



iTM9139

**Sub-GHz FSK Transceiver Module for
915MHz Band**

Module Datasheet

Revision History

| Date | Revision Content | Revised By | Version |
|------------|--------------------|------------|---------|
| 2017/09/26 | - Initial released | Issac Chen | 0.1 |
| 2018/04/16 | - Formal released | Issac Chen | 1.0 |
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1. General Description

The iTM9139 SIP module is designed for 915MHz ISM band wireless applications using AMICCOM's A7139 FSK/GFSK transceiver chipset. This compact module features a fully programmable frequency synthesizer by SPI interface. The maximum data rate is up to 100kbps (by using 12.8MHz crystal, or 250kbps by using 16MHz crystal)

iTM9139 is optimized for very low power consumption. In addition, it can offer a very good link budget with a high efficient class-E power amplifier up to 16dBm and a low phase noise receiver. Therefore, iTM9139 is very suitable for battery powered application with a nice LOS (line-of-sight) wireless range.

2. Features

- RF Chipset : AMICCOM A7139
- Frequency band: 915 MHz.
- Programmable data rate from 2Kbps to 100Kbps
- Programmable TX power level from –34dBm to 15dBm.
- On chip regulator, supports input voltage 1.9 ~ 3.6 V.
- Ultra low deep-sleep mode current consumption 0.3uA
- RX mode current consumption (AGC Off): 3.8mA
- High RX sensitivity -102dBm@100Kbps data rate
- Easy to use.

3. Electrical Specification

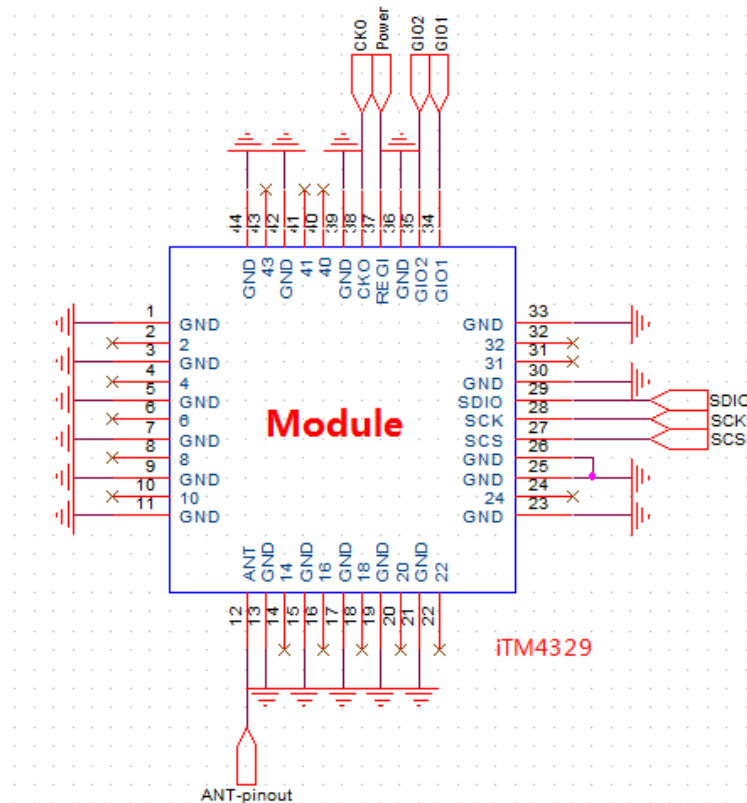
| Item | Specification | Remark |
|---------------------|--|--|
| Supply Voltage | 2.2V~3.6V | |
| Current Consumption | 0.3uA @Deep Sleep mode 2.0uA @Sleep mode(WOR off) 3.0uA @Sleep mode(WOR on) 0.15mA @Idle mode 0.45mA @Stand-by mode 2.6mA @PLL mode 4.9mA @Rx mode(AGC OFF) 14.0mA @Tx mode (-34.0dBm,TBG=0, TDC=0, PAC=0) 72.0mA @Tx mode (13.5dBm,TBG=5, TDC=3, PAC=1) 72.5mA @Tx mode (15.0dBm,TBG=7, TDC=2, PAC=1) | Typical +3.3V, 25°C *1 |
| Frequency | 915 MHz | ISM band |
| TX Output Power | 15.0 dBm (TBG=7, TDC=2, PAC=1) | Typical, +3.3V, 25°C *1 |
| RX Sensitivity | -117 dBm @ 2 Kbps mode, Dev = 8 KHz, IFBW=50KHz -112 dBm @ 2 Kbps mode, Dev = 8 KHz, IFBW=100KHz -112 dBm @ 10 Kbps mode, Dev = 1875 KHz, IFBW=50KHz -109 dBm @ 10 Kbps mode, Dev = 37.5 KHz, IFBW=100KHz -104 dBm @ 50 Kbps mode, Dev = 18.75 KHz, IFBW=50KHz -102 dBm @ 100 Kbps mode, Dev = 37.5 KHz, IFBW=100KHz -100 dBm @ 150 Kbps mode, Dev = 56.25 KHz, IFBW=150KHz -99 dBm @ 250 Kbps mode, Dev = 93.75 KHz, IFBW=250KHz | BER ≤ 1E-3 +3.3V, 25°C *2 |
| Modulation | FSK | |
| Operating Temp. | -40 ~ 85 °C | |

* 1 To pass CE, the setting of TBG, TDC, PAC maybe changed with different antenna

*2 For 250Kbps data rate mode, customers should use 16MHz X'tal.

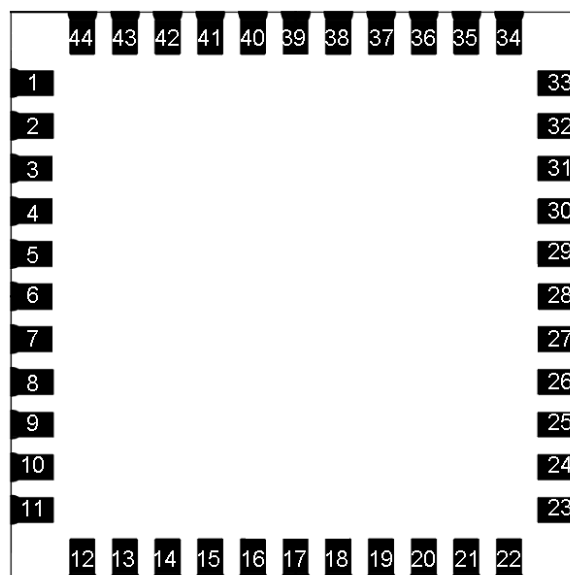
4. Pin Assignments

4.1 Schematic Diagram



4.2 PCB Pin Outline (12X12mm)

< TOP VIEW >

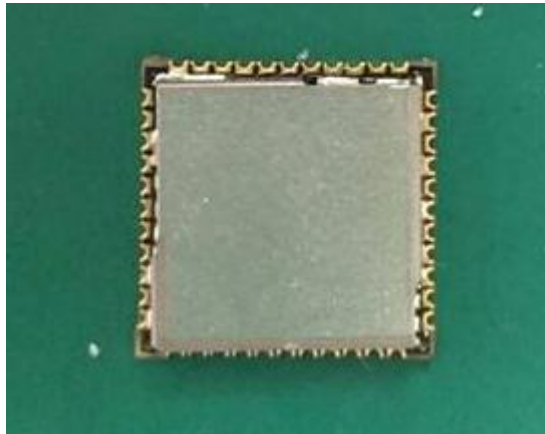


4.3 Pin Definition

| NO | Name | Type | Description |
|----|------|------|---------------------------------------|
| 1 | GND | G | Ground connections |
| 2 | NC | — | Not connected |
| 3 | GND | G | Ground connections |
| 4 | NC | — | Not connected |
| 5 | GND | G | Ground connections |
| 6 | NC | — | Not connected |
| 7 | GND | G | Ground connections |
| 8 | NC | — | Not connected |
| 9 | GND | G | Ground connections |
| 10 | NC | — | Not connected |
| 11 | GND | G | Ground connections |
| 12 | ANT | I/O | RF input/output |
| 13 | GND | G | Ground connections |
| 14 | NC | — | Not connected |
| 15 | GND | G | Ground connections |
| 16 | NC | — | Not connected |
| 17 | GND | G | Ground connections |
| 18 | NC | — | Not connected |
| 19 | GND | G | Ground connections |
| 20 | NC | — | Not connected |
| 21 | GND | G | Ground connections |
| 22 | NC | — | Not connected |
| 23 | GND | G | Ground connections |
| 24 | NC | — | Not connected |
| 25 | GND | G | Ground connections |
| 26 | GND | G | Ground connections |
| 27 | SCS | I | SPI Select Input |
| 28 | SCK | I | SPI Clock Input |
| 29 | SDIO | I/O | SPI Data I/O |
| 30 | GND | G | Ground connections |
| 31 | NC | — | Not connected |
| 32 | NC | — | Not connected |
| 33 | GND | G | Ground connections |
| 34 | GIO1 | I/O | Multi-function IO 1 / SPI data output |

| | | | |
|-----------|-------|-----|---------------------------------------|
| 35 | GIO2 | I/O | Multi-function IO 2 / SPI data output |
| 36 | GND | G | Ground connections |
| 37 | REG_I | P | Voltage supply Input |
| 38 | CKO | O | Multi-function clock output |
| 39 | GND | G | Ground connections |
| 40 | NC | — | Not connected |
| 41 | NC | — | Not connected |
| 42 | GND | G | Ground connections |
| 43 | NC | — | Not connected |
| 44 | GND | G | Ground connections |

4.4 Module Appearance

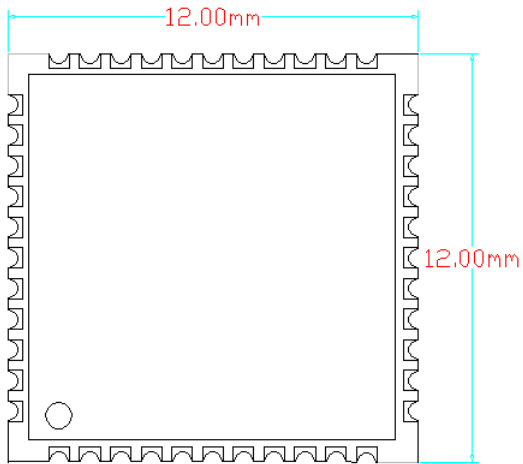


5. Dimensions

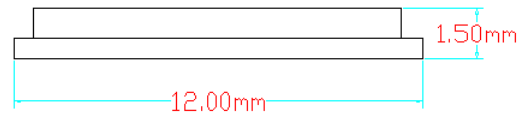
5.1 Physical Dimension

(Unit: mm)

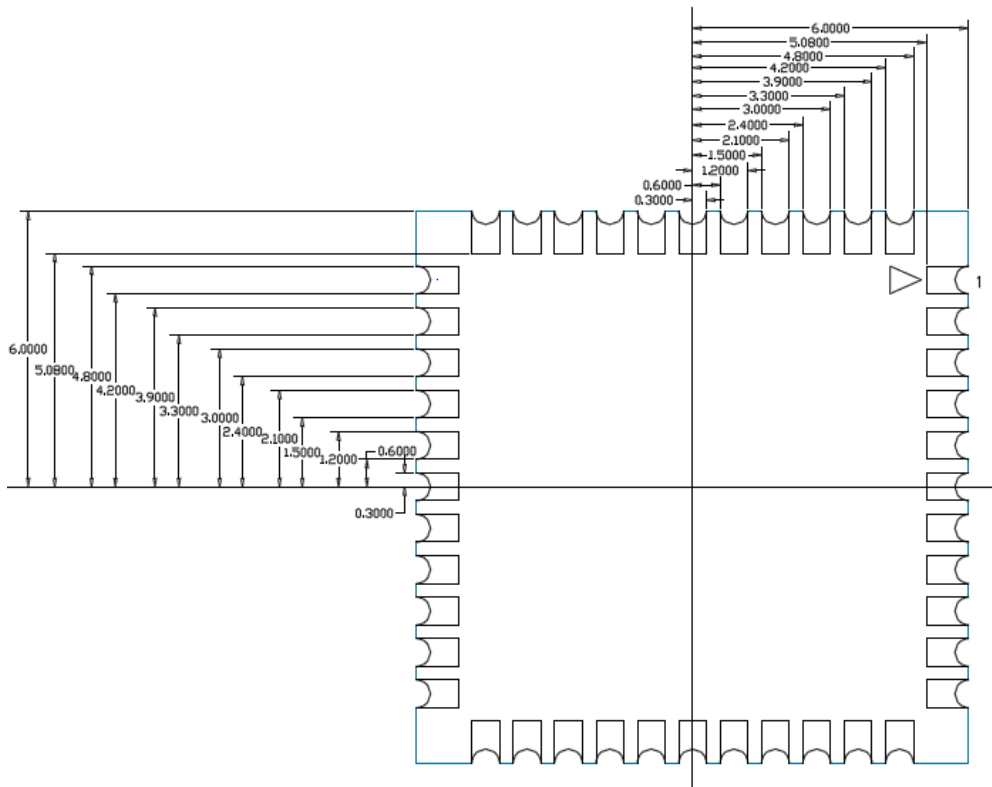
< TOP VIEW >



<SIDE VIEW>

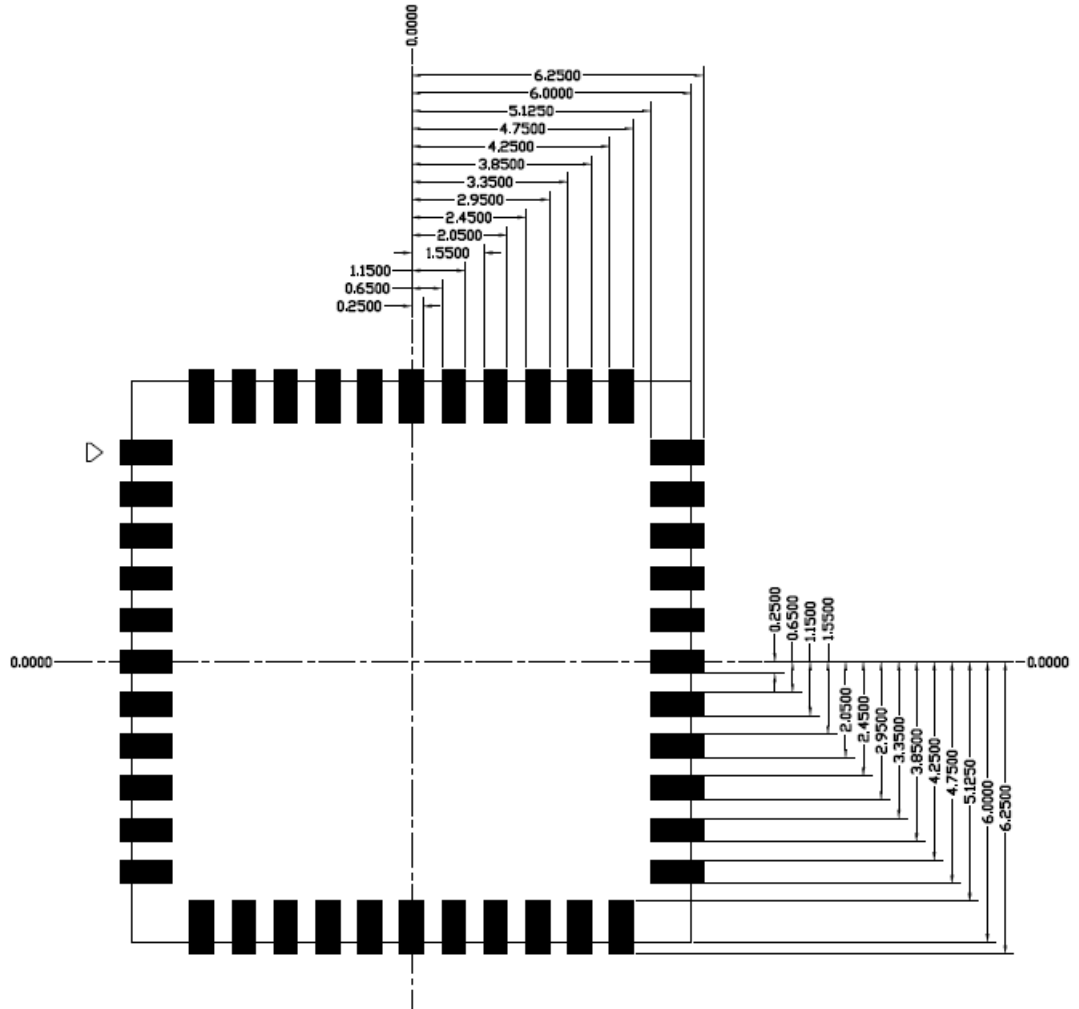


< BOTTOM VIEW >



5.2 Layout Recommendation

< TOP VIEW >



6. Host Interface Timing Diagram

6.1 SPI Timing Diagram

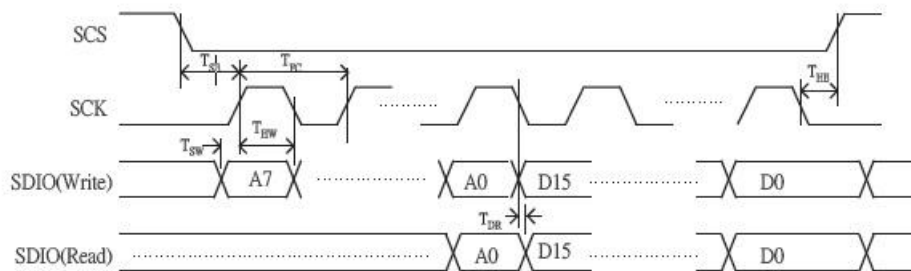
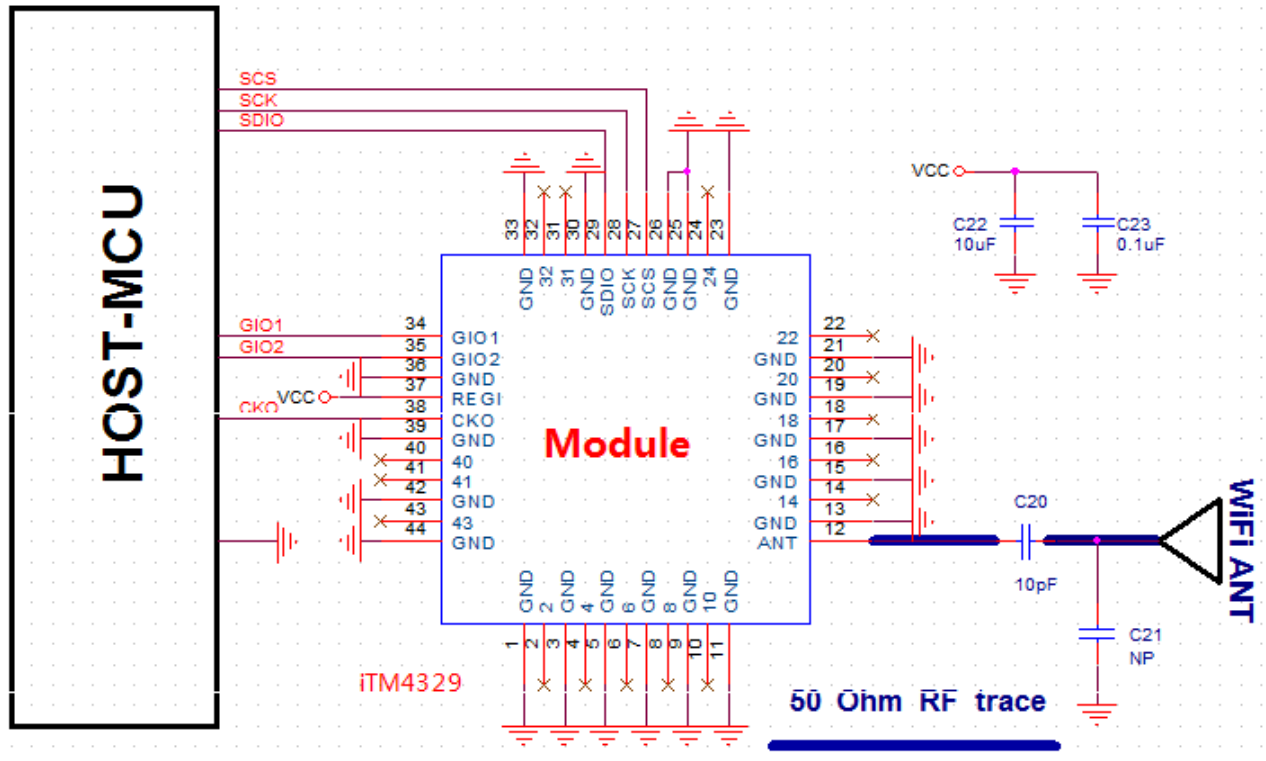


Figure 10.3 SPI timing sequence

| Parameter | Description | Min. | Max. | Unit |
|-----------|------------------|------|------|------|
| T_{FC} | Clock frequency. | | 10 | MHz |
| T_{SE} | SCS setup time. | 50 | | ns |
| T_{HE} | SCS hold time. | 50 | | ns |
| T_{SW} | SDIO setup time. | 50 | | ns |
| T_{HW} | SDIO hold time. | 50 | | ns |
| T_{DR} | SDIO delay time. | 0 | 100 | ns |
| T_{HR} | SDIO hold time. | 0 | | ns |

7. Reference Design

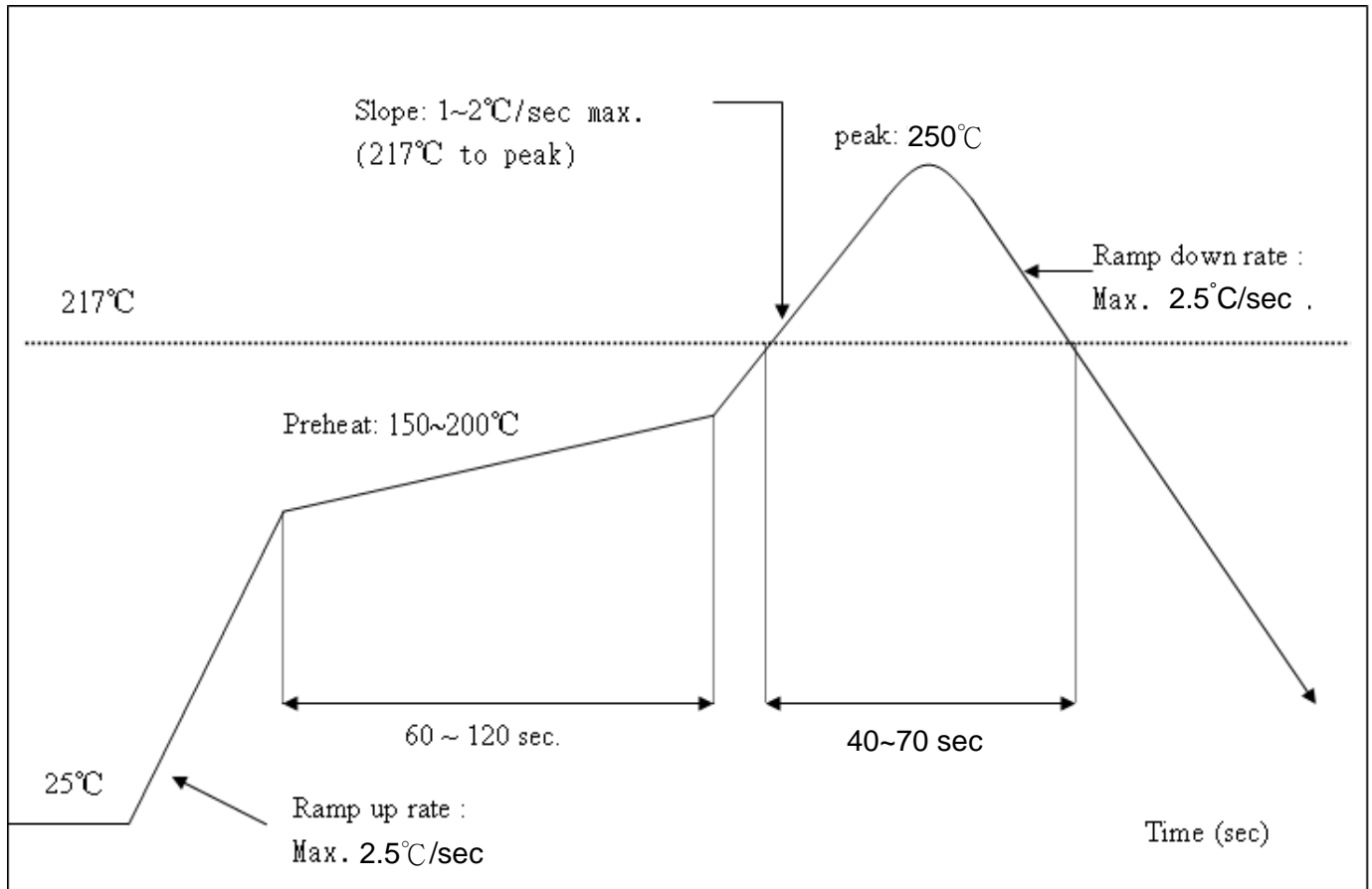


8. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

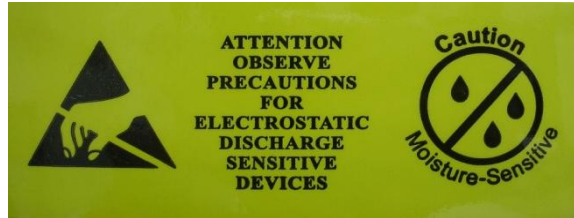
Number of Times : ≤ 2 times



9. Packing Information

9.1 Label

Label A → Anti-static and humidity notice



Label B → MSL caution / Storage Condition

| | | |
|---|--|-------|
| | Caution | LEVEL |
| | This bag contains MOISTURE-SENSITIVE DEVICES | |
| <p>1. Calculated shelf life in sealed bag: 12 months at <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)</p> <p>2. Peak package body temperature: _____ $^{\circ}\text{C}$ <small># blank, see adjacent bar code label</small></p> <p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be</p> <p>a) Mounted within: _____ hours of factory conditions <small># blank, see adjacent bar code label</small> ≤30°C/60% RH, or</p> <p>b) Stored per J-STD-033</p> <p>4. Devices require bake, before mounting, if:</p> <p>a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at $23 \pm 5^{\circ}\text{C}$</p> <p>b) 3a or 3b are not met</p> <p>5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure</p> <p>Bag Seal Date: _____ <small># blank, see adjacent bar code label</small></p> <p style="text-align: center;"><small>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</small></p> | | |

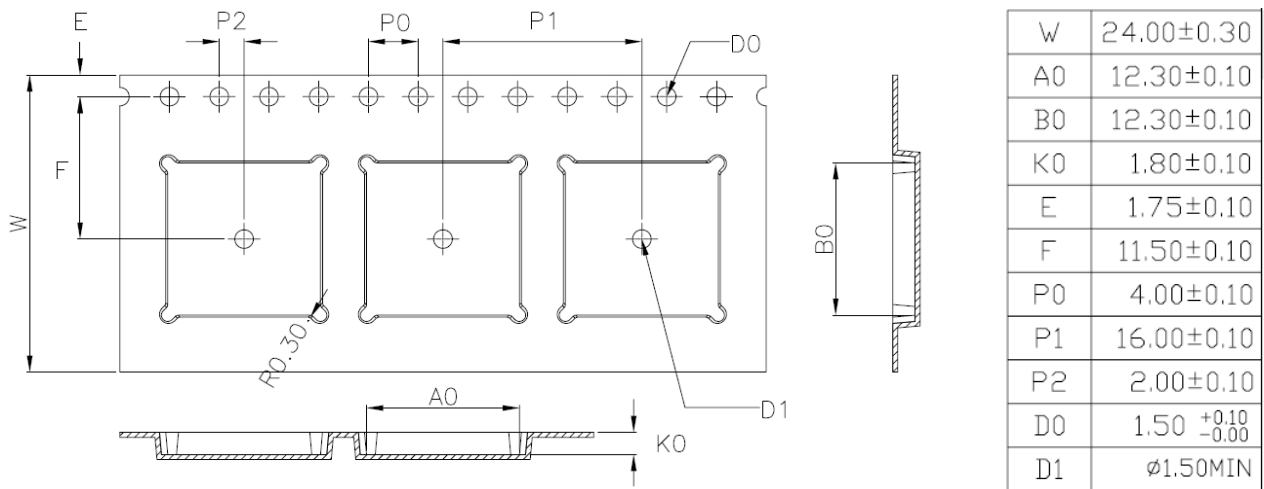
Label C → Inner box label .

| | |
|-------------|----------------|
| PKG S/N : | |
| | 9PKG1201310001 |
| Model: | |
| | XXXXXXXX(HF) |
| P/N : | |
| | 99P-W01-0042R |
| Qty : | |
| | 1500 |
| Date Code : | |
| | 1205 |
| Lot Code : | |
| | T0C102B |

Label D → Carton box label .

| | |
|----------------------------|------------------------|
| iotTech Corporation | |
| Model Name : | |
| | XXXXXXXX(HF) |
| Part No : | |
| | 99P-W01-0042R |
| Quantity : | |
| | 7500 <small>ea</small> |
| Lot D/C : | |
| | 1205 |
| Manufacture : | |
| | 2012/02/22 |

9.2 Dimension



1. 10 sprocket hole pitch cumulative tolerance ± 0.20 .
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481-D requirements.
5. Thickness : 0.30 ± 0.05 mm.
6. Packing length per 22" reel : 98.5 Meters.(1:3)
7. Component load per 13" reel : 1500 pcs.

