# Sigfox Module WSG300S

Compact-sized
With Ultra-low Power Consumption

RF on Pad

IPEX

- Sigfox Support
- ISM RC2 (902MHz)
  ISM RC4 (920MHz)
- AT Commands
- Extended Temperature Range: -40˚C to +85˚C
- Ultra-Low Power Consumption (2.2uA @ sleep mode)

WSG300S RC24 is a Sigfox modem module for the low power wide area network (LPWAN) market. It is designed with STM's system S2-LP + STM MCU + Sky66421 for the US or other FCC-like market (FCC Part 15.247).

The module was designed for high performance, high quality, low cost, small form factor and most importantly, high RF power of up to 22dBm. The design is fully compliant to FCC regulations. The Sigfox application is running on STM32 MCU at high efficiency using its internal 32bit core Cortex-M0 processor.

Every module is preloaded with Sigfox application software, module specific ID/KEY/PAC as referring to Sigfox network system. The preloaded software also includes a bootloader which allows software update or future user application development.

## General Feature

- General Sigfox module for Smart City, Smart Agriculture , Smart Industry, IOT Application
- Compact Form Factor: 22.5 x 16.5 x 3.0 mm
- 51 Pin LGA Pad for PCB SMT mounting
- Interface : I2C*1/UART*1/GPIO*3/ADC*2/SWD*1
- Temperature range: -40°C to +85°C
- Supply voltage: 2.1 ~ 3.6V
- Frequency range: ISM RC2 (902MHz) and RC4 (920MHz)
- FCC Part 15.247
- Preloaded Sigfox application with ID/KEY/PAC and bootloader for firmware update

## Product Specifications

| RF Function | |
|---|---|
| Standard | Sigfox Network System |
| Interface | I2C/UART/GPIO/ADC/SWD |
| Transmit Output Power | 22dBm |
| Data Rate | RC2/4: Uplink 600bps / Downlink 600bps |
| Modulation Techniques | Uplink DBPSK Modulation<br>Downlink GFSK Modulation |
| Frequency bands | RC2 uplink Central Frequency 902.200 MHz<br>RC2 downlink Central Frequency 905.200 MHz<br><br>RC4 uplink Central Frequency 920.800 MHz<br>RC4 downlink Central Frequency 922.300 MHz |
| Operating Voltage | 2.1 ~ 3.6V |
| Operating Temperature | -40 ~ 85 degree C |
| Current consumption | Tx mode(TX period): 80mA<br>Uplink(TX 1 frame): 166mA<br>Downlink:14mA<br>Normal mode: 5mA<br>Sleep mode: 2.2 uA |

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# Sigfox Verified™ Certificate

# M_004E_77AD_01

Congratulations LITE-ON, the following product is now Sigfox Verified™ certified :

sigfox verified

**MODULE** : WSG300S
**TYPE** : RC2 UPLINK AND DOWNLINK
**LAYOUT** : WSG300S_V04
**SCHEMATIC VERSION** : WSG300S_V04
**BOM** : WSG300S_V04
**FIRMWARE** : V2.0.0.8
**SIGFOX LIB** : V2.2.3_FDL
**TEST REPORT** : CORP-6773_RC2_UDL
**CERTIFICATION DATE** : MAY 23, 2018

This certificate is valid for this product only. Any change to the certified product has to be reported to Sigfox as it may lead to a renewal of the Sigfox Verified™ certification.
The Sigfox Verified™ logo must be used in respect of Sigfox branding guidelines.

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# Sigfox Verified™ Certificate

# M_004E_77AD_01

Congratulations LITE-ON, the following product is now Sigfox Verified™ certified :

sigfox verified

**MODULE** : WSG300S
**TYPE** : RC4 UPLINK AND DOWNLINK
**LAYOUT** : WSG300S_V04
**SCHEMATIC VERSION** : WSG300S_V04
**BOM** : WSG300S_V04
**FIRMWARE** : V2.0.0.8
**SIGFOX LIB** : V2.2.3_FDL
**TEST REPORT** : CORP-9531_RC4_UDL
**CERTIFICATION DATE** : MAY 24, 2018

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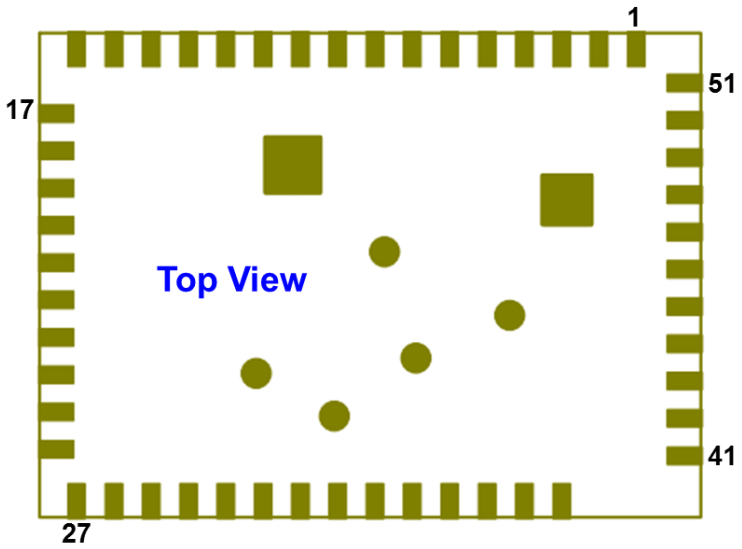
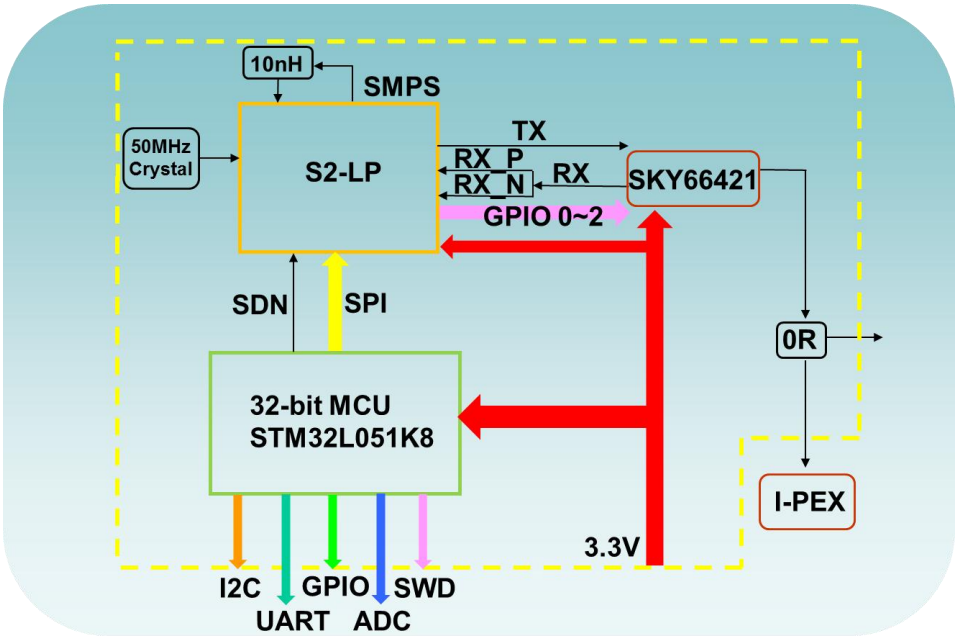
## Module Pinout



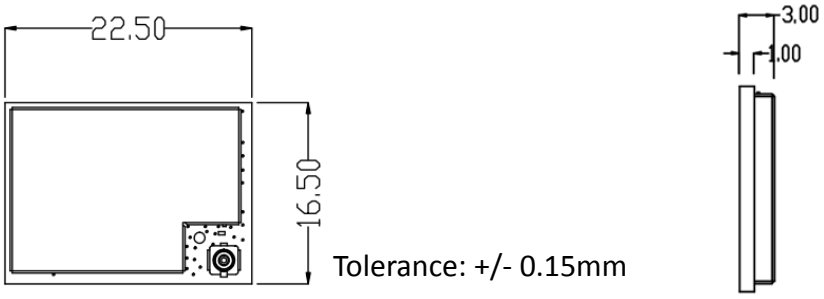

## Pin Definition

| Pin. | Description | Function | Pin. | Description | Function |
|---|---|---|---|---|---|
| 1,2,3,4,5,15,16, 39,40,41,42,43, 44,45,47,48,49, 50,51 | GND | GND | 24 | PA11 | PA11 |
| 6 | SDO | PA6 | 25 | PA12 | PA12 |
| 7 | SDI | PA7 | 26 | SWDIO | PA13 (MCU debugging and programming) |
| 8 | SCLK | PB3 | 27 | SWCLK | PA14 (MCU debugging and programming) |
| 9 | CSN | PA1 | 28 | NC | NC- |
| 10 | GPIO0 | PA0 | 29 | PB4 | PB4 |
| 11 | GPIO1 | PA4 | 30 | PB5 | PB5 |
| 12 | GPIO2 | PB1 | 31 | I2C1_SCL | PB6 |
| 13 | GPIO3 | PA15 (S2-LP Uplink Interrupt pin) | 32 | I2C1_SDA | PB7 |
| 14 | SDN | SDN=0, Shutdown mode | 33 | NRST | NRST (MCU Reset) |
| 17 | USART2_TX | PA2 (115200bps) | 34 | BOOT0 | BOOT0 (Floating or Low) |
| 18 | USART2_RX | PA3 (115200bps) | 35 | PB8 | PB8 |
| 19 | PA5 | PA5 | 36 | XI | PC14-OSC_IN (Ready for External Crystal) |
| 20 | PB0 | PB0 | 37 | XO | PC15-OSC32_OUT (Ready for External Crystal) |
| 21 | PB2 | PB2 | 38 | VDD | VDD_3V3 |
| 22 | UART1_TX | PA9 (115200bps) | 46 | ANT1 | SigFox Antenna |
| 23 | UART1_RX | PA10 (115200bps) | | | |

## Block Diagram

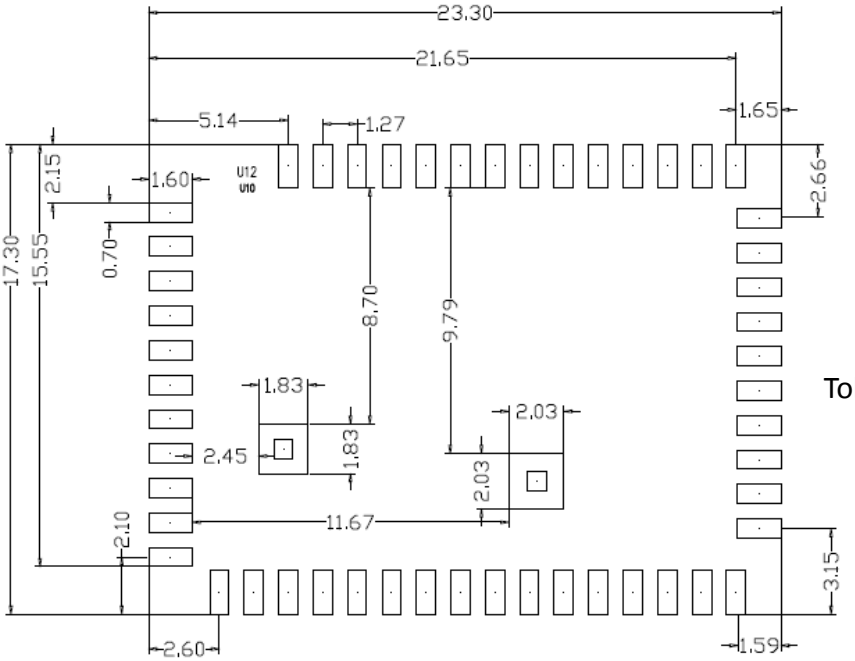



## Module Dimension



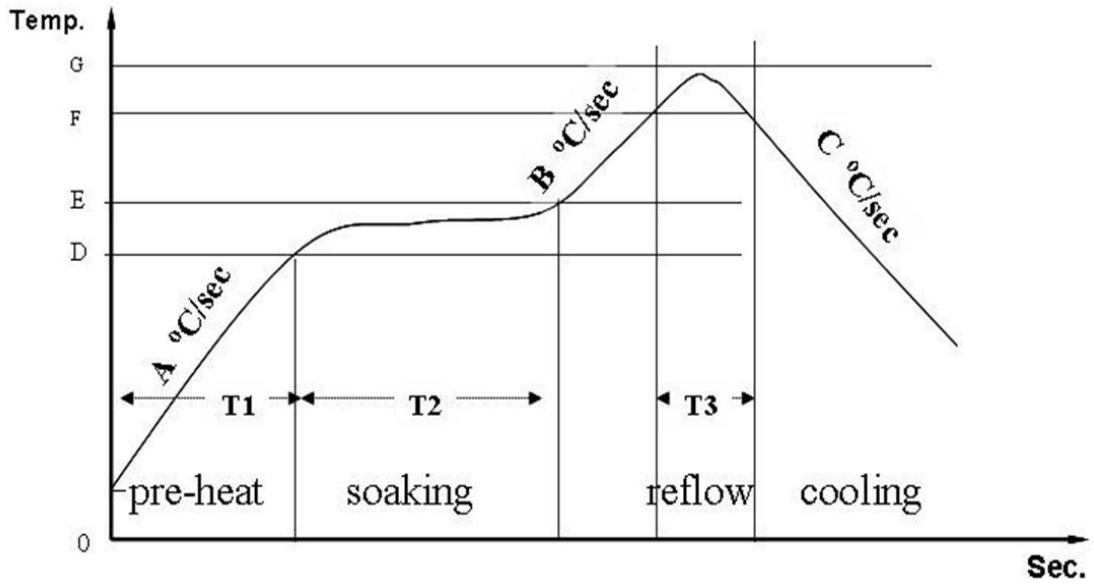

Tolerance: +/- 0.15mm

## Recommended Footprint




Tolerance: +/- 0.1mm

## RECOMMENDED REFLOW PROFILE



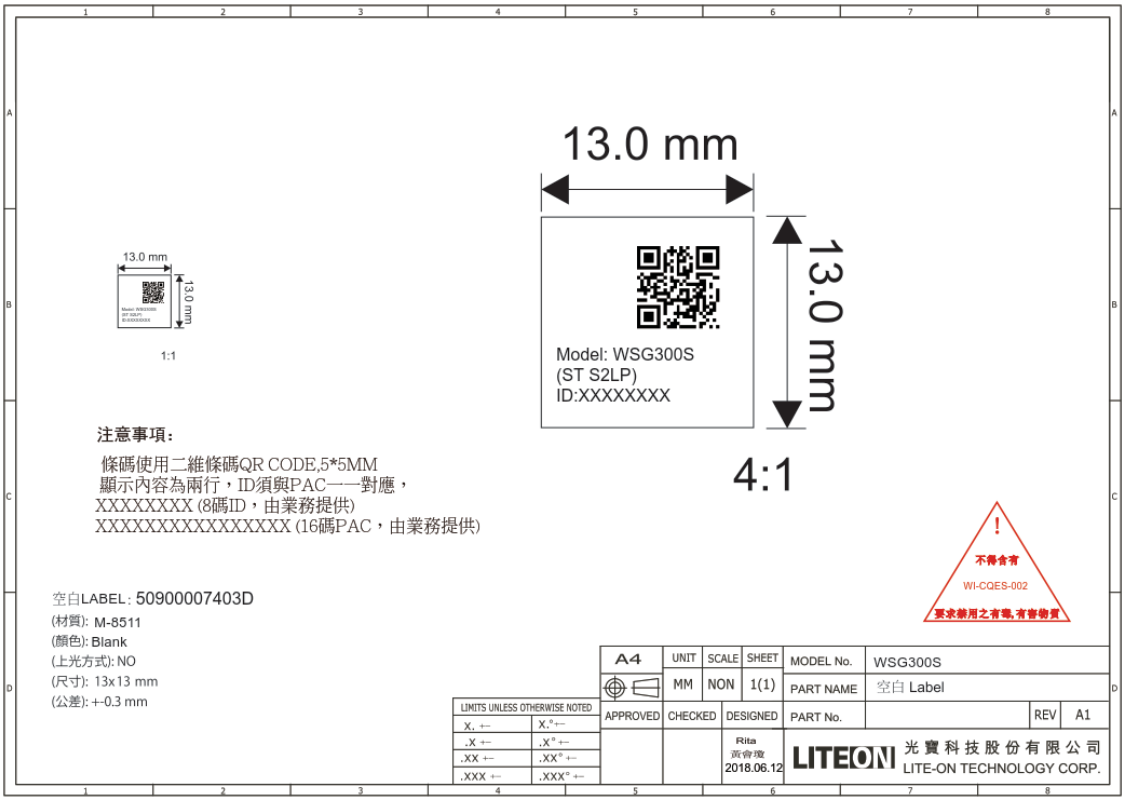

Standard conditions for reflow soldering:

- a. Pre-heating Ramp (A) (Initial temperature: 150℃): 1~2.5℃/sec;
- b. Soaking Time (T2) (150℃~180℃): 60sec~100sec;
- c. Peak Temperature (G): 230~250℃;
- d. Reflow Time (T3) (>220℃): 30~60 sec;
- e. Ramp-up Rate (B): 0~2.5℃/ sec;
- f. Ramp-down Rate (C): 1~3℃/ sec.

## AT COMMAND LIST

| Command | Description | Value |
|---|---|---|
| Switch_Public_Key v | Set public key state | v= 0: private , 1: public |
| Open_RCZ u | Open sigfox library for RCZ u | u=2,4 |
| Get_ID | Get device ID | return ID |
| Get_PAC | Get device PAC | return PAC |
| Get_RCZ | Get device regional | return regional |
| Get_Sigfox_Ver | Get the Sigfox library version | return library version |
| Get_FWVer | Get the firmware version | return firmware version |
| Get_FreqBase | Get current frequency setting | Return frequency in Hz |
| Set_FreqBase u | Set transmission frequency in Hz | e.g. u= 920800000 |
| Send_MSG u | Send payload data, 1 to 12 bytes | Frame: data bytes (0,1,2,3…C,D,E,F) to be sent, 12 byte maximum |
| | | if data not 1 bytes must be discarded e.g. u= 012 -> 01 |
| Send_Frame u v w | Send payload data, 1 to 12 bytes | Frame: data bytes (0,1,2,3…C,D,E,F) to be sent, 12 byte maximum |
| | | u= data to transmit, e.g. u= 1234 |
| | | v= Number of repetition[1 to 3], e.g. v= 2 |
| | | w=Flag to initiate a downlink response, 1= downlink 0= non downlink |
| | | if data not 1 bytes, fill up with 0 e.g. u= ABC -> AB0C |
| Uplink u | Send the number of payload data, the data is 11223344 | u = how many frames to send |
| Set_CWTx u | Continuous TX wave transmission | e.g. u = 5000, u is the number of frames to be sent |
| | | the transmission default frequency is 920800000 Hz |
| SleepMode | Set device in Sleep Mode | In Sleep Mode, press any key to exit and reset device |
| Reset | system soft reset | |

## LABEL DRAWING



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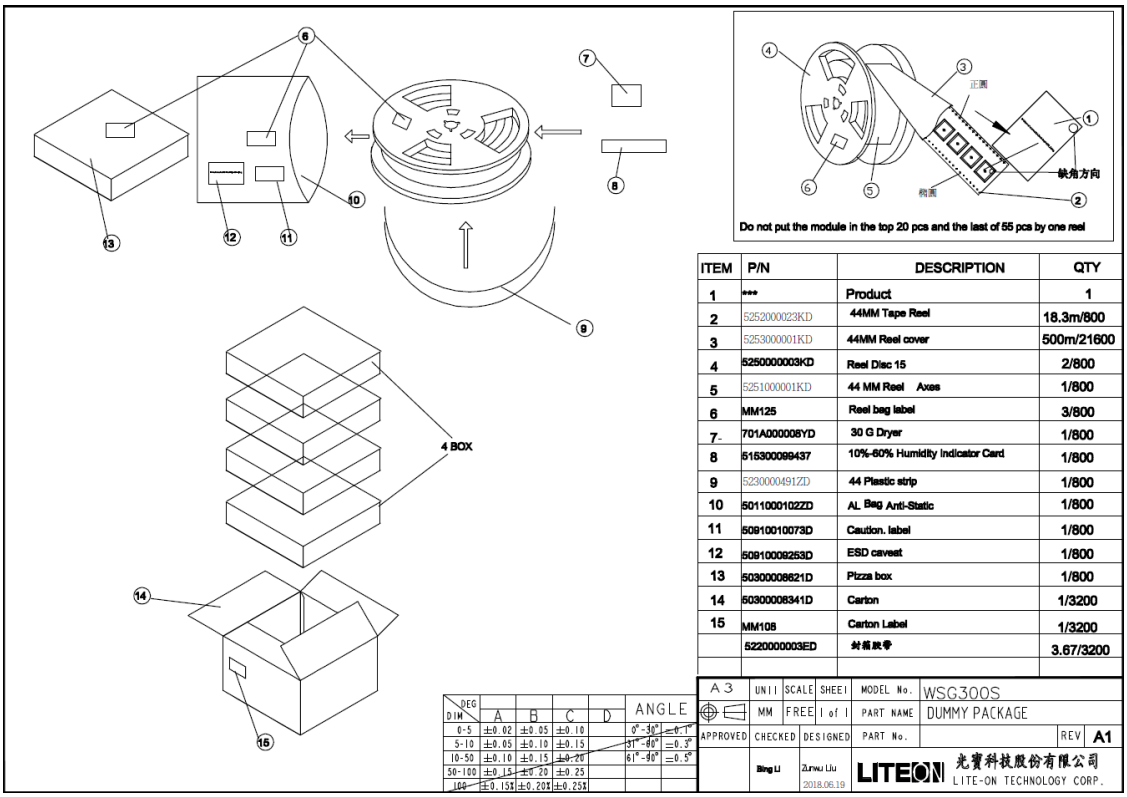
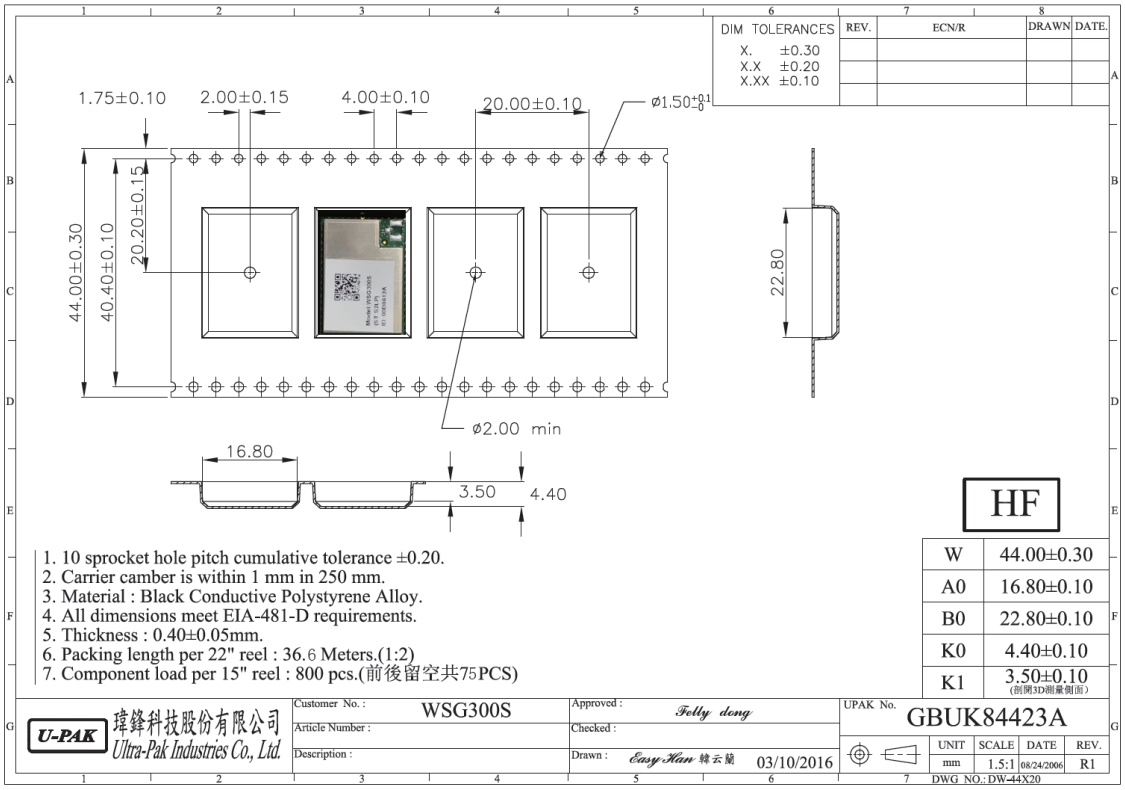
# PACKAGING SPEC



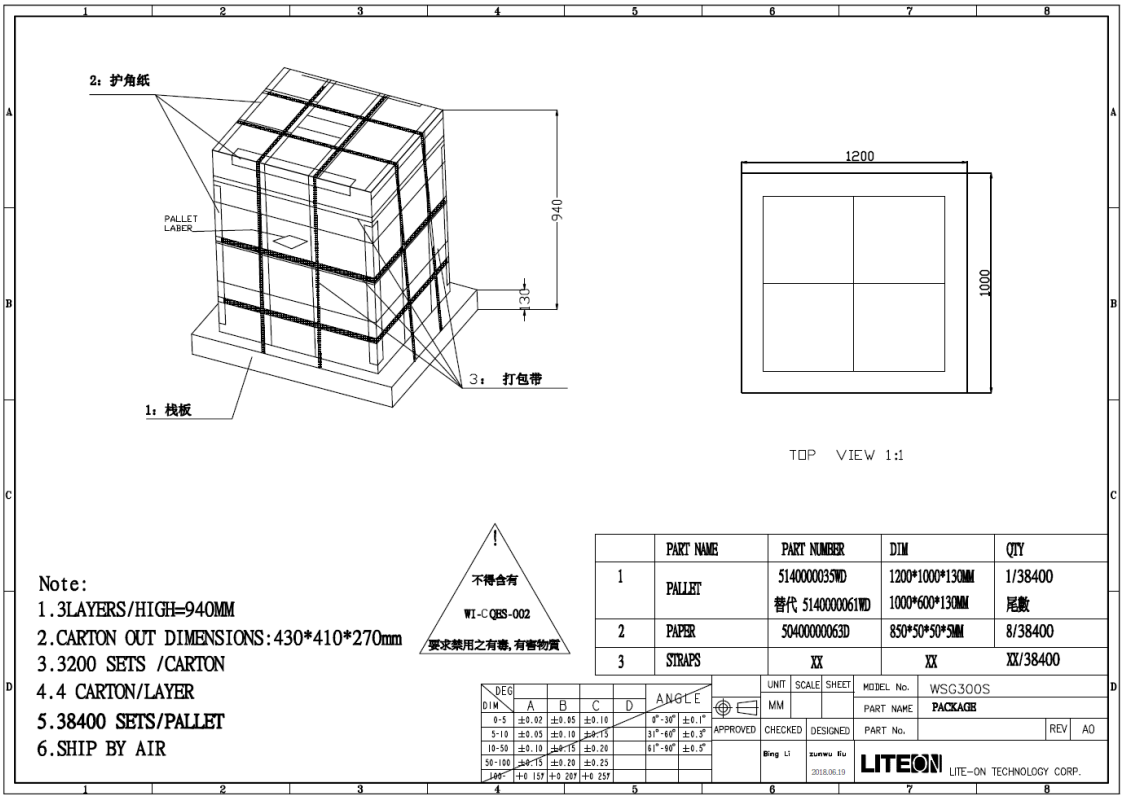

| ITEM | P/N | DESCRIPTION | QTY |
|---|---|---|---|
| 1 | *** | Product | 1 |
| 2 | 5252000023KD | 44MM Tape Reel | 18.3m/800 |
| 3 | 5253000001KD | 44MM Reel cover | 500m/21600 |
| 4 | 5250000003KD | Reel Disc 15 | 2/800 |
| 5 | 5251000001KD | 44 MM Reel Axes | 1/800 |
| 6 | MM125 | Reel bag label | 3/800 |
| 7 | 701A000008YD | 30 G Dryer | 1/800 |
| 8 | 515300099437 | 10%-60% Humidity Indicator Card | 1/800 |
| 9 | 5230000491ZD | 44 Plastic strip | 1/800 |
| 10 | 5011000102ZD | AL Bag Anti-Static | 1/800 |
| 11 | 50910010073D | Caution. label | 1/800 |
| 12 | 50910009253D | ESD caveat | 1/800 |
| 13 | 5030000821D | Pizza box | 1/800 |
| 14 | 5030000834 1D | Carton | 1/3200 |
| 15 | MM108 | Carton Label | 1/3200 |
| | 5220000003ED | 封箱胶带 | 3.67/3200 |

| DEG / DIM | A | B | C | D | ANGLE |
|---|---|---|---|---|---|
| 0-5 | ±0.02 | ±0.05 | ±0.10 | | 0°-30° =0.1° |
| 5-10 | ±0.05 | ±0.10 | ±0.15 | | 31°-60° =0.3° |
| 10-50 | ±0.10 | ±0.15 | ±0.20 | | 61°-90° =0.5° |
| 50-100 | ±0.15 | ±0.20 | ±0.25 | | |
| 100 | ±0.15% | ±0.20% | ±0.25% | | |

| A3 | UNIT | SCALE | SHEET | MODEL No. | WSG300S |
|---|---|---|---|---|---|
| | MM | FREE | 1 of 1 | PART NAME | DUMMY PACKAGE |
| APPROVED | CHECKED | DESIGNED | | PART No. | REV A1 |
| | Bing Li | Zurwu Liu | 2018.06.19 | LITEON 光寶科技股份有限公司 LITE-ON TECHNOLOGY CORP. | |



# PACKAGING SPEC

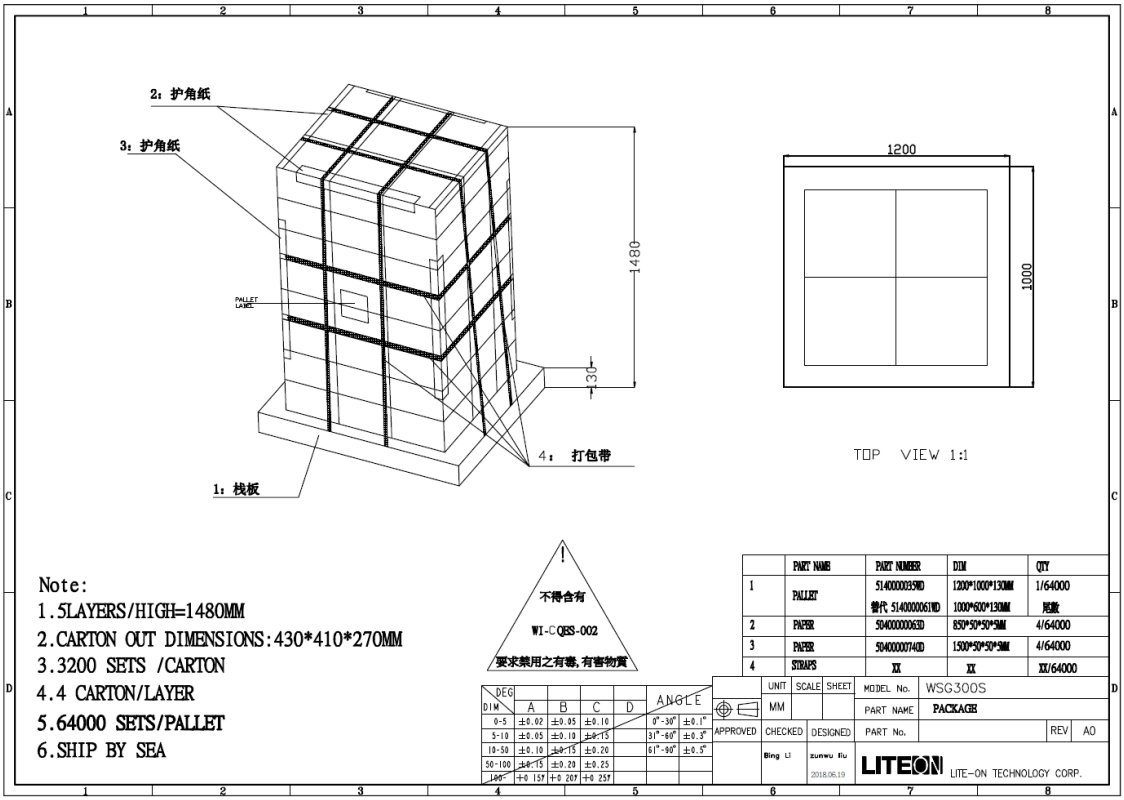



Note:
1.3LAYERS/HIGH=940MM
2.CARTON OUT DIMENSIONS:430*410*270mm
3.3200 SETS /CARTON
4.4 CARTON/LAYER
5.38400 SETS/PALLET
6.SHIP BY AIR

| | PART NAME | PART NUMBER | DIM | QTY |
|---|---|---|---|---|
| 1 | PALLET | 5140000035WD<br>替代 5140000061WD | 1200*1000*130MM<br>1000*600*130MM | 1/38400<br>尾數 |
| 2 | PAPER | 50400000063D | 850*50*50*5MM | 8/38400 |
| 3 | STRAPS | XX | XX | XX/38400 |

| DEG DIM | A | B | C | D | ANGLE |
|---|---|---|---|---|---|
| 0-5 | ±0.02 | ±0.05 | ±0.10 | | 0°-30° ±0.1° |
| 5-10 | ±0.05 | ±0.10 | ±0.15 | | 31°-60° ±0.3° |
| 10-50 | ±0.10 | ±0.15 | ±0.20 | | 61°-90° ±0.5° |
| 50-100 | ±0.15 | ±0.20 | ±0.25 | | |
| 100- | +0 15T | +0 20T | +0 25T | | |

UNIT: MM | SCALE | SHEET
APPROVED | CHECKED | DESIGNED: Bing Li, zunwu liu, 2018.06.19
MODEL No.: WSG300S
PART NAME: PACKAGE
PART No. | REV: A0
LITEON LITE-ON TECHNOLOGY CORP.




Note:
1.5LAYERS/HIGH=1480MM
2.CARTON OUT DIMENSIONS:430*410*270MM
3.3200 SETS /CARTON
4.4 CARTON/LAYER
5.64000 SETS/PALLET
6.SHIP BY SEA

| | PART NAME | PART NUMBER | DIM | QTY |
|---|---|---|---|---|
| 1 | PALLET | 5140000035WD<br>替代 5140000061WD | 1200*1000*130MM<br>1000*600*130MM | 1/64000<br>尾數 |
| 2 | PAPER | 50400000063D | 850*50*50*5MM | 4/64000 |
| 3 | PAPER | 50400000074DD | 1500*50*50*5MM | 4/64000 |
| 4 | STRAPS | XX | XX | XX/64000 |

| DEG DIM | A | B | C | D | ANGLE |
|---|---|---|---|---|---|
| 0-5 | ±0.02 | ±0.05 | ±0.10 | | 0°-30° ±0.1° |
| 5-10 | ±0.05 | ±0.10 | ±0.15 | | 31°-60° ±0.3° |
| 10-50 | ±0.10 | ±0.15 | ±0.20 | | 61°-90° ±0.5° |
| 50-100 | ±0.15 | ±0.20 | ±0.25 | | |
| 100- | +0 15T | +0 20T | +0 25T | | |

UNIT: MM | SCALE | SHEET
APPROVED | CHECKED | DESIGNED: Bing Li, zunwu liu, 2018.06.19
MODEL No.: WSG300S
PART NAME: PACKAGE
PART No. | REV: A0
LITEON LITE-ON TECHNOLOGY CORP.

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## CHANGE LIST

| Rev | Date | Author | Change List |
|---|---|---|---|
| V1.0 | 2018.02.12 | Kaysa Lee | Preliminary |
| V1.1 | 2018.06.11 | Kelly Hsu | Update Voltage supply<br>Update Current consumption<br>Update AT Command List |
| V1.2 | 2018.06.19 | Kaysa Lee | Add Packaging spec |
| V1.3 | 2018.07.02 | Kelly Hsu | Add Reflow profile<br>Add Label Drawing |
| V1.4 | 2018.08.17 | Kelly Hsu | Change sample photo |
| V1.5 | 2018.09.03 | Kaysa Lee | Add sigfox P1 cert. |
| V1.6 | 2018.09.25 | Kaysa Lee | Revise Power consumption data |