

GP1USC3xXP (Series)

Infrared Detector for Remote Control



■ Features

1. Compact size: (mounting area 5.0 × 4.5; and 1.35 mm tall)
2. SMD (Surface Mount Device), reflow capable
3. Low power dissipation: 0.6 mA MAX.
4. Wide operating temperature range: -30 to + 85°C
5. Five parts, offering a number of center frequencies:

Part Number	Center Bandpass Frequency (TYP.)
GP1USC30XP	36 kHz
GP1USC31XP	38 kHz
GP1USC32XP	36.7 kHz
GP1USC33XP	32.75 kHz
GP1USC34XP	40 kHz

■ Agency Approvals/Compliance

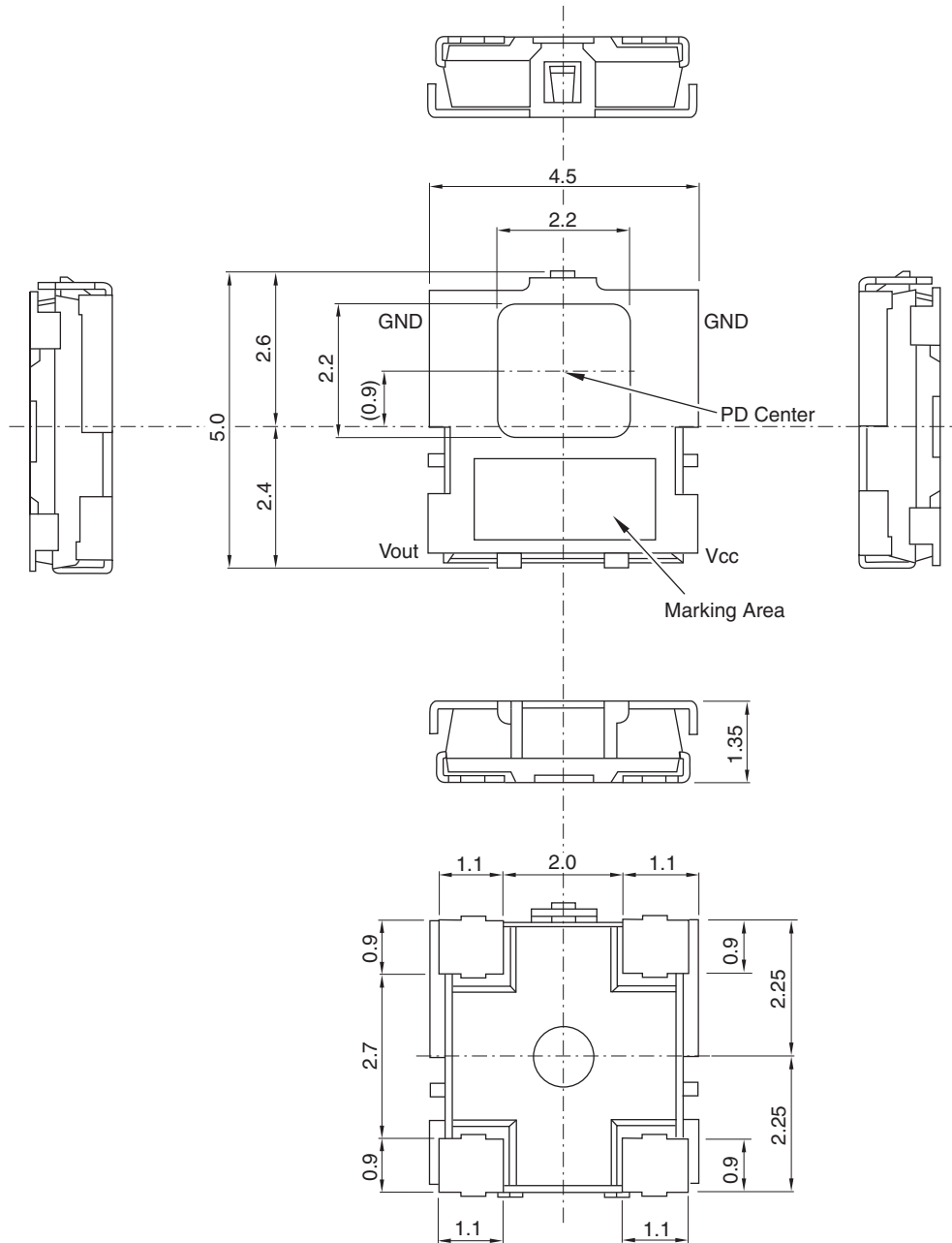
1. Compliant with RoHS directive (2002/95/EC)
2. Content information about the six substances specified in "Management Methods for Control of Pollution Caused by Electronic Information Products Regulation" (popular name: China RoHS) (Chinese: 电子信息产品污染控制管理办法); refer to page 12.

■ Applications

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

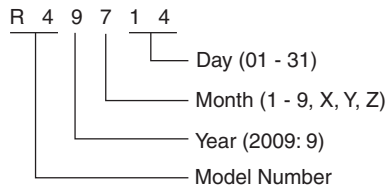
Notice The content of this Data Sheet is subject to change without prior notice.
In the absence of confirmation by device specification sheets, Sharp takes no responsibility for any defects that may occur in equipment using any Sharp devices shown in catalogs, data books, etc. Contact Sharp in order to obtain the latest device specification sheets before using any Sharp device.

External Dimensions



NOTES:

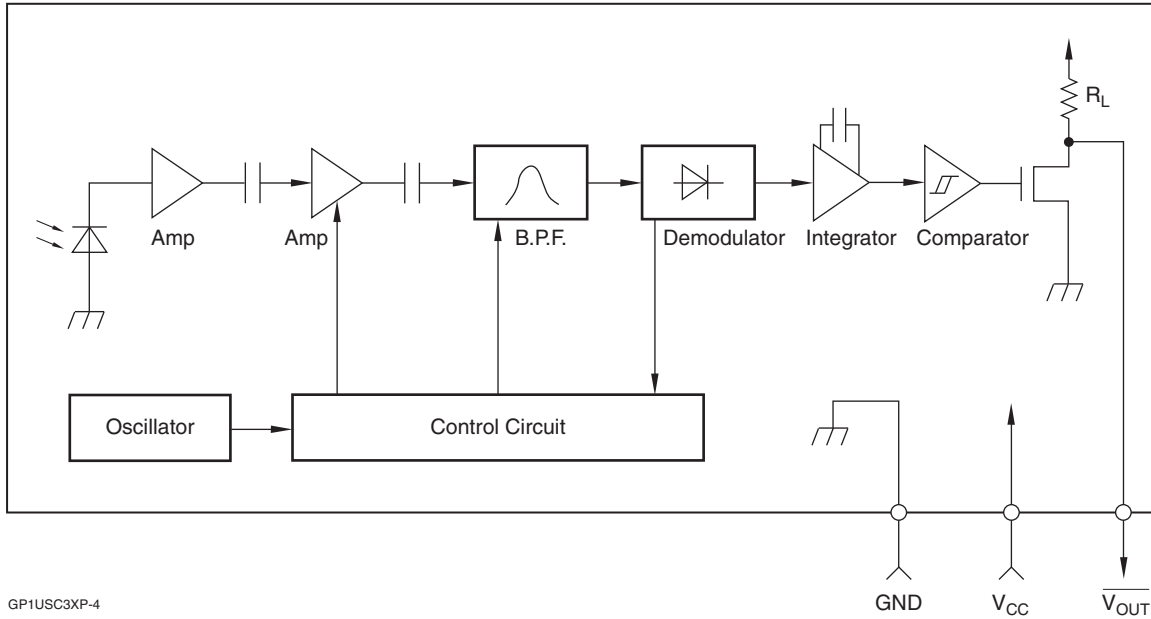
1. Units: mm
2. Unspecified tolerance: ± 0.3
3. Case and lead material: Cu (Au, Pd plating)
4. Mold resin: Epoxy resin
5. Product mass: Approx 0.06 g



Model No.	Stamp
GP1USC30XP	R0
GP1USC31XP	R1
GP1USC32XP	R2
GP1USC33XP	R3
GP1USC34XP	R4

GP1USC3XP-1

■ **Block Diagram**



GP1USC3XP-4

■ **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}	-40 to +85	°C	
Soldering temperature	T_{sol}	255 (peak) 230	°C	*2

*1 Non-condensing; humidity kept above dew point.

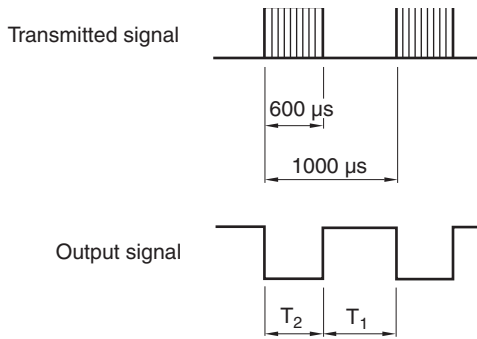
*2 255°C is a peak maximum value when flow-soldering; for hand soldering, 230°C and apply heat no more than 40 seconds.

■ **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)	—	0.35	0.6	mA
Output HIGH voltage	V_{OH}	See Note 1	$V_{CC} - 0.5$	—	—	V
Output LOW voltage	V_{OL}	$I_{OL} = 1.6$ mA ^{*1}		—	0.45	V
Output HIGH pulse width	T_1	See Figure 2	600		1200	μs
Output LOW pulse width	T_2	See Figure 2	400		1000	μs
Bandpass Frequency center	f_o	GP1USC30XP		36		kHz
		GP1USC31XP		38		kHz
		GP1USC32XP		36.7		kHz
		GP1USC33XP		32.75		kHz
		GP1USC34XP		40		kHz
Output pullup resistance	R_L			50		kΩ

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

Fig. 1. Transmitted and Received Pulses



GP1USC3XP-5

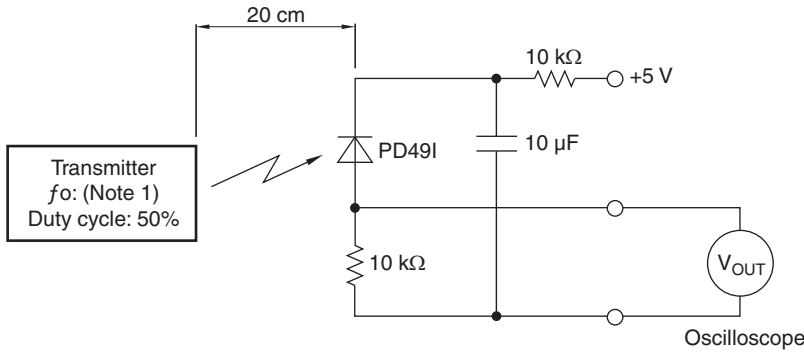
● Performance Measurements

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 15.0 meters; detector face illumination: $E_v < 10 \text{ lx}$, $\phi = 0^\circ$

2. Reception Angle Sensitivity: Distance between transmitter and receiver: 0.2 to 12 meters; detector face illumination: $E_v < 10 \text{ lx}$, $\phi \leq 30^\circ$
3. Transmitter Test Setup: In Fig. 2, the transmitter is set so that V_{out} will be 180 mV p-p. The PD49PI has a short-circuit current $I_{SC} = 2.6 \mu\text{A}$ at $E_v = 100 \text{ lx}$.

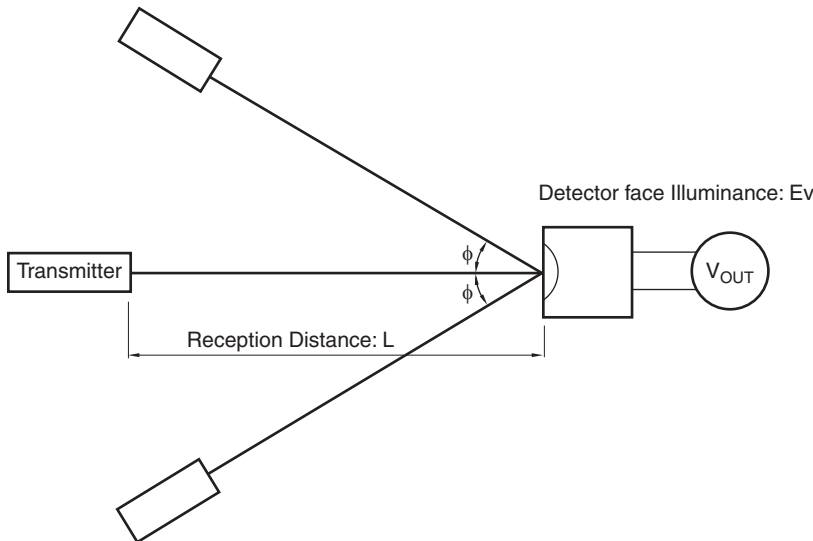
Fig. 2. Transmitter Test Setup



NOTE: 1. The BPF center frequency f_o varies with model, as shown in the Electro-optical Characteristics

GP1USC3XP-6

Fig. 3. Receiver Test Setup



NOTE: ϕ : Indicates horizontal and vertical directions

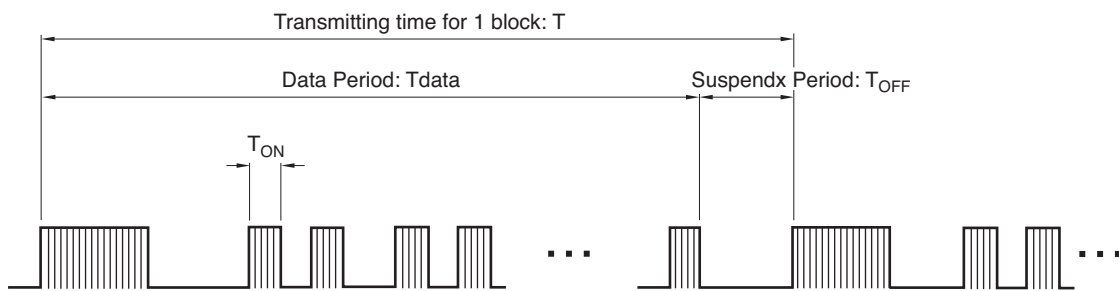
GP1USC3XP-7

■ 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. Conductive thermoplastics are used in the second mold resin of this part. Do not allow this resin to come in contact with the PCB landing or any circuit runs.
4. When using this part in a remote control detector, the incoming signal must be managed so that T_{data} is less than 100 ms and T_{off} (suspend time) is more than 25 ms; and the minimum pulse width of modulated IR data is 250 μ s during T_{on} . Should the signal format fail to meet these conditions, the reception distance or device output may be compromised. See Fig. 4.

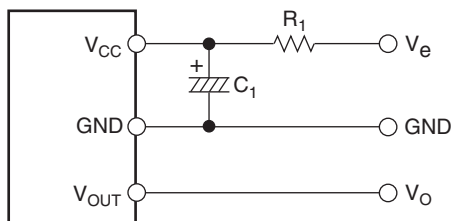
Fig. 4. Transmit Time for One Signal Block



GP1USC3XP-2

5. 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.
6. This device may have degraded optical performance if the detector surface becomes dirty or coated with any foreign substance. This may happen through the use of process chemicals, including washing; it is for this reason that Sharp does not recommend washing this part. If the detector surface becomes contaminated, use a soft cloth to wipe it clean.
7. 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.

Fig. 5. Device Connection



NOTES:

$R_1 = 47 \Omega \pm 5\%$

$C_1 = 47 \mu F$

GP1USC3XP-3

8. 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 $47\ \Omega$ (1/10 W) resistor and $10\ \mu\text{F}$ capacitor.
9. This part is not highly tolerant of condensing conditions. Condensation can degrade the case and lead connections, leading to degraded electrical characteristics.

■ 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%. Mount the parts within 2 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. If these parts will undergo a second reflow operation, and if they have exceeded the open time as noted above, they must be baked.

In all cases, these parts may be baked only once:

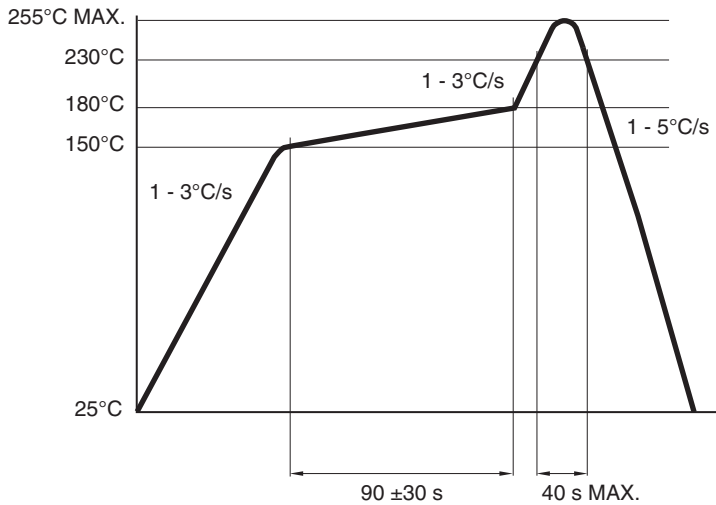
- When in the tape carrier, bake them at a temperature of 65°C for 48 hours. Bake only one reel at a time; reels will become deformed if stacked.
- When loose on a metal tray or on a PCB, bake them at a temperature of 100°C to 110°C , for 12 to 24 hours. Temporary mounting on a PCB must be using an adhesive and not by soldering.

Baking these particular parts in the reels is to be avoided if at all possible. To properly bake these parts, they should be mounted to a PCB with adhesive (not soldered) or placed in a metal tray.

● 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

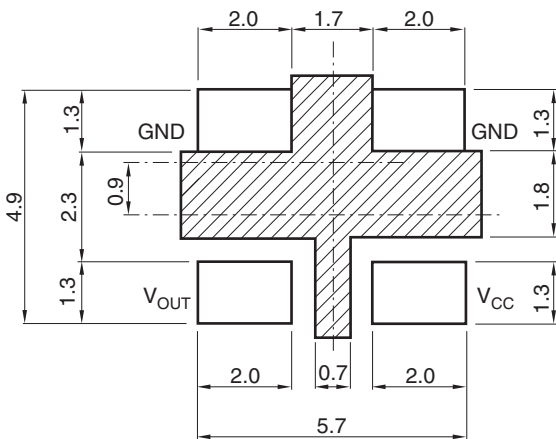


GP1USC3XP-8

● Soldering Mask

Fig. 7 shows the recommended solder mask for this device.

Fig. 7. Soldering Mask



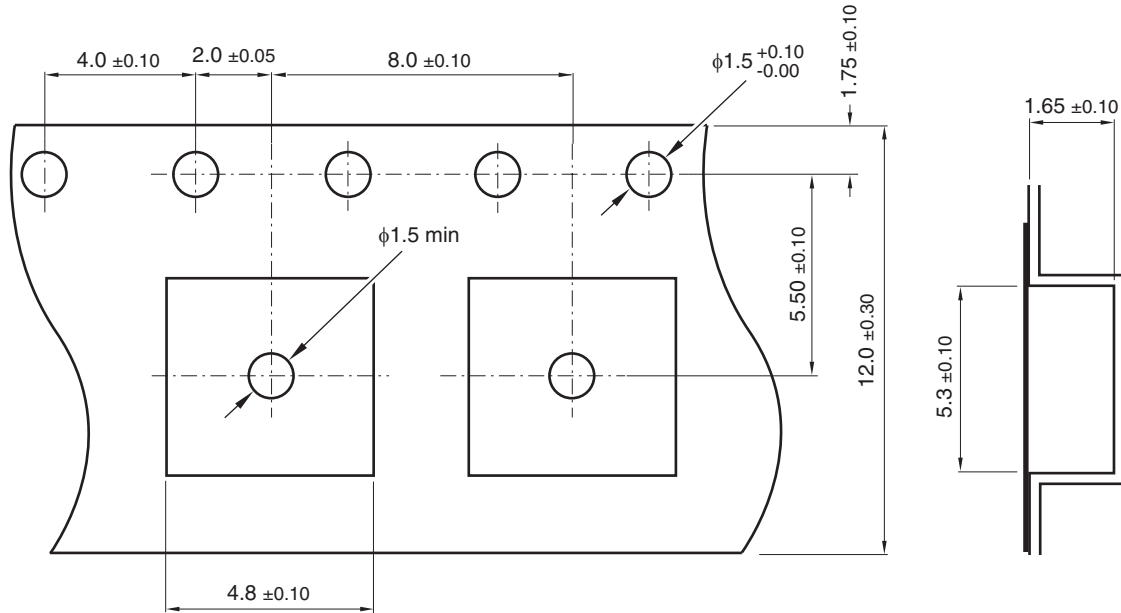
GP1USC3XP-13

● Cleaning Instructions

- 1. If the detector face becomes contaminated, the optical characteristics of this part will be affected. Do not wash this part, as residue left from solvents may be left behind. Only clean the part with a soft cloth.
- 2. Recommended solvent materials: Ethyl alcohol, Methyl alcohol, and Isopropyl alcohol.

■ Tape Specifications

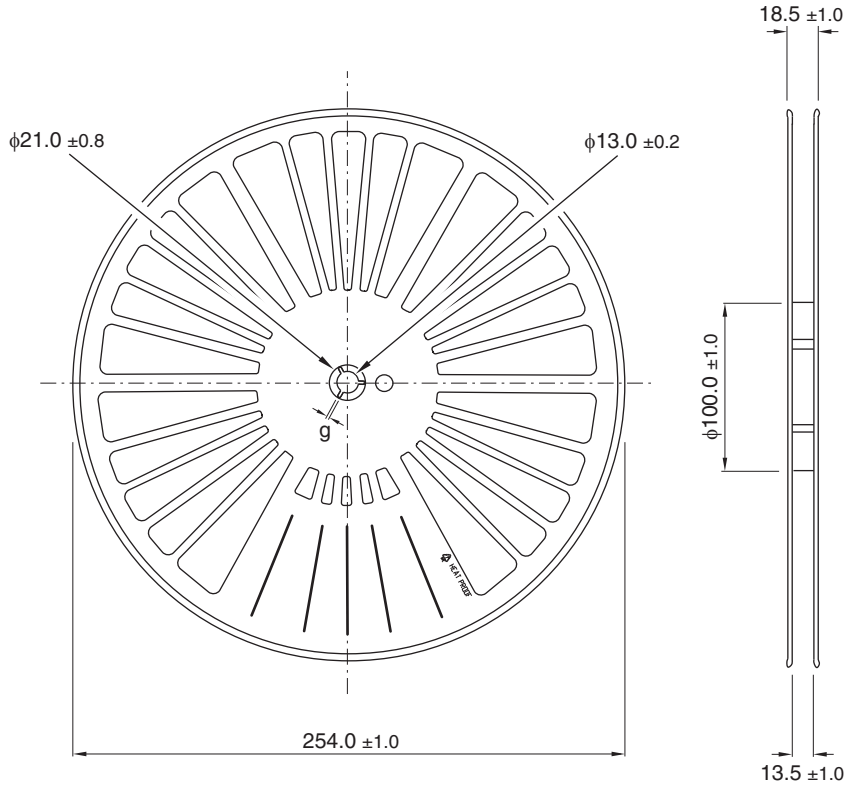
Fig. 8 Tape Shape and Dimensions



GP1USC3XP-9

■ Reel Specifications

Fig. 9 Reel Shape and Dimensions

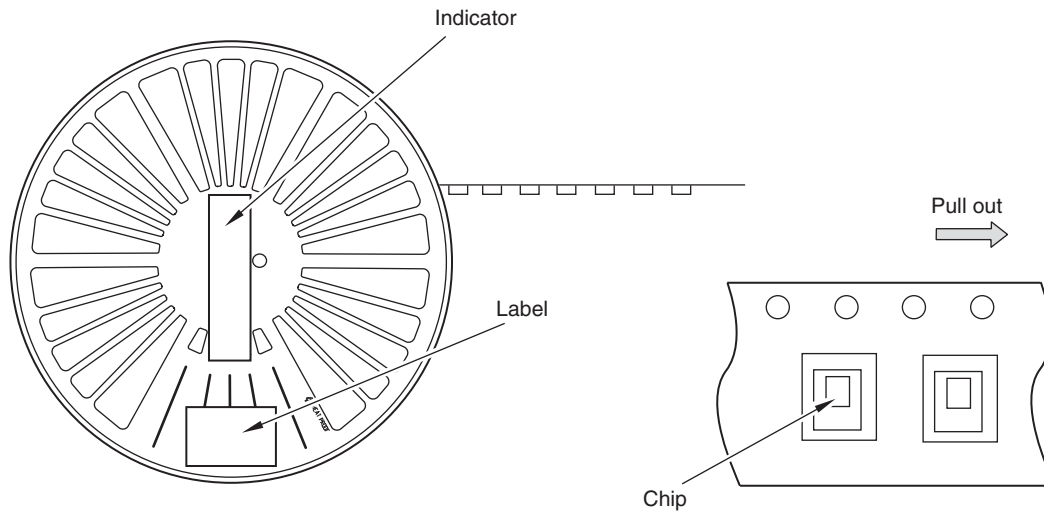


GP1USC3XP-10

■ Product Insertion Direction

Fig. 10 shows the orientation of the device in the tape.

Fig. 10 Product Insertion



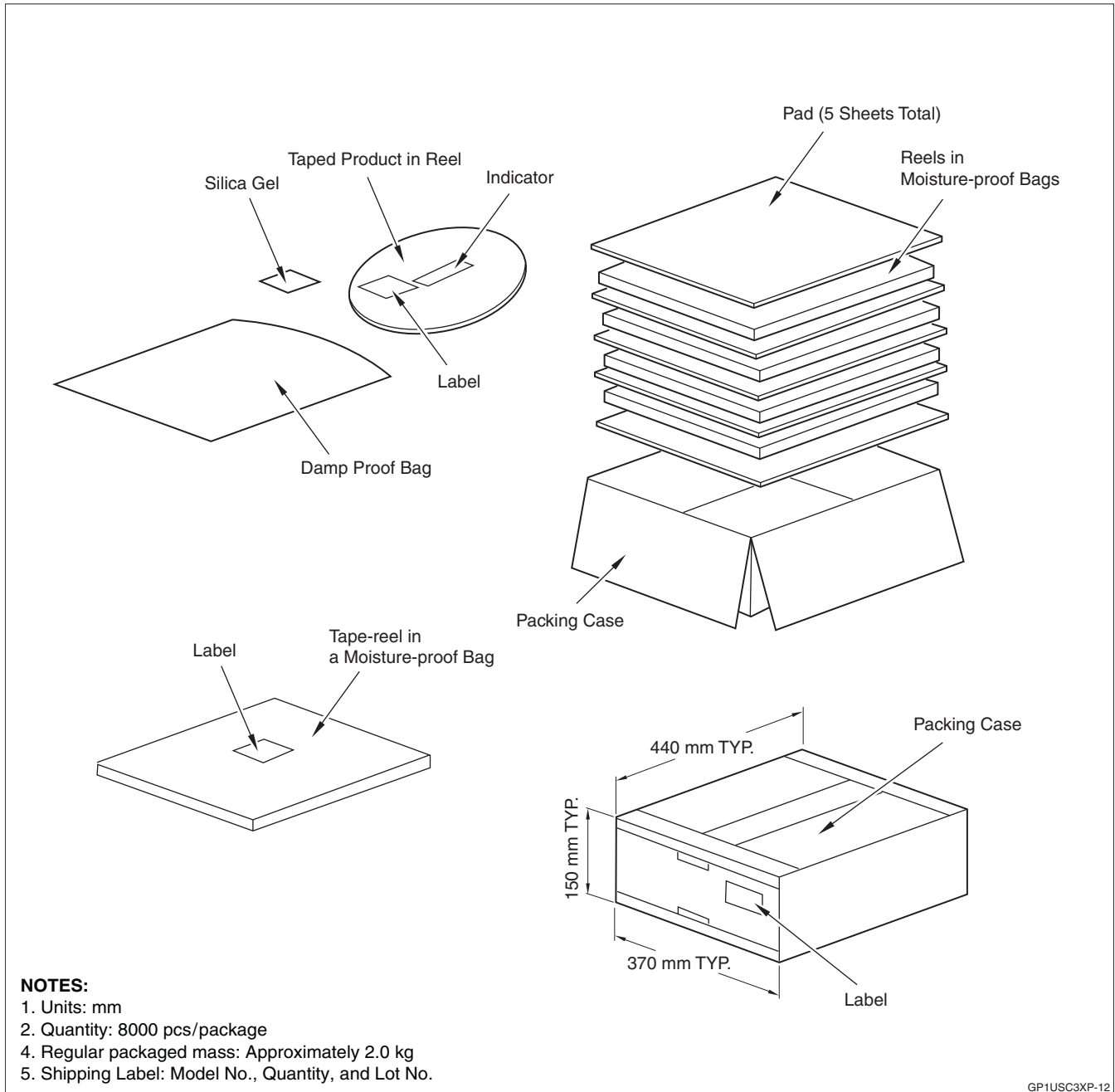
GP1USC3XP-11

● 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 2 kg; the mass of each part is approximately 0.05 g.

Fig. 11 Shipping Package Drawing



■ 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.

■ Important Notices

· The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.

· Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.

· Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(i) The devices in this publication are designed for use in general electronic equipment designs such as:

- Personal computers
- 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:

- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
- Traffic signals
- Gas leakage sensor breakers
- Alarm equipment
- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

- Space applications
- Telecommunication equipment (trunk lines)
- Nuclear power control equipment
- Medical and other life support equipment (e.g. scuba)

· If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

· This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

· Contact and consult with a SHARP representative if there are any questions about the contents of this publication.