 and 15.109 for USA<br>ETSI 300 328-2, 301 489-1/-17, EN60950, CE Marker for Europe |
| Data Rate | | IEE802.11 data rates of 1 and 2 Mbps<br>IEEE802.11b data rates of 5.5 and 11 Mbps<br>IEEE802.11g data rates of 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| WEP | | Support 64/128/152 bit WEP Encryption |
| WPA | | (WPA+802.1X) Support |
| Operating Temperature | | -10°C ~ 65°C |
| Storage Temperature | | -20°C ~ 85°C |

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## 3.2. Absolute Maximum Ratings

Over operating free-air temperature range

| Characteristics | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| DVDD33 | Digital I/O Power Supply | 2.52 | 2.8~3.3 | 3.63 | V |
| DVDD28 | Digital I/O Power Supply | 2.52 | 2.8 | 3.63 | V |
| PAVDD33 | Analog Power Supply | --- | 2.8~3.3 | 3.63 | V |
| DVDDMIO | Digital I/O Power Supply | 1.62 | 1.8~3.3 | 3.63 | |
| VDD18 | AFE Power Supply | 1.7 | 1.8 | 1.9 | V |
| Operating Ambient Temperature Range | | -10 to 65 | | | °C |
| Storage Temperature Range | | -20 to 85 | | | °C |

## 3.3. RF Characteristic

| Item | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **802.11g Transmitter** | | | | | |
| Operating frequency range | | Channel 1 | | Channel 14 | |
| Transmit power level | 54Mbps | 13 | 14 | 15 | dBm |
| Transmit center frequency tolerance | | -10 | | 10 | ppm |
| Transmit modulation accuracy | 54 Mbps | | -31.5 | -28 | dB |
| | 48 Mbps | | -30 | -27 | dB |
| | 36 Mbps | | -29.5 | -26 | dB |
| | 24 Mbps | | -28 | -25 | dB |
| | 18 Mbps | | -27 | -24 | dB |
| | 12 Mbps | | -26.5 | -23 | dB |
| | 9 Mbps | | -26 | -22 | dB |
| | 6 Mbps | | -26 | -21 | dB |
| **802.11b Transmitter** | | | | | |
| Operating frequency range | | Channel 1 | | Channel 14 | |
| Transmit power level | 2M DQPSK | 15 | 16 | 17 | dBm |
| Transmit center frequency tolerance | | -25 | | 25 | ppm |
| **802.11g Receiver** | | | | | |

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| | | | | | |
|---|---|---|---|---|---|
| Receiver minimum input level sensitivity (PER < 10%) | 54 Mbps | | -72 | -70 | dBm |
| | 48 Mbps | | -72 | -70 | dBm |
| | 36 Mbps | | -80 | -77 | dBm |
| Receiver minimum input level sensitivity (PER < 10%) | 24 Mbps | | -80 | -77 | dBm |
| | 18 Mbps | | -87 | -84 | dBm |
| | 12 Mbps | | -87 | -84 | dBm |
| | 9 Mbps | | -90 | -87 | dBm |
| | 6 Mbps | | -90 | -87 | dBm |
| **802.11b Receiver** | | | | | |
| Receiver minimum input level sensitivity (PER < 10%) | 11 Mbps | | -87 | -84 | dBm |
| | 5.5 Mbps | | -91 | -88 | dBm |
| | 2 Mbps | | -92 | -90 | dBm |
| | 1 Mbps | | -92 | -90 | dBm |

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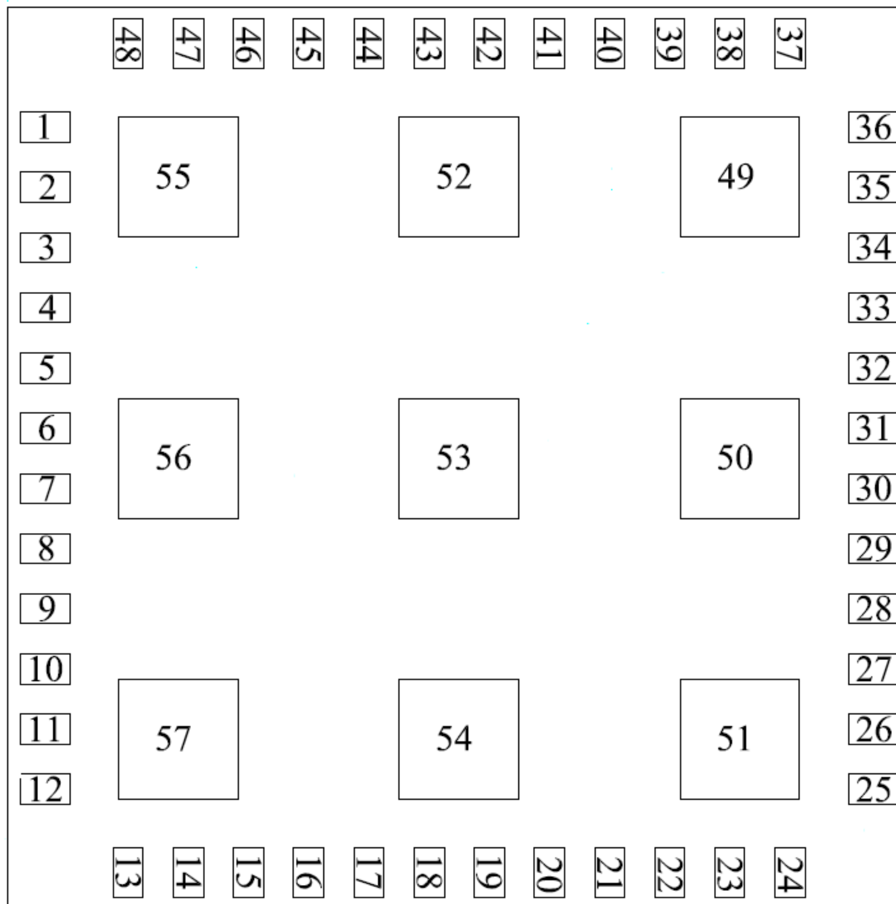
# 4. PACKAGE INFORMATION

## 4.1. Signal Layout (Top View)




## 4.2. Pin Assignment

| Pin No. | Pin Name | I/O | Power Domain | Description |
|---|---|---|---|---|
| 1 | WLAN_ACT | I/O | DVDD28 | WLAN_ACT for 2-/3-/4- wire mode.<br>BT-coexistence |
| 2 | BT_PRI | I | DVDD28 | BT_PRI for 2-/3-/4- wire mode.<br>BT-coexistence |
| 3 | OSC_EN | O | | Oscillator enable |
| 4 | GND | P | - | Ground |

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| | | | | |
|---|---|---|---|---|
| 5 | PAVDD33 | I | PAVDD33 | 3.3V power supply for RF PA. |
| 6 | GPIO2 | I/O | DVDD28 | ● General purpose IO 2<br>● 3.3/2.8V interrupt output<br>● Daisy chain input for external oscillator control |
| 7 | LED1 | O | DVDD33 | LED Control |
| 8 | MODE1 | I | DVDD33 | Mode select bit 1 |
| 9 | MODE0 | I | DVDD33 | Mode select bit 0 |
| 10 | GPIO0 | I/O | DVDD28 | ● General purpose IO 0<br>● BT_ACT for 3-/4-wire mode BT-coexistence<br>● Daisy chain input for external oscillator control |
| 11 | GND | P | - | Ground |
| 12 | GND | P | - | Ground |
| 13 | ANT_OUT | I/O | - | WLAN RF antenna port |
| 14 | GND | P | - | Ground |
| 15 | D5 | I/O | DVDDMIO | eHPI 8/16 data bus bit 5 |
| 16 | D6 | I/O | DVDDMIO | eHPI 8/16 data bus bit 6 |
| 17 | GND | P | - | Ground |
| 18 | VDD18 | P | VDD18 | 1.8V power input |
| 19 | D7 | I/O | DVDDMIO | eHPI 8/16 data bus bit 7 |
| 20 | D8 | I/O | DVDDMIO | eHPI 8/16 data bus bit 8 |
| 21 | D9 | I/O | DVDDMIO | eHPI 8/16 data bus bit 9 |
| 22 | D10 | I/O | DVDDMIO | eHPI 8/16 data bus bit 10 |
| 23 | D11 | I/O | DVDDMIO | eHPI 8/16 data bus bit 11 |
| 24 | D12 | I/O | DVDDMIO | eHPI 8/16 data bus bit 12 |
| 25 | D14 | I/O | DVDDMIO | eHPI 8/16 data bus bit 14 |
| 26 | D4 | I/O | DVDDMIO | eHPI 8/16 data bus bit 4 |
| 27 | D2 | I/O | DVDDMIO | ● eHPI 8/16 data bus bit 2<br>● SDIO data bus bit 2 |
| 28 | D3 | I/O | DVDDMIO | ● eHPI 8/16 data bus bit 3<br>● SDIO data bus bit 3 |
| 29 | GND | P | - | Ground |
| 30 | CS_N | I/O | DVDDMIO | ● eHPI 8/16 chip select<br>● SDIO command bus |

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| | | | | |
|---|---|---|---|---|
| 31 | A0 | I | DVDDMIO | ● eHPI 8/16 address select<br>● SDIO clock input |
| 32 | GPIO1 | I/O | DVDD28 | ● General purpose IO 1<br>● BT_FREQ for 4-wire mode BT-coexistence<br>● Daisy chain input for external oscillator control |
| 33 | D0 | I/O | DVDDMIO | ● eHPI 8/16 data bus bit 0<br>● SDIO data bus bit 0 |
| 34 | D13 | I/O | DVDDMIO | eHPI 8/16 data bus bit 13 |
| 35 | D1 | I/O | DVDDMIO | ● eHPI 8/16 data bus bit 1<br>● SDIO data bus bit 1 |
| 36 | INT_N | O | DVDDMIO | Host interface interrupt output |
| 37 | EXT_RST_N | I | DVDD28 | External hardware reset |
| 38 | WE_N | I | DVDDMIO | eHPI 8/16 write strobe |
| 39 | OE_N | I | DVDDMIO | eHPI 8/16 read strobe |
| 40 | D15 | I/O | DVDDMIO | eHPI 16 data bus bit 15 |
| 41 | DVDDMIO | I | DVDDMIO | Host interface power input |
| 42 | GND | P | - | Ground |
| 43 | XIN_32K | I | DVDD33 | External 32.768KHZ clock input |
| 44 | GND | P | - | Ground |
| 45 | DVDD28 | I | DVDD28 | 2.8V digital power input |
| 46 | GND | P | - | Ground |
| 47 | DVDD33 | I | DVDD33 | 3.3V digital power input |
| 48 | GND | P | - | Ground |
| 49 ~ 57 | GND | P | - | Ground |

**I = input; O = output; IO = bidirectional; P = power pin (VDD, ground or LDO output)**

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## 4.3. Module Marking

Date Code: **YYWWSSF**

**YY** = Digit of the year, ex: 2008=08

**WW** = Week (01~53)

**SS** = Serial number from 01 ~99 match to manufacture's lot number

**F** = 1 for Taiwan

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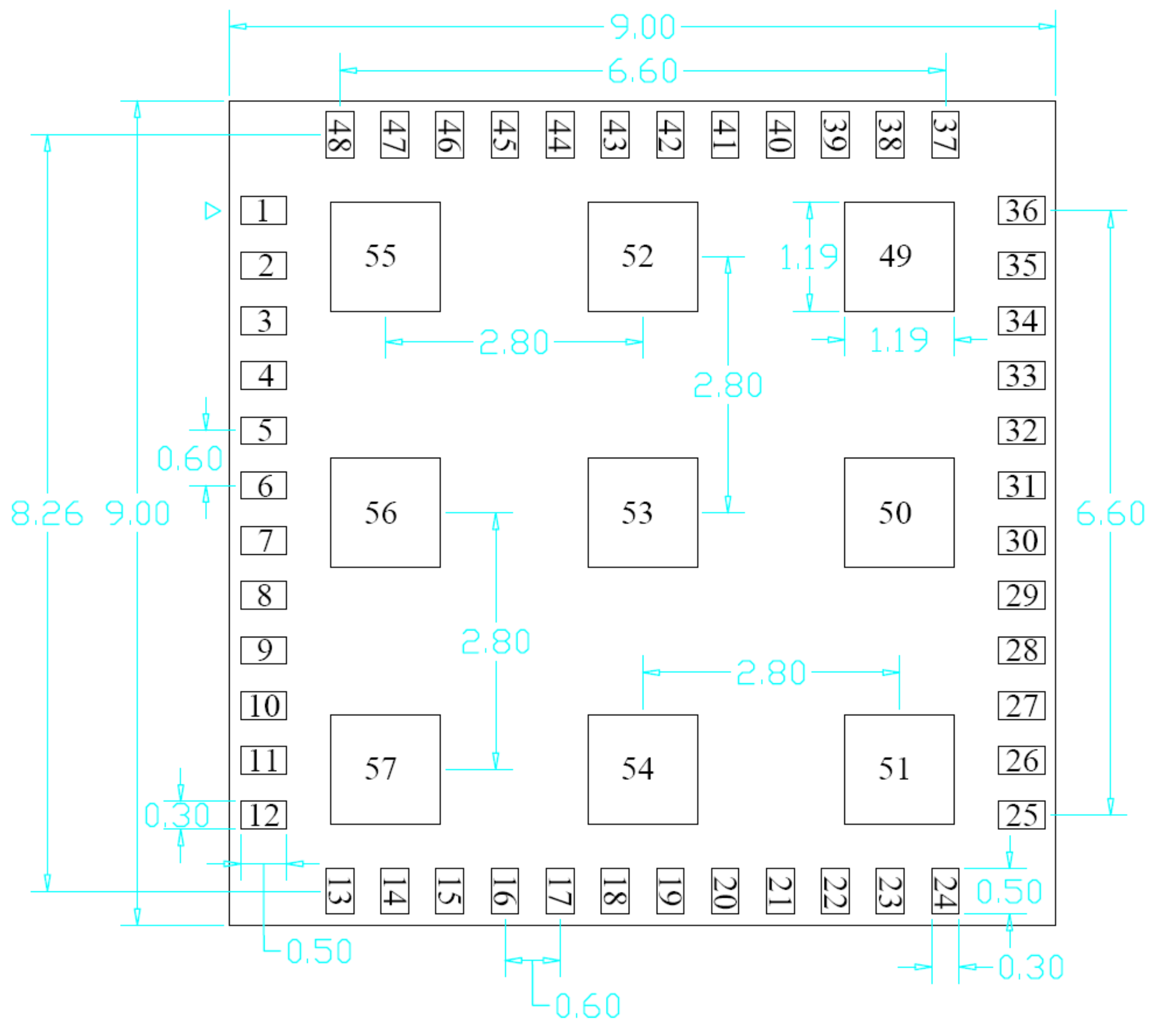
# 5. MECHANICAL CHARACTERISTICS

## 5.1. Module Dimension




Unit: mm

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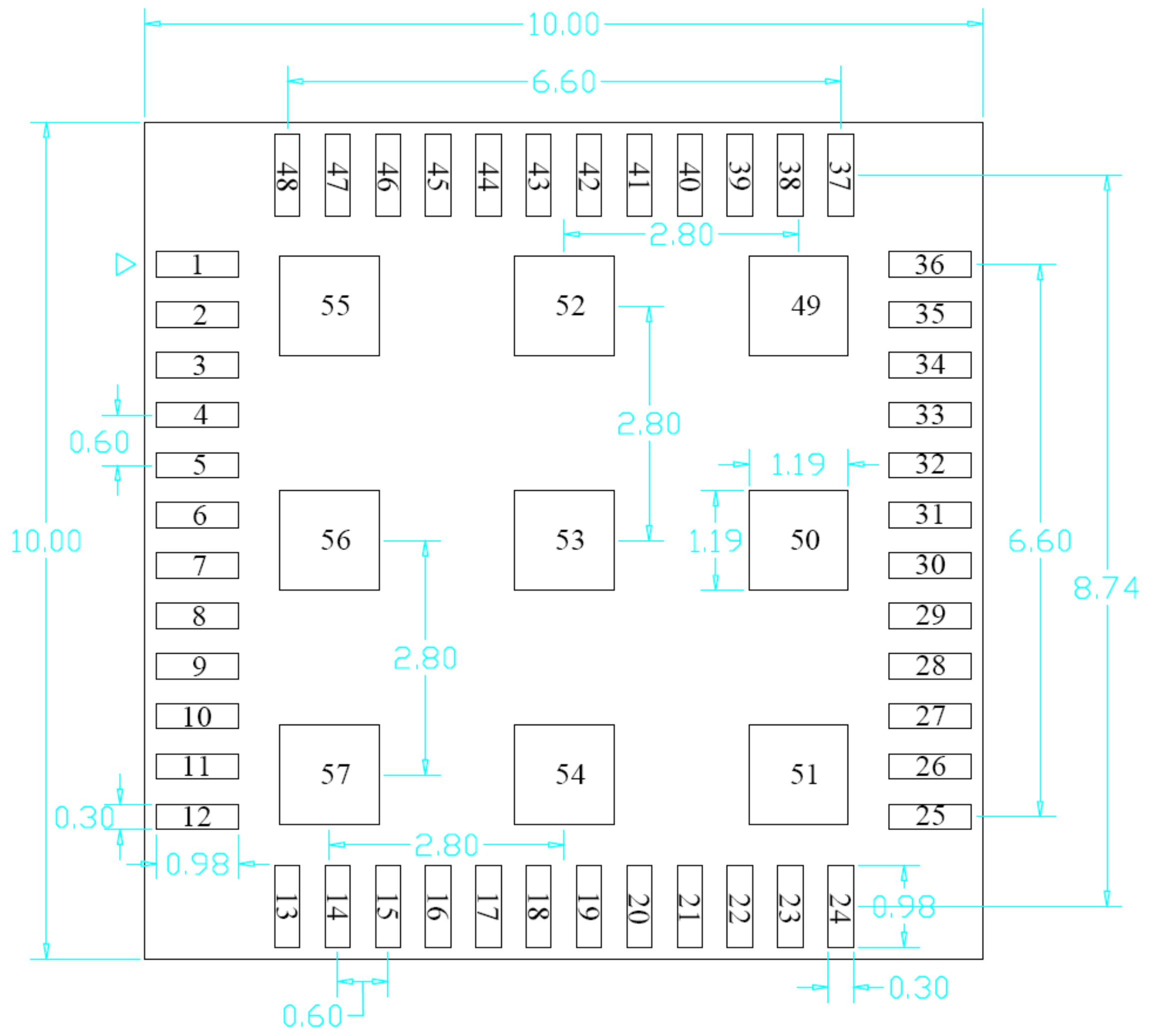
## 5.2. Recommended Footprint




Unit: mm

# 6. SMT & BAKING RECOMMENDATION

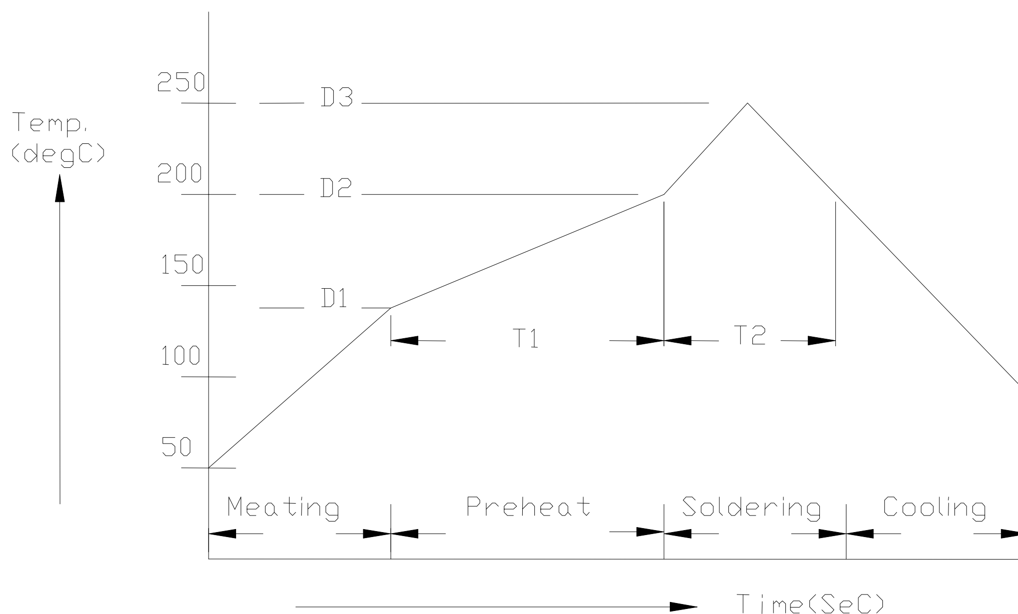
## 6.1. Baking Recommendation

- Baking condition：
  - Follow MSL Level 4 to do baking process.
  - After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
    a) Mounted within 72 hours of factory conditions <30°C/60% RH, or
    b) Stored at <10% RH.
  - Devices require bake, before mounting, if Humidity Indicator Card reads >10%

**<u>If baking is required, Devices may be baked for 24 hrs at 125 °C.</u>**

## 6.2. SMT Recommendation

- **Recommended Reflow profile：**

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| No. | Item | Temperature (°C) | Time (sec) |
| --- | --- | --- | --- |
| 1 | Pre-heat | D1: 140 ~ D2: 200 | T1: 60 ~ 120 |
| 2 | Soldering | D2: >= 200 | T2: 80 max |
| 3 | Peak-Temp. | D3: 250 °C max | |

Note: (1) Reflow soldering is recommended two times maximum.
(2) Add Nitrogen while Reflow process： SMT solder ability will be better.

- **Stencil thickness：** 0.13~ 0.15 mm
- **Soldering paste (without Pb)：** Recommended SENJU N705-GRN3360-K2-V can get better soldering effects.
- Module suggested wetting Flux before mounting if printed circuit board is immersion Tin substrate.

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