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## **WiFi Module Data Sheet**

**Cypress BCM43362 WiFi + ST Micro STM32F405 MCU**

**Electric Imp P/N : imp003**

**MURATA P/N : LBWA1ZV1CD-716**

## Revision history

| Issued Date | Revision Code | Revision Page           | Changed Items  | Change Reason |
|-------------|---------------|-------------------------|--|---------------|
| Apr.11.2014 |               |                         | First issued   |               |
| May.23.2014 | A             | P4                      | 3. Block Diagram, 2MBit -> 4MBi  |               |
| Jun.3.2014  | B             | P10<br>P17              | 7. Absolute Maximum Rating<br>8. Operating Condition<br>9. Electric characteristics<br>14. Recommended Components  |               |
| Jul.1.2014  | C             | P9<br>P11<br>P12<br>P18 | 5. LED Drive<br>6. Phototransistor<br>Corrected reference paragraph<br>10. External clock source characteristics add<br>11. Power Up Sequence<br>Changed "NRST" to "RESET_L"<br>15.4. Low Power Schematic<br>-ABS07-120-32.768kHz-T add<br>-Changed "ST3215SB32768B0HPWB1" to "ST3215SB32768B0HPWB3" |               |
| Jul.31.2014 | D             | P10<br>P18              | 7. SPI Flash Requirements<br>Added SPI Flash Requirements<br>16. Recommended Components<br>Added SPI Flash   |               |
| Oct.14.2014 | E             | P18                     | 16. Recommended Components<br>-Changed APT2012P3BT with KDT00030TR<br>-Changed S24FLxxx with S25FLxxx  |               |
| Jun.8.2015  | F             | P18                     | 16.5. Low Power Schematic<br>-Changed "AP2281" to " AP2281-1/AP2281-3"<br>-Changed "ABS25-32.768KHZ-T" to "ABS25-32.768KHZ-6-T "   |               |
| Jan.21.2016 | G             | P5<br>P11<br>P13,14     | 4.1. Dimensions<br>-add marking information<br>11. Electric characteristics<br>-updated<br>13. RF Characteristics<br>-updated current consumption  |               |
| Apr.26.2016 | H             | P16                     | 15. Reference Circuit<br>-Corrected  |               |
| Oct.13.2016 | I             | P9, 10,<br>11, 18       | 5. LED<br>- add failure codes<br>6. Phototransistor<br>- add RF coupling capacitor recommendation<br>7. SPI flash<br>- add more detail on compatible flash types<br>15.1. Low Cost schematic<br>- connected OSC32_IN to GND<br>16.2. Phototransistor   |               |
| Oct.20.2016 | J             |                         | Remove RF characteristics section, add typical specs. Update cloud description   |               |

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Please be aware that an important notice concerning availability, standard warranty and use in critical applications of Murata products and disclaimers thereto appears at the end of this specification sheet.



## 1. Scope

This specification is for the LBWA1ZV1CD (imp003) module that provides connectivity to the internet via WiFi. The fully maintained, secure OS that is part of the Electric Imp cloud service comes pre-loaded.

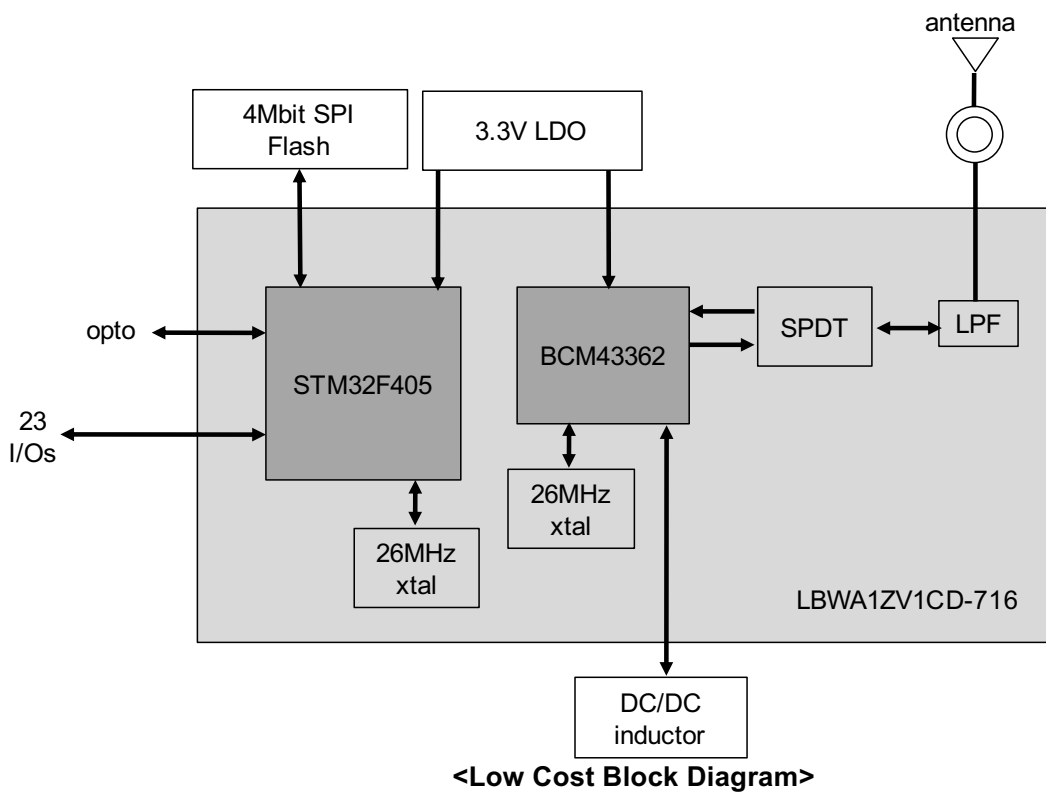
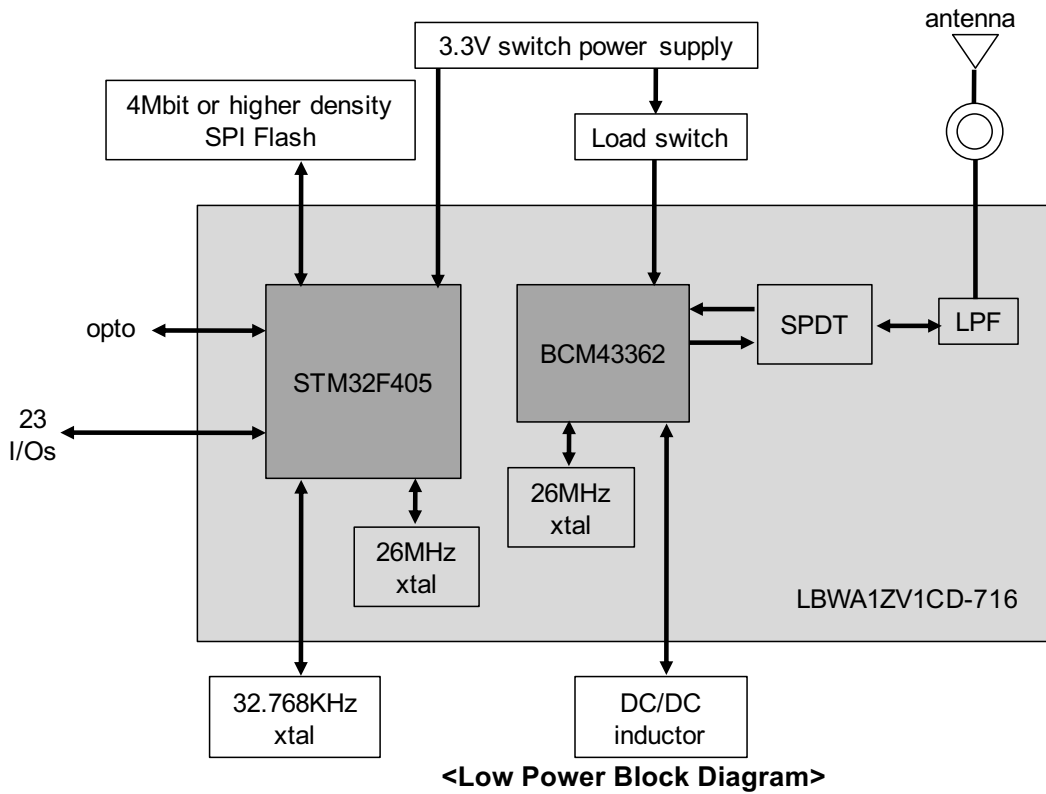
- 802.11 b/g/n 1x1 WiFi
  - 802.11b 17.0dBm +/-2.0dBm
  - 802.11g 13.0dBm +/-2.0dBm
  - 802.11n 12.0dBm +/-2.0dBm (20MHz channels)
  - RX Sensitivity -94dBm typical (@1Mbps)
  - Diversity antenna switch outputs
  - Supports WEP, WPA, WPA2, WPS
- 32-bit Cortex M4 processor
  - Robust embedded operating system with fail-safe firmware updates
  - Virtual machine for customer firmware
  - 256kB of application bytecode flash
  - Around 130kB of dedicated application RAM
- Electric Imp OS & service
  - Robust embedded operating system with fail-safe, secure OS & application updates
  - Pre-provisioned MAC address & per-device secrets
  - TLS1.2-RSA-ECDHE (forward secrecy) connection to cloud
  - Elliptic curve challenge-response to prevent device impersonation
  - Fully featured cloud VM for every device for easy integration with RESTful APIs
  - Open source integrations with AWS, Azure, etc services
- LED drive for red/green status LEDs
- Phototransistor input for Electric imp's patented BlinkUp™ technology for easy configuration from any smartphone, tablet, or web browser
- 23 user selectable I/Os
  - GPIO, PWM, Analog input & output, SPI, UART, I2C
  - Dedicated SPI bus for local storage
- Low power 4uA sleep mode (with external load switch)
  - Option for coin cell RTC battery backup
- Compliant with the RoHS directive

## 2. Part Number

| Sample Part Number |
|--------------------|
| LBWA1ZV1CD-TEMP    |

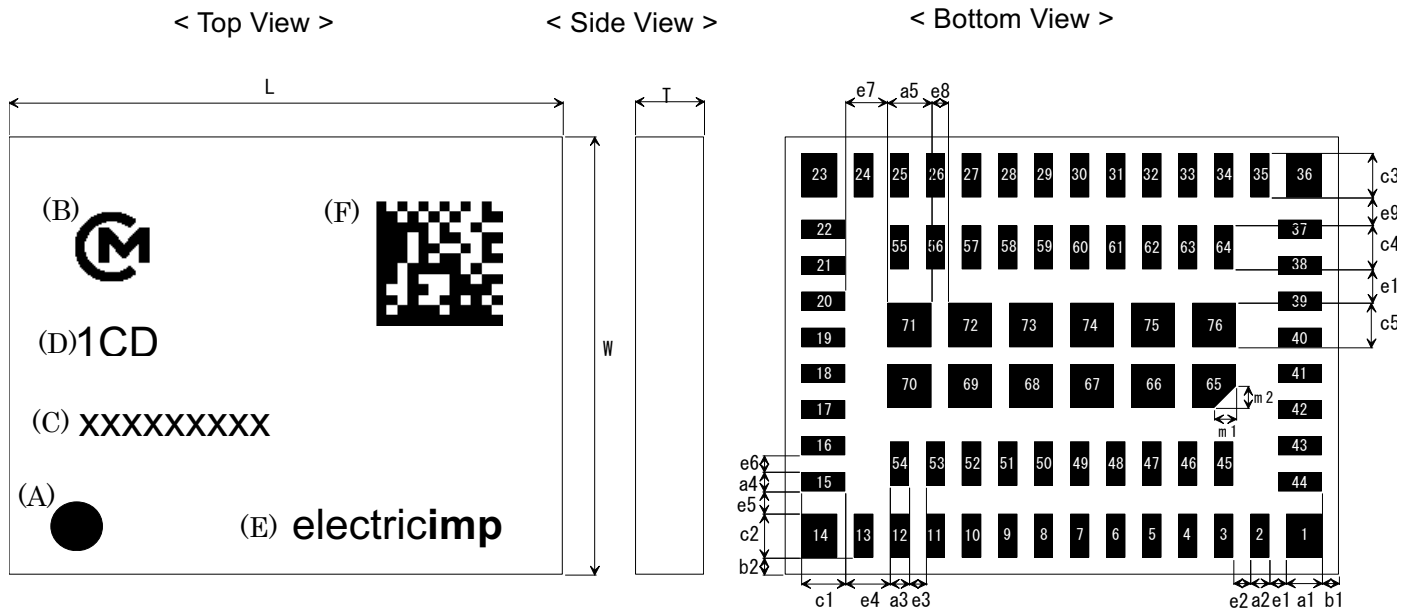
| Production Part Number |
|------------------------|
| LBWA1ZV1CD-716         |

### 3. Block Diagram



## 4. Dimensions, Marking and Terminal Configurations

### 4.1. Dimensions



| Mark | Dimensions   | Mark | Dimensions   | Mark | Dimensions   |
|------|--------------|------|--------------|------|--------------|
| L    | 10.0 +/- 0.2 | W    | 7.9 +/- 0.2  | T    | 1.25 max.    |
| a1   | 0.65 +/- 0.1 | a2   | 0.35 +/- 0.1 | a3   | 0.35 +/- 0.1 |
| a4   | 0.35 +/- 0.1 | a5   | 0.80 +/- 0.1 | b1   | 0.30 +/- 0.2 |
| b2   | 0.30 +/- 0.2 | c1   | 0.80 +/- 0.1 | c2   | 0.80 +/- 0.1 |
| c3   | 0.80 +/- 0.1 | c4   | 0.80 +/- 0.1 | c5   | 0.80 +/- 0.1 |
| e1   | 0.30 +/- 0.1 | e2   | 0.30 +/- 0.1 | e3   | 0.30 +/- 0.1 |
| e4   | 0.80 +/- 0.1 | e5   | 0.40 +/- 0.1 | e6   | 0.30 +/- 0.1 |
| e7   | 0.75 +/- 0.1 | e8   | 0.30 +/- 0.1 | e9   | 0.50 +/- 0.1 |
| e10  | 0.60 +/- 0.1 | m1   | 0.40 +/- 0.1 | m2   | 0.40 +/- 0.1 |

(unit : mm)

### Marking

| Marking | Meaning           |
|---------|-------------------|
| (A)     | Pin 1 Marking     |
| (B)     | Murata Logo       |
| (C)     | Inspection Number |
| (D)     | Module Type       |
| (E)     | Electric Imp Logo |
| (F)     | 2D code           |

## 4.2. Terminal Configurations

| No. | Terminal Name | Type | Description   |
|-----|---------------|------|---|
| 1   | GND           | -    | Ground  |
| 2   | OPTO_BIAS     | O    | Phototransistor bias voltage                                  |
| 3   | OPTO_IN       | I    | Phototransistor input   |
| 4   | PinW          | I/O  | I/O, please refer to Pin mux table                            |
| 5   | OSC32_IN      | I    | MCU sleep clock input   |
| 6   | OSC32_OUT     | O    | MCU sleep clock output  |
| 7   | PinN          | I/O  | I/O, please refer to Pin mux table                            |
| 8   | PSU_EN        | O    | External power supply enable                                  |
| 9   | WLAN_POWER_EN | O    | External power gate enable                                    |
| 10  | GND           | -    | Ground  |
| 11  | GND           | -    | Ground  |
| 12  | ANT           | -    | Antenna   |
| 13  | GND           | -    | Ground  |
| 14  | GND           | -    | Ground  |
| 15  | VDD           | PI   | Power supply for MCU VDD and WLAN Digital IO                  |
| 16  | WLAN_ANT_CTL2 | O    | Antenna switch control. Default is low.<br>NC if not in use.  |
| 17  | WLAN_ANT_CTL1 | O    | Antenna switch control. Default is high.<br>NC if not in use. |
| 18  | VDD_PA        | PI   | Power supply for Internal Power Amplifier.                    |
| 19  | VDD_PA        | PI   |   |
| 20  | VDD_WLAN      | PI   | Power supply for WLAN IC                                      |
| 21  | VDD_WLAN      | PI   |   |
| 22  | VDD_DCDC_IN   | PI   | Voltage input for core LDO, low noise LDO1 and VCO/LDO        |
| 23  | GND           | -    | Ground  |
| 24  | VDD_DCDC_OUT  | PO   | Voltage output for core LDO.                                  |
| 25  | SPIFLASH_NCS  | O    | SPI flash nCS   |
| 26  | SPIFLASH_MISO | I    | SPI flash MISO  |



|    |               |     |  |
|----|---------------|-----|--|
| 27 | SPIFLASH_MOSI | O   | SPI flash MOSI   |
| 28 | SPIFLASH_SCK  | O   | SPI flash CLK  |
| 29 | LED_RED       | O   | Must be connected to the Red terminal of the indicator LED   |
| 30 | LED_GREEN     | O   | Must be connected to the Green terminal of the indicator LED |
| 31 | PinM          | I/O | I/O, please refer to Pin mux table                           |
| 32 | PinL          | I/O | I/O, please refer to Pin mux table                           |
| 33 | PinK          | I/O | I/O, please refer to Pin mux table                           |
| 34 | PinJ          | I/O | I/O, please refer to Pin mux table                           |
| 35 | PinH          | I/O | I/O, please refer to Pin mux table                           |
| 36 | GND           | -   | Ground   |
| 37 | PinG          | I/O | I/O, please refer to Pin mux table                           |
| 38 | PinF          | I/O | I/O, please refer to Pin mux table                           |
| 39 | PinE          | I/O | I/O, please refer to Pin mux table                           |
| 40 | PinD          | I/O | I/O, please refer to Pin mux table                           |
| 41 | PinC          | I/O | I/O, please refer to Pin mux table                           |
| 42 | PinB          | I/O | I/O, please refer to Pin mux table                           |
| 43 | PinA          | I/O | I/O, please refer to Pin mux table                           |
| 44 | VDDA          | PI  | MCU analog power and reference, must be connected to VDD     |
| 45 | VBAT          | PI  | MCU retention RAM and RTC backup supply                      |
| 46 | PinY          | I/O | I/O, please refer to Pin mux table                           |
| 47 | GND           | -   | Ground   |
| 48 | PinV          | I/O | I/O, please refer to Pin mux table                           |
| 49 | GND           | -   | Ground   |
| 50 | DNC           | -   | Do not connect   |
| 51 | GND           | -   | Ground   |
| 52 | RESET_L       | I   | MCU reset, internally pulled up                              |
| 53 | GND           | -   | Ground   |
| 54 | GND           | -   | Ground   |

|       |      |     |   |
|-------|------|-----|---|
| 55    | GND  | -   | Ground                                      |
| 56    | GND  | -   | Ground                                      |
| 57    | GND  | -   | Ground                                      |
| 58    | PinQ | I/O | I/O, please refer to Pin mux table          |
| 59    | PinR | I/O | I/O, please refer to Pin mux table          |
| 60    | PinT | I/O | I/O, please refer to Pin mux table          |
| 61    | PinP | I/O | I/O, please refer to Pin mux table          |
| 62    | PinS | I/O | I/O, please refer to Pin mux table          |
| 63    | PinU | I/O | I/O, please refer to Pin mux table          |
| 64    | PinX | I/O | I/O, please refer to Pin mux table          |
| 65    | VSSA | -   | MCU analog ground, must be connected to GND |
| 66-76 | GND  | -   | Ground                                      |

### 4.3. Pin Mux Table

| Pin   | uartFG | uartQRPW | uartUVGD | uartWJ | uartDM | i2cFG | i2cAB | spiEBCA | spiLGDK | ADC | DAC | PWM | Wake from sleep | State change callback | Pin trig pulse gen |
|-------|--------|----------|----------|--------|--------|-------|-------|---------|---------|-----|-----|-----|-----------------|-----------------------|--------------------|
| Pin A |        |          |          |        |        |       | SCL   | nSS     |         | yes | yes |     |                 | yes                   |                    |
| Pin B |        |          |          |        |        |       | SDA   | MISO    |         | yes |     | yes |                 | yes                   |                    |
| Pin C |        |          |          |        |        |       |       | SCLK    |         | yes | yes | yes |                 | yes                   |                    |
| Pin D |        |          | CTS      |        | TX     |       |       |         | SCLK    |     |     |     |                 | yes                   |                    |
| Pin E |        |          |          |        |        |       |       | MOSI    |         | yes |     | yes |                 | yes                   | for C              |
| Pin F | TX     |          |          |        |        | SCL   |       |         |         | yes |     | yes |                 |                       | for K,X            |
| Pin G | RX     |          | RTS      |        |        | SDA   |       |         | MISO    |     |     |     |                 | yes                   |                    |
| Pin H |        |          |          |        |        |       |       |         |         | yes |     |     |                 |                       |                    |
| Pin J |        |          |          | RX     |        |       |       |         |         | yes |     |     |                 |                       |                    |
| Pin K |        |          |          |        |        |       |       |         | nSS     | yes |     | yes |                 |                       |                    |
| Pin L |        |          |          |        |        |       |       |         | MOSI    |     |     | yes |                 |                       | for G              |
| Pin M |        |          |          |        | RX     |       |       |         |         |     |     | yes |                 | yes                   | for D              |
| Pin N |        |          |          |        |        |       |       |         |         | yes |     |     |                 |                       |                    |
| Pin P |        | RTS      |          |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin Q |        | TX       |          |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin R |        | RX       |          |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin S |        |          |          |        |        |       |       |         |         |     |     |     |                 |                       |                    |
| Pin T |        |          |          |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin U |        |          | TX       |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin V |        |          | RX       |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin W |        | CTS      |          | TX     |        |       |       |         |         | yes |     |     | yes             | yes                   |                    |
| Pin X |        |          |          |        |        |       |       |         |         |     |     |     |                 | yes                   |                    |
| Pin Y |        |          |          |        |        |       |       |         |         |     |     |     |                 |                       |                    |

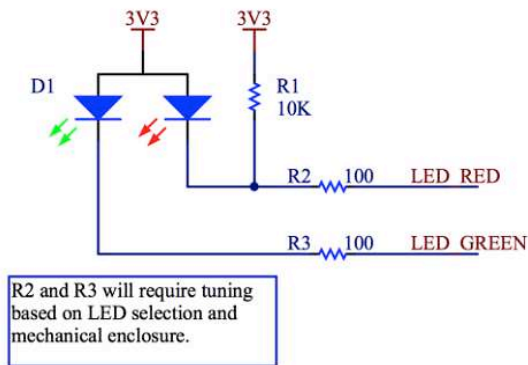
## 5. LED Drive

The indicator LED should be bicolor, because red, green and amber (red+green) are used to indicate status.

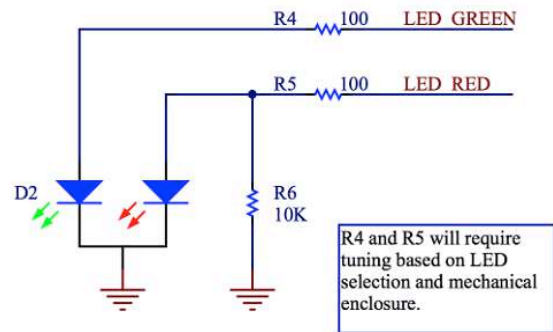
The LED drive pins will auto-detect common anode or common cathode parts. The detection is done by looking to see which way up the LED\_RED pin is idling at boot; to ensure this works correctly, please place a 10k resistor in parallel with the red LED.

The current drive on these pins is 20mA maximum.  
Please refer to section 15 for the recommended LEDs.

<Common anode diagram>



<Common cathode diagram>



Two specific LED codes indicate errors when talking to the SPI flash:

|                     |       |       |     |
|---------------------|-------|-------|-----|
| SPI flash not found | amber | red   | off |
| SPI flash error     | red   | amber | off |

If you encounter either of these codes, then this indicates an electrical connection issue or an incompatible flash part.

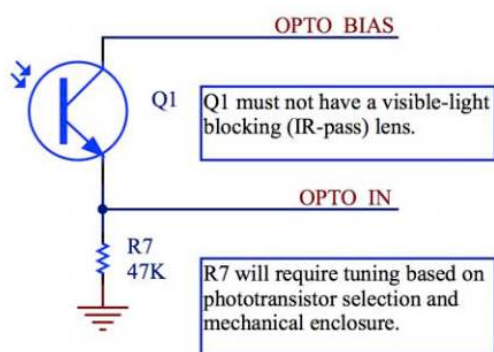
## 6. Phototransistor

The phototransistor is used to receive BlinkUp configuration data. The bias resistor connected between OPTO\_IN and GND may need to be adjusted to ensure adequate sensitivity and response time - in general you need at least 500mV swing on the OPTO\_IN pin between black and white states, with the worst (dimpest) BlinkUp sender you can find. More information and sample code to tune blinkup is available on the Electric Imp dev center website.

End-user BlinkUp send data at between 30 and 60 bits per second, depending on the user's device. For factory configuration, data is typically sent at 142 bits per second using red LED(s) in a test fixture. If your application does not require optical configuration, config can be sent electrically at 142 bits per second from another micro using the OPTO\_IN pin. Please contact us for more details.

It is also recommended to place 0402, 13pF capacitor footprints (Murata GRM1555C1H130JA01) close to the imp003 between OPTO\_BIAS and GND, and OPTO\_IN and GND. If issues are seen with RF coupling onto the blinkup circuit, then these components will address the issue by presenting a low impedance in the 2.4GHz band.

Please refer to paragraph 15 for the recommended phototransistors.



## 7. SPI Flash Requirements

An external SPI Flash part is required for operation.

The minimum size of the SPI Flash is 4Mbit (512kB), and the maximum size is 128Mbit (16MB). The area below address 0x70000 (448kB) is reserved for use by the OS. The remainder of the flash device is made available to user code programmatically, and may optionally be pre-programmed for user applications before assembly.

The imp003's SPI flash chip **must** support both 4KB and 64KB erases (command 0x20 and 0xD8) and Page Program (command 0x02). You must also ensure that the SPI flash you use is able to run down to the **minimum operational voltage** of your product to ensure that the SPI flash is operational at all times that the imp is operational. This is critical during upgrades in low battery states. If you are running from a single LiMnO<sub>2</sub> cell (eg. CR123), you should use a wide voltage range SPI flash that is operational from 1.7-3.6V such as the [Macronix MX25R8035FM2IH0](#).

|                                      |                                 |
|--------------------------------------|---------------------------------|
| Minimum Size                         | 4 Mbit (512 kByte)              |
| Reserved for OS (do not pre-program) | 0x000000 to 0x70000 (448 kByte) |

## 8. Absolute Maximum Ratings

|                     |          | min. | max. | unit  |
|---------------------|----------|------|------|-------|
| Storage Temperature |          | -40  | +85  | deg.C |
| Supply Voltage      | VDD      | -0.3 | 4    | V     |
|                     | VDD_PA   | -0.3 | 6    | V     |
|                     | VDD_WLAN | -0.3 | 6    | V     |

Caution! The absolute maximum ratings indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

## 9. Operating Conditions

|   |          | min.                | typ. | max.                                | unit  |
|---|----------|---------------------|------|-------------------------------------|-------|
| Operating Temperature Range <sup>(*1)</sup> |          | -40                 |      | +85                                 | deg.C |
| Specification Temperature Range             |          | -20                 |      | +70                                 | deg.C |
| Supply Voltage                              | VDD      | 1.8                 | 3.3  | 3.6                                 | V     |
|   | VDD_PA   | 2.3 <sup>(*2)</sup> | 3.3  | 4.8 <sup>(*2)</sup> <sup>(*3)</sup> | V     |
|   | VDD_WLAN | 2.3 <sup>(*2)</sup> | 3.3  | 4.8 <sup>(*2)</sup> <sup>(*3)</sup> | V     |
| Backup operating Voltage                    | VBAT     | 1.65                | 3.3  | 3.6                                 | V     |

[Note] All RF characteristics in this datasheet are defined by Specification Temperature Range

(\*1) Functionality is guaranteed but specifications require derating at extreme temperatures.

(\*2) The BCM43362 is functional across this range of voltage. RF performance is guaranteed only 3.0V < VDD\_PA/WLAN < 4.8V

(\*3) The maximum continuous voltage is 4.8V. Voltages up to 5.5V for up to 10 seconds, cumulative duration, over the lifetime of the device are allowed voltages as high 5.0V for up to 250 seconds, cumulative duration, over the lifetime of the device are allowed.

## 10. Electrical characteristics

| Parameter                 | Description  | Min                  | Typ | Max                | Unit |
|---------------------------|--|----------------------|-----|--------------------|------|
| I <sub>DDA</sub>          | Current input on VDDA  |                      | 70  | 500                | uA   |
| V <sub>IH</sub>           | I/O input high level voltage                                       | 0.7V <sub>dd</sub>   |     | 3.6                | V    |
| V <sub>IL</sub>           | I/O input low level voltage  | V <sub>ss</sub> -0.3 |     | 0.3V <sub>dd</sub> | V    |
| I <sub>OUT</sub>          | Output current on any single I/O pin                               | -8                   |     | 8                  | mA   |
|                           | Output current on LED_RED pin                                      | -20                  |     | 20                 | mA   |
|                           | Output current on LED_GREEN pin                                    | -20                  |     | 20                 | mA   |
|                           | Total output current on all I/O pins including LED_RED & LED_GREEN | -80                  |     | -80                | mA   |
| I/O input leakage current | V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>DD</sub>                |                      |     | 6                  | uA   |
| Load capacitance          | Pins A to Y  |                      | 15  |                    | pF   |

## 11. External clock source characteristics

### 11.1. Low-speed external user clock characteristics

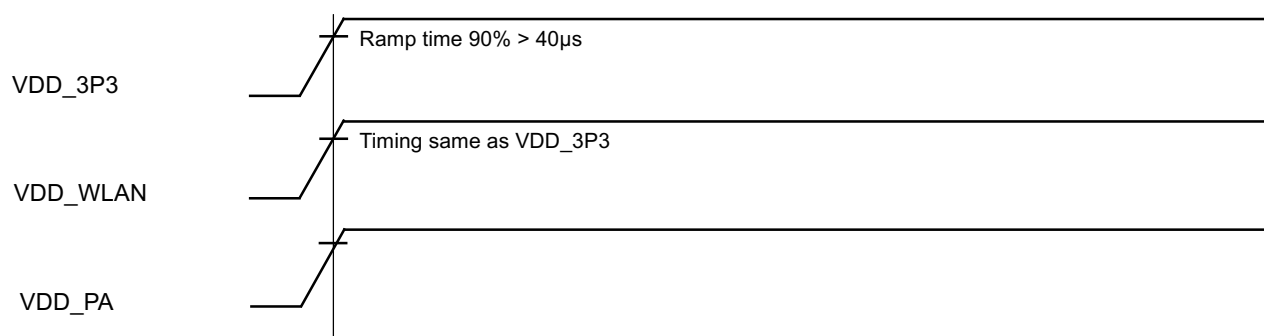
| Symbol                                     | Parameter   | Conditions  | Min                | Typ    | Max                | Unit |
|--|---|---|--------------------|--------|--------------------|------|
| f <sub>LSE_ext</sub>                       | User External clock source frequency <sup>(*)</sup> |   | -                  | 32.768 | 1,000              | kHz  |
| V <sub>LSEH</sub>                          | OSC32_IN input pin high level voltage               |   | 0.7V <sub>DD</sub> | -      | V <sub>DD</sub>    | V    |
| V <sub>LSEL</sub>                          | OSC32_IN input pin low level voltage                |   | V <sub>SS</sub>    | -      | 0.3V <sub>DD</sub> |      |
| t <sub>W(LSE)</sub><br>t <sub>f(LSE)</sub> | OSC32_IN high or low time <sup>(*)</sup>            |   | 450                | -      | -                  | ns   |
| t <sub>r(LSE)</sub><br>t <sub>f(LSE)</sub> | OSC32_IN rise or fall time <sup>(*)</sup>           |   | -                  | -      | 50                 |      |
| C <sub>in(LSE)</sub>                       | OSC32_IN input capacitance <sup>(*)</sup>           |   | -                  | 5      | -                  | pF   |
| DuCy <sub>(LSE)</sub>                      | Duty cycle  |   | 30                 | -      | 70                 | %    |
| I <sub>L</sub>                             | OSC32_IN Input leakage current                      | V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>DD</sub> | -                  | -      | ±1                 | uA   |
| ESR  | Equivalent Series Resistance                        |   | -                  | -      | 60                 | kΩ   |
| CL   | Load Capacitance                                    |   |                    | 6      |                    | pF   |
| C0   | Shunt Capacitance                                   |   |                    | 1.5    |                    | pF   |

(\*) Guaranteed by design, not tested in production



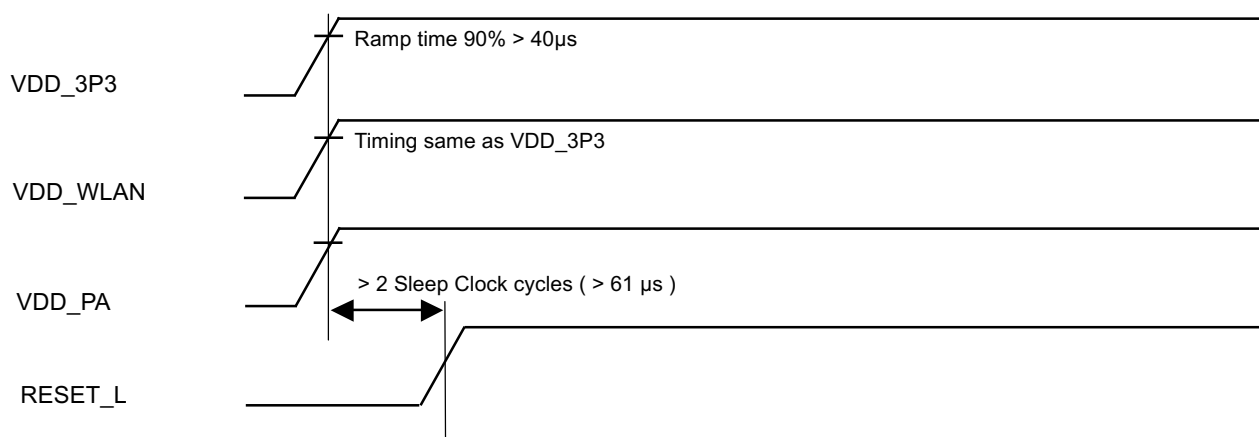
## 12. Power Up Sequence

### 12.1. Without RESET\_L control



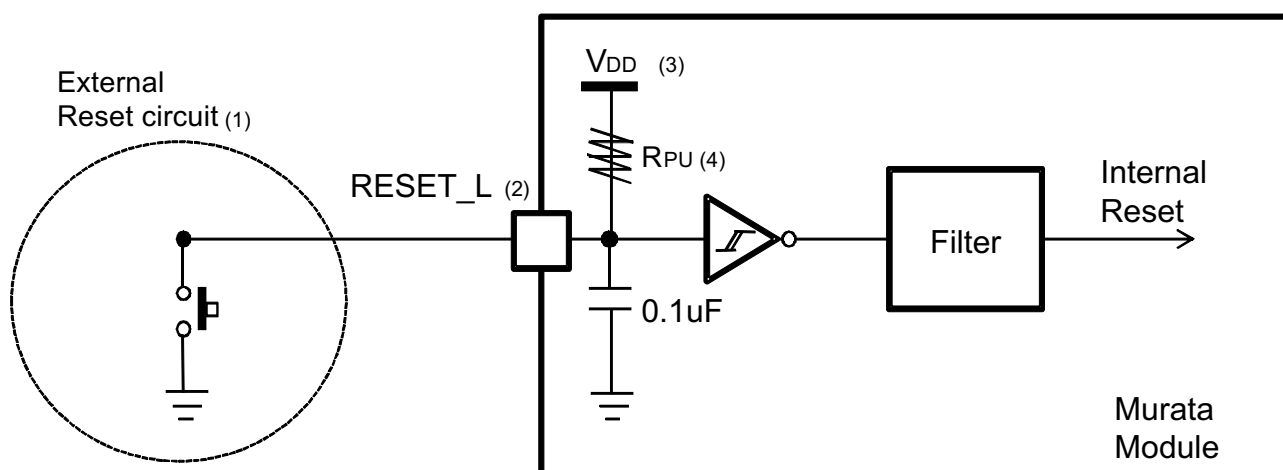
\*Power down sequence is opposite sequence of power up.

### 12.2. With RESET\_L control



\*Power down sequence is opposite sequence of power up.

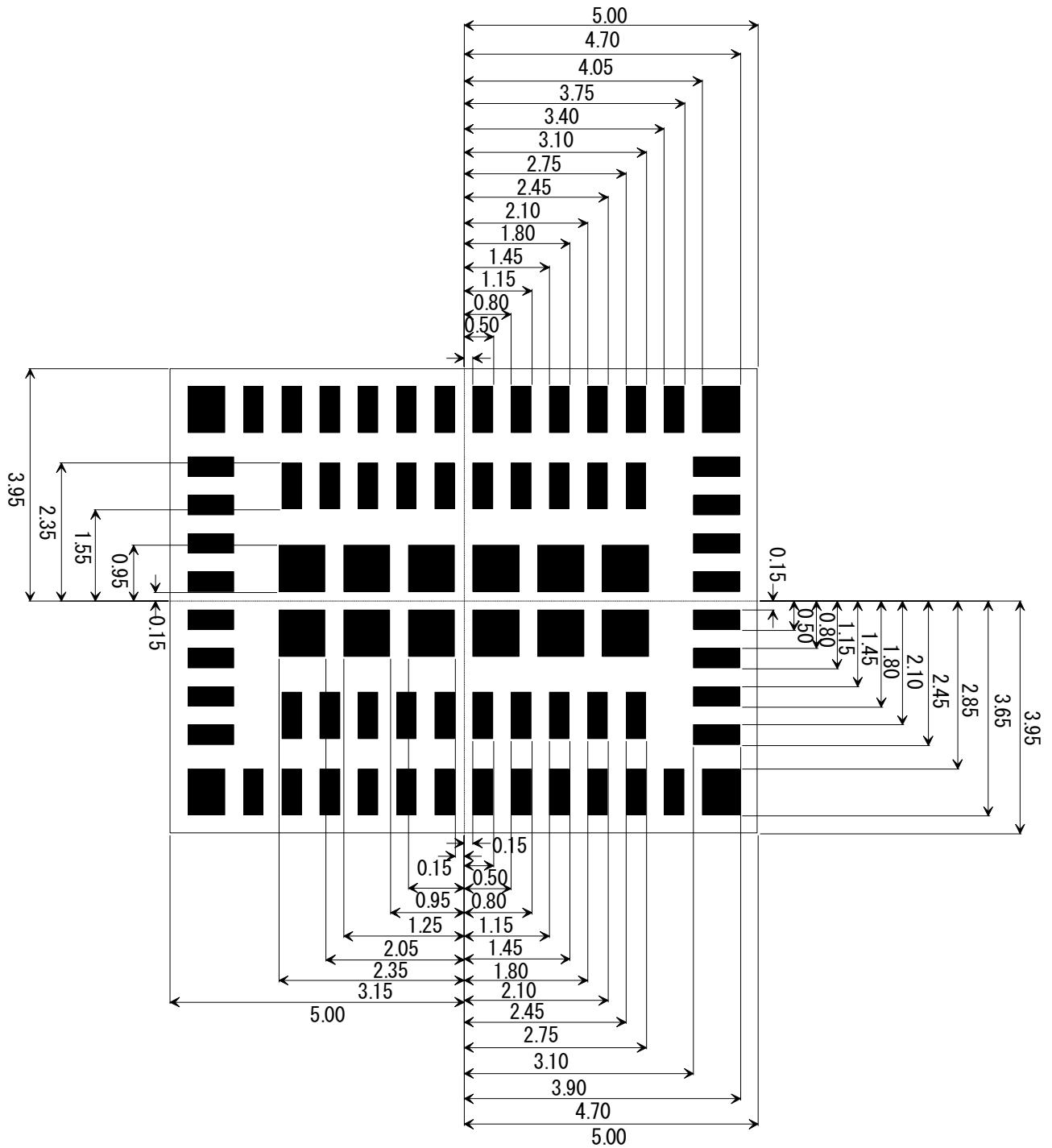
#### 12.2.1. RESET\_L Circuit



- (1) The reset network protects the device against parasitic resets.
- (2) The user must ensure that the level on the RESET\_L pin can go below the 0.8V. Otherwise the reset is not taken into account by the device.
- (3) VDD=3.3V(for the  $1.8 \leq VDD \leq 3.6$  voltage range)
- (4) RPU=40k ohm (for the  $30 \leq RPU \leq 50$ kohm range)

### 13. Land Pattern (Top View)

Schematic symbols and CAD footprints are available on the Electric Imp dev center website.

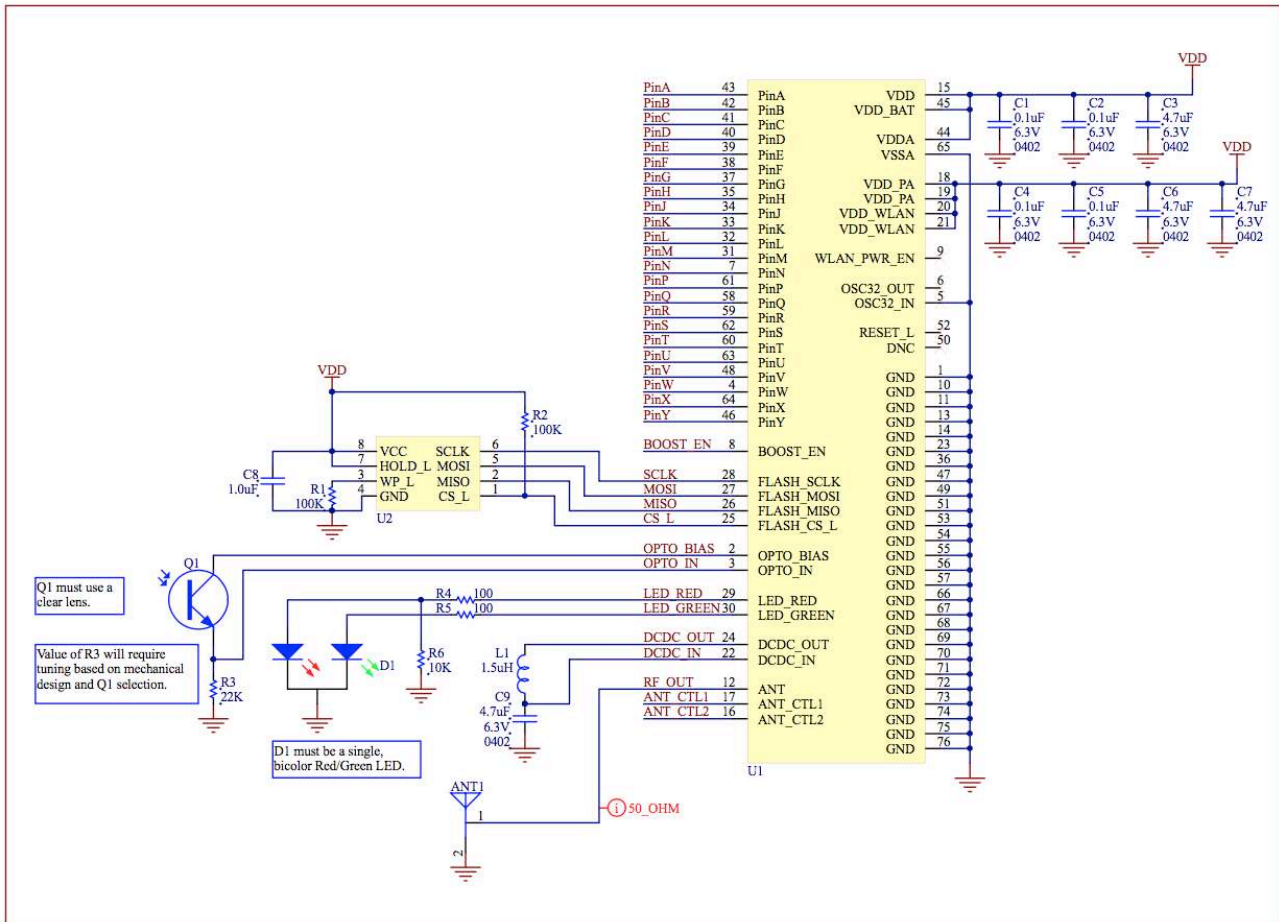


Unit : mm

## 14. Reference Circuit

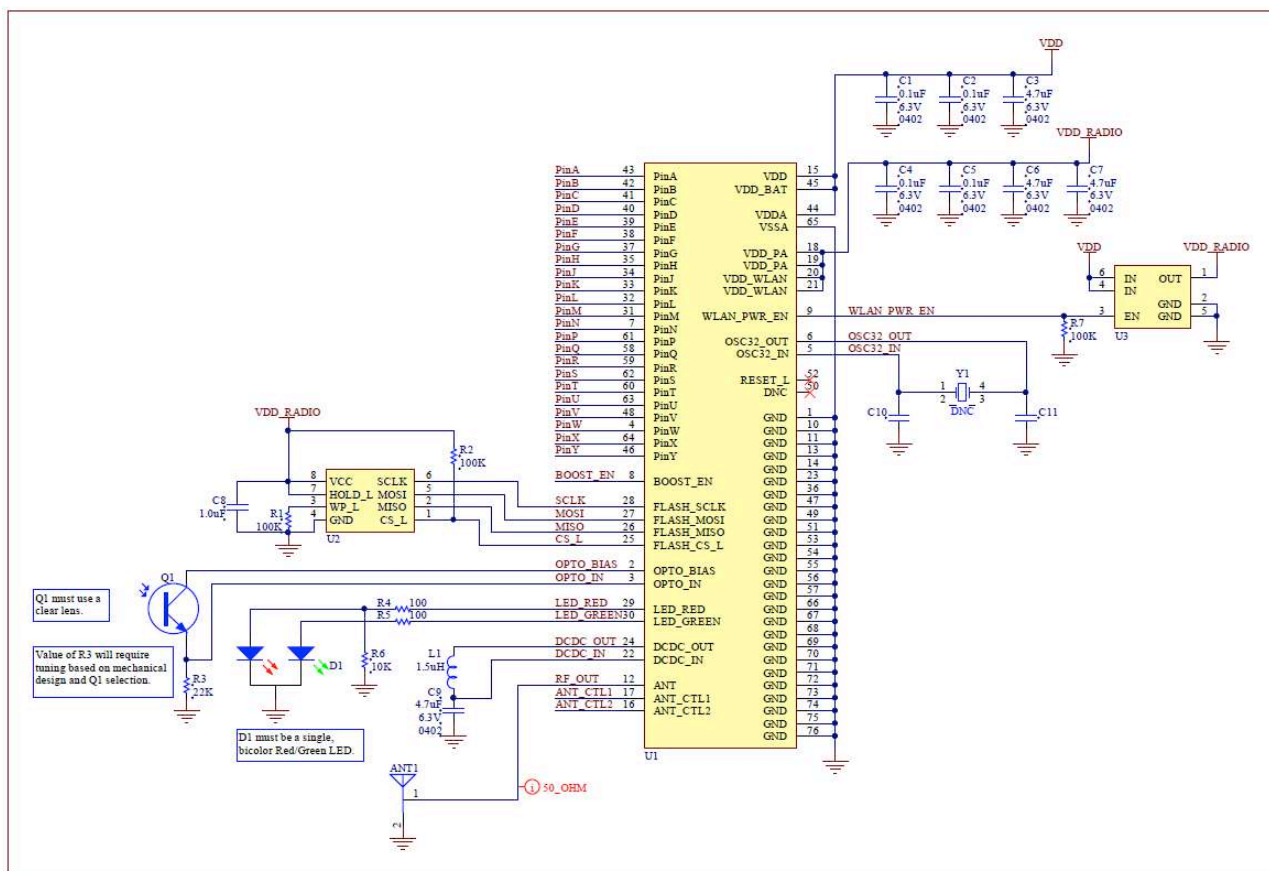
### 14.1. Low Cost Schematic

Please refer to paragraph 16 for the low cost recommended components.



## 14.2. Low Power Schematic

Please refer to paragraph 16 for the low power recommended components.



## 15. Recommended Components

### 15.1. Bi-color LED

|                      | Manufacturer | Manufacturer's part number |
|----------------------|--------------|----------------------------|
| <b>Surface mount</b> |              |                            |
| top-view             | SunLED       | XZMDKVG59W-1               |
|                      | Liteon       | LTST-C195KGJRKT            |
| side-view            | SunLED       | XZMDKVG88W                 |
|                      | Bivar        | SM1204BC                   |
| <b>Through-hole</b>  |              |                            |
| 3mm                  | SunLED       | XLMDKVG34M                 |
|                      | Liteon       | LTL1BEKVJNN                |

### 15.2. Phototransistor

|                      | Manufacturer | Manufacturer's part number |
|----------------------|--------------|----------------------------|
| <b>Surface mount</b> |              |                            |
| top-view             | Everlight    | PT17-21C/L41/TR8           |
|                      | Fairchild    | KDT00030TR                 |
| side-view            | SunLED       | XZRNI56W-1                 |
|                      | Everlight    | PT12-21C/TR8               |
| <b>Through-hole</b>  |              |                            |
| 3mm                  | SunLED       | XRNI30W-1                  |
|                      | LiteOn       | LTR-4206                   |

### 15.3. SPI Flash

| Size    | Manufacturer | Manufacturer's part number |
|---------|--------------|----------------------------|
| 4 Mbit  | Spansion     | S25FL204K                  |
| 4 Mbit  | Macronix     | MX25L4006E                 |
| 32 Mbit | Spansion     | S25FL132K                  |
| 32 Mbit | Macronix     | MX25L3206E                 |

### 15.4. Low Cost Schematic

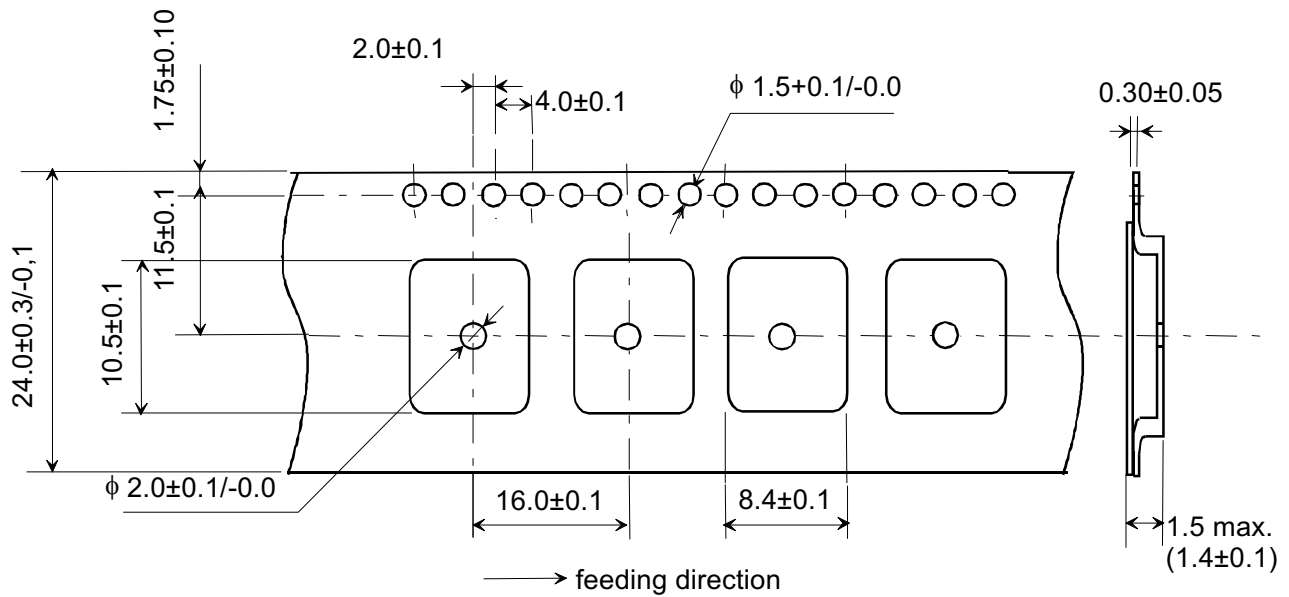
| Size | Manufacturer                 | Manufacturer's part number | Description                |
|------|------------------------------|----------------------------|----------------------------|
| U2   | please refer to section 16.3 |                            | SPI Flash                  |
| Q1   | please refer to section 16.2 |                            | clear lens phototransistor |
| D1   | please refer to section 16.1 |                            | red/green bicolor LED      |
| L1   | Murata                       | LQM21PN1R5MC0              | 1.5uH inductor             |

### 15.5. Low Power Schematic

| Ref Des | Manufacturer                 | Manufacturer's part number | Description                |
|---------|------------------------------|----------------------------|----------------------------|
| U2      | please refer to section 16.3 |                            | SPI Flash                  |
| U3      | Diodes Inc.                  | AP2281-1/AP2281-3          | 2A load switch             |
| Q1      | please refer to section 16.2 |                            | clear lens phototransistor |
| D1      | please refer to section 16.1 |                            | red/green bicolor LED      |
| L1      | Murata                       | LQM21PN1R5MC0              | 1.5uH inductor             |
| Y1      | Kyocera                      | ST3215SB32768B0HPWB3       | 32.768kHz crystal          |
|         | Abrakon                      | ABS25-32.768KHZ-6-T        |                            |
|         | Abrakon                      | ABS07-120-32.768kHz-T      |                            |

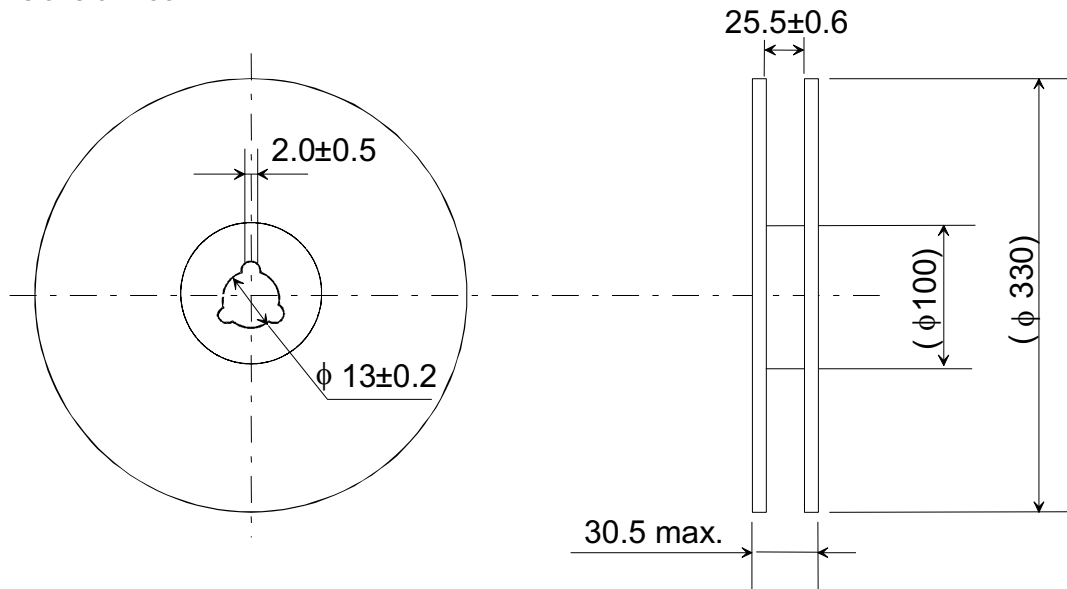
## 16. Tape and Reel Packing

### (1) Dimensions of Tape (Plastic tape)



- 1) The corner and ridge radiuses (R) of inside cavity are 0.3mm max.
- 2) Cumulative tolerance of 10 pitches of the sprocket hole is  $\pm 0.2$ mm
- 3) Measuring of cavity positioning is based on cavity center in accordance with JIS/IES standard.

### (2) Dimensions of Reel



(unit : mm)



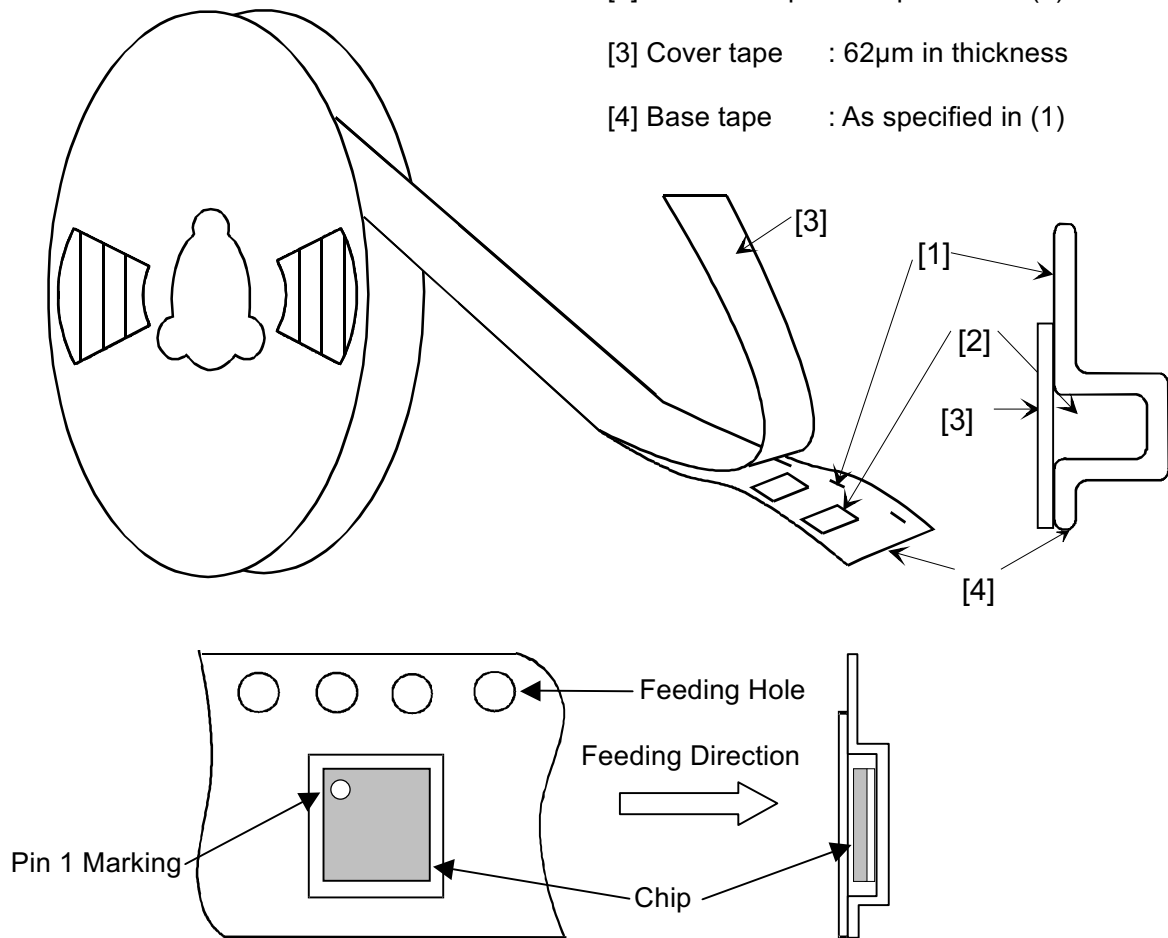
### (3) Taping Diagrams

[1] Feeding Hole : As specified in (1)

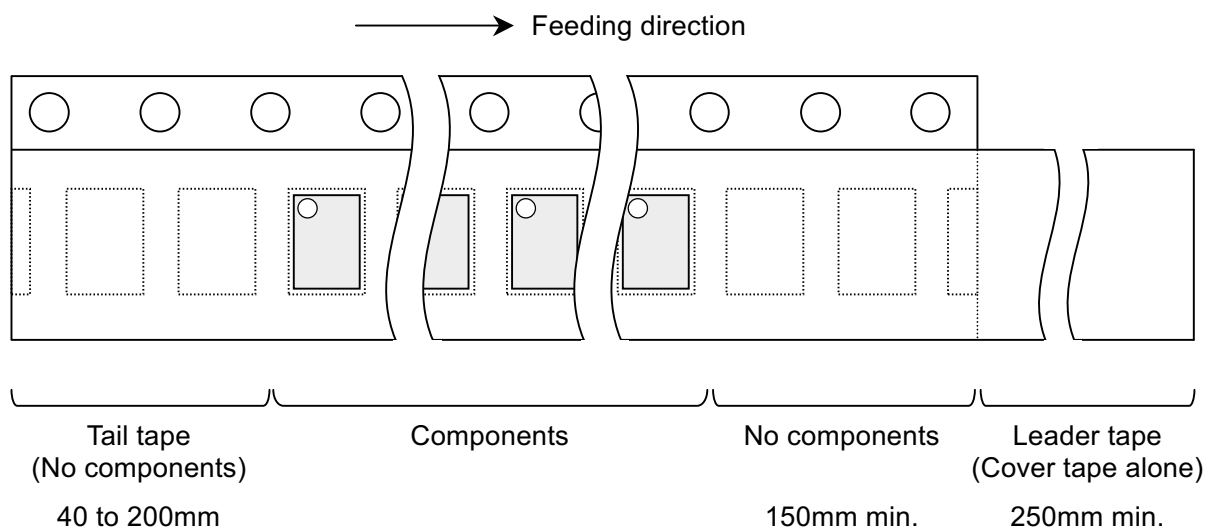
[2] Hole for chip : As specified in (1)

[3] Cover tape : 62μm in thickness

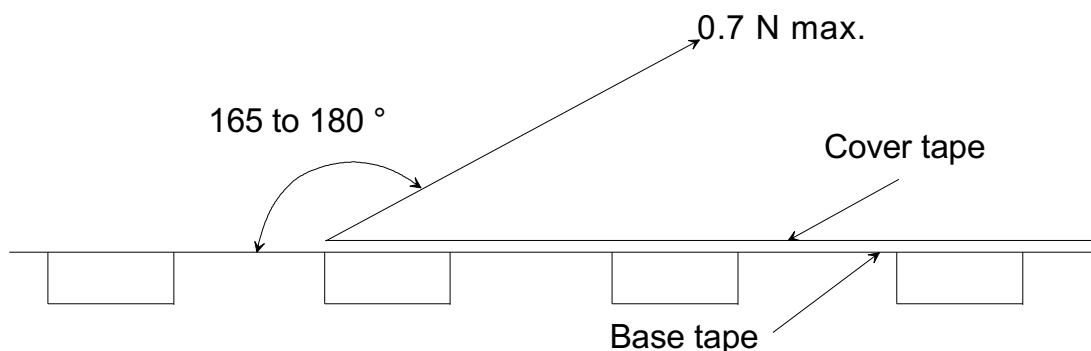
[4] Base tape : As specified in (1)



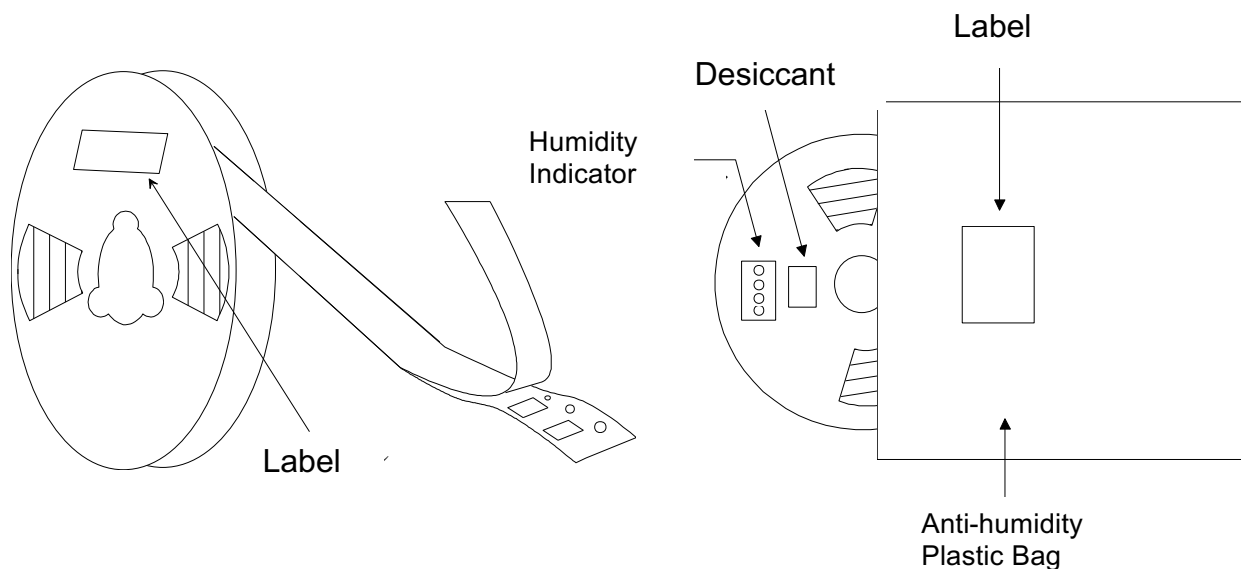
### (4) Leader and Tail tape



- (5) The tape for chips are wound clockwise, the feeding holes to the right side as the tape is pulled toward the user.
- (6) The cover tape and base tape are not adhered at no components area for 250mm min.
- (7) Tear off strength against pulling of cover tape : 5N min.
- (8) Packaging unit : 1000pcs./ reel
- (9) material : Base tape : Plastic  
Real : Plastic  
Cover tape, cavity tape and reel are made the anti-static processing.
- (10) Peeling of force : 0.7N max. in the direction of peeling as shown below.



- (11) Packaging (Humidity proof Packing)



Tape and reel must be sealed with the anti-humidity plastic bag. The bag contains the desiccant and the humidity indicator.

## **17. NOTICE**

### **17.1. Storage Conditions:**

Please use this product within 6month after receipt.

- The product shall be stored without opening the packing under the ambient temperature from 5 to 35deg.C and humidity from 20 to 70%RH.

(Packing materials, in particular, may be deformed at the temperature over 40deg.C.)

- The product left more than 6months after reception, it needs to be confirmed the solderbility before used.

- The product shall be stored in non corrosive gas (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>2</sub>, No<sub>x</sub>, etc.).

- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.

This product is applicable to MSL3 (Based on JEDEC Standard J-STD-020)

- After the packing opened, the product shall be stored at  $\leq 30\text{deg.C}$  /  $\leq 60\%\text{RH}$  and the product shall be used within 168hours.

- When the color of the indicator in the packing changed, the product shall be baked before soldering.

Baking condition: 125+5/-0deg.C, 24hours, 1time

The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

### **17.2. Handling Conditions:**

Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

### **17.3. Standard PCB Design (Land Pattern and Dimensions):**

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Murata beforehand.

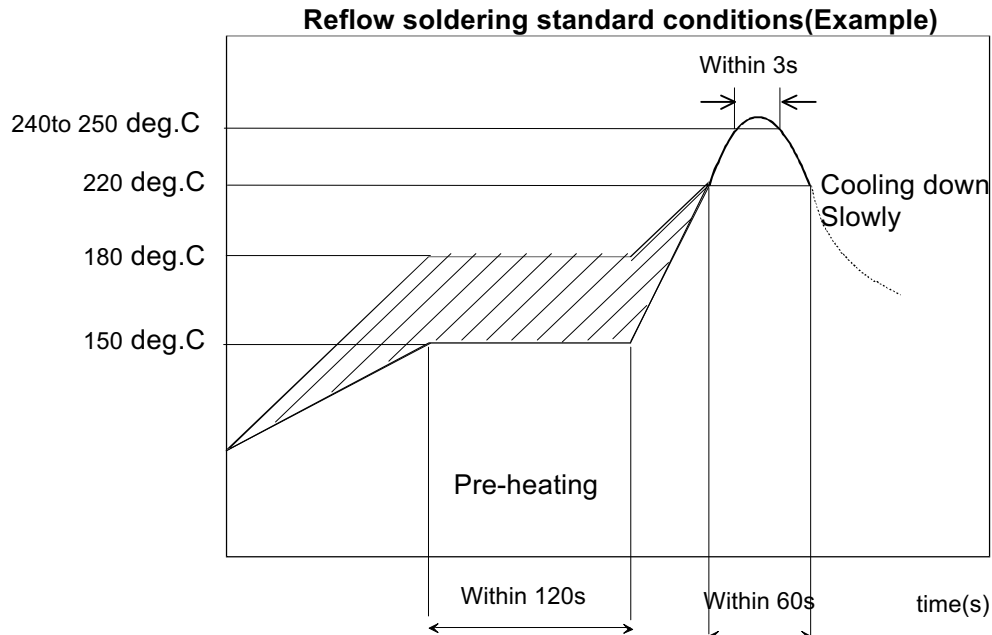
### **17.4. Notice for Chip Placer:**

When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

### 17.5. Soldering Conditions:

The recommendation conditions of soldering are as in the following figure.

When products are immersed in solvent after mounting, pay special attention to maintain the temperature difference within 100 °C. Soldering must be carried out by the above mentioned conditions to prevent products from damage. Set up the highest temperature of reflow within 260 °C. Contact Murata before use if concerning other soldering conditions.



Please use the reflow within 2 times.

Use rosin type flux or weakly active flux with a chlorine content of 0.2 wt % or less.

### 17.6. Cleaning:

Since this Product is Moisture Sensitive, any cleaning is not permitted.

### 17.7. Operational Environment Conditions:

Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur.

- In an atmosphere containing corrosive gas ( Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>x</sub>, NO<sub>x</sub> etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty place.
- Direct sunlight place.
- Water splashing place.
- Humid place where water condenses.
- Freezing place.

If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.

As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

### 17.8. Input Power Capacity:

Products shall be used in the input power capacity as specified in this specifications.

Inform Murata beforehand, in case that the components are used beyond such input power capacity range.

## 18. PRECONDITION TO USE OUR PRODUCTS

PLEASE READ THIS NOTICE BEFORE USING OUR PRODUCTS.

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.

All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.

Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

WE HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.

The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements. Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment
- Undersea equipment.
- Power plant control equipment
- Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment.
- Disaster prevention / crime prevention equipment.
- Burning / explosion control equipment
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

We expressly prohibit you from analyzing, breaking, reverse-engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.

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Please do not use our products, our technical information and other data provided by us for the purpose of developing of mass-destruction weapons and the purpose of military use.

Moreover, you must comply with "foreign exchange and foreign trade law", the "U.S. export administration regulations", etc.

Please note that we may discontinue the manufacture of our products, due to reasons such as end of supply of materials and/or components from our suppliers.

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