# GP2W1001YP0F

## IrDA Compliant Transceiver Module
## 9.6 kb/s to 4 Mb/s (FIR)
## Low Profile
## Low Consumption Current



### ■Description

The **GP2W1001YP0F** is an infrared transceiver module for IrDA ver. 1.4 (FIR).

The transceiver consisits of a pin-photo diode, infrared emitter and control IC in a single package.

### ■Features

1. Compliant with the IrDA 1.4 (FIR)
   Transmission speed : 9.6 kb/s to 4 Mb/s
   Transmission distance : 1 m
2. Small package
   L 10.0 × W 4.38 × H 3.53 mm
3. Peak emission wavelength : 880 nm
4. Side view type
5. Soldering reflow type
6. Shield type
7. Low consumption current due to shutdown function
   (Consumption current at shutdown mode : Max. 1.0 μA)
8. Operates from 2.7 to 5.5 V

### ■Agency approvals/Compliance

1. Compliant with IEC60825-1 class 1 eye safety standard
2. Compliant with RoHS directive (2002/95/EC)
3. Content status of six substances specified in
   " Management Methods for Control of Pollution Caused by Electronic Information Products Regulation "
   (popular name : *China RoHS*)
   (Chinese : 电子信息产品污染控制管理办法)
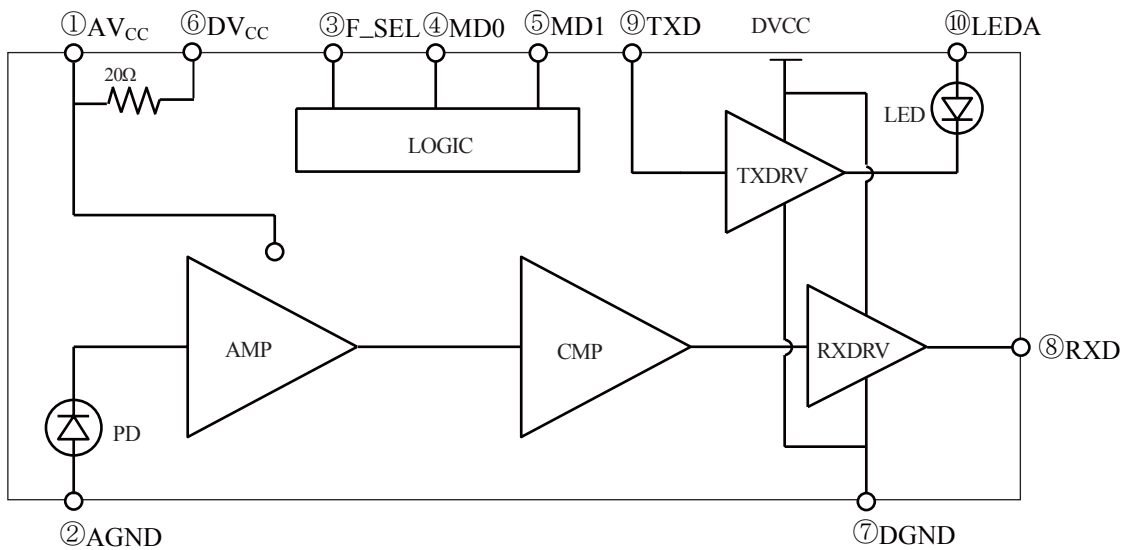   ; refer to page 13
4. Lead (Pb) free device

### ■Applications

1. Mobile equipment
   (Cellular phone, Pager, Smart phone, PDAs, Portable printer, etc. )
2. Digital imaging equipment
   (Digital camera, Photo imaging printer)
3. POS equipment
4. Personal computers
5. Personal information tools

## ■Block diagram



## ■Outline Dimensions

(Unit : mm)



| | Terminal | Symbol |
|---|---|---|
| ① | Analog $V_{CC}$ | $AV_{CC}$ |
| ② | Analog Ground | AGND |
| ③ | Channel Select | F_SEL |
| ④ | Mode Select 0 | MD0 |
| ⑤ | Mode Select 1 | MD1 |
| ⑥ | Digital $V_{CC}$ | $DV_{CC}$ |
| ⑦ | Digital Ground | DGND |
| ⑧ | Receiver signal output | RXD |
| ⑨ | Transmitter signal input | TXD |
| ⑩ | LED Anode | LEDA |

1) ▨▨▨ area: Au plating
2) Unspecified tolerance shall be ± 0.2 mm
3) Adhesion of resin to the terminal area shall be allowed Max. 0.2 mm.

Product mass : approx. 0.15g

## ■Recommended PCB Foot Pattern

Dimensions are shown for reference

(Unit:mm)
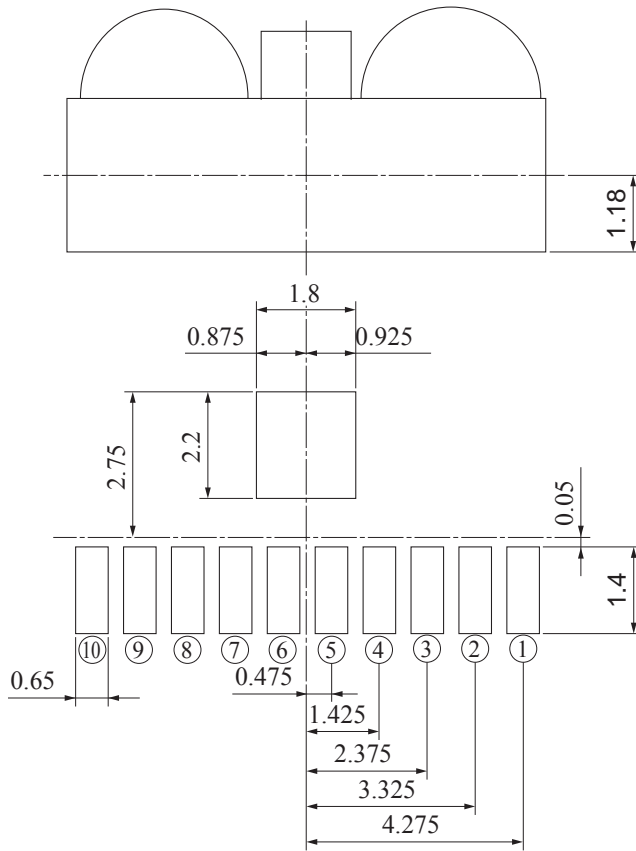


| | Terminal | Symbol |
|---|---|---|
| ① | Analog $V_{CC}$ | $AV_{CC}$ |
| ② | Analog Ground | AGND |
| ③ | Channel Select | F_SEL |
| ④ | Mode Select 0 | MD0 |
| ⑤ | Mode Select 1 | MD1 |
| ⑥ | Digital $V_{CC}$ | $DV_{CC}$ |
| ⑦ | Digital Ground | DGND |
| ⑧ | Receiver signal output | RXD |
| ⑨ | Transmitter signal input | TXD |
| ⑩ | LED Anode | LEDA |

## ■Recommended Size of Solder Creamed Paste (Reference)

(unit : mm)

Dimensions are shown for reference.
Please open the solder mask as below
so that the size of solder creamed paste
for this device before reflow soldering
must be as large as one of the foot
pattern land indicated for reference.
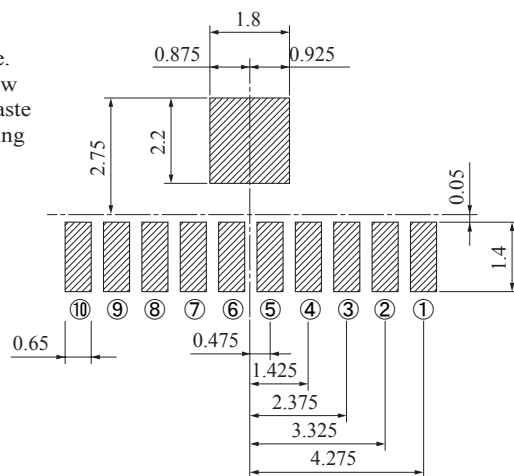


▨ : Solder paste area

## ■Absolute Maximum Ratings  (Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 6 | V |
| LED Supply voltage | $V_{LEDA}$ | 6 | V |
| Transmission signal duty ratio | $D_u$ | 50 | % |
| Peak forward current | $I_{FM}$ | 600 | mA |
| Operating temperature | $T_{opr}$ | -10 to +70 | ℃ |
| Storage temperature | $T_{stg}$ | -20 to +85 | ℃ |

Note) Transmission signal duty ratio show the time share of H level of transmission wave at TX terminal. The frequency shall be 1kHz or more.

## ■Electro-optical Characteristics  (Ta=25±3°C, $V_{CC}$=3.3±0.1V, 5±0.1V, Ambient illuminance of detecting face:10 lx or less)

| Parameter | Symbol | Rating | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Current consumption at no input signal | $I_{CC}$ | RXOUT:H,TXIN:L,$V_{CC}$=3.3V | — | — | 1.2 | mA |
| | | RXOUT:H,TXIN:L,$V_{CC}$=5.0V | — | — | 1.5 | mA |
| Current consumption at shutdown mode | $I_{CC-S}$ | RXOUT:H,TXIN:L,$V_{CC}$=3.3V | — | 0.1 | 1 | μA |
| | | RXOUT:H,TXIN:L,$V_{CC}$=5.0V | — | 0.2 | 2 | μA |
| LED peak current | $I_{CCP}$ | Peak value,$V_{CC}$=3.3V($R_L$=2.0Ω), $V_{CC}$=5.0V($R_L$=5.6Ω) | — | 400 | 600 | mA |
| Receiver wakeup time | $t_{RSD}$ | | — | — | 1.5 | ms |
| Receive sensitivity($\theta \leqq \pm15°$) | $S_{rx\theta}$ | SIR:9.6k to 115.2kb/s | 0.04 | — | 5000 | $W/m^2$ |
| | | FIR:1.152M/4Mb/s | 0.1 | — | 5000 | |
| RXOUT terminal "L" level | $V_{OL}$ | $V_{CC}$=3.3,5.0V | — | — | 0.4 | V |
| RXOUT terminal "H" level | $V_{OH}$ | $V_{CC}$=3.3,5.0V | $V_{CC}$-0.4 | — | — | V |
| Rise time | $T_{rrA}$ | SIR:9.6k to 115.2kb/s | — | — | 200 | ns |
| | $T_{rrB}$ | FIR:1.152M/4Mb/s | — | — | 40 | |
| Fall time | $T_{frA}$ | SIR:9.6k to 115.2kb/s | — | — | 200 | ns |
| | $T_{frB}$ | FIR:1.152M/4Mb/s | — | — | 40 | |
| Peak receive wavelength | $\lambda_{rx}$ | | — | 940 | — | nm |
| RXOUT terminal pulse width | $t_{w1}$ | SIR mode,9.6kb/s[1] | 1 | — | 22 | μs |
| | $t_{w2}$ | SIR mode,115.2kb/s[1] | 1 | — | 4 | μs |
| | $t_{w3}$ | FIR mode,1.152Mb/s[1] | 110 | — | 500 | ns |
| | $t_{w4}$ | FIR mode,4Mb/s (Single)[1] | 85 | — | 165 | ns |
| Maximum receive distance | L | [1] | 1 | — | — | m |
| Peak emission wave length | $\lambda_{tx}$ | | 850 | 880 | 900 | nm |
| Radiant intensity | $I_{EL\phi}$ | Low Power | — | 15 | — | mW/sr |
| | $I_{EM\phi}$ | Middle Power | — | 60 | — | |
| | $I_{EF\phi}$ | Full Power($\theta \leqq \pm15°$) | 100 | — | 500 | |
| TXIN terminal "L" level | $V_{IL1}$ | $V_{CC}$=3.3,5.0V | — | — | $V_{CC}\times0.2$ | V |
| TXIN terminal "H" level | $V_{IH1}$ | $V_{CC}$=3.3,5.0V | $V_{CC}\times0.67$ | — | — | V |
| TXIN terminal input current | $I_{IL}$ | TXIN=GND | -0.1 | 0 | 0.1 | μA |
| | $I_{IH}$ | TXIN=$V_{CC}$=5.0V | — | — | 50 | |
| Logic terminal "L" level | $V_{IL2}$ | Terminal F SEL,MID0,MD1 $V_{CC}$=3.3,5.0V | — | — | $V_{CC}\times0.33$ | V |
| Logic terminal "H" level | $V_{IH2}$ | Terminal F SEL,MID0,MD1 $V_{CC}$=3.3,5.0V | $V_{CC}\times0.67$ | — | — | V |
| Output Radiant rise time | $t_{rtx}$ | | — | — | 40 | ns |
| Output Radiant fall time | $t_{ftx}$ | | — | — | 40 | ns |

*1 Refer to Fig. 2, 3

## ■Recommended Operating Conditions

(Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 2.7 to 5.5 | V |
| LED Supply voltage | $V_{LED}$ | 2.7 to 7.0 | V |
| Operating temperature | $T_{opr}$ | 0 to +70 | ℃ |
| Data rate | BR | 9.6k to 4M | b/s |

## ■Truth Table

| Input | | Output | |
|---|---|---|---|
| TXD (Transmitter) | Receiver | State of LED (Transmitter) | RXD terminal |
| High | – | ON | X |
| Low | ON | OFF | Low |
| Low | OFF | OFF | High |

X:Do not care

## ■Input Output Logic Table

| MD0 | MD1 | F_SEL | TXD | RXD terminal mode | TXO *2 | Remarks |
|---|---|---|---|---|---|---|
| 1 | 0 | X | 0 | Shut down | Shut down | – |
| ⟍ | 0 | 1 | 0 | RXA | X | Latch TXD |
| ⟍ | 0 | 1 | 1 | RXB | X | Latch TXD |
| 0 | 0 | 0 | X | RXA | HPW | TXO Output High Power mode |
| 0 | 1 | 0 | X | ↓ | MPW | TXO Output Middle Power mode |
| 1 | 1 | 0 | X | ↓ | LPW | TXO Output Low Power mode |
| 0 | 0 | 1 | X | RXB | HPW | TXO Output High Power mode |
| 0 | 1 | 1 | X | ↓ | MPW | TXO Output Middle Power mode |
| 1 | 1 | 1 | X | ↓ | LPW | TXO Output Low Power mode |

*1 F_SFL → 0:reset latching state of TXD, and turn to RXA channel.
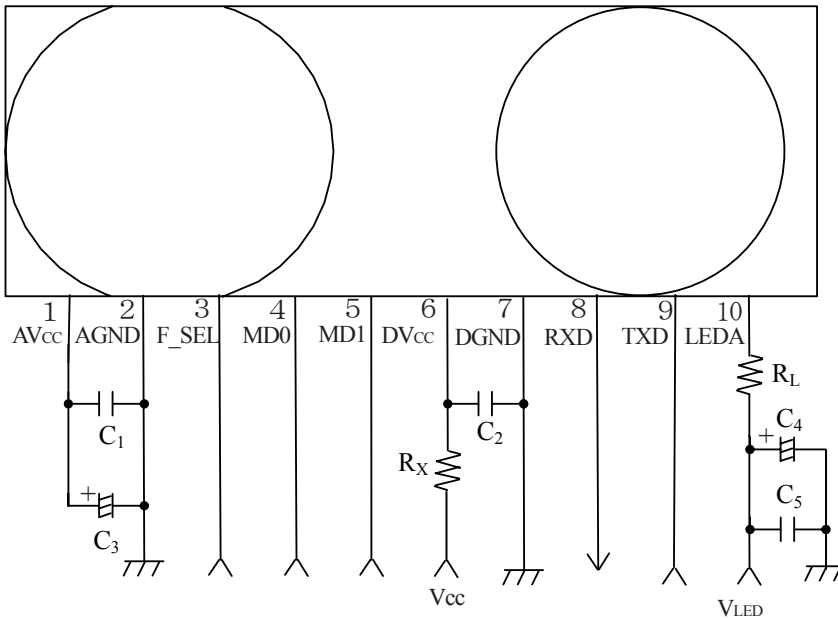*2 When a power supply is on, F_SFL should be Low.
*3 When communication starts from RXB channel mode, once select RXA channel mode and change RXB channel mode.
*4 RXA:RXA channel mode:115kb/s or less (SIR 115.2kb/s, 9600b/s)
*5 RXB:RXB channel mode:115kb/s or more (FIR 1.152Mb/s, 4Mb/s)

## Fig.1 Recommended External Circuit



| Components | Recommended values |
|---|---|
| $C_1, C_2$ | 1.0μF±10%(Note) |
| $C_3$ | 4.7μF±10%(Note) |
| $R_X$ | 1 to 10Ω 1/8W |
| $R_L$ | 2.0Ω±5% 1/2W ($V_{LED}$=3.3V) |
| | 5.6Ω±5% 1/2W ($V_{LED}$=5.0V) |
| $C_4$ | 5.6μF±10%(Note) |
| $C_5$ | 0.1μF±10%(Note) |

(Note)1. Component chooses the most suitable constant of $C_1,C_2,C_3,C_4$ and $C_5$ according to the noise level and noise frequency of a power supply.
Depending on the noise level of a power supply, and noise frequency, a noise may be unable to be removed only by capacitor of a standard circuit.
At this time, pulses other than a signal may be outputted from a RXD terminal in a specific communication distance.
Please confirm with the system that it is satisfactory with each transmission speed in all communication distance at the time of examination.
When there is a noise ingredient which cannot be removed only by $C_1,C_2,C_3$, please insert $R_X$(1 to 10Ω) and it after a check.
When there is a problem, please use it after a check as a noise measure Circuit.
2.Don't connect an Avcc terminal with power supply because it is the connection of only capacitor.

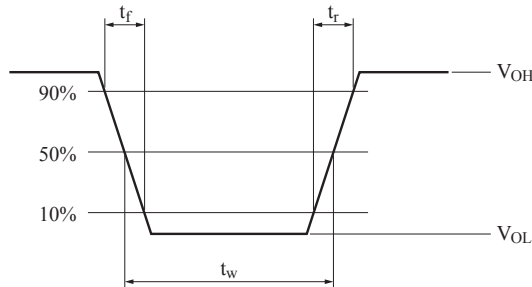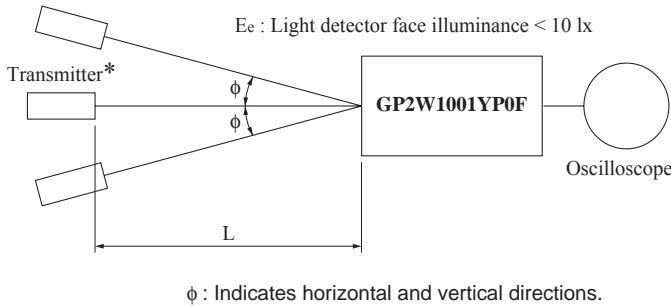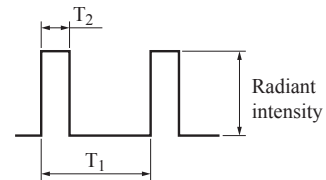## Fig.2 Output Waveform Specification(Receiver side)($C_L \leq 10pF$)
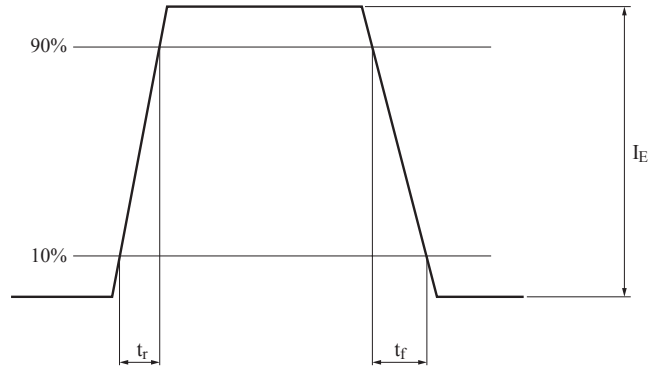


## Fig.3 Standard Optical System(Receiver side)



$E_e$ : Light detector face illuminance < 10 lx

φ : Indicates horizontal and vertical directions.

*The light emitting diode (SHARP **GL710**, $\lambda_P$=850 to 900nm) is used as the transmitter, where the following continuous signals are transmitted.
In Fig.3, output signal shall be complete receiver side electro-optical characteristics.

| Data rate | $T_1$ | $T_2$ | $T_2/T_1$ | Radiant intensity |
|-----------|-------|-------|-----------|-------------------|
| 9.6kb/s | 104 $\mu$ s | 19.53 $\mu$ s | 3/16 | 40mW/sr |
| 115.2kb/s | 8.68 $\mu$ s | 1.63 $\mu$ s | 3/16 | 40mW/sr |
| 1.152Mb/s | 868ns | 217ns | 1/4 | 100mW/sr |
| 4Mb/s | 500ns | 125ns | 1/4 | 100mW/sr |

## Fig.4 Output Waveform Specification(Transmitter side)



## Fig.5 Standard Optical System(Transmitter side)



GP2W1001YP0F

Detector for
radiant intensity measuring

$\phi$ : Indicates horizontal and vertical directions.
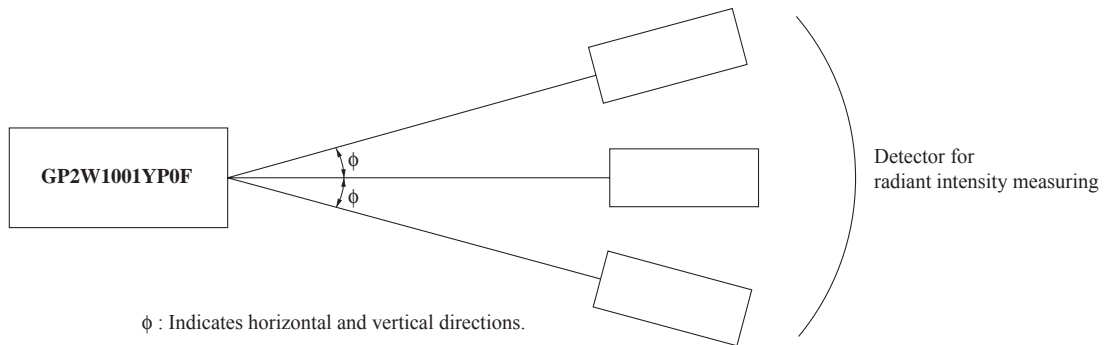
## Fig.6 Recommended Circuit of Transmitter side



$DV_{CC}=3.3V, R_L=2.0\Omega$

LEDA

TX

GP2W1001YP0F

1.63μs

$V_{IN}Tx=2.8V$

BR=115.2kb/s
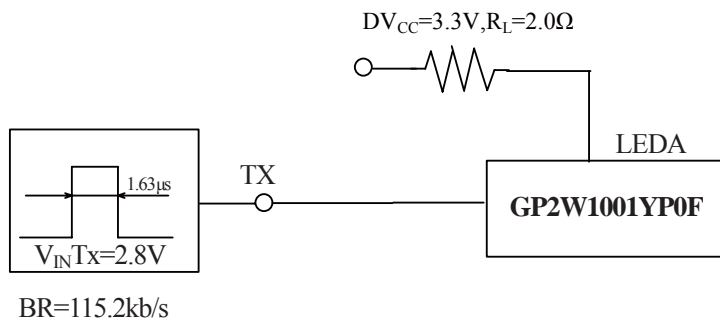
## Fig.7 Peak Forward Current vs. Ambient Temperature

Pulse width 22 µs, Duty ratio 1/4

[Graph: Peak forward current $I_{FM}$ (mA) on vertical axis (0, 200, 400, 600) vs. Ambient temperature Ta (℃) on horizontal axis (-25, -10, 0, 25, 50, 70, 75, 100)]
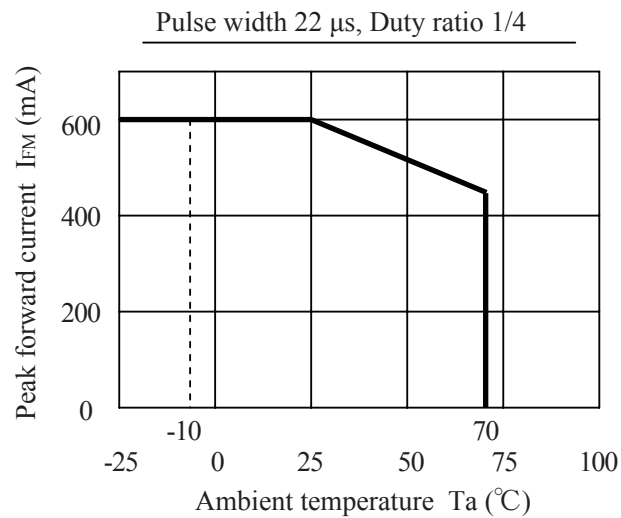
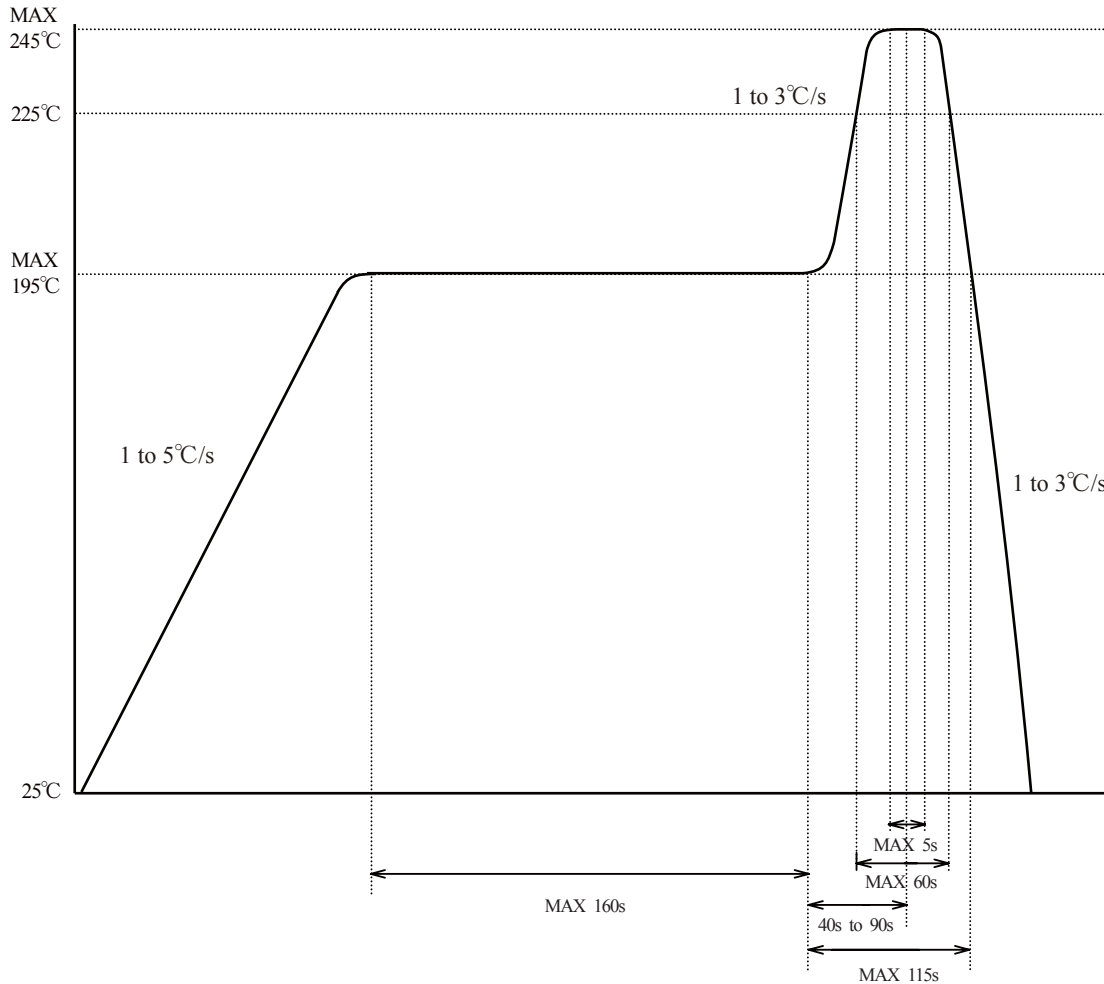■**Notes**

(1) When the system (program) is designed, the Turn Around Time shall be secured by considering 500 µs or more that is specified to IrDA.
Then, this Turn Around Time means the time when this device does not temporarily detect the signal light, since the transmitted light form the transceiver reaches the detector side of the transceiver.

(2) As it is necessary 1.5 ms or more (at Ta =25 °C, no input signal) to return from shut-down mode to ready-operation mode, please consider this point at the system (program) designing.
Also, please confirm thoroughly the operation in actual application.

(3) When there is much external disturbing light source is located near this transceiver and the detector face resceiver much external disturbing light, there is case that the pulse other than signal output is generated as noise on output terminal of this transceiver. Please consider the lay-out and structure to reduce disturbing light on the detector face.

(4) In case that this sensor is adopted in IR communication system, please use it according to the signal method which is specified by [Serial Infrared Physical Layer Link Specification Version 1.4] published by Infrared Data Association. False operation may happen if the different signal method is used.

(5) In circuit designing, make allowance for the degradation of light emitting diode output that results from long continuous operation. ( 50 % degradation/5 years)

## ■Soldering Method

1.  In case of solder reflow

    Please carry out only one time soldering at the temperature and the time within the temperature profile as shown in the figure below.



MAX 245℃

225℃

1 to 3℃/s

MAX 195℃

1 to 5℃/s

1 to 3℃/s

25℃

MAX 5s

MAX 60s

40s to 90s

MAX 160s

MAX 115s

2.  Other precautions

    An infrared lamp used to heat up for soldering may cause a localized temperature rise in the resin.
    So keep the package temperature within that specified in Item 1. Also avoid immersing the resin part in the solder.
    Even if within the temperature profile above, there is the possibility that the gold wire in package is broken
    in case that the deformation of PCB gives the affection to lead pins.  Please use after confirming the conditions fully
    by actual solder reflow machine.

3.  Soldering

    ・Soldering iron shall be less than 25W, and temperature of point of soldering iron shall use at 260℃or less.
    ・Soldering time shall be within 5s.
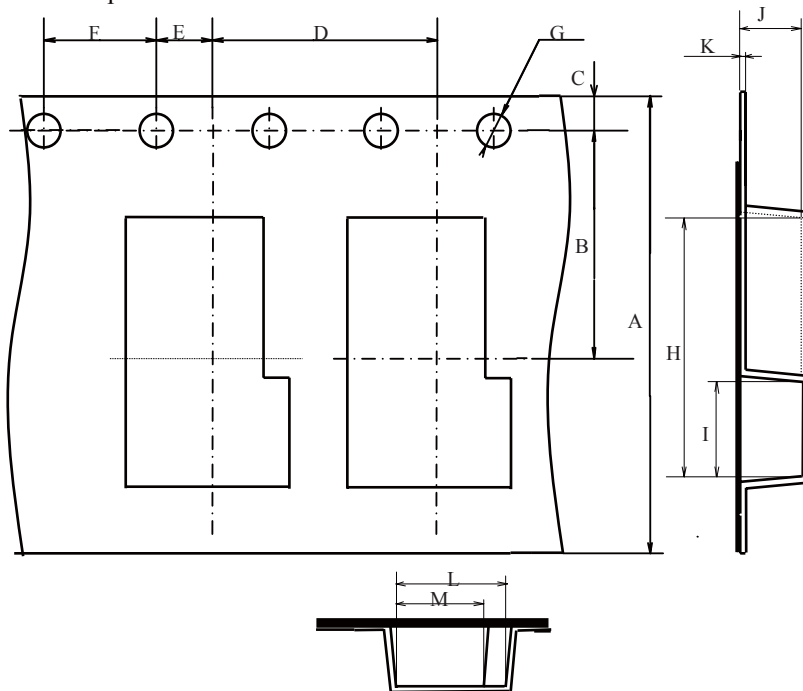    ・Soldered product shall treat at normal temperature.

# ■Package specification

## ●Tape and Reel package
### 2000 pcs/reel

Taping materials

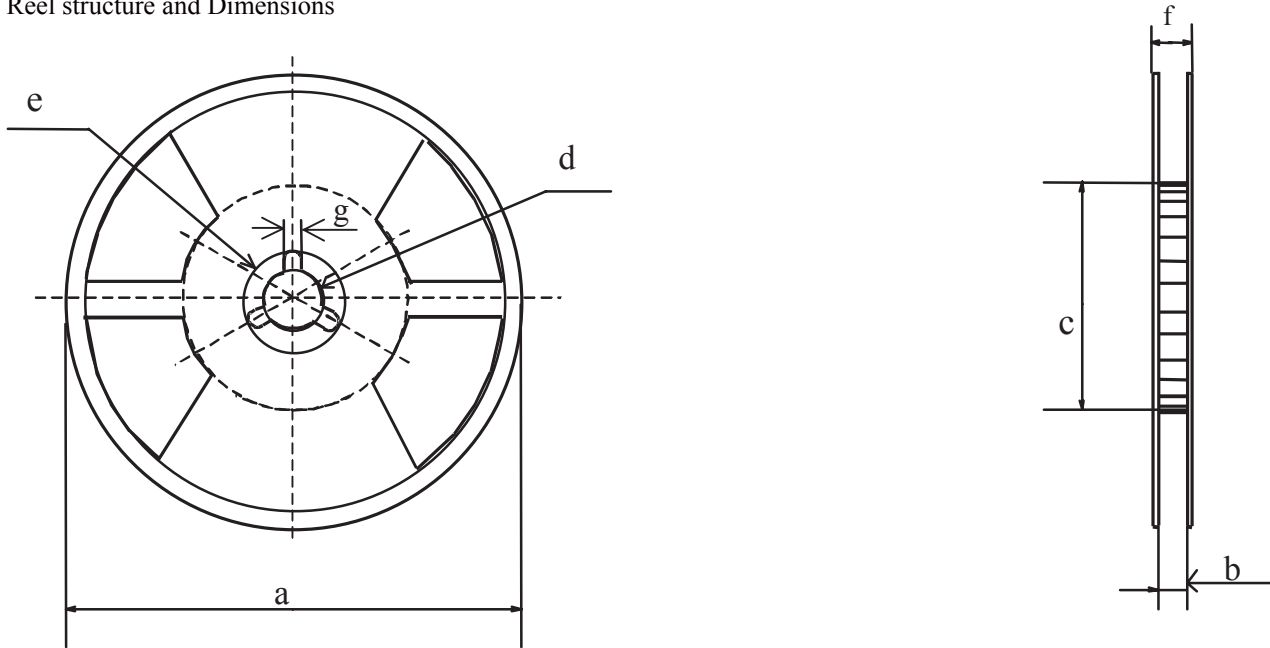| Name | Material | Counter measure for ESD |
|------|----------|-------------------------|
| Reel | PPE | Coped(Conductivity) |
| Carrier tape | PC | Coped(Conductivity) |
| Cover tape | PET | Coped(Conductivity) |

Carrier tape structure and Dimensions



Dimension List                                                                                    (Unit : mm)

| A | B | C | D | E | F | |
|---|---|---|---|---|---|---|
| 16.0±0.3 | 7.5±0.1 | 1.75±0.1 | 8.0±0.1 | 2.0±0.1 | 4.0±0.1 | |
| G | H | I | J | K | L | M |
| $\phi\,1.5^{+0.1}_{-0.0}$ | 10.6±0.1 | 4.0±0.1 | 4.0±0.1 | 0.33±0.05 | 4.6±0.1 | 4.1±0.1 |

Reel structure and Dimensions

(Unit : mm)

| a | b | c | d |
|---|---|---|---|
| $\phi\,330\pm2$ | $17.5\pm1$ | $\phi\,100\pm1$ | $\phi\,13\pm0.2$ |
| e | f | g | |
| $\phi\,21\pm0.8$ | $22.5\pm0.1$ | $2\pm0.5$ | |

Direction of product insertion

Pull out direction

Lens side
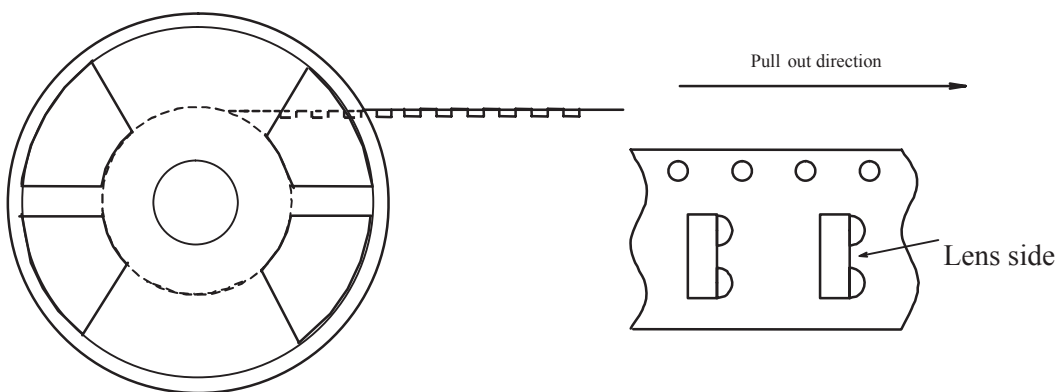
● **Cleaning Instructions**

Solvent cleaning :

Solvent temperature 45℃ or less, Immersion for 3 min or less

Ultrasonic cleaning :

The effect to device by ultrasonic cleaning differs by cleaning bath size, ultrasonic power output, cleaning time, PCB size or device mounting condition etc.
Please test it in actual using condition and confirm that doesn't occur any defect before starting the ultrasonic cleaning. The cleaning shall be carried out with solvent below.

Recommended Solvent materials :

Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

● **Presence of ODC etc.**

This product shall not contain the following materials.
And they are not used in the production process for this product.
Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBB and PBDE are not used in this product at all.

• The RoHS directive (2002/95/EC)
 This product complies with the RoHS directive (2002/95/EC).
 Object substances: lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and
                    polybrominated diphenyl ethers (PBDE)

• Content of six substances specified in " Management Methods for Control of Pollution Caused by Electronic
 Information Products Regulation " (Chinese : 电子信息产品污染控制管理办法)

| Category | Toxic and hazardous substances | | | | | |
|---|---|---|---|---|---|---|
| | Lead (Pb) | Mercury (Hg) | Cadmium (Cd) | Hexavalent chromium $(Cr^{6+})$ | Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE) |
| Infrared data communication device | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part
    is below the concentration limit requirement as described in SJ/T 11363-2006 standard.

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    --- Office automation equipment
    --- Telecommunication equipment [terminal]
    --- Test and measurement equipment
    --- Industrial control
    --- Audio visual equipment
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    --- Traffic signals
    --- Gas leakage sensor breakers
    --- Alarm equipment
    --- Various safety devices, etc.
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    --- Telecommunication equipment [trunk lines]
    --- Nuclear power control equipment
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