

# GP1UF31xYP0F

## Infrared Detector for Remote Control



### ■ Features

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

Part Number	Center Bandpass Frequency (TYP.)
GP1UF310YP0F	36 kHz
GP1UF311YP0F	38 kHz
GP1UF312YP0F	36.7 kHz
GP1UF314YP0F	40 kHz

### ■ Agency Approvals/Compliance

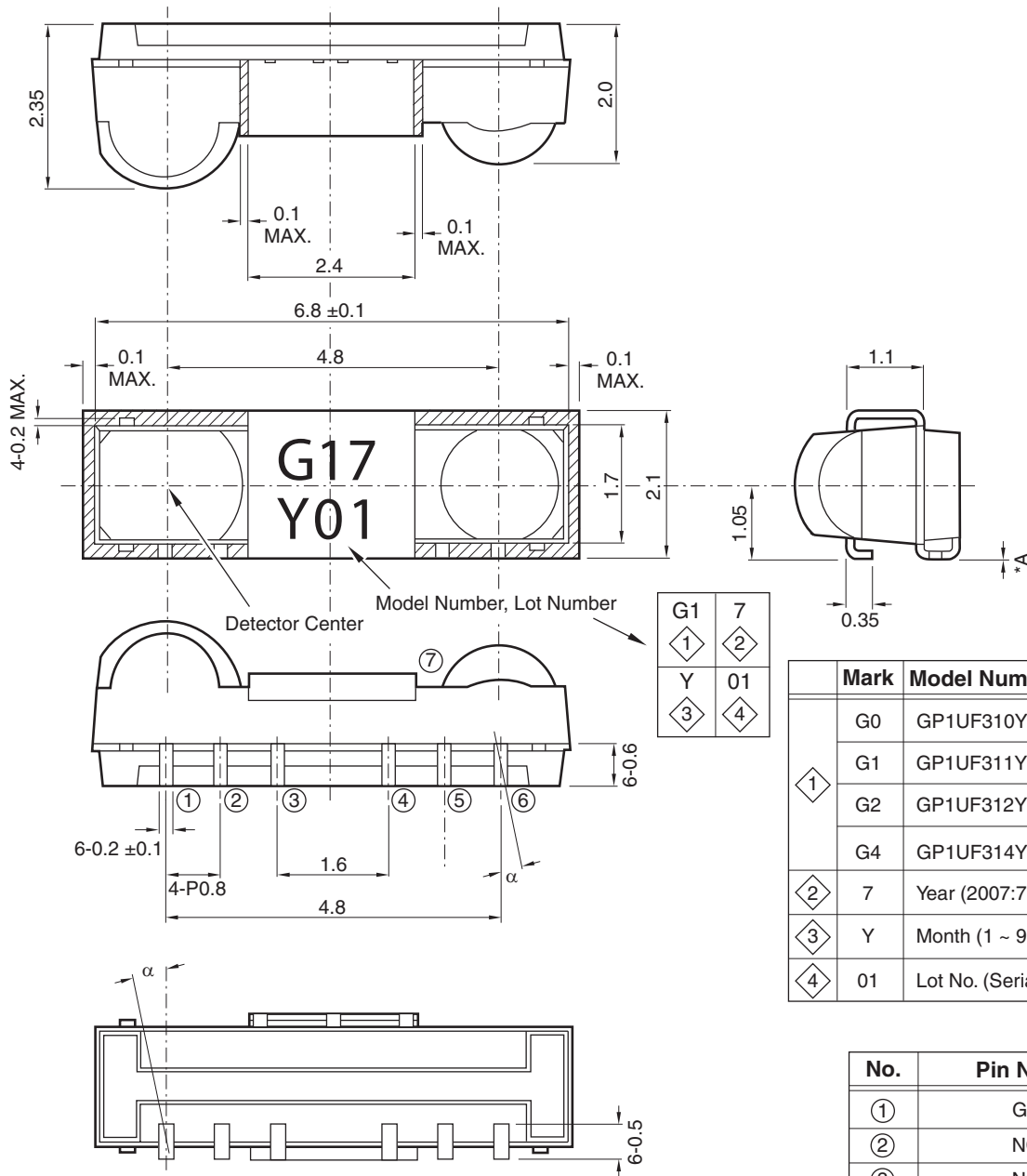
1. Compliant with RoHS directive (2002/95/EC)
2. Content information about the six substances specified in "Management Methods for Control of Pollution Caused by Electronic Information Products Regulation" (popular name: China RoHS) (Chinese: 电子信息产品污染控制管理办法); refer to page 14.

### ■ Applications

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

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External Dimensions

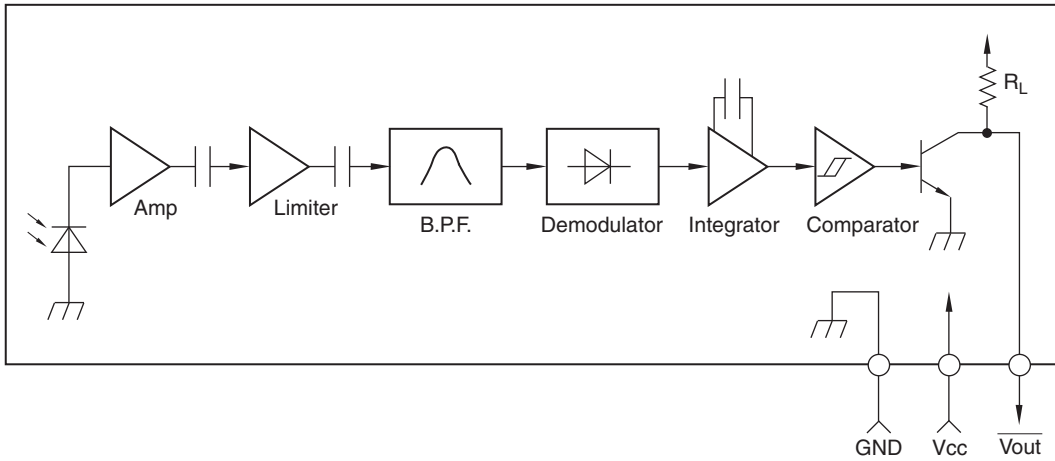


**NOTES:**

1. Units: mm
2. Unspecified tolerance: ±0.2 mm
3. Resin burr portions are shown
4. A\*: 0.15 mm MAX. Coplanarity
5. α: ±10° MAX.

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■ **Block Diagram**



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■ **Absolute Maximum Ratings**

Parameter	Symbol	Rating	Unit	Notes
Supply voltage	$V_{CC}$	0 to 6	V	
Operating temperature	$T_{opr}$	-30 to +85	°C	*1
Storage temperature	$T_{stg}$	-30 to +85	°C	
Soldering temperature	$T_{sol}$	260	°C	*2

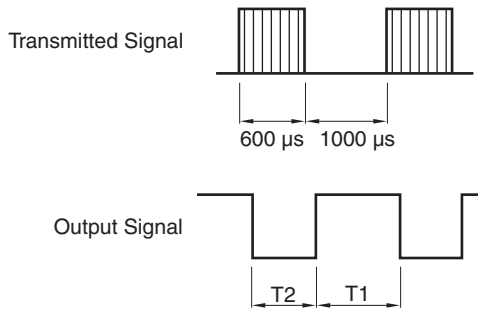
\*1 Non-condensing: humidity kept above dew point.  
 \*2 Apply heat no more than 10 seconds.

■ **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 <sup>*1</sup>		—	0.45	V
Output HIGH pulse width	T1	See Figure 2	600		1200	μS
Output LOW pulse width	T2	See Figure 2	400		1000	μS
Bandpass Frequency center	$f_o$	GP1UF310YP0F		36		kHz
		GP1UF311YP0F		38		kHz
		GP1UF312YP0F		36.7		kHz
		GP1UF314YP0F		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%

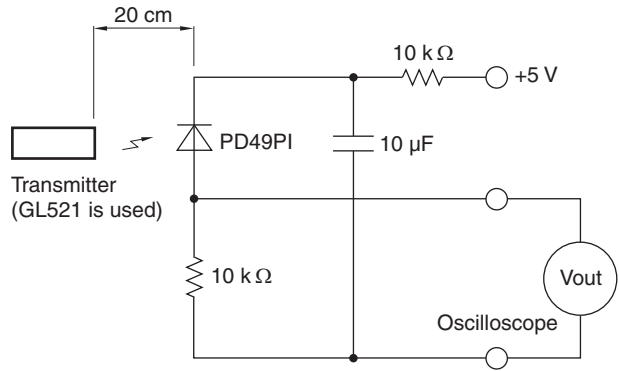
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● Performance Measurements

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

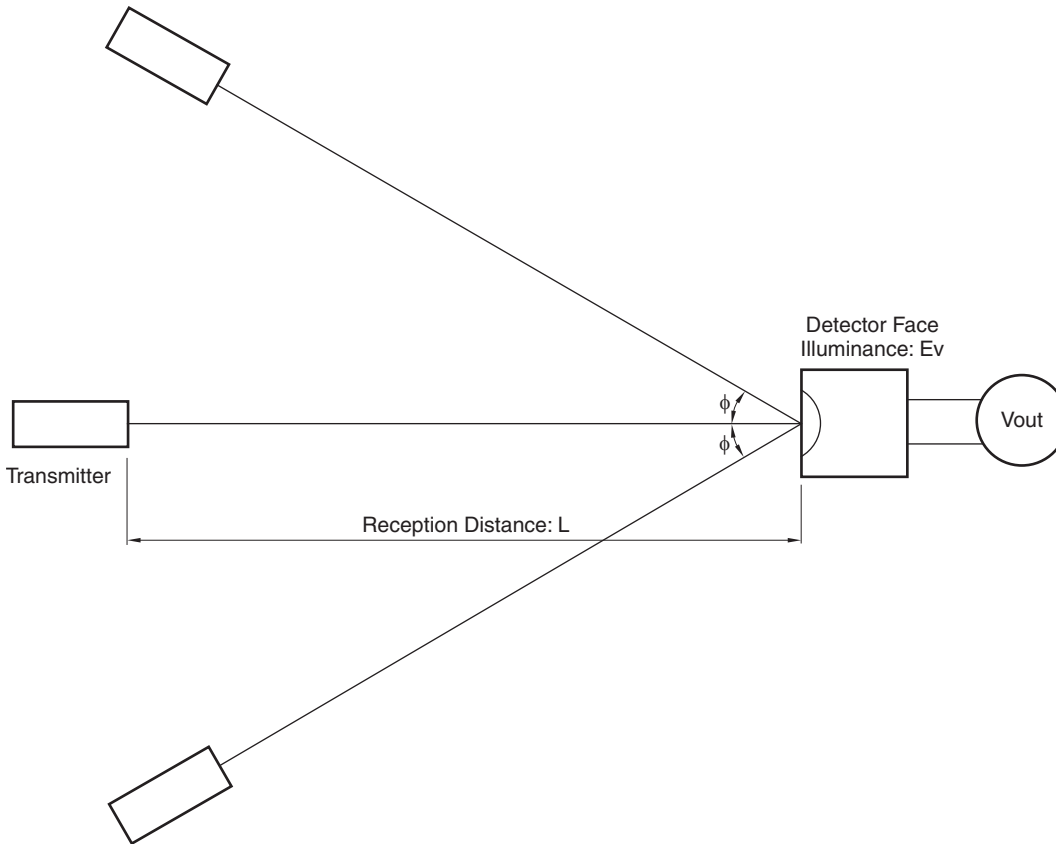
Fig. 2. Transmitter Test Setup



NOTE: Carrier Duty 50%

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Fig. 3. Receiver Test Setup



NOTE:  $\phi$ : Indicates horizontal and vertical directions.

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**■ Design Considerations**

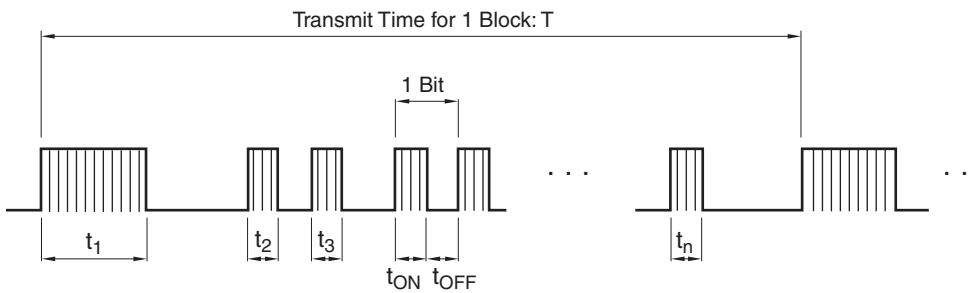
**Design Guidelines**

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  $\mu$ s or more. The OFF signal time of  $T_{OFF}$  (which is the pulse width per bit of the modulated IR) should be 400  $\mu$ s or more when  $V_{CC} = 2.7$  to 3.0 V; and 300  $\mu$ s 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**

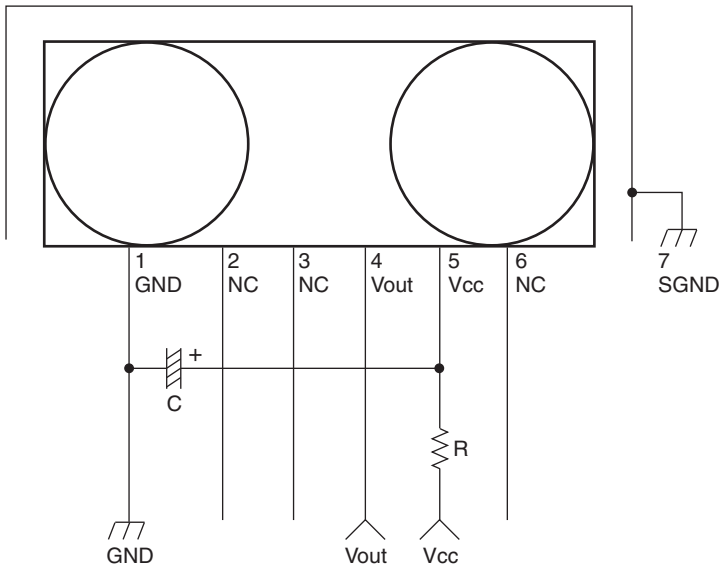


$$D_t = \left( \frac{\sum_{N=1}^n t_N}{T} \right) \times 100 (\%)$$

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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 structure so as to reduce the amount of external light interference. 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  $\Omega$  (1/10W) resistor and 10  $\mu$ F capacitor.

Fig. 5. Device Connection



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## ■ Manufacturing Guidelines

### ● Storage and Handling

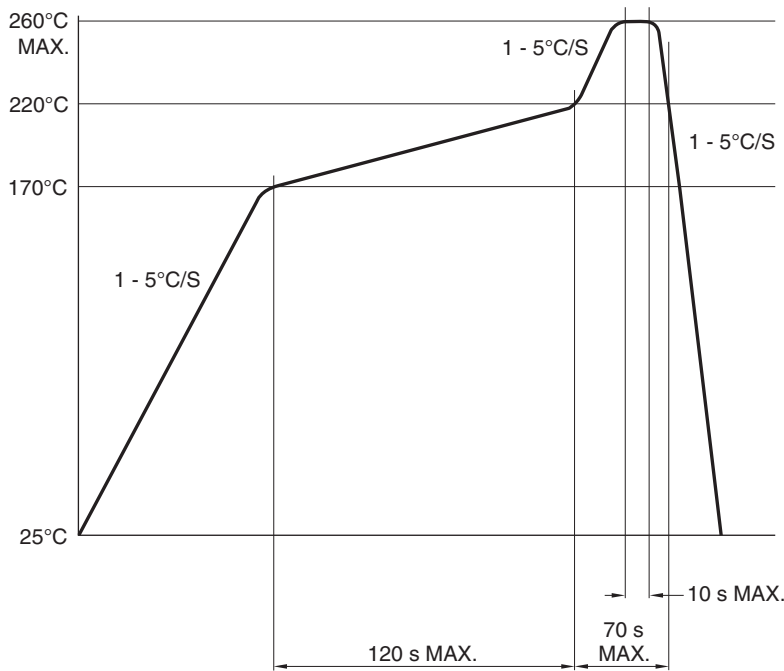
1. Moisture-proofing: These parts are shipped in vacuum-sealed packaging to keep them dry and ready for use.
2. Store these parts between 10°C and 30°C, at a relative humidity of less than 70%, for up to a year.
3. After breaking the package seal, maintain the environment within 10°C to 30°C, at a relative 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. 6. Reflow should occur within three days, after storing at 10°C 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. 6.
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. 6. Soldering Profile**



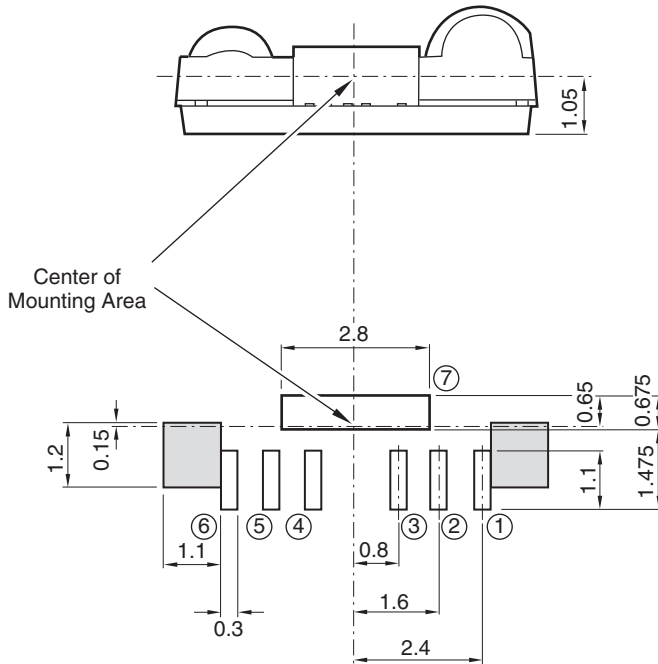
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● **PCB Footprint**

Fig. 7 shows the recommended PCB footprint for this device.

**Fig. 7. Device Footprint**



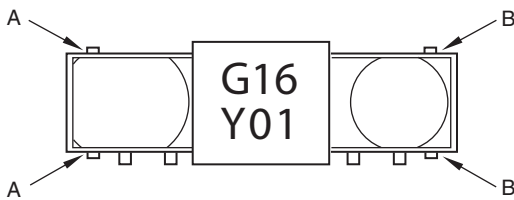
Avoid circuit runs in this area.

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● **Conductive Areas**

Fig. 8 shows the externally conductive areas on this device. Note that the areas marked 'A' are electrically connected to GND. Areas marked 'B' are NC.

**Fig. 8. Conductive Areas**



**NOTES:**

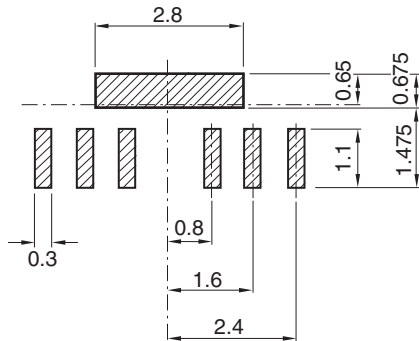
1. Tabs "A" are electrically connected to GND internally.
2. Tabs "B" are NC internally.

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● **Soldering Mask**

Fig. 9 shows the recommended solder mask for this device.

**Fig. 9. Soldering Mask**



**NOTES:**

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

 = Soldering paste area

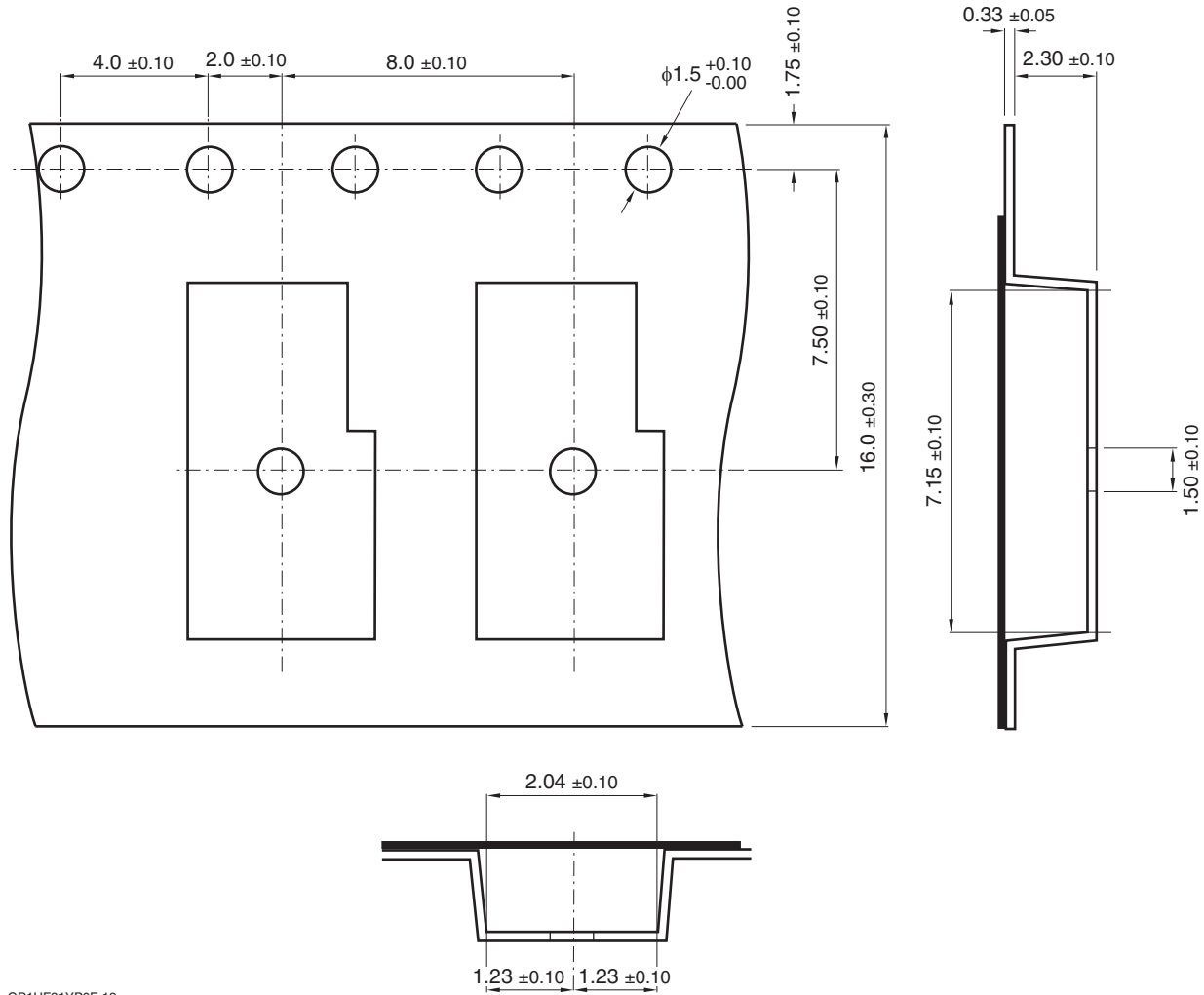
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● **Cleaning Instructions**

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

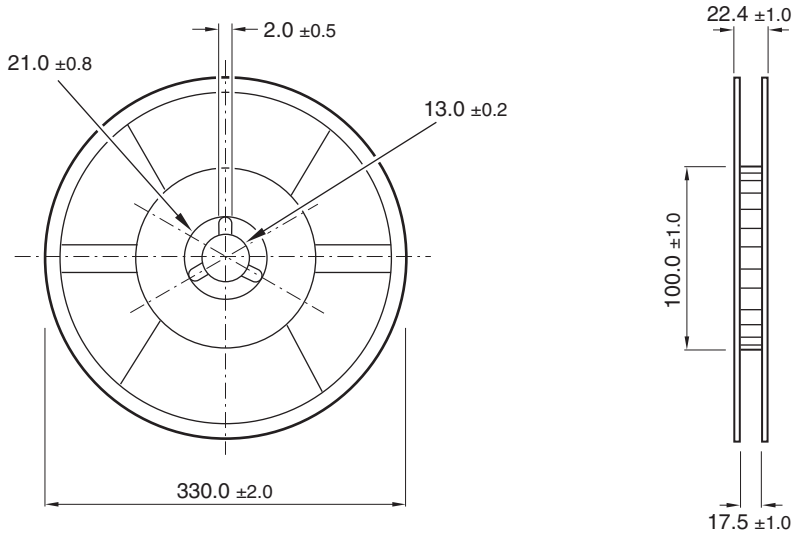
Fig. 10 Tape Shape and Dimensions



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■ Reel Specifications

Fig. 11 Reel Shape and Dimensions

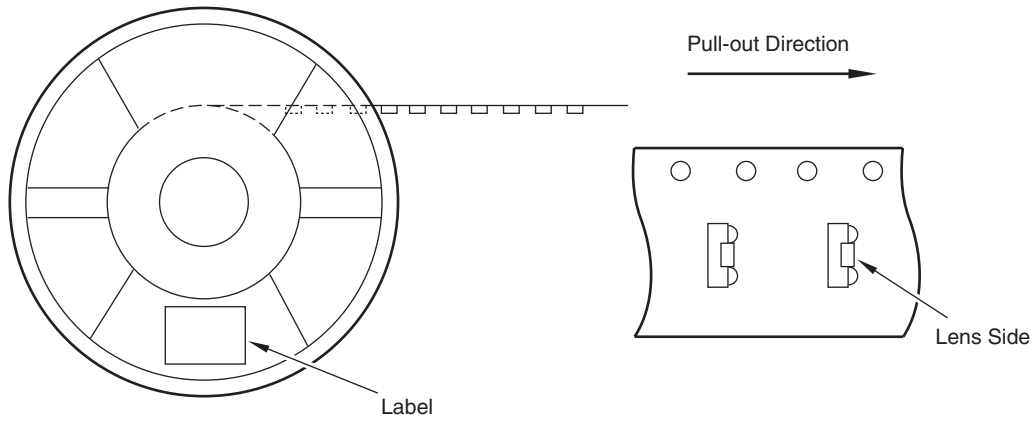


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■ Product Insertion Direction

Fig. 12 shows the orientation of the device in the tape.

Fig. 12 Product Insertion



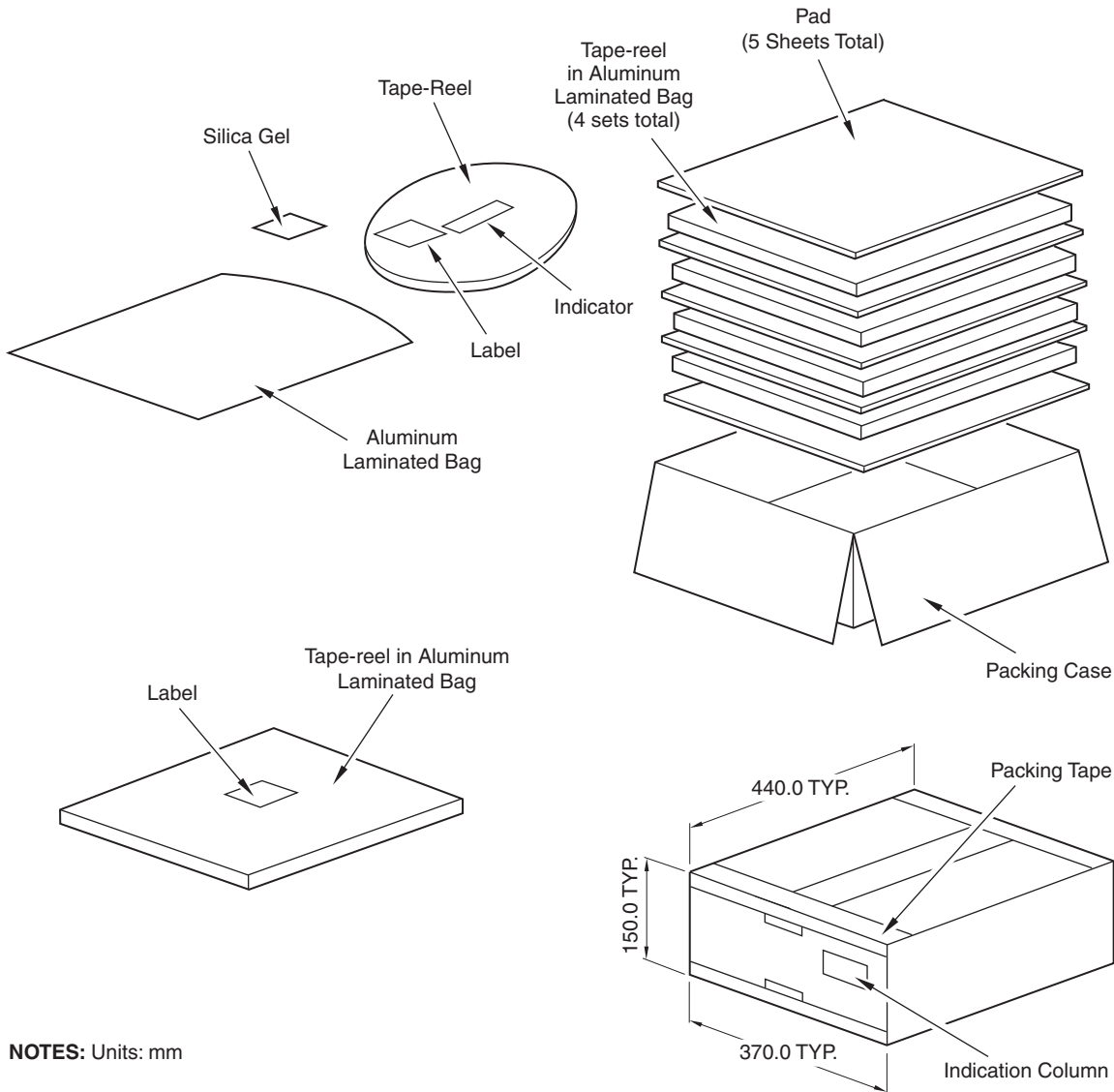
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● Packing Information

Product is sealed in laminated aluminum bags with 2000 pieces per reel, silica gel desiccant, and humidity telltale. The EIAJ C-3 compliant label is filled out and affixed to the bag. Four of these packaged reels of product are then 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 Drawing



NOTES: Units: mm

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**■ 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 <sup>6+</sup> )	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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- Office automation equipment
- Telecommunication equipment (terminal)
- Test and measurement equipment
- Industrial control
- Audio visual equipment
- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:

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

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