

SPECIFICATIONS

PRODUCT NAME : Wireless Module for Lighting Control

MODEL NAME : TWZT-V001D-F

CUSTOMER MODEL NAME :

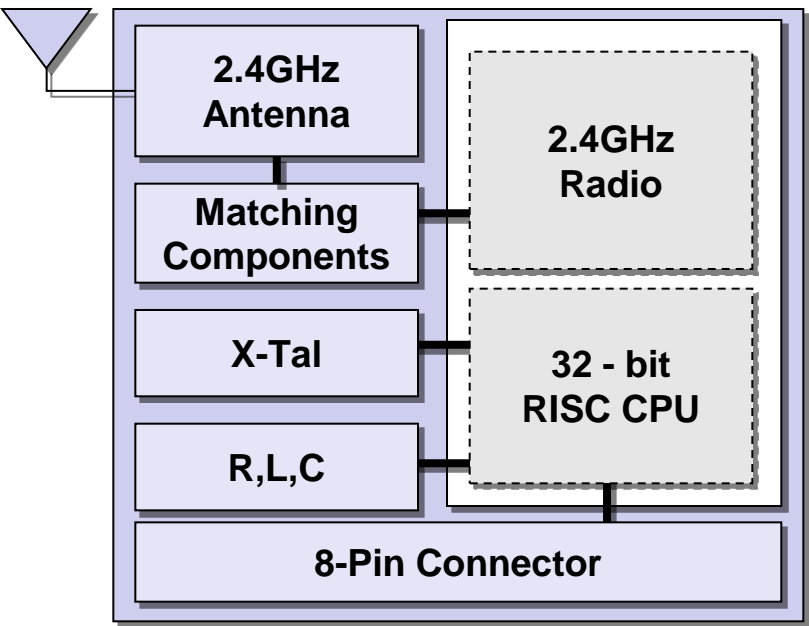
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|--------------------|--------------------|--------------------|----------------------|-------------|
| Designed | Checked | Approved | LG Innotek Co., Ltd. | |
| Yun Yeong Uk | Ro Young Suk | Kim Yong Gyu | | |
| | | | DOCUMENT No. | 14-RFM-0174 |
| '14.09.17 | '14.09.17 | '14.09.17 | PAGE | 21 |

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| <div>1. GENERAL DESCRIPTION</div> <div>LG Innotek’s Common Zigbee Module solution for IEEE 802.15.4, Zigbee(ZHA) and RF4CE applications. In addition, this modules are high performance hardware feature and easy connectivity solution for wireless lighting control and smart home applications. It enables robust network nodes to be built with very low total bill-of material costs. This module is suited for systems where very low power consumption is required. Very low-power sleep modes are available. Short transition times between operating modes further enable low power consumption.</div> <div>LG Innotek’s common Zigbee Module contains the RF IC and necessary external components and integrated very small size PCB pattern Antenna. It is provides very simple hardware support for easy smart lighting control and WSN applications</div> <div>2. FEATURES</div> <div><div>- 2.4GHz IEEE802.15.4 compliant RF Transceiver</div><div>- Excellent Receiver Sensitivity and Robustness to interference</div><div>- Programmable Output Power Up to 6.5 dBm</div><div>- Small Module with PCB Pattern Antenna Solution : Size 22 × 29 × 7.7mm</div><div>- High performance and Low power 32-bit RISC CPU</div><div>- 192-KB In-System-Programmable Flash and External 256-KB Flash for OTA(Over the Air)</div><div>- 8-Pin connection for Power Supply Unit</div><div>- Support Standard Protocol (ZHA)</div><div>- Support Wireless S/W Upgrade(OTA : Over the Air)</div></div> | | |

3. BLOCK DIAGRAM



| Pin No. | Pin Function |
|---------|-------------------------------|
| 1 | Mode Sel |
| 2 | Reserved |
| 3 | Power Supplied with Typ. 3.0V |
| 4 | Reserved |
| 5 | GND |
| 6 | Dimming (PWM) |
| 7 | Reserved |
| 8 | On/Off |

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4. ABSOLUTE MAXIMUM RATING⁽¹⁾

| NO | | | RATING | UNIT |
|----|---------------------------|-----------------------------------------------------------|----------|------|
| 1 | Supply voltage | All supply pins must have the same voltage ⁽¹⁾ | 3.6 | V |
| 2 | Storage temperature range | | -20 ~ 85 | ℃ |
| 3 | Input RF level | | 10 | dBm |

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5. RECOMMENDED OPERATING CONDITIONS

| NO | ITEM | RATING | UNIT |
|----|-----------------------------------------------------------|-----------|------|
| 1 | Operating ambient Temperature Range, TA | -20 ~ +85 | ℃ |
| 2 | Operating supply voltage (Typ. 3.0v), Power Ripple ±100mV | 2.7 ~ 3.3 | V |

6. GENERAL CHARACTERISTICS

Measured on LG Innotek [TWZT-V001D-F] design with VDD = 3.0V and TA=25℃, Unless otherwise noted. all limits apply over the entire operating range, TA = -20 ~ +85℃, VDD 3.0±0.3 and fc = 2.4 ~ 2.5GHz

| NO | Test Item | | MIN. | Typ. | MAX. | Unit | Condition |
|----|--------------------------|------------------|------|------|--------|------|------------------------------------------|
| 1 | Operating Supply Voltage | | 2.7 | 3.0 | 3.3 | V | - |
| 2 | Frequency Range | | 2400 | - | 2483.5 | MHz | 5MHz Channel Spacing |
| 3 | Peak Current Consumption | Tx(at +6 dBm) | 40 | 45 | 50 | mA | Active-Mode |
| | | Rx(Boost mode) | 23 | 28 | 33 | mA | Active-Mode |
| 4 | ESD | | -15 | - | +15 | KV | Air Condition, No Electrical Problem |
| | | | -2.0 | - | +2.0 | KV | Contact Condition, No Electrical Problem |

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7. RF SPECIFICATION

Measured on LG Innotek [TWZT-V001D-F] design with VDD = 3.0V and Ta=25℃, RF Conducted Test, Unless otherwise noted. All limits apply over the entire operating range, Ta = -20 ~ +85℃, VDD 3.0±0.3 and fc = 2.4 ~ 2.4835 GHz

| NO | Test Item | MIN. | Typ. | MAX. | Unit | Condition |
|----|------------------------------|------|------|------|------|------------------------------------------------|
| 1 | Nominal Output Power | 3 | 6 | - | dBm | Single Ended 50Ω Load (Required Min. -3dBm) |
| 2 | Receiver Sensitivity | - | -100 | -94 | dBm | PER=1% (Required -85dBm) |
| 3 | Maximum Input Level | - | - | 0 | dBm | PER=1% (Required -20dBm) |
| 4 | Frequency Tolerance | -20 | - | +20 | ppm | All Operating Temp. (Required Max. ±40ppm) |
| 5 | Error Vector Magnitude (EVM) | - | 10 | 35 | % | (Required Max. 35%) |
| 6 | Harmonic | - | - | -31 | dBm | 2 nd Harmonic |
| | | | - | -31 | dBm | 3 rd Harmonic |
| 7 | Spurious Emissions | - | - | -31 | dBm | All Band (30MHZ ~ 12.5GHz) |

➤ (Required ~) : refer to IEEE 802.15.4

8. ANTENNA SPECIFICATION

| NO | Test Item | MIN. | Typ. | MAX. | Unit | Condition |
|----|-------------------------------------|------|-------|--------|------|----------------------------|
| 1 | Frequency Range | 2.4 | - | 2.4835 | GHz | All Operating Temp. |
| 2 | Nominal Impedance | - | 50 | - | Ω | |
| 3 | Band width | - | 80 | - | MHz | All Band (30MHZ ~ 12.5GHz) |
| 4 | Internal Antenna Passive efficiency | 45 | 50 | - | % | Single Antenna unit(Only) |
| 5 | Internal Antenna VSWR | - | 1.5:1 | 2.5:1 | - | Single Antenna unit(Only) |
| 6 | Peak Gain | | 3.0 | | dB | Single Antenna unit(Only) |
| 7 | Directivity | | 6.0 | | dB | Single Antenna unit(Only) |

➤ Mechanical Information : Size : 15×5.5×0.9mm, PCB Material Fr-4 (4.4 εr)

➤ Condition : It can be changed by measurement condition(only R&D Environment)

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9. FIRMWARE Support Profile

Firmware Version 1.2.0

TOKEN_MFG_BOARD_NAME: "TWZT_V001D_F"

TOKEN_MFG_STRING: "LG Innotek"

TOKEN_MFG_MANUF_ID: 0x102E

TOKEN_MFG_PHY_CONFIG: 0xFFFE

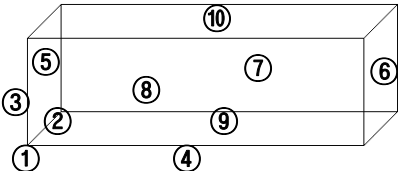
It can be updated by customer's request.

< LED indicator Description >

| LED Mode | Operation | Description |
|-----------------------|------------------------------------|---------------------------------------------------------------------------------------|
| Scene1 (Normal) | On | After first association |
| Scene2 (Normal) | Off | Before first association or After factory reset |
| Scene3 (Test Mode) | On, Off toggle 1 times(repeatedly) | The on/off output will begin to cycle on, and off |
| Scene4 (Test Mode) | On, Off toggle 2 times(repeatedly) | dimming output will operate to sweep the light between minimum and maximum intensity. |
| Scene5 (Normal) | On, Off toggle(repeatedly) | Identify mode after association |

10. RELIABILITY SPECIFICATIONS

1) Transportation Test

| ITEM | Conditions | Characteristic | | | | | | | | | | | |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------|--|--------|------|--------|------|------|---------|------|------|-------------------------------------------------------------------|
| Packaging Drop | Direction : <div style="text-align: center;">  </div> Height : depend on weight of packaging <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Weight</th><th colspan="2">Drop Height (cm)</th></tr> <tr> <th>Bottom</th><th>Etc.</th></tr> </thead> <tbody> <tr> <td>10Kg ↓</td><td>65cm</td><td>50cm</td></tr> <tr> <td>10~20Kg</td><td>60cm</td><td>45cm</td></tr> </tbody> </table> | Weight | Drop Height (cm) | | Bottom | Etc. | 10Kg ↓ | 65cm | 50cm | 10~20Kg | 60cm | 45cm | - No Electrical Problem - No Mechanical Problem - Box Check |
| Weight | Drop Height (cm) | | | | | | | | | | | | |
| | Bottom | Etc. | | | | | | | | | | | |
| 10Kg ↓ | 65cm | 50cm | | | | | | | | | | | |
| 10~20Kg | 60cm | 45cm | | | | | | | | | | | |
| High Temp. Storage | Temp. : +85℃ Humidity : 90%RH Time : 96-Hr Set Condition : Packaging | - No Electrical Problem - No Mechanical Problem | | | | | | | | | | | |
| Low Temp. Storage | Temp. : -20℃ Humidity : 0%RH Time : 96-Hr Set Condition : Packaging | - No Electrical Problem - No Mechanical Problem | | | | | | | | | | | |
| Packaging Vibration | Initial value measured at standard test condition Frequency : 10~500Hz Axis : X,Y,Z G : X-axis 1.5G, 60min Y-axis 1.5G, 30min Z-axis 1.5G, 30min | - Box Check - No Electrical Problem - No Mechanical Problem | | | | | | | | | | | |

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10. RELIABILITY SPECIFICATIONS

2) Environment Test

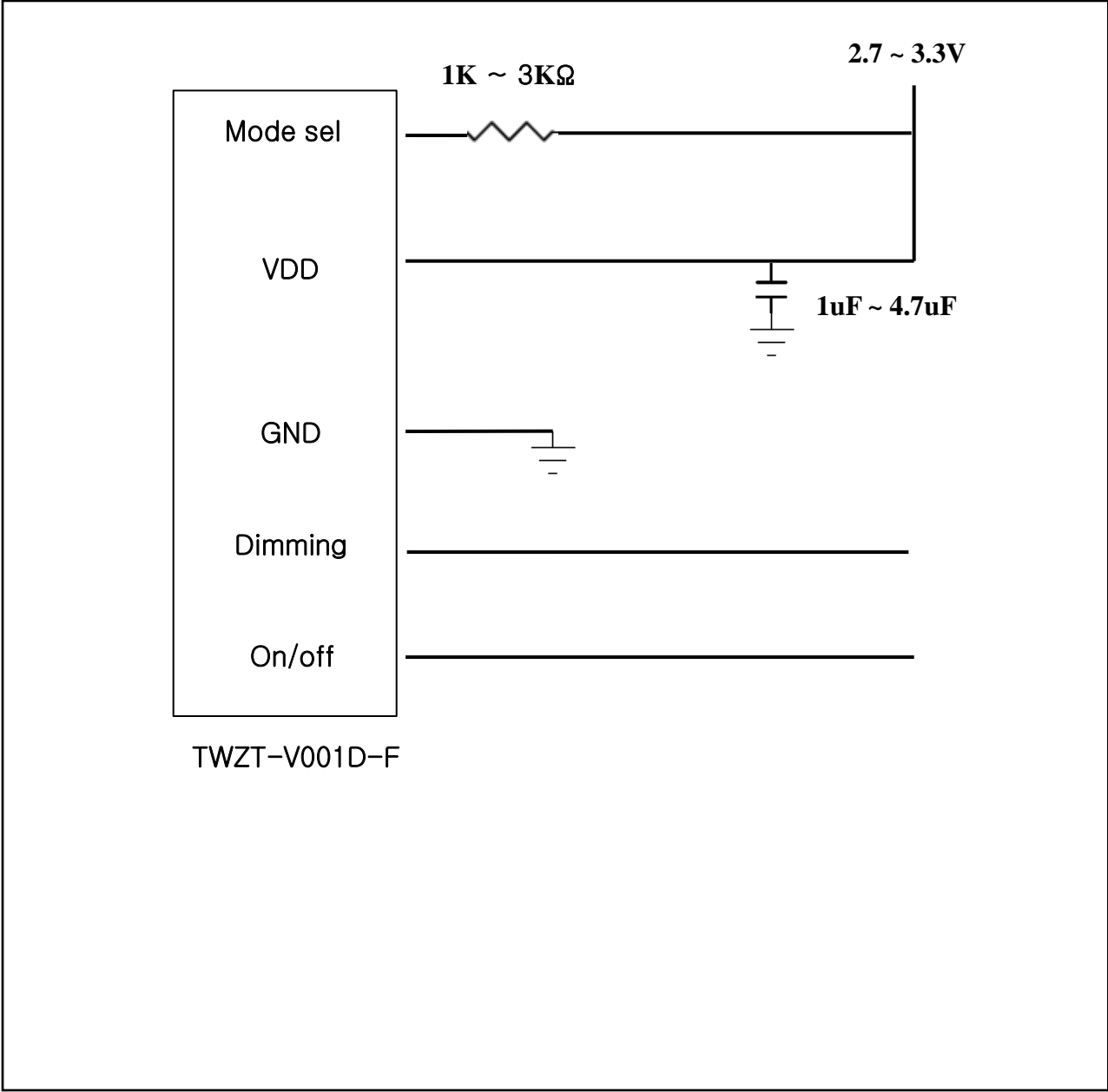
| ITEM | Conditions | Characteristic |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| High Temp. Operating | Initial value measured at standard test condition Temp. : +85 °C Voltage : standard±5% Time : 96Hr, Full Load Mode | - No Electrical Problem |
| Low Temp. Operating | Initial value measured at standard test condition Temp. : -20 °C Humidity : 0%RH Voltage : standard±5% Time : 96-Hr, Full Load Mode | - No Electrical Problem |
| High Temp. Storage | Initial value measured at standard test condition Temp. : +85 °C Time : 96-Hr After exposure at the condition of +70 °C. Specimens would be keep at room temperature for 2-Hr and do test. | - No Electrical Problem |
| Low Temp. Storage | Initial value measured at standard test condition Temp. : -20 °C Humidity : 0%RH Time : 96-Hr After exposure at the condition of -10°C. Specimens would be keep at room temperature for 2-Hr and do test. | - No Electrical Problem |
| High Temperature & Humidity Storage | Initial value measured at standard test condition Temp. : +85 °C Humidity : 90%RH Time : 96-Hr After exposure at the condition of +70 °C. Specimens would be keep at room temperature for 3-Hr and do test. | - No Electrical Problem |
| High Temperature & Humidity Operating | Initial value measured at standard test condition Temp. : +85 °C Humidity : 85%RH Time : 96-Hr After exposure at the condition of +70 °C. Specimens would be keep at room temperature for 2-Hr and do test. | - No Electrical Problem |

| ITEM | Conditions | Characteristic |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Temperature & Humidity Cycle | Initial value measured at standard test condition Temp./Humidity : : [25 °C→55 °C (3h),55 °C (9h), 55 °C→25 °C (3h),25 °C (9h)] X6 / 95%, 144Hrs. Measuring After 1-2hr at standard conditions | - No Electrical Problem |
| Thermal Shock Test | -20 °C~85 °C 100Cycle Measuring After 1-2hr at standard conditions. | - No Electrical Problem |
| Vibration Test | Initial value measured at standard test condition Frequency : 10~500Hz Axis : X,Y,Z G : X-axis 1.5G, 60min Y-axis 1.5G, 30min Z-axis 1.5G, 30min | - No Electrical Problem |
| ESD Test | Condition - Contact : 150PF / 330Ω, ± 2 kV, 10 times - Air : 150PF / 330Ω, ± 15kV, 10 times | All functions and playing shall be recovered after ESD hit without reboot for reset. |

*It can be changed (Not fixed)

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11. APPLICATION CIRCUIT



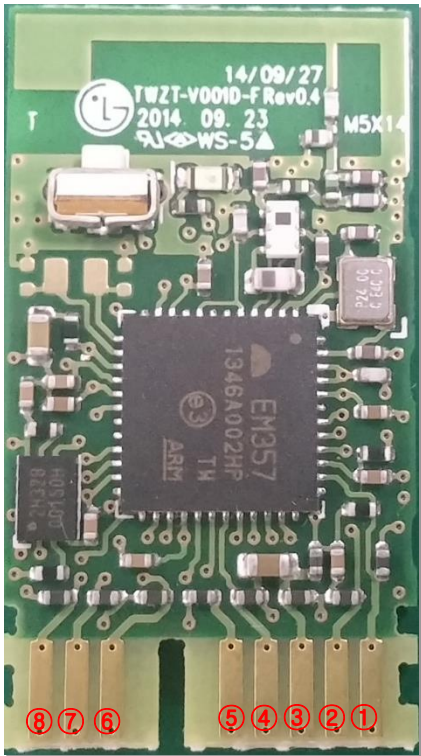
12. MODULE INTERFACE [PIN DESCRIPTION]

< Host Interface with PSU >

-. PWM Mode

| No. | I/O | Pin Name | Description |
|-----|-----|----------|--------------------------------------|
| 1 | I | Mode Sel | Low -> Test mode |
| 2 | - | GPIO1 | Reserved |
| 3 | - | VDD | Power Supply Typ. 3.0V (2.7V ~ 3.3V) |
| 4 | O | GPIO2 | Reserved |
| 5 | - | GND | Ground |
| 6 | O | Dim | Dimming Control |
| 7 | O | GPIO3 | Reserved |
| 8 | O | On/off | On/off Control |

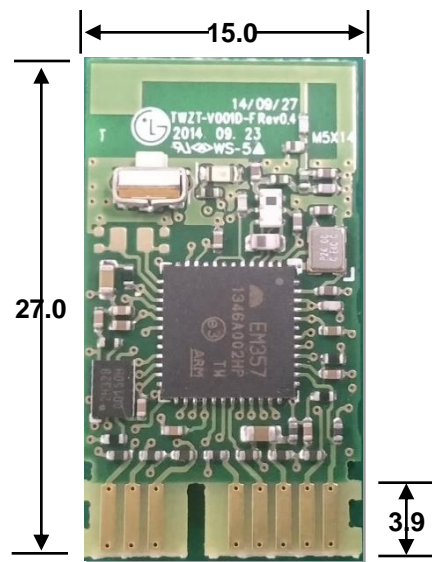
* Recommended Dimming & On/off Pin Initial State : Pull up



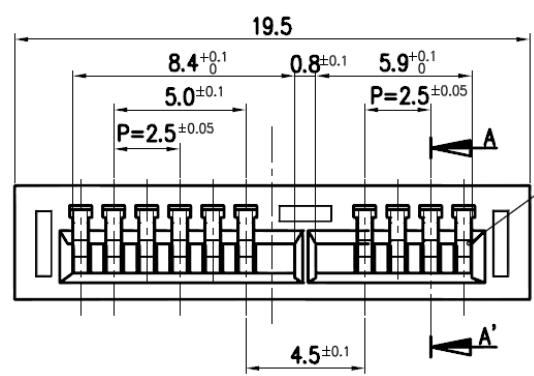
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13. MECHANICAL INFORMATION

< MODULE PCB-A >

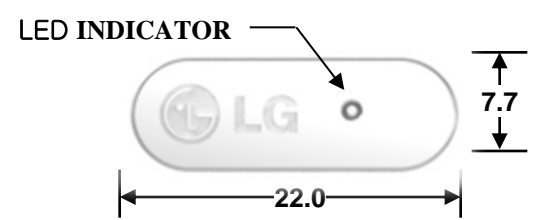
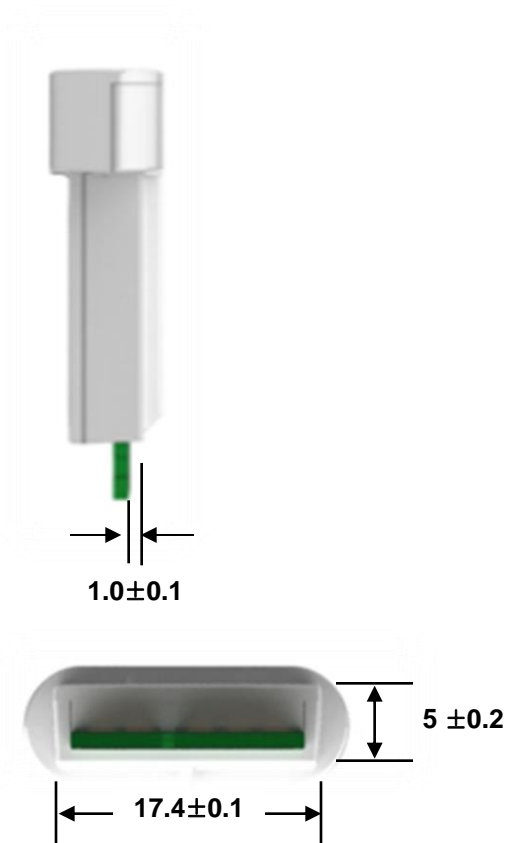
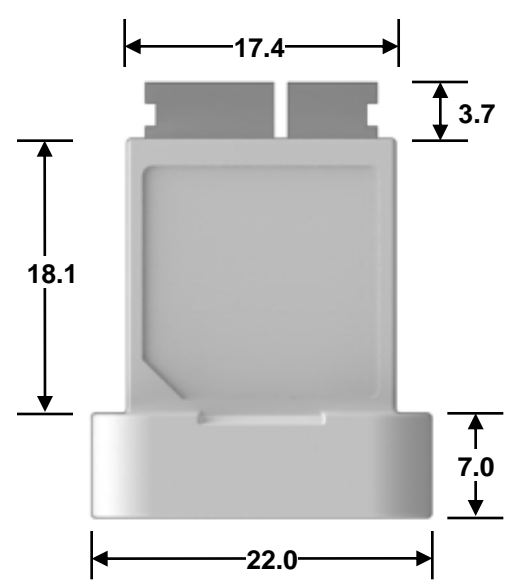


< Module Top Feature >



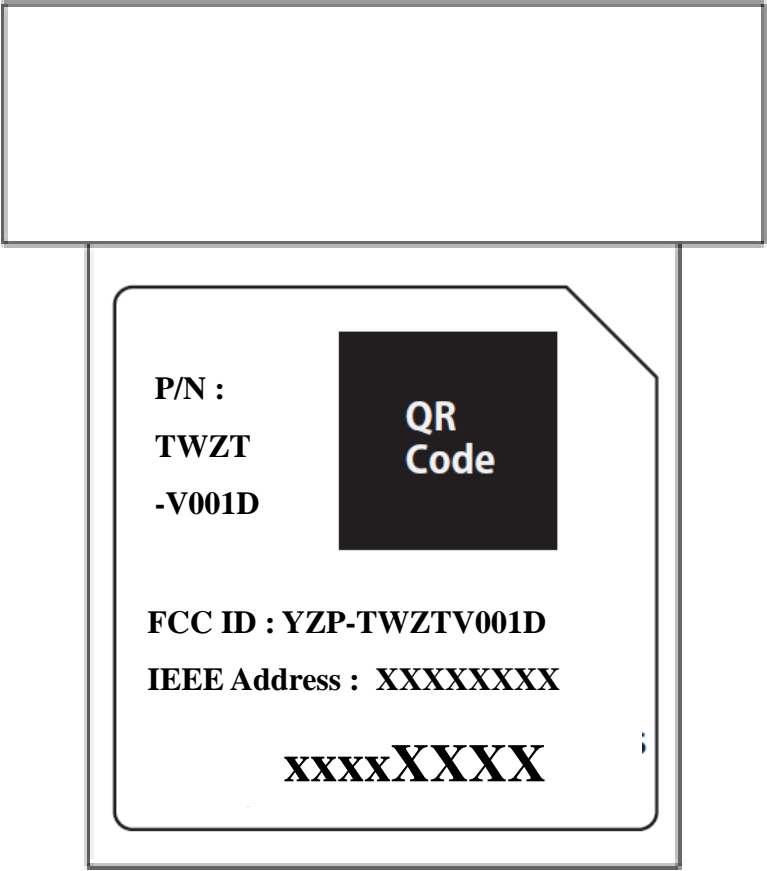
< Module Slot Dimension >

< CASE ASS'Y >



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14. PRODUCT LABEL INFORMATION

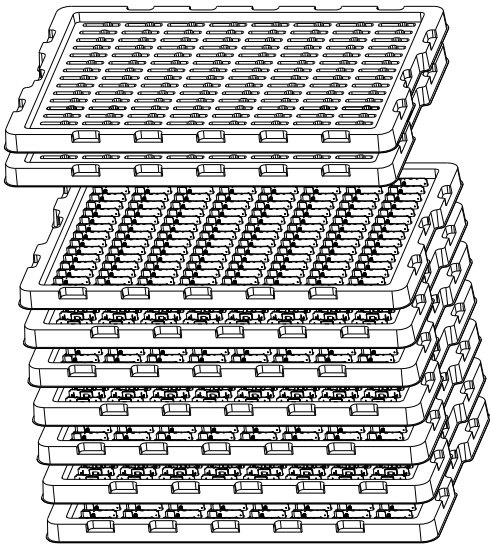
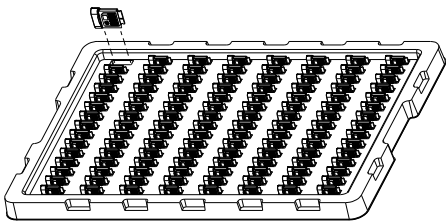


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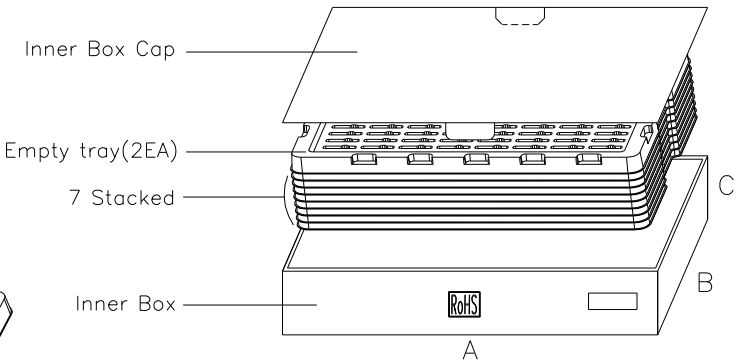
15. PACKING INFORMATION

PACKING SPECIFICATION

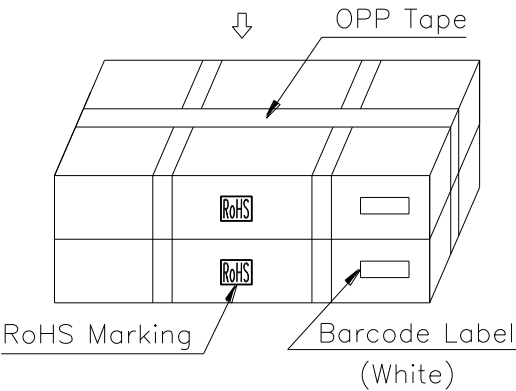
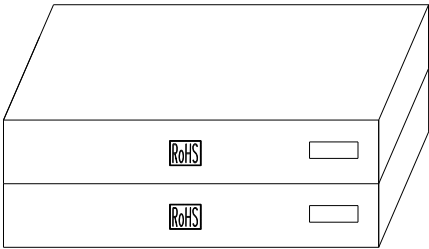
- o 1 Tray Packing Q'ty : 120 EA
- o Tray Material : PET polymer 0.8t
- o 1 Tray Weight : 0.48kg
(1 Module Weight : 2.7g)



- o All of tray are stacked by zigzag.
- o Top of tray is empty.



- o 1 Box Packing Q'ty : 840 EA
- o Size : A X B X C (512 X 375 X 121.5)
- o Box Material : Corrugated Fibreboards
- o 1 Box Packing Weight : 4kg

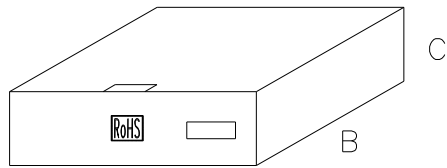


- o Total Packing Q'TY : 1,680 EA
- o Total Packing Weight : 8kg
- o RoHS Marking : Label, Stamp, Printing
- o Marking Color : Gray or Red for Stamp, Label, Printing on the Board and etc.
Black only for Printing on Label.

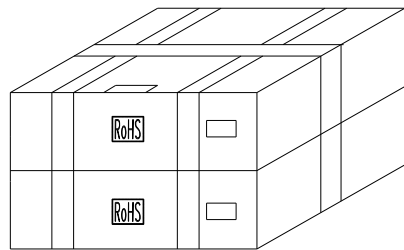
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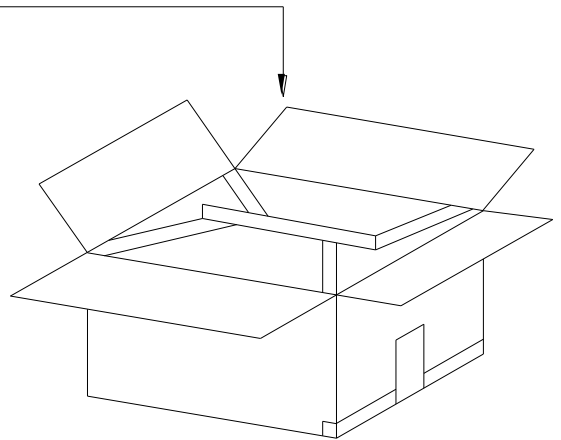
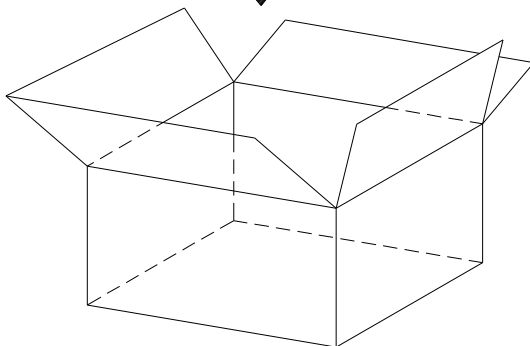
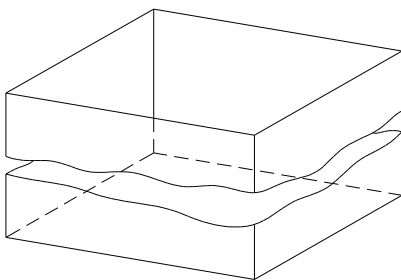
CARTON BOX PACKING SPECIFICATION



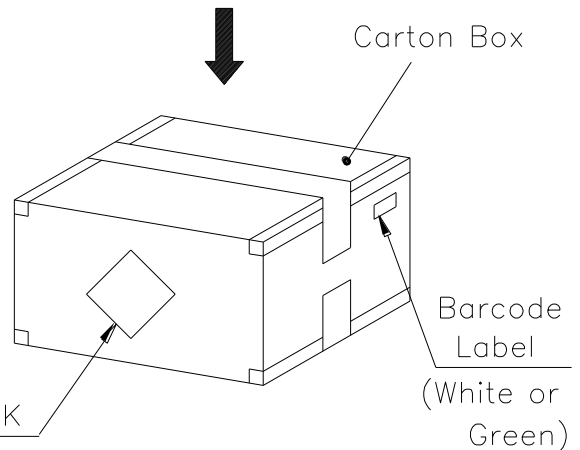
- o 1 Box Packing Q'ty : 840EA
- o Size : A X B X C
(512 X 375 X 121.5)
- o 1 Box Packing Weight : 4kg



- o Box Material : Corrugated Fibreboards
- o Total Packing Q'TY : 1680EA
- o Size : 517 x 380 x 248
- o Total Packing Weight : 8kg

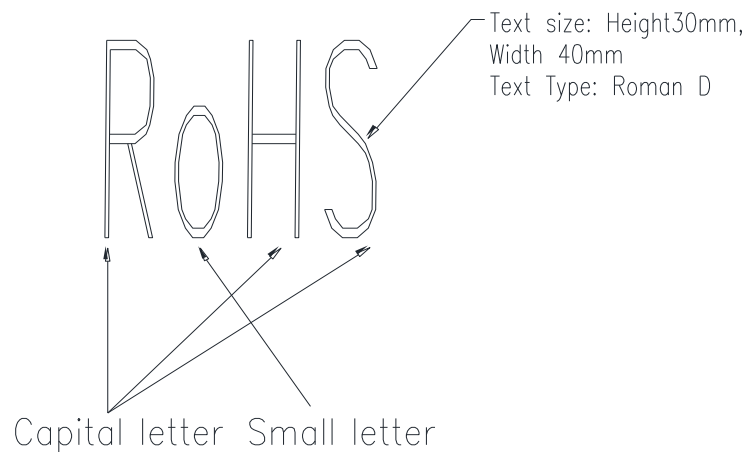
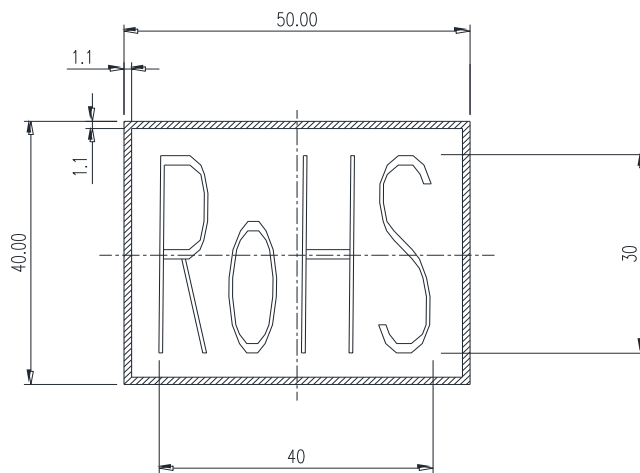


SHIPPING MARK



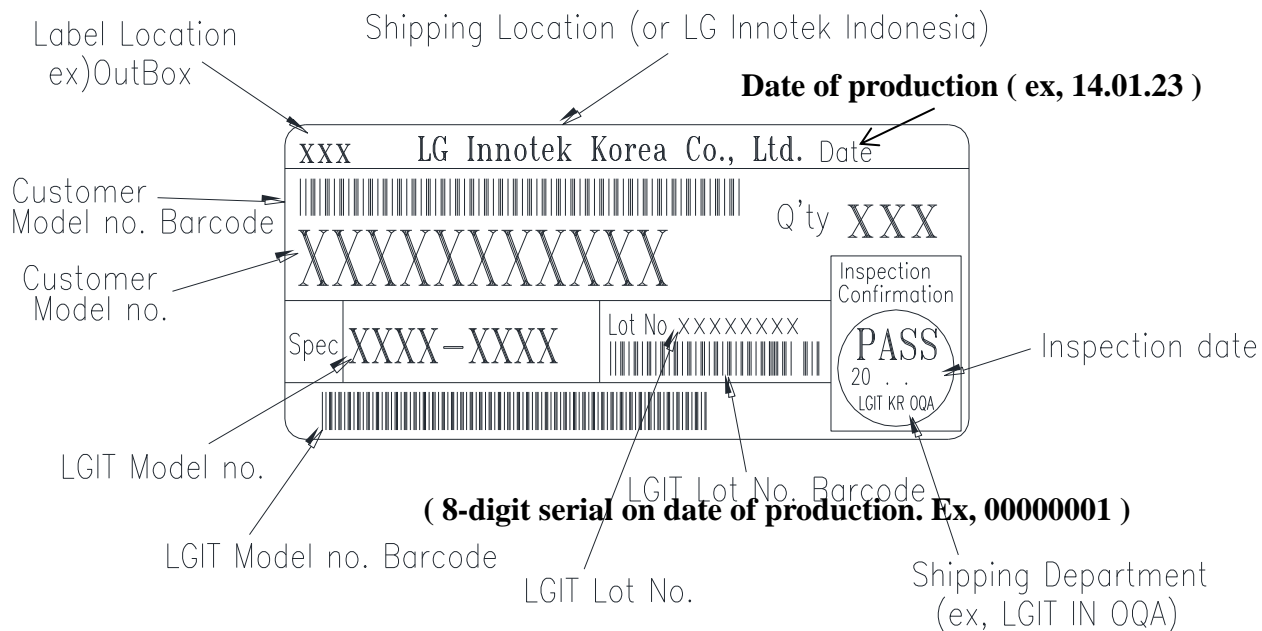
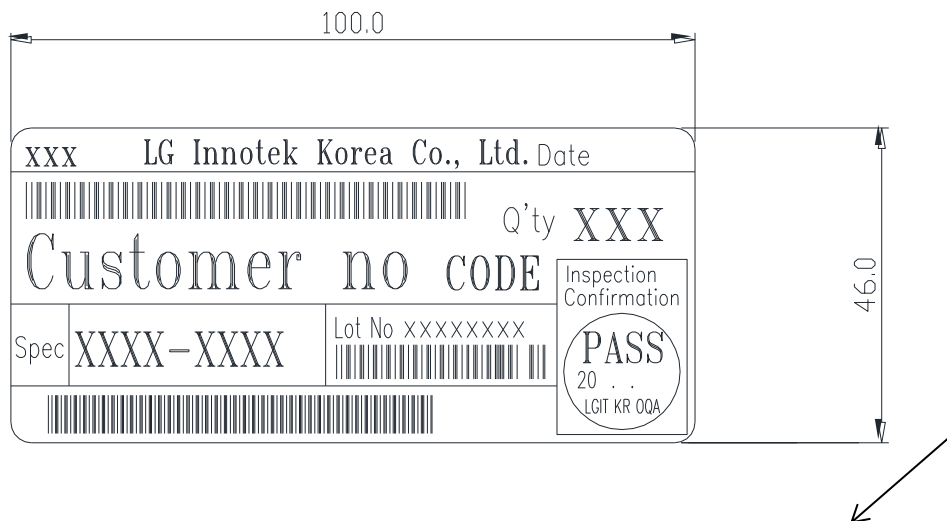
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RoHS Marking SPECIFICATION

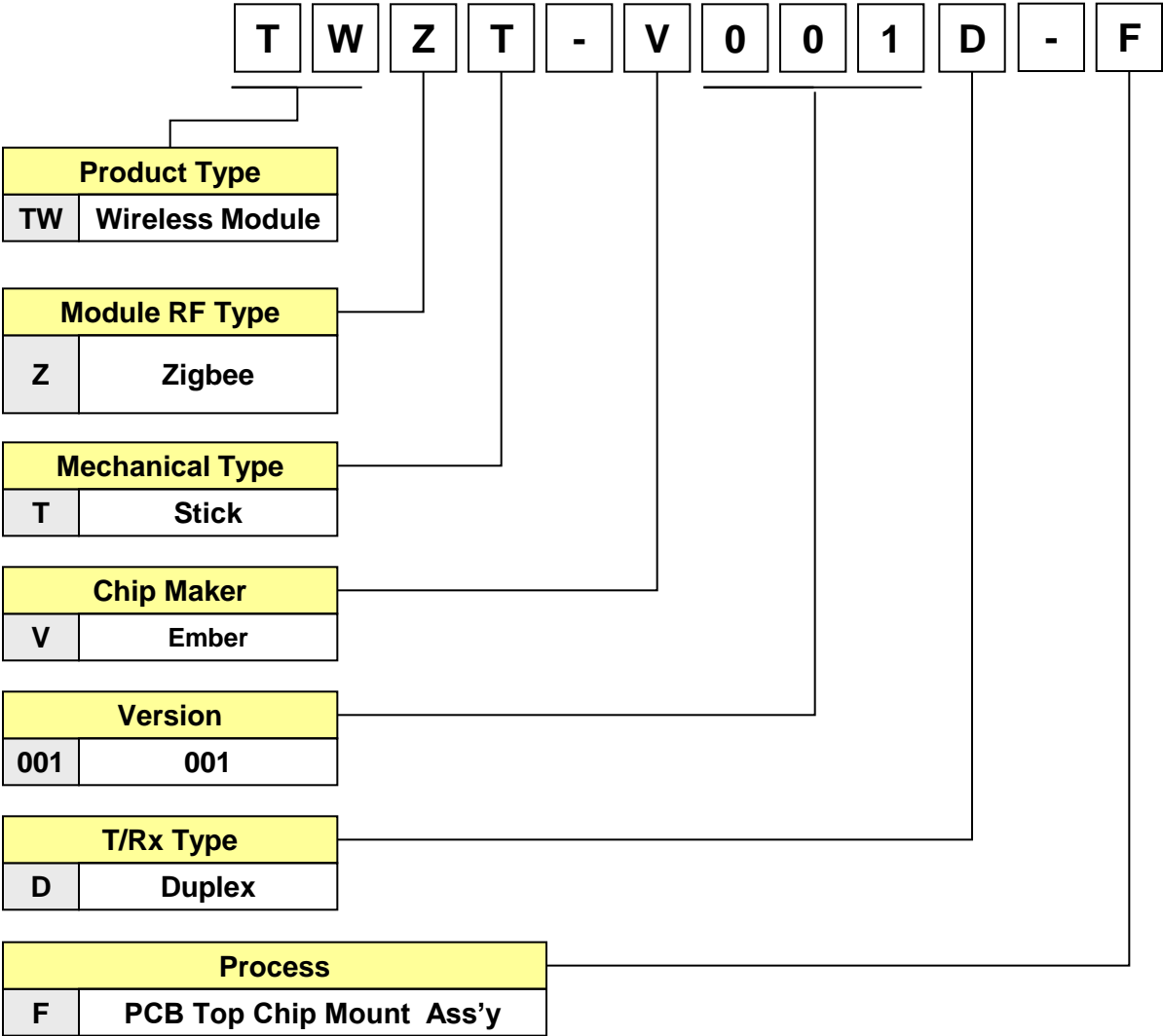


- o RoHS Marking : Label, Stamp, Printing
- o Marking Color : Gray or Red for Stamp, Label, Printing on the Board and etc.
Black only for Printing on Label.

BARCODE LABEL SPECIFICATION



16. ORDERING INFORMATION



FCC Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions :

- (1) This Device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for CLASS B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try correct the interference by one or more of the following measures:

- 1.1. Reorient or relocate the receiving antenna.
- 1.2. Increase the separation between the equipment and receiver.
- 1.3. Connect the equipment into an outlet on a circuit different from that to which receiver is connected.
- 1.4. Consult the dealer or experienced radio/TV technician for help.

WARNING

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

"CAUTION : Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.