AMPAK Technology Inc.

正基科技股份有限公司

產品規格書

SPECIFICATION

PRODUCT NAME： WMCT-759B_B

SPEC. NO.： _____ REV： 1.2

DATE： 2018/10/22

PREPARED	REVIEW		APPROVED	DCC ISSUE
	PM	QA		
Kasen	Eason	Carol	James	Ampak 2018.11.13 DCC PUBLISH

FW V2.2.29

AMPAK

WMCT-759B_B

ARM Cortex M3 + Bluetooth Low Energy Module

Product Specification Sheet

Revision History

Date	Revision Content	Revised By	Version
2017/4/10	- Original release	Geoffrey	1.0
2018/3/26	- Update Packing Dimension	Geoffrey	1.1
2018/10/22	- Update the PCB version in Outline Dimension	Geoffrey	1.2

Contents

1. Introduction

AMPAK Technology would like to announce a low-cost and low-power consumption module which has of the BLE functionalities. The highly integrated WMCT-759B_B with RF front end BLE module makes the possibilities of Bluetooth Low Energy HID(Human Interface Device**) and other applications.**

1.1 DESCRIPTION

The WMCT-759B_B_B is Very low active and low power mode current consumption as well as fast mode transitions provide excellent battery lifetime and allows operation on small coin cell batteries and in energy harvesting applications.
Integrated a powerful 32-bit Cortex M3 running at 48 MHz has more than 30% more processing power per MHz than Cortex M0 based systems and significantly more than 8 and 16-bit processors.
The Bluetooth Low Energy Controller is embedded into ROM and are partly running on a separate ARM Cortex M0 dedicated for radio purpose. This improves overall system performance and power consumption as well as frees up FLASH memory for the application.

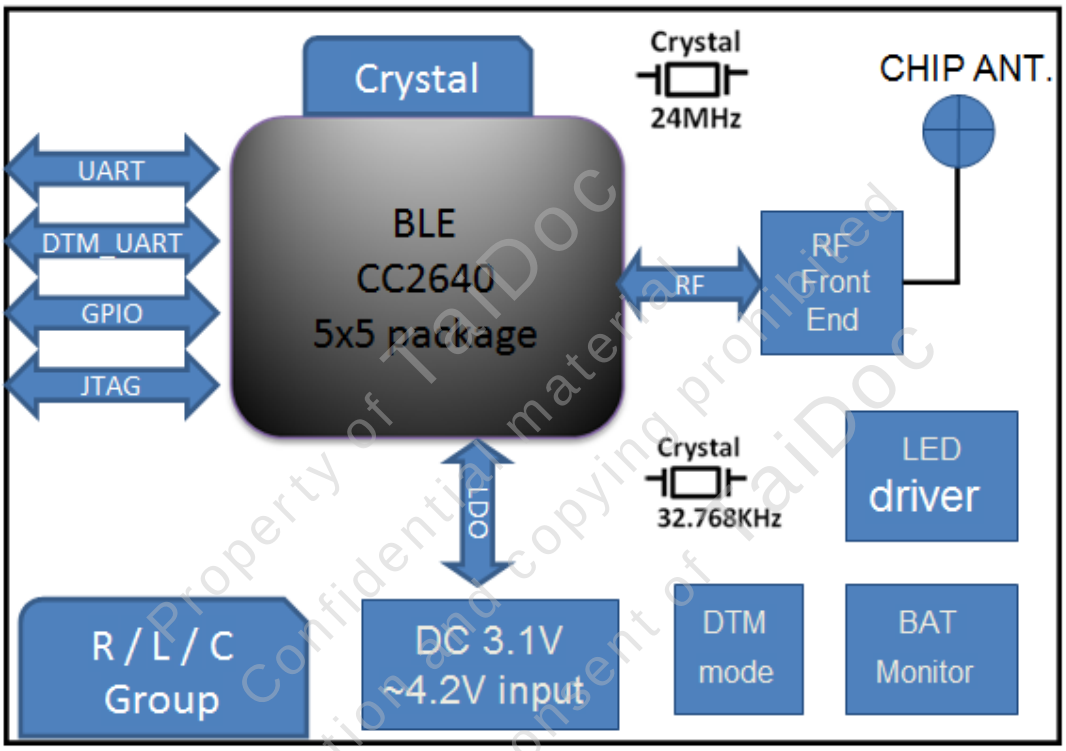
1.2 APPLICATIONS

- **Consumer electronics**
- **Mobile phone accessories**
- **Sports & Fitness equipment**
- **HID applications**
- **Home Automation and Lighting Control**
- **Alarm and Security**
- **Electronic Shelf Labeling**
- **Proximity Tags**
- **Medical and Healthcare**
- **Remote Controls**
- **Wireless Sensor Networks**

2. FEATURES

- **Lead Free design which is compliant with RoHS requirements.**
- **Integrated Ceramic Chip Antenna**
- **Integrated Power Inductor 10uH for DC/DC converter**
- **- 2.4 GHz RF transceiver compatible with Bluetooth 4.0 low energy and proprietary communication protocols**
- **- Programmable GFSK modulation mode.**
- **- Excellent receiver sensitivity (-97 dBm for BLE), selectivity and blocking performance**
- **- Programmable output power up to +5 dBm**
- **- Suitable for systems targeting compliance with worldwide radio frequency regulations**
- **- Low Power Mode: 1 µA (RTC Running + RAM/CPU retention)**
- **- Low Power Mode: 100 nA (Wake-up on External Events)**
- **- 12-bit ADC, 200 ksamples/s, 8 channel analog MUX**
- **- Ultra-low-power analog comparator**
- **- UART**
- **- GPIOs**
- **- Real-time clock**
- **- AES-128 security module**
- **- Support for 8 capacitive sensing channels**
- **- Very few external components**
- **- Low-speed clock can be derived from high-speed crystal**

System Block Diagram



3. General Specification

3.1 General Specification

Model Name	**WMCT-759B_B**
Product Description	**BLE module**
Dimension	**10.0 mm x 23.0 mm x 2.1mm (Tolerance : ±0.2mm)**
Operating temperature	**-10°C to +65°C**
Storage temperature	**-20°C to +85°C**
Humidity	**Operating Humidity 10% to 80% (Non-Condensing)** **Storage Humidity 5% to 95% (Non-Condensing)**
Weight	**0.75±10% g**

3.2 Voltage Ratings

3.2.1 **Absolute Maximum Ratings**

Symbol	Description	Min.	Typ.	Max.	Unit
VBAT	**Module Voltage**	**3.1**	**3.3**	**5**	**V**
VCC	**Module Voltage (Output)**		**3**		**V**

3.2.2 Recommended Operating Ratings

Test conditions: At room temperature 25°C				
Symbol	**Min.**	**Typ.**	**Max.**	**Unit**
VBAT	**3.1**	**3.3**	**4.2**	**V**

3.3 Power Consumption

3.3.1 BLE Power Consumption

Test conditions: VBAT=3.3V; Temp=25°C

Current@VBAT

Power Mode	Description	Current (Peak)	Unit
Broadcast	BLE Broadcast case	**274.5**	**uA**
BLE Connection	Connect with remote device	**476.2**	**uA**
Broadcast(Standby)	After Press Reset Button, enter advertising state for 10 sec then enter Standby Mode(Specific FW)	**191.4**	**uA**
Standby mode		**2.1**	**uA**

4. Main CPU Overview

The WMCT-759B_B contains an ARM® Cortex™ M3 (CM3) 32-bit CPU, which runs the application and protocol stack in the product, and the protocol stack in the wireless network processor (WNP) products.

4.1 CM3 Features

32-bit ARM Cortex-M3 architecture optimized for small-footprint embedded applications

Outstanding processing performance combined with fast interrupt handling

Thumb®-2 mixed 16- and 32-bit instruction set delivers the high performance expected of a 32-bit ARM core in a compact memory size usually associated with 8- and 16-bit devices, typically in the range of a few kilobytes of memory for microcontroller-class applications:

–Atomic bit manipulation (bit-banding), delivering maximum memory use and streamlined peripheral control

–Unaligned data access, enabling data to be efficiently packed into memory

Fast code execution permits slower processor clock or increases sleep mode time

Harvard architecture characterized by separate buses for instruction and data

Efficient process core, system and memories

Hardware division and fast digital-signal-processing oriented multiply accumulate

Saturating arithmetic for signal processing

Deterministic, high-performance interrupt handling for time-critical applications

Enhanced system debug with extensive breakpoint and trace capabilities

Serial wire trace reduce the number of pins required for debugging and tracing

Migration from the ARM7™ processor family for better performance and power efficiency

Optimized for single-cycle flash memory use

Ultra-low power consumption with integrated sleep modes

48 MHz operation – the operating frequency can be dynamically altered to minimize power requirements.

1.25 DMIPS / MHz

5. RF Specification

5.1 BLE Specification

1 Mbps GFSK (Bluetooth low energy)

Conditions : VDD=3.3V ; Temp:25°C. Using Anisu CombiTest with MT8852B

TX

Output Power					
TX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
Output power @2402MHz	>-20 <+10	4.87	4.88	4.89	dBm
Peak to Average Power @2402MHz	<3dB		0.11		dB
Output power @2440MHz	>-20 <+10	4.82	4.82	48.3	dBm
Peak to Average Power @2440MHz	<3dB		0.11		dB
Output power @2480MHz	>-20 <+10	4.90	4.91	4.91	dBm
Peak to Average Power @2480MHz	<3dB		0.11		dB
Carrier Frequency Offset and Drift					
TX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
Frequency Offset @2402MHz	≦±150 kHz	15.3	19.5	22.7	KHz
Drift Rate / 50 µs @2402MHz	≦20 kHz / 50 µs		11.48		KHz
Max Drift @2402MHz	≦50 kHz		8		KHz
Frequency Offset @2440MHz	≦±150 kHz	16.8	19.7	23.5	KHz
Drift Rate / 50 µs @2440MHz	≦20 kHz / 50 µs		5.27		KHz
Max Drift @2440MHz	≦50 kHz		8		KHz
Frequency Offset @2480MHz	≦±150 kHz	18.3	19.5	20.9	KHz
Drift Rate / 50 µs @2480MHz	≦20 kHz / 50 µs		-5.66		KHz

Max Drift @2480MHz	≦50 kHz		-9		KHz
Modulation Characteristics					
TX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
F1avg @2402MHz	225 kHz < F1avg < 275 kHz		257.4	272.2	KHz
F2max @2402MHz	>= 185 kHz		202.2		KHz
'F2max' Pass Rate @2402MHz	> 99.9 %		100		%
F1/F2 ratio @2402MHz	>= 0.80		0.89		
F1avg @2440MHz	225 kHz < F1avg < 275 kHz		257.7	268.1	KHz
F2max @2440MHz	>= 185 kHz		208.1		KHz
'F2max' Pass Rate @2440MHz	> 99.9 %		100		%
F1/F2 ratio @2440MHz	>= 0.80		0.91		
F1avg @2480MHz	225 kHz < F1avg < 275 kHz		265.7	274.9	KHz
F2max @2480MHz	>= 185 kHz		214.3		KHz
'F2max' Pass Rate @2480MHz	> 99.9 %		100		%
F1/F2 ratio @2480MHz	>= 0.80		0.91		

RX

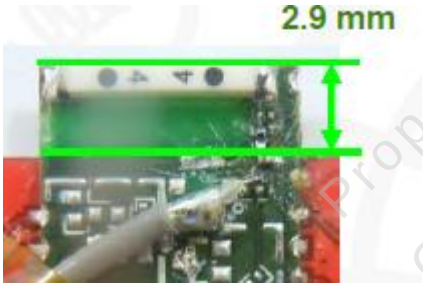
Receiver sensitivity(Power Level: -93.0 dBm, Dirty Tx Status: On)					
RX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
Frame Error Rate@2402MHz	<= 30.800 %		16.8		%
Frame Error Rate@2440MHz	<= 30.800 %		16.333		%
Frame Error Rater @2480MHz	<= 30.800 %		16.867		%
PER Report Integrity(Power Level: -30.0 dBm, Packet Number Mode: Random)					
RX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
Frame Error Rate@2402MHz	50.0 % <= PER <= 65.4 %		50.3		%
Frame Error Rate@2440MHz	50.0 % <= PER <= 65.4 %		50.2		%
Frame Error Rate@2480MHz	50.0 % <= PER <= 65.4 %		50.0		%
Maximum Input Signal Level(Power Level: -10.0 dBm)					
RX PARAMETER	**limit**	**MIN**	**TYP**	**MAX**	**UNIT**
Fame Error Rate @2402MHz	<= 30.800 %		0.8		%
Frame Error Rate@2440MHz	<= 30.800 %		0.933		%
Frame Error Rate@2480MHz	<= 30.800 %		0.733		%

6. Ceramic Chip Antenna Specification

6.1 Description Value

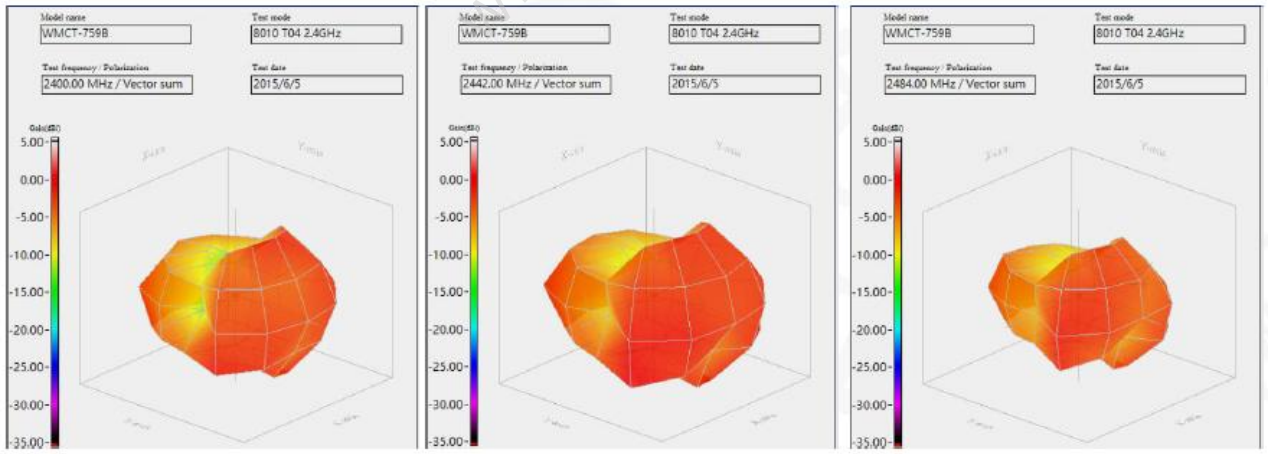
- ✧ **Centre Frequency 2.45 GHz**
- ✧ **Bandwidth 170 MHz (Typ.)**
- ✧ **Polarization Linear**
- ✧ **Azimuth Beamwidth Omni-directional**
- ✧ **Peak Gain 5.46 dBi (Typ.)**
- ✧ **Impedance 50 Ω**
- ✧ **Maximum Power 1 W**
- ✧ **Termination Ni / Sn (Environmentally-Friendly Leadless)**

6.2 Antenna patterns



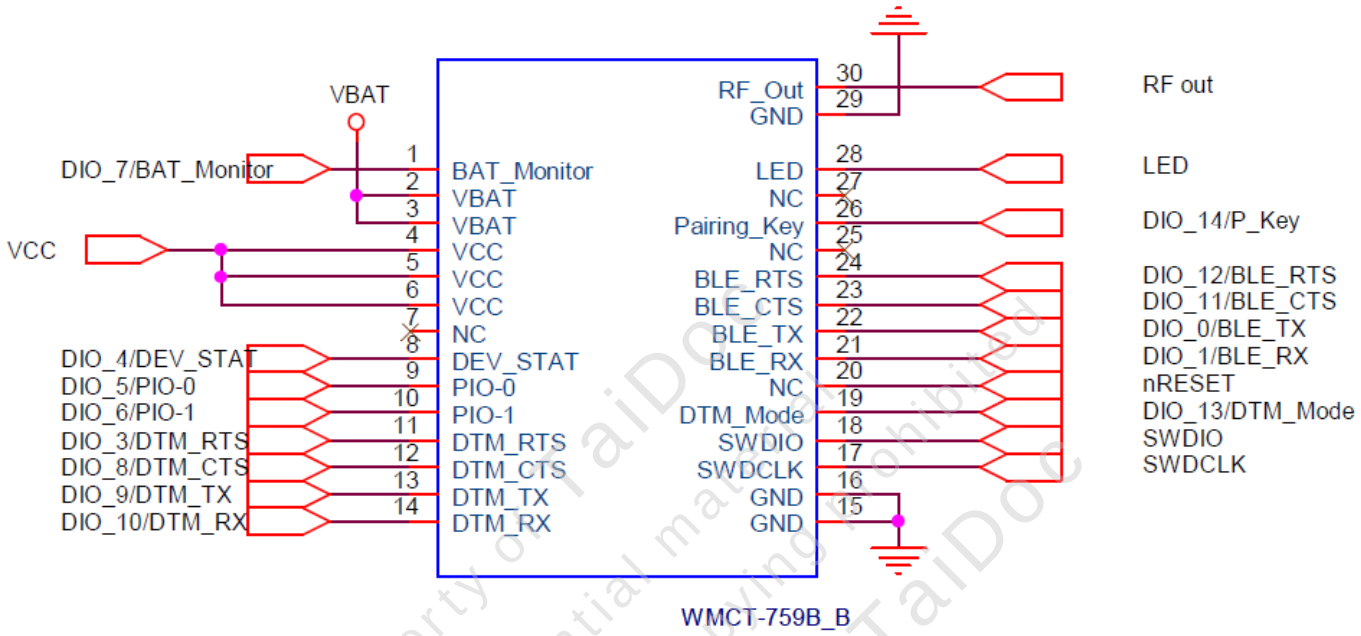
3D Radiation Pattern

2.4 GHz – 2.484 GHz



7. Pinout Information

7.1 Schematic Diagram



7.2 Pin Descriptions

Pin	Symbol	I/O Type	Description	Drive Strength
1	BAT_Monitor	I	Battery Voltage Monitor [GPIO(Digital/Analog I/O)]	2mA/4mA
2	VBAT	P	3.3V Power input	
3	VBAT	P	3.3V Power input	
4	VCC	P	3V Power Output	
5	VCC	P	3V Power Output	
6	VCC	P	3V Power Output	
7	NC	NC	Not Connect	
8	DEV_STAT	O	Wakeup Device [GPIO(Digital I/O)]	2mA / 4mA/ 8mA
9	PIO-0	I/O	GPIO (Digital I/O) // JTAG_TDO	2mA / 4mA/ 8mA
10	PIO-1	I/O	GPIO (Digital I/O) // JTAG_TDI	2mA / 4mA/ 8mA
11	DTM_RTS	I	UART RTS signal (Note.1) [GPIO(Digital I/O)]	2mA / 4mA/ 8mA

Pin	Symbol	I/O Type	Description	Drive Strength
12	DTM_CTS	O	UART CTS signal (Note.1) [GPIO(Digital/Analog I/O)]	2mA/4mA
13	DTM_TX	O	UART TX signal (Note.1) [GPIO(Digital/Analog I/O)]	2mA/4mA
14	DTM_RX	I	UART RX signal (Note. 1) [GPIO(Digital/Analog I/O)]	2mA/4mA
15	GND	P	GND	
16	GND	P	GND	
17	SWDCLK	I	JTACK Clock	
18	SWDIO	I/O	JTACK Data	
19	DTM_Mode	I	Set Low to DTM Mode Set High to BLE Mode [GPIO(Digital/Analog I/O)]	2mA/4mA
20	nRESET	I	RESET, active-low	
21	BLE_RX	I	UART RX (Bootloader) // [GPIO(Digital I/O)]	2mA/4mA
22	BLE_TX	O	UART TX (Bootloader) // [GPIO(Digital I/O)]	2mA/4mA
23	BLE_CTS	O	UART CTS [GPIO(Digital/Analog I/O)]	2mA/4mA
24	BLE_RTS	I	UART RTS [GPIO(Digital/Analog I/O)]	2mA/4mA
25	NC	NC	Not Connect	
26	Paring_Key	I	Set Low to Paring Device [GPIO(Digital/Analog I/O)]	2mA/4mA
27	NC	NC	Not Connect	
28	LED	O	LED indicator [GPIO(Digital I/O)]	2mA / 4mA/ 8mA
29	GND	P	GND	
30	RF out	I/O	RF Input/Output	

Note.1 DTM is Direct Test Mode。

8. Software Overview

8.1 WMCT-759B_B board GPIO configuration file path

The PIN definition can be modified in SDK
C:\ti\tirtos_simplelink_2_xx_xx_xx\packages\ti\boards\SRF06EB

Source files:

...\CC2650EM_5XD\Board.h
...\CC2650EM_5XD\Board.c

8.2 PIN define in header file Board.h

```
//Customer Define
#define Board_UART_TX                   IOID_0
#define Board_UART_RX                   IOID_1
#define Board_LED_BLUE                  IOID_2
#define Board_UART_TX_DTM               IOID_9
#define Board_UART_RX_DTM               IOID_10
#define Board_DTM_Enable                IOID_13
#define Board_Pairing_Key               IOID_14
```


8.3 TUV profile authenticate item

BAS, BLP, BLS, DIS, GLP, GLS, HTP, HTS

8.4 Device information

Brocast name：iFORA

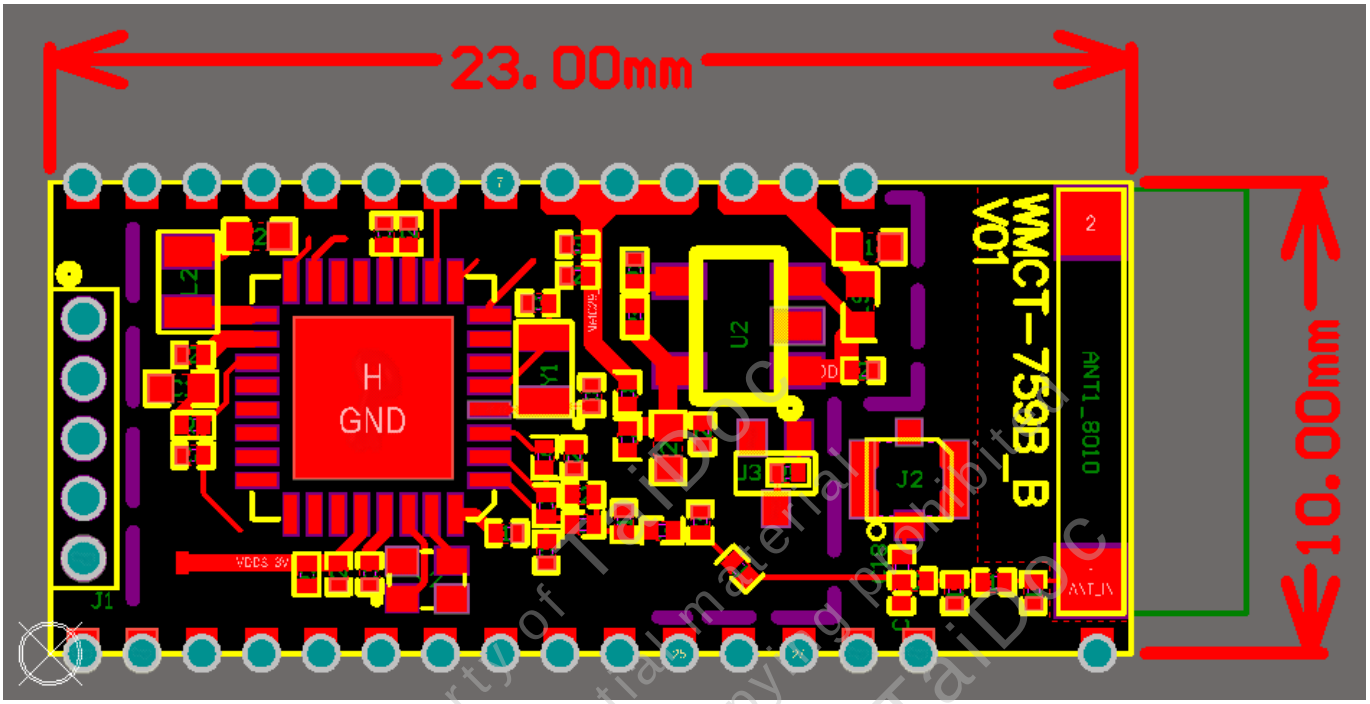
[Baudrate]

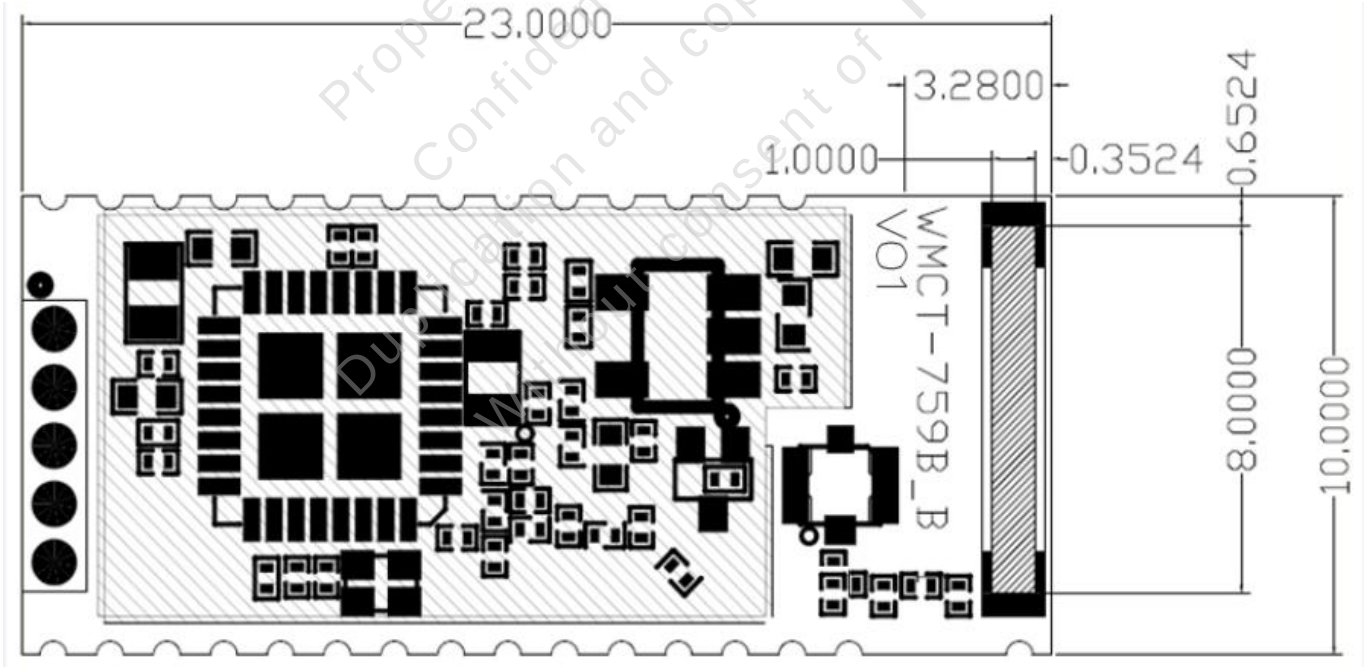
Support auto change baudrate.

Thermometer Meter	9600
Glucose Meter	19200
Blood Pressure Meter	115200

9. Module Dimensions

9.1 Outline Dimension



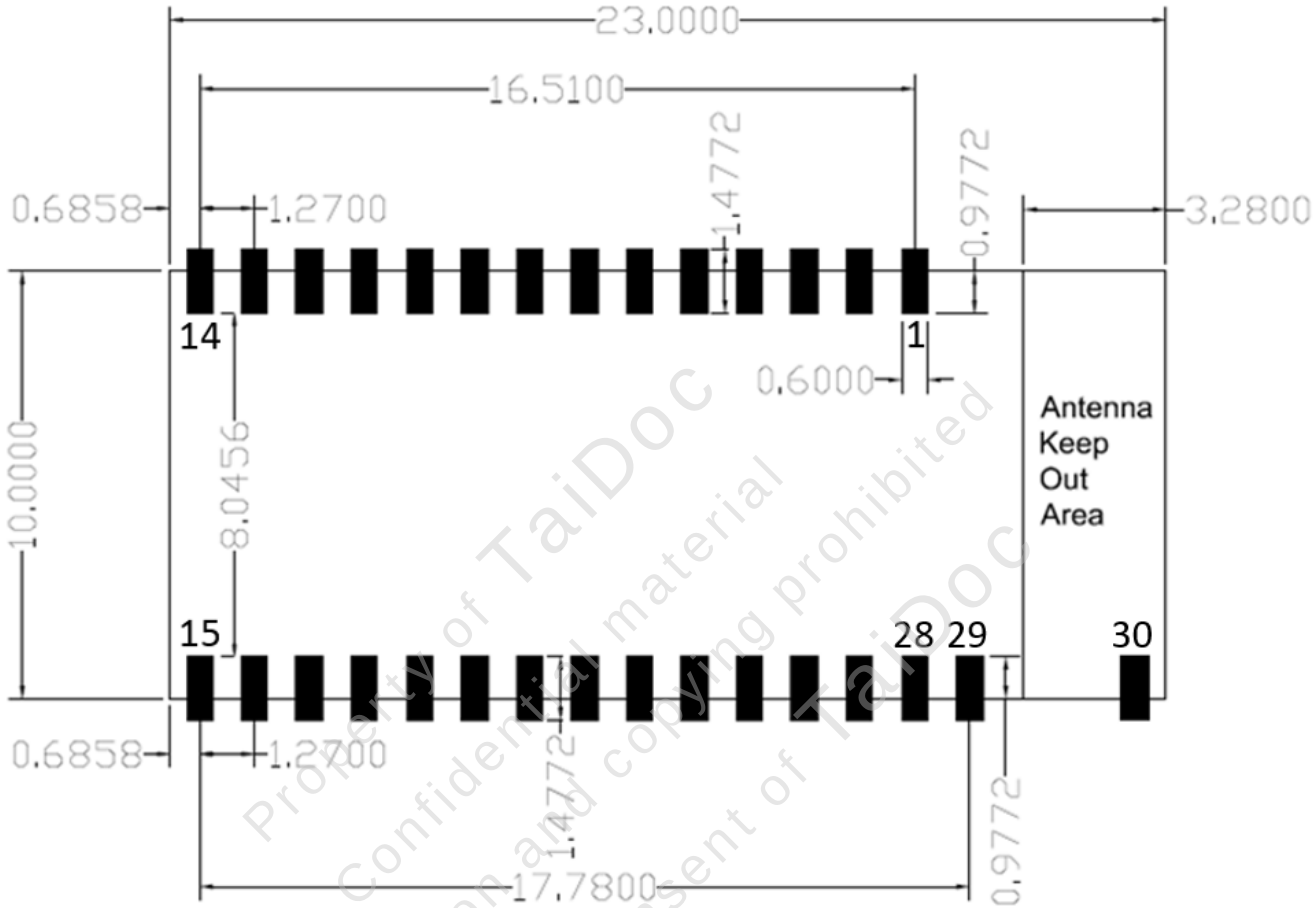


(Unit: mm)

Tolerance : ±0.2mm

9.2 Recommended Footprint

< TOP VIEW >



(Unit: mm)

Footprint Tolerance : ±0.1mm

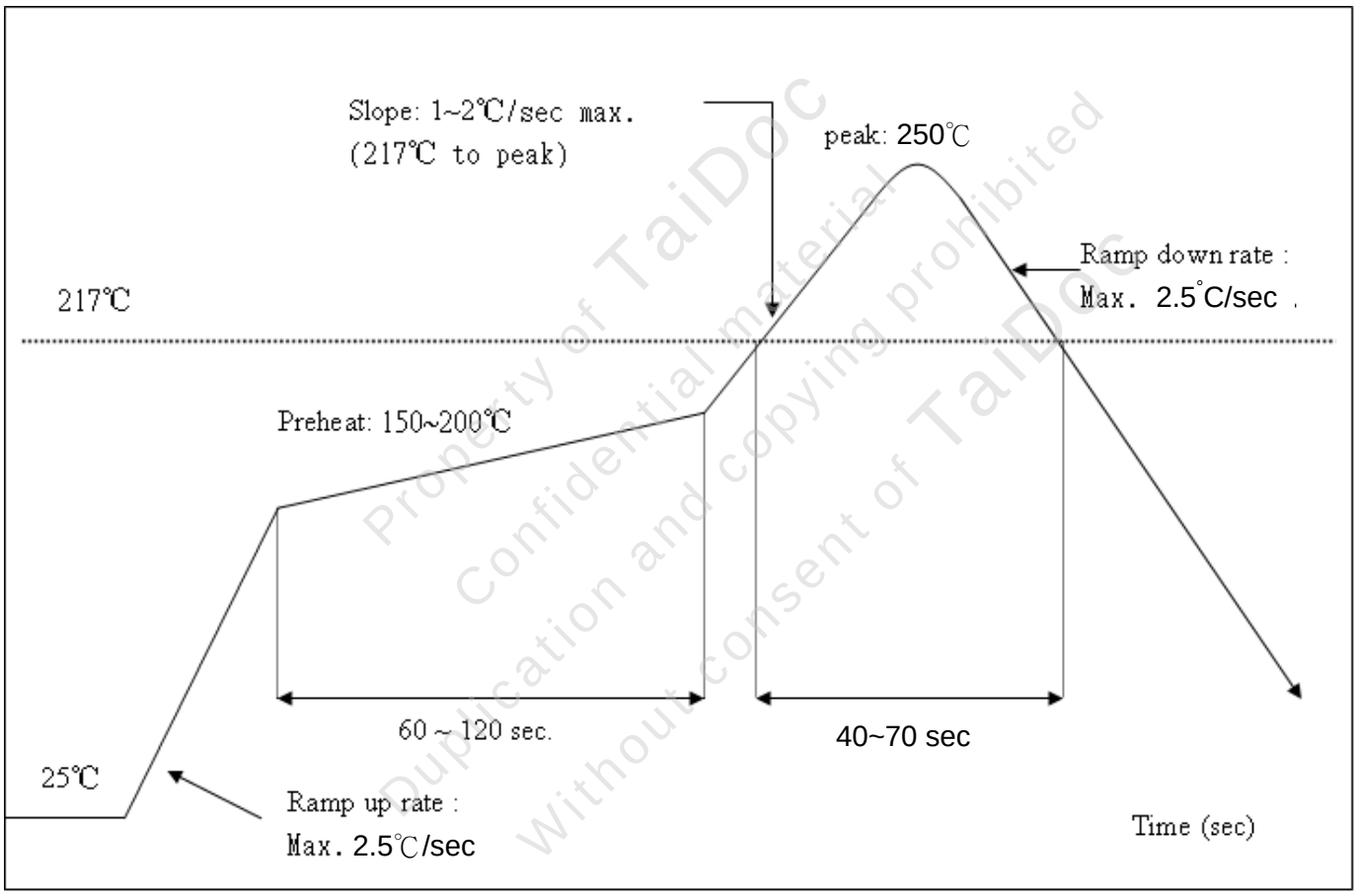
10. Recommended Reflow Profile

“reflow 時需使用 N2, 含氧量建議 5000 ppm 以下”，焊接可接受參考 IPC-610 的 Class2 規格

It must use N2 for reflow and suggest the concentration of oxygen less than 5000 ppm ,Soldering acceptability reference IPC-610 Class2 specification

Peak Temperature : <250°C

Number of Times : ≤2 times

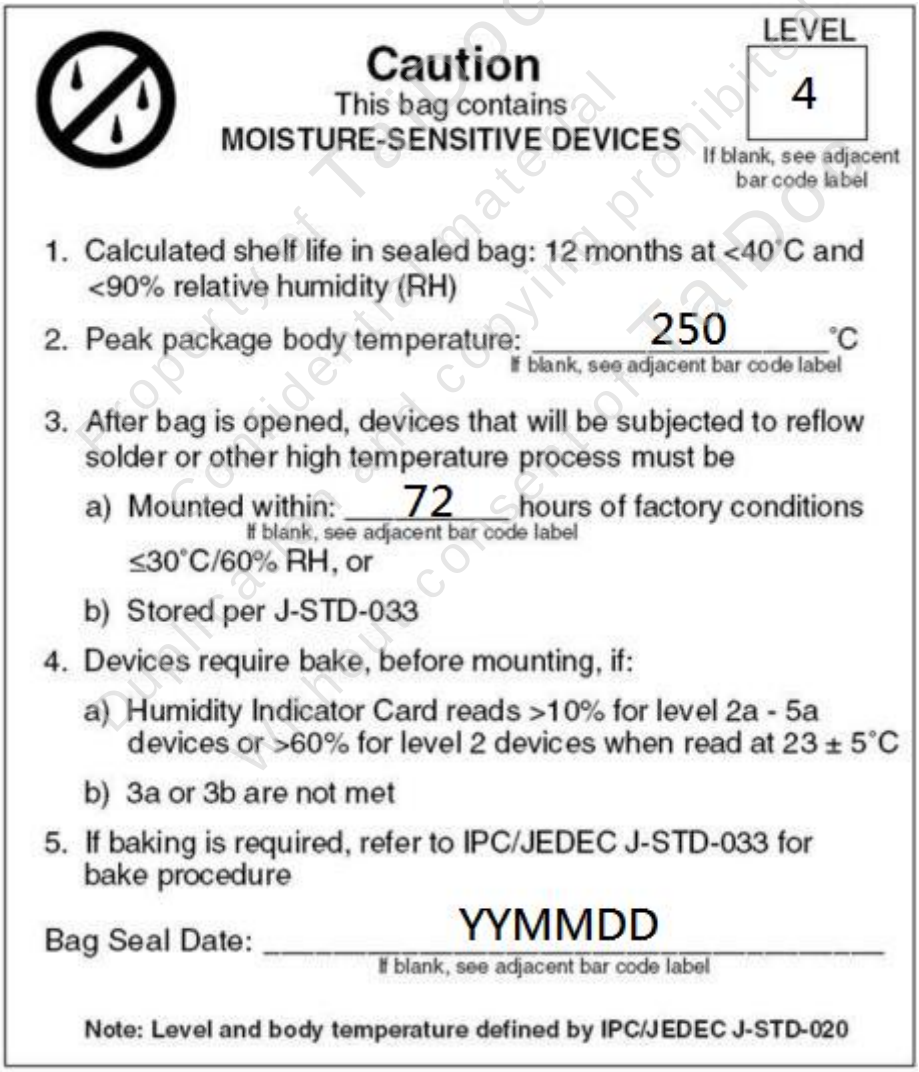


11. Packing Information

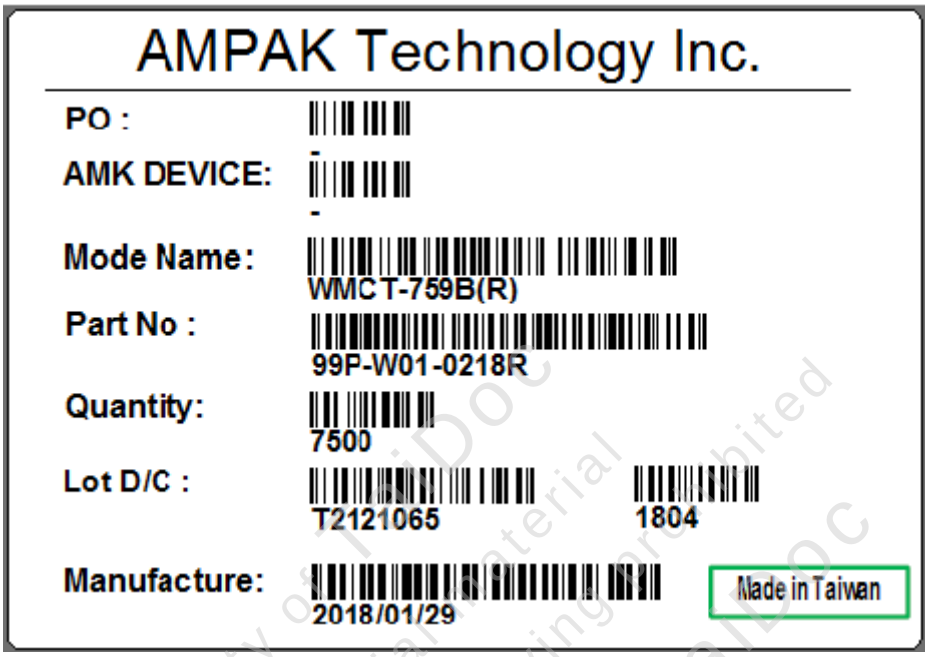
11.1 Label

Label A Anti-static and humidity notice

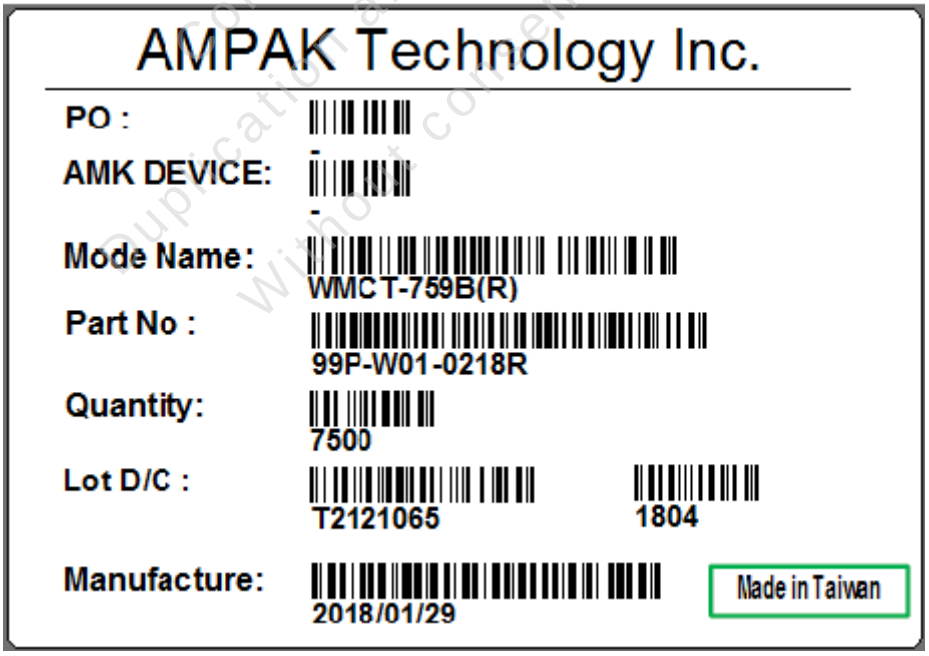
Label B MSL caution / Storage Condition



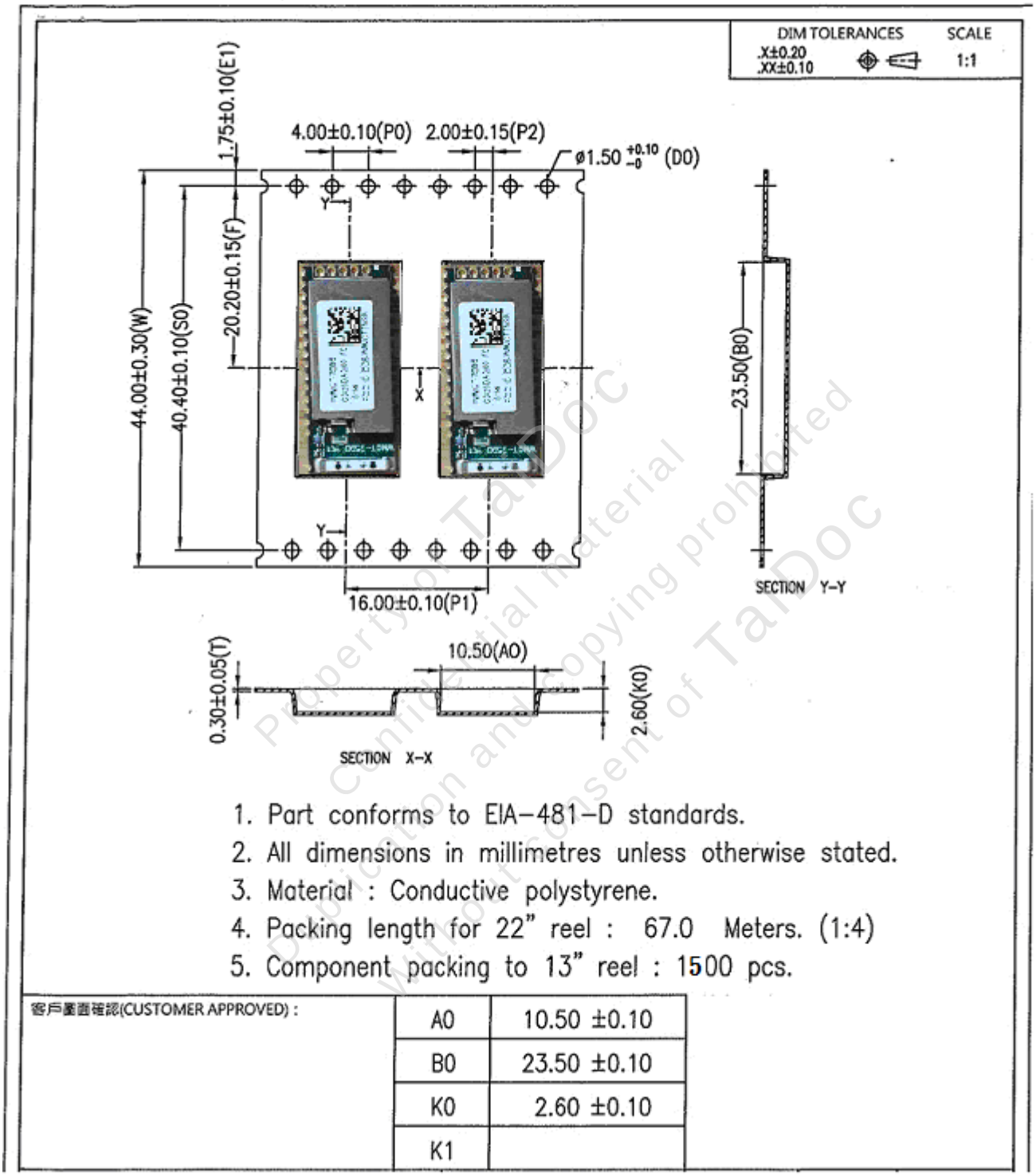
Label C Inner box label



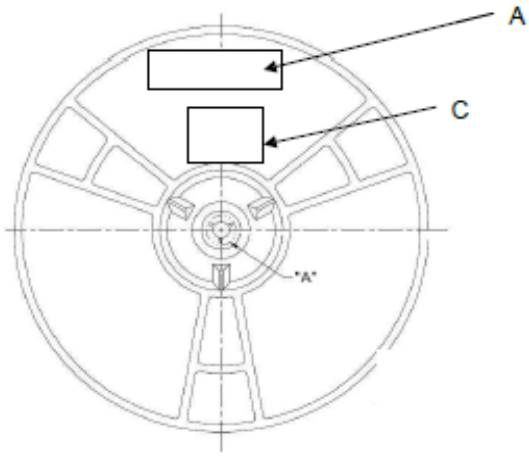
Label D Carton box label

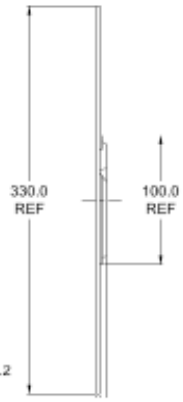


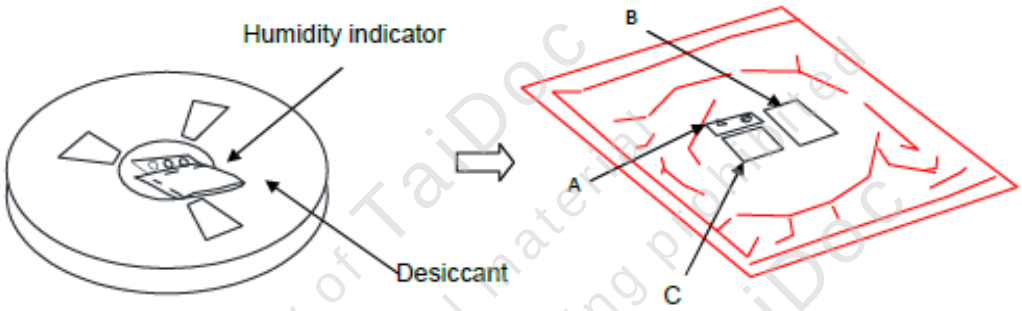
11.2 Packing Dimension

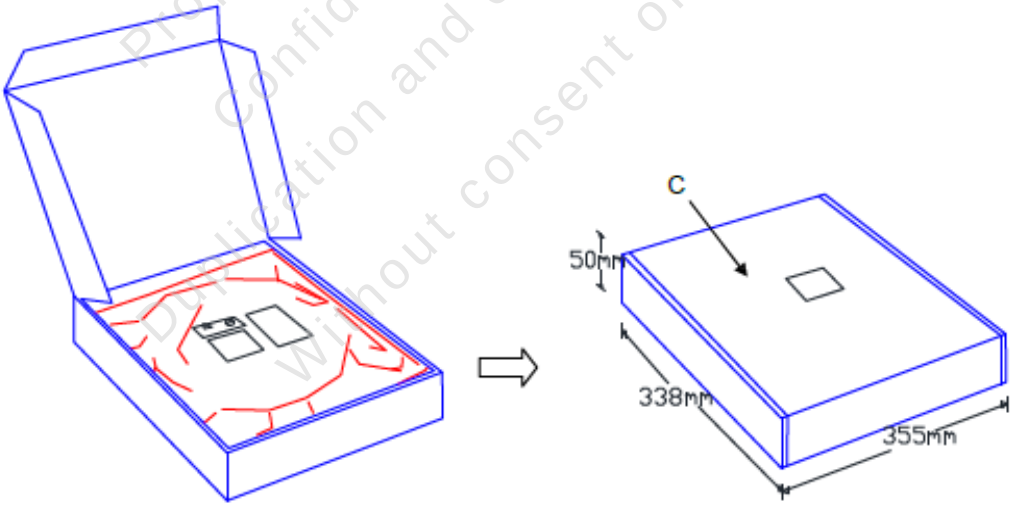


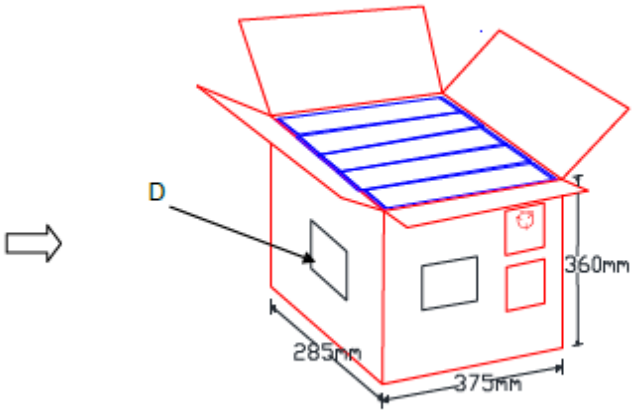
(Reel blank: Top 25 After 25)











11.3 Packing materials

NO	TITLE	P/N
1	Anti-static and humidity notice Label (A)	N/A
2	MSL caution / Storage Condition Label (B)	N/A
3	Box Label (C) 70mmX 50mm	42P-200-0001R
4	Carton Label (D) 90mmX 85mm	42P-210-0002R
5	Reel	41P-900-0011R
6	Carrier tape	
7	Cover tape	41P-900-0010R
8	Protective band	41P-900-0012R
9	AL bag	41P-230-0005R
10	HIC	45P-900-0002R
11	Desiccant, SILICAGEL EXSICCATOR SK30 HB	45P-900-0001R
12	Box (355*338*50mm)	41P-130-0005R
13	Carton (375*360*285mm)	41P-120-0005R