# GP1UF31xXP0F

## Infrared Detector for Remote Control

## ■ Features

1. Low power dissipation with no light input (270 µA TYP.)
2. Self-protected against static electricity
3. Four parts, offering a number of center frequencies:

| Part Number | Center Bandpass Frequency (TYP.) |
|---|---|
| GP1UF310XP0F | 36 kHz |
| GP1UF311XP0F | 38 kHz |
| GP1UF312XP0F | 36.7 kHz |
| GP1UF314XP0F | 40 kHz |

## ■ Agency Approvals/Compliance

1. Compliant with RoHS directive (2002/95/EC)
2. Content information about the 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 14.

## ■ Applications

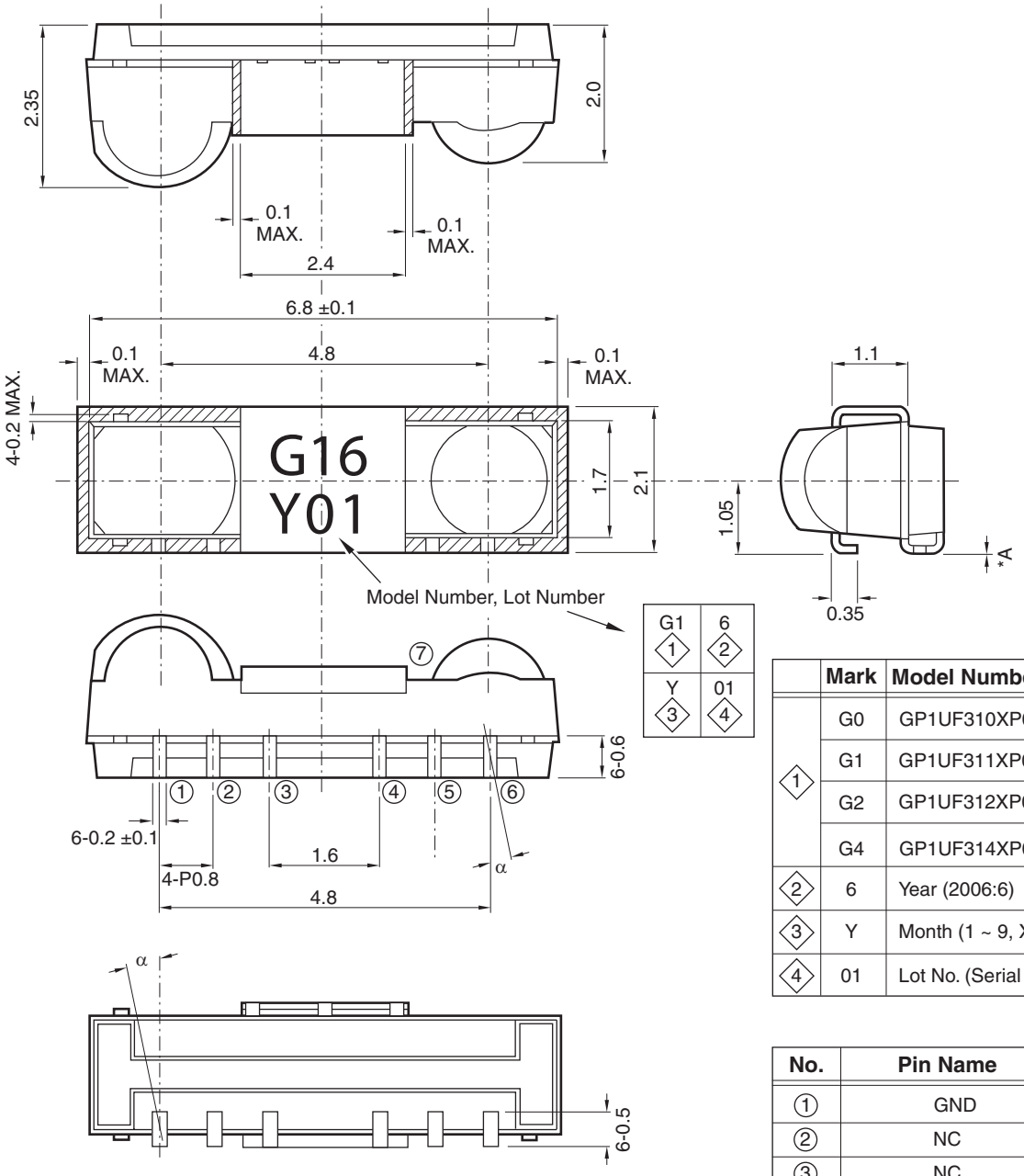
1. Automotive audio
2. Personal Computers
3. Audio visual equipment





Sheet No.: OP06Y12
March 2009

## ■ External Dimensions



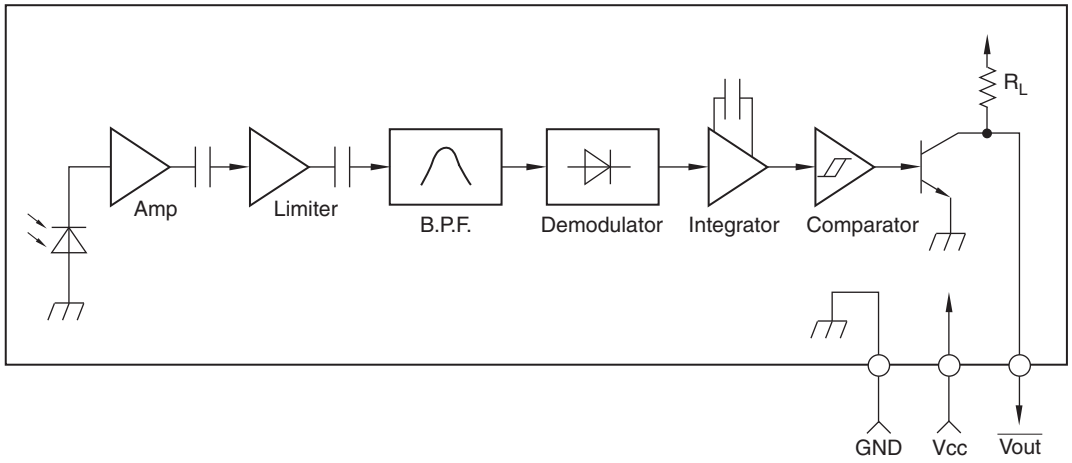

| | Mark | Model Number |
|---|---|---|
| ◇1 | G0 | GP1UF310XP0F |
| | G1 | GP1UF311XP0F |
| | G2 | GP1UF312XP0F |
| | G4 | GP1UF314XP0F |
| ◇2 | 6 | Year (2006:6) |
| ◇3 | Y | Month (1 ~ 9, X, Y, Z |
| ◇4 | 01 | Lot No. (Serial number) |

| No. | Pin Name |
|---|---|
| ① | GND |
| ② | NC |
| ③ | NC |
| ④ | Vout |
| ⑤ | Vcc |
| ⑥ | NC |
| ⑦ | Shield Ground (SGND) |

**NOTES:**
1. Units: mm
2. Unspecified tolerence: ±0.2 mm
3. Portions are shown for resin burr
4. A*: 0.15 mm MAX. Coplanarity
5. α: ±10° MAX.

GP1UF31XP0F-1

## ■ Block Diagram




GP1UF31XP0F-7

## ■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit | Notes |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | 0 to 6 | V | |
| Operating temperature | Topr | -30 to +85 | °C | *1 |
| Storage temperature | Tstg | -30 to +85 | °C | |
| Soldering temperature | Tsol | 260 | °C | *2 |

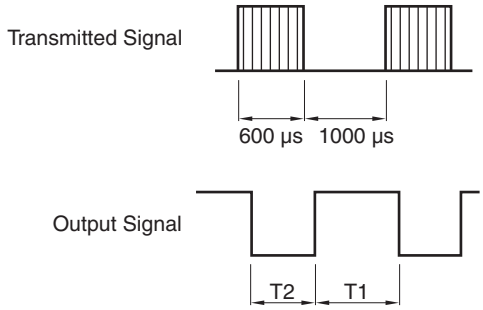
*1 Humidity to be kept above dew point.
*2 Apply heat no more than 10 seconds.

## ■ Electro-optical Characteristics

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Operating Supply Voltage | $V_{CC}$ | | 2.7 | | 5.5 | V |
| Current dissipation | $I_{CC}$ | $E_V$ = 0 lx (no light) | — | 0.27 | 0.4 | mA |
| Output HIGH voltage | $V_{OH}$ | See Note 1 | $V_{CC}$ – 0.5 | — | — | V |
| Output LOW voltage | $V_{OL}$ | $I_{OL}$ = 1.6 mA; Also See Note 1 | | — | 0.45 | V |
| Output HIGH pulse width | T1 | See Figure 1 | 600 | | 1200 | µS |
| Output LOW pulse width | T2 | See Figure 1 | 400 | | 1000 | µS |
| Bandpass Frequency center | *fo* | GP1UF310XP0F | | 36 | | kHz |
| | | GP1UF311XP0F | | 38 | | kHz |
| | | GP1UF312XP0F | | 36.7 | | kHz |
| | | GP1UF314XP0F | | 40 | | kHz |
| Output pullup resistance | $R_L$ | | 70 | 100 | 130 | kΩ |

∗1 The waveform shown in Fig. 1 was transmitted at the test part's center frequency.
Measurements were begun at transmission start and ended at pulse 50.

## Fig. 1. Transmitted and Received Pulses




**NOTE:** Carrier Duty 50%

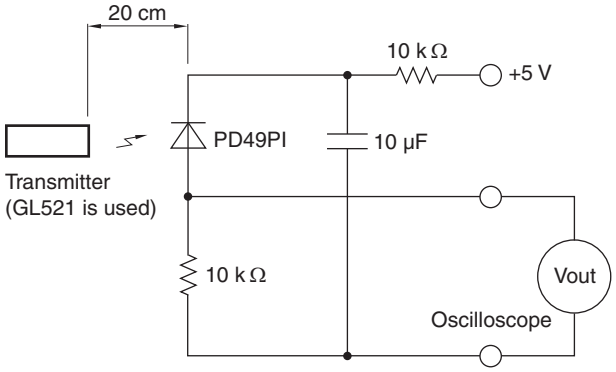
GP1UF31XP0F-8

## ● Performance Measurements

The parameters in the Characteristics tables were gathered using the transmitter jig in Fig. 2, along with the receiver jig in Fig. 3.

1. Linear Reception: Distance between transmitter and receiver: 0.2 to 5.0 meters; detector face illumination: Ev < 10 lx, $\phi = 0°$
2. Reception Angle Sensitivity: Distance between transmitter and receiver: 0.2 to 4.0 meters; detector face illumination: Ev < 10 lx, $\phi \leq 30°$
3. Side Rejection: Distance between transmitter and receiver: 0.2 to 3.0 meters; detector face illumination: Ev ≤ 300 lx, $\phi = 0°$. A CIE type A light source was placed at 45° from the perpendicular axis of the detector's centerline.
4. Transmitter Test Setup: In Fig. 2, the transmitter is set so that Vout will be 40 mV p-p. The PD49PI has a short-circuit current $I_{SC}$ = 2.6 µA at Ev = 100 lx.

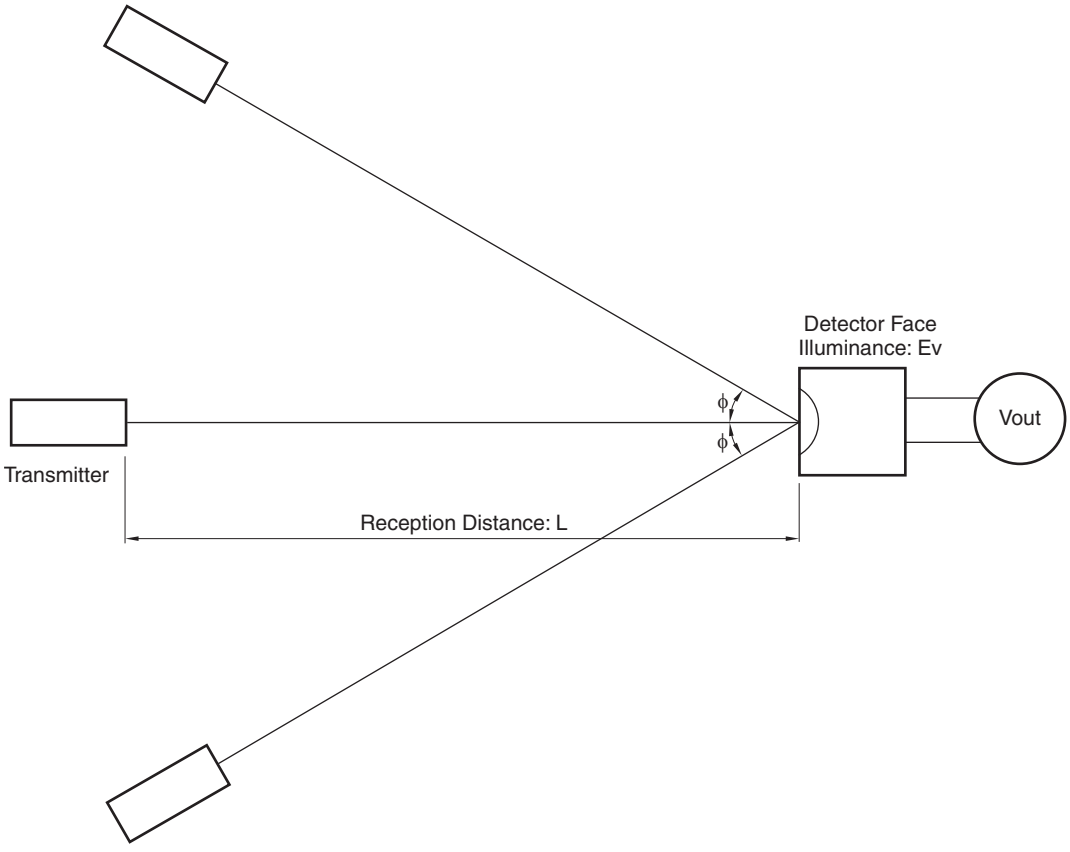
## Fig. 2. Transmitter Test Setup




**NOTE:** Carrier Duty 50%

GP1UF31XP0F-9

## Fig. 3. Receiver Test Setup




**NOTE:** $\phi$: Indicates horizontial and vertical directions.

GP1UF31XP0F-10

## ■ Design Considerations

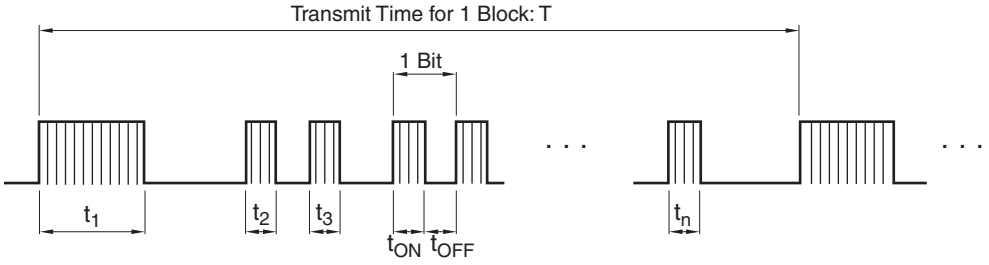
### Design Guidelines

1. This product is not designed to be electromagnetic- and ionized-particle-radiation resistant.
2. Avoid placing mechanical stress upon this part, whether to the case or terminals. Such stresses may crack the molding material, possibly breaking internal wire bonds in the part.
3. When using this part in a remote control function, the recommended signal format is NEC code, RC-6 code, or similar. the transmitter's duty ratio should follow the formula when calculating the transmission time for 1 block. (Where $D_t$ is emission time and T is the transmit time for one block.)

$$D_t = \frac{\sum_{N=1}^{n} t_N}{T}$$

It should yield a 40% duty cycle or less. The ON signal time of $T_{ON}$ (which is the pulse width per bit of the modulated IR) should be 200 µs or more. The OFF signal time of $T_{OFF}$ (which is the pulse width per bit of the modulated IR) should be 400 µs or more when $V_{CC}$ = 2.7 to 3.0 V; and 300 µs or more when $V_{CC}$ = 3.0 to 5.5 V. Should the signal format exceed these conditions, the reception distance or device output may be compromised. See Fig. 4.

## Fig. 4. Transmit Time for One Signal Block

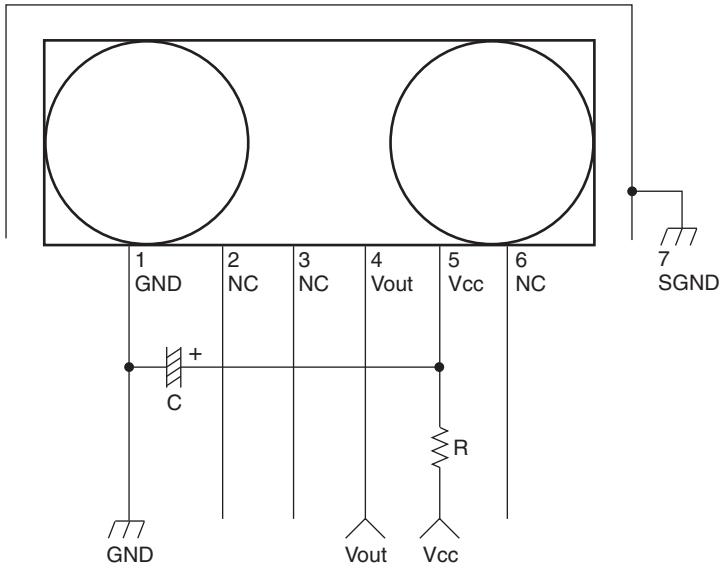



$D_t = (\sum_{N=1}^{n} t_N/T) \times 100\ (\%)$

GP1UF31XP0F-2

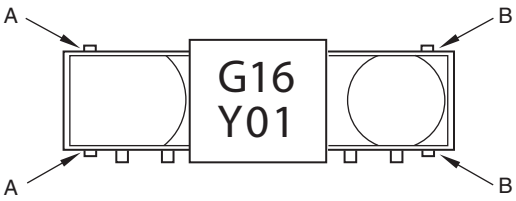
4. Output noise may be caused by environmental factors, even in the absence of a received signal. If the device is used in the presence of strong external light, this may show up as noise in the detector. Sharp recommends checking the layout and and structure so as to reduce the amount of external light intereference. Also, confirm the device's performance in actual operation, as the output may be affected by signal format, temperature, and the distance from the transmitter.
5. This device may have degraded optical performance if the surface becomes dirty or coated with any foreign substance.
6. Sharp recommends a circuit similar to the one shown in Fig. 5 to accompany this device. The values should be adjusted to reflect the actual circuit conditions, and be placed as physically close to the device as possible.
7. This device has a parallel transistor internally to protect it against static. However, the internal protection should not be counted upon to protect the device against overvoltage or noise spikes in the power supply, as the transistor could experience a secondary breakdown short. Sharp recommends decoupling the power supply near the device with a 47 Ω (1/10W) resistor and 10 µF capacitor.
8. Areas marked 'A' in Fig. 6 are electrically connected to GND; areas marked 'B' are NC.

## Fig. 5. Device Connection




GP1UF31XP0F-3

## Fig. 6. Areas Connected to GND




**NOTES:**
1. Tabs “A” are electrically connected to GND internally.
2. Tabs “B” portions are NC internally.

GP1UF31XP0F-5

## ■ Manufacturing Guidelines

### ● Storage and Handling

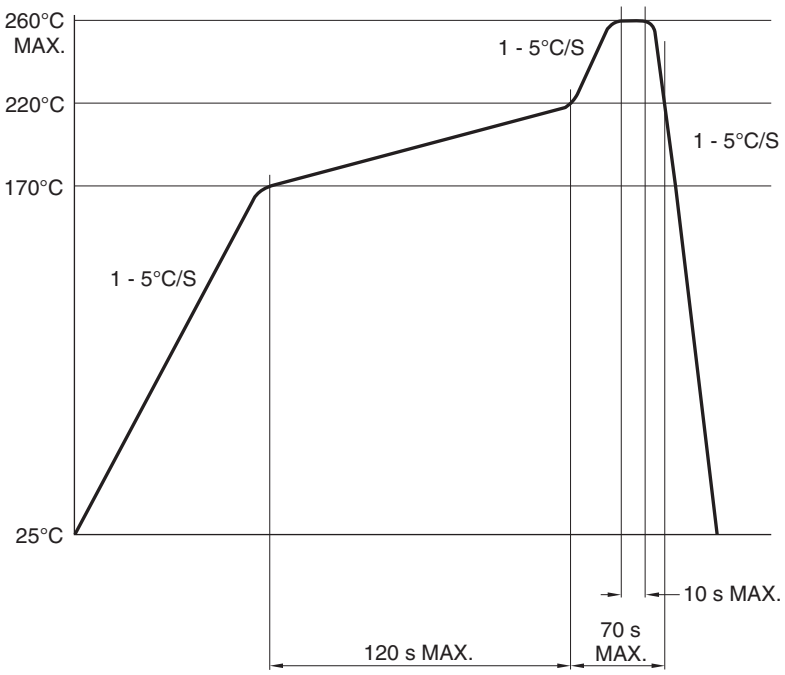
1. Moisture-proofing: These parts are shipped in vacuum-sealed packaging to keep them dry and ready for use.
2. Store these parts between 10°C and 30°C, at a relative humidity of less than 70%, for up to a year.
3. After breaking the package seal, maintain the environment within 10°C to 30°C, at a relative humidity of less than 70%. Solder the parts within 3 days.
4. If the parts will not be used immediately, repack them in a dry box, or re-vacuum-seal them with a desiccant. Store them as above, but since the seal has been broken, the parts must be used within 4 weeks.
5. If the parts are exposed to air for more than 3 days, if there are more than 3 days between reflow operations, or if the silica gel telltale indicates moisture contamination, bake the parts only once:
   - When in the tape carrier, bake them at a temperature of 65°C for 48 hours.
   - When loose on a metal tray or on a PCB, bake them at a temperature of 100°C to 110°C, for 12 to 24 hours. Temporary mounting on a PCB must be using an adhesive and not by soldering.

Note that the reels will become distorted if they are in a stack when baking. Confirm that the parts have cooled to room temperature after baking.

**Soldering Instructions**

1. Sharp recommends soldering this part no more than twice and at the profile shown in Fig. 7. Reflow should occur within three days, after storing at 10 to 30°C, and at no more than 70% relative humidity.
2. When preheating this part with infrared, localized high temperatures can be generated in the resin of this part; therefore the process should be confirmed that it remains within the limits shown in Fig. 7.
3. When hand soldering, use a temperature-controlled iron with the point < 350°C < 5 seconds.
4. Do not subject the package to excessive mechanical force during soldering as it may cause deformation or defects in plated connections. Internal connections may be severed due to mechanical force placed on the device due to the PCB flexing during the soldering process.
5. Sharp recommends handling this part in a static-controlled work area.

## Fig. 7. Soldering Profile

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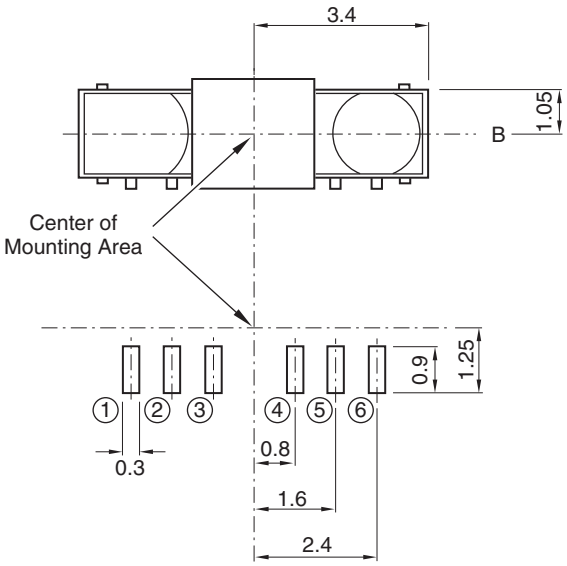
## ● PCB Footprint

Figure shows the recommended PCB footprint for this device.

### Fig. 8. Device Footprint




| No. | Pin Name |
|---|---|
| ① | GND |
| ② | NC |
| ③ | NC |
| ④ | Vout |
| ⑤ | Vcc |
| ⑥ | NC |

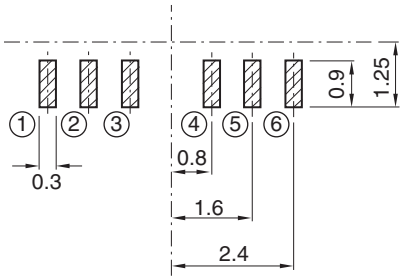
**NOTES:**
1. Units: mm

GP1UF31XP0F-4

## ● Soldering Mask

Figure shows the recommended solder mask for this device.

### Fig. 9. Soldering Mask




| No. | Pin Name |
|---|---|
| ① | GND |
| ② | NC |
| ③ | NC |
| ④ | Vout |
| ⑤ | Vcc |
| ⑥ | NC |

**NOTES:**
1. Units: mm
2. Dimensions are shown for reference

= Soldering paste area

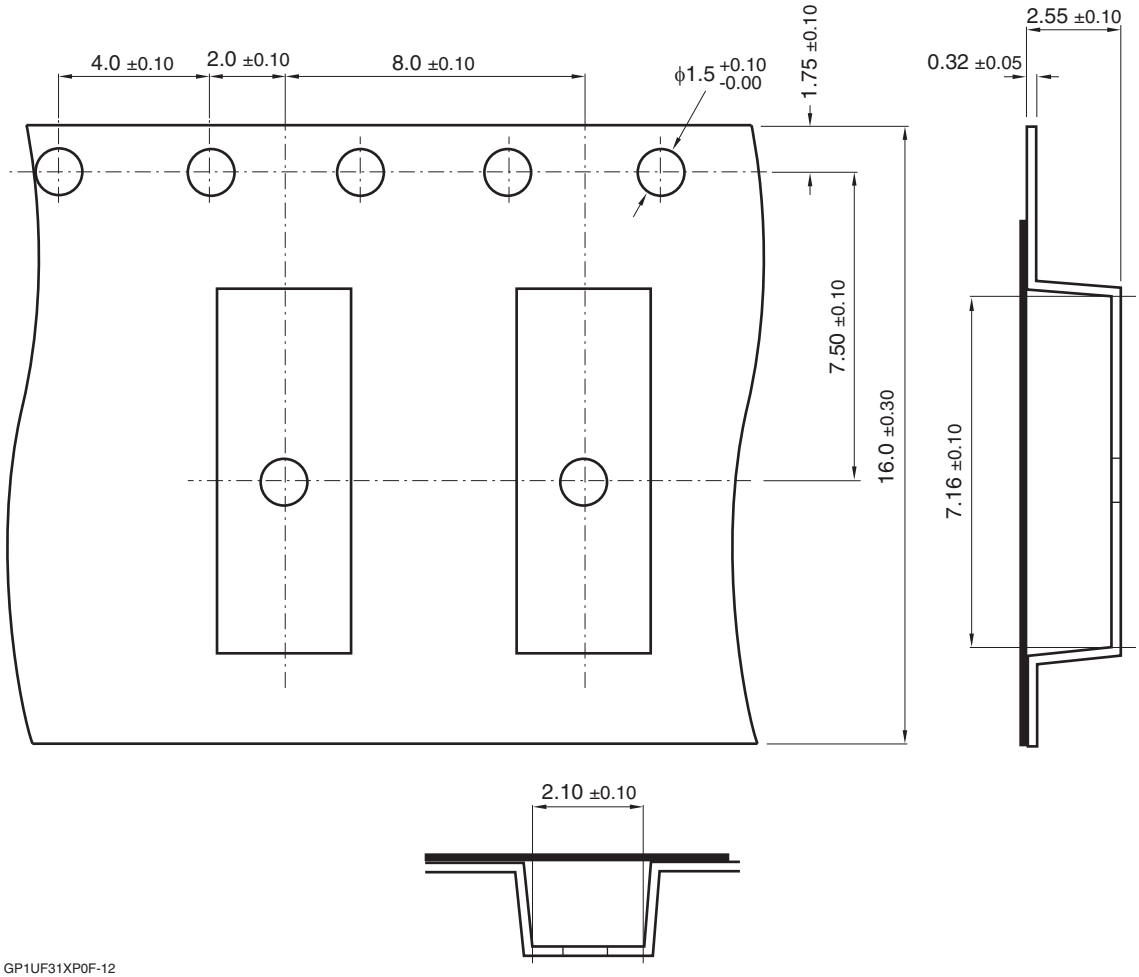
GP1UF31XP0F-6

**Cleaning Instructions**

1. Confirm this device's resistance to process chemicals before use, as certain process chemicals may affect the optical characteristics.
2. This part may be cleaned ultrasonically. Solvent temperature must be 45°C or less, and immersion for 3 minutes or less. Effectiveness of ultrasonic cleaners vary with the board configuration, power output, cleaning time, and device mounting specifics. Sharp recommends confirming the process before beginning production.
3. Recommended solvent materials: Ethyl alcohol, Methyl alcohol, and Isopropyl alcohol.

## ■ Tape Specifications

### Fig. 10 Tape Shape and Dimensions

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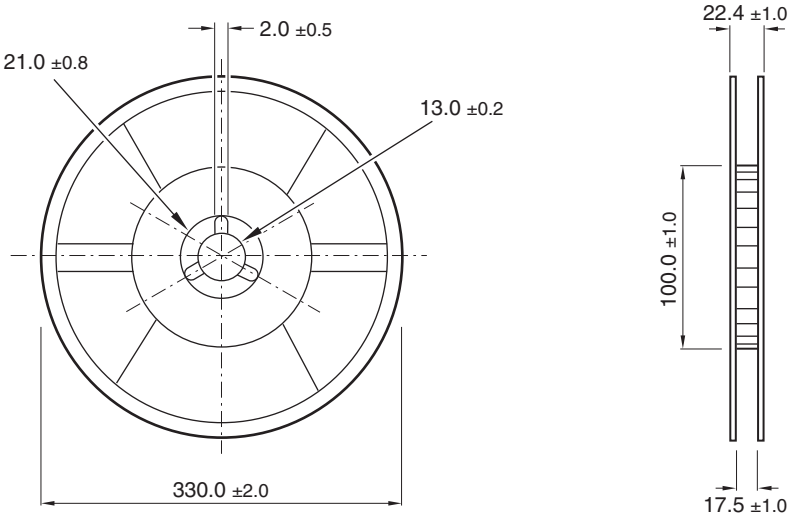
## ■ Reel Specifications

### Fig. 11 Reel Shape and Dimensions

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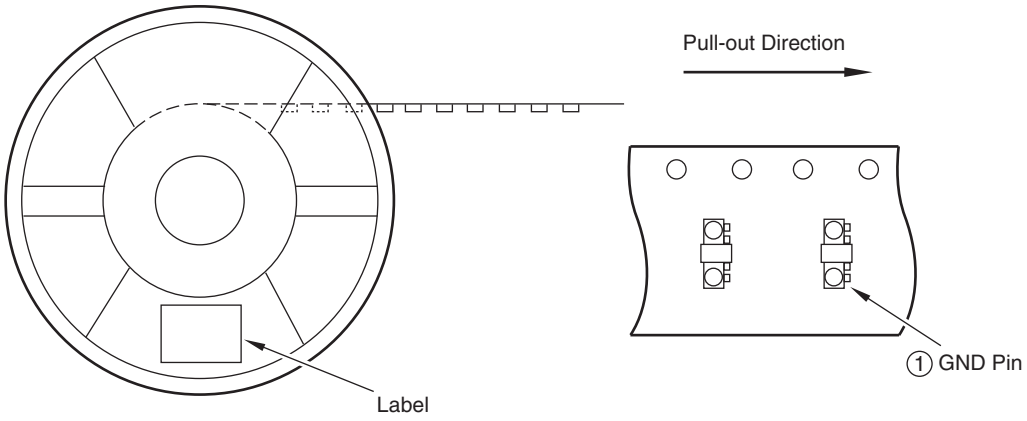
### Fig. 12 Product Insertion Direction



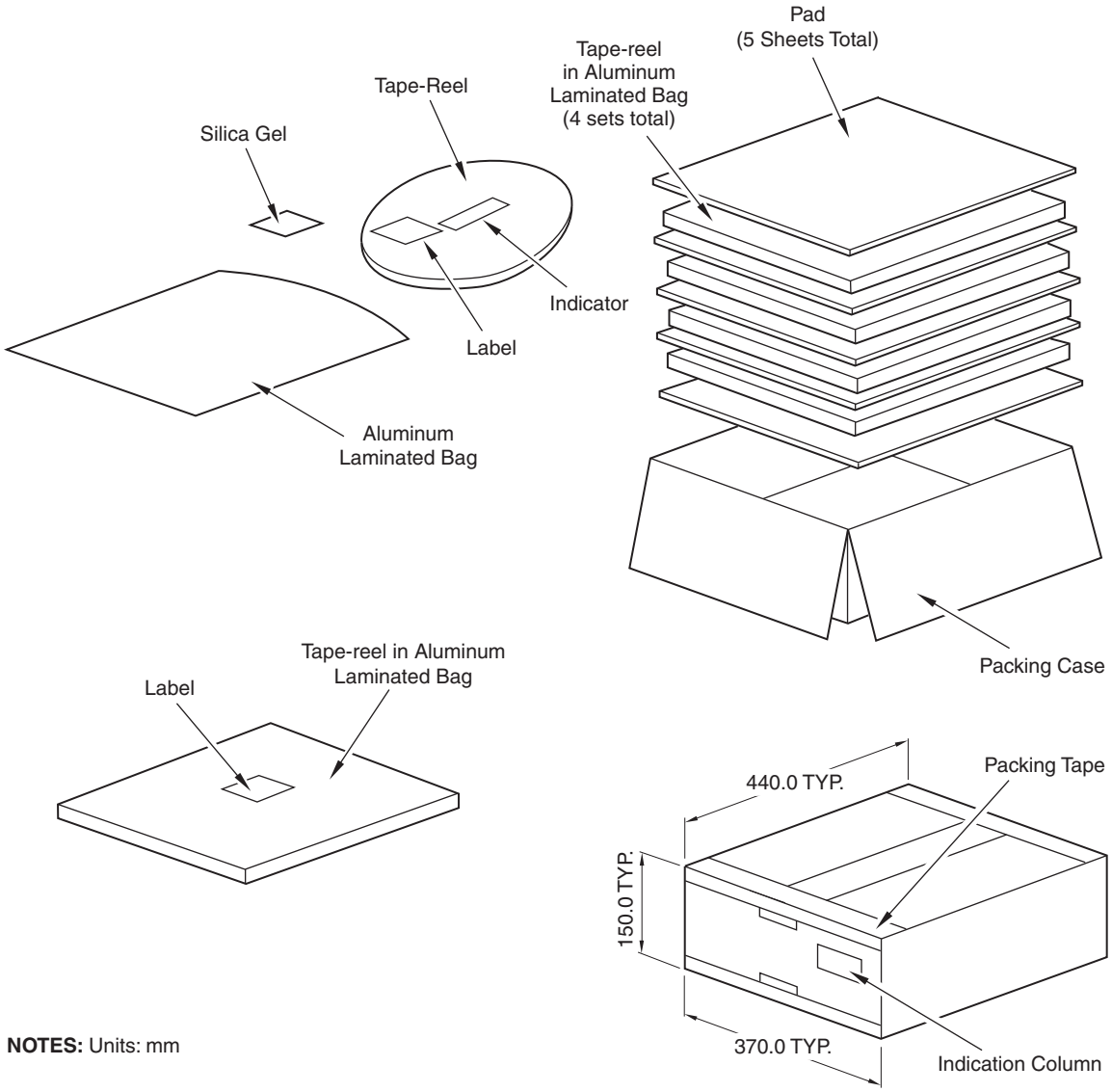

GP1UF31XP0F-14

## ● Packing Information

Products are packed in bags with 2000 pieces per reel. Four reels are placed in the shipping box with pads separating them, as well as a pad on both the top and bottom. The boxes are then sealed with kraft tape, indicating number, quantity, and lot number.

Each box carries 8000 pieces for a total mass of approximately 3.3 kg; the mass of each part is approximately 0.04 g.

### Fig. 13 Shipping Package Drawings




**NOTES:** Units: mm

GP1UF31XP0F-15

## ■ Presence of ODCs (RoHS Compliance)

This product shall not contain the following materials, and they are not used in the production process for this product:

- Regulated substances: CFCs, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methylchloroform). Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).
- Content information about the 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 Detectors | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

NOTE: ✓ 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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--- Industrial control
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--- Consumer electronics

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--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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--- Nuclear power control equipment
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