

# GP1S56TJ000F

Gap : 2mm, Slit : 0.15mm  
Phototransistor Output,  
Case package Transmissive  
Photointerrupter



## ■ Description

**GP1S56TJ000F** is a standard, phototransistor output, transmissive photointerrupter with opposing emitter and detector in a case, providing non-contact sensing. For this family of devices, the emitter and detector are inserted in a case, resulting in a through-hole design.

This device is unique because it uses position pins to insure accurate placement on the PCB, and has the short profile.

## ■ Features

1. Transmissive with phototransistor output
2. Highlights :
  - Vertical Slit for alternate motion detection
  - Positioning Pin to prevent misalignment
  - High resolution (Slit width : 0.15 mm)
3. Key Parameters :
  - Gap Width : 2mm
  - Slit Width (detector side): 0.15mm
  - Package : 11×7.5×5mm
4. RoHS directive compliant

## ■ Agency approvals/Compliance

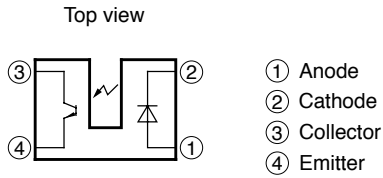
1. Compliant with RoHS directive

## ■ Applications

1. General purpose detection of object presence or motion.
2. Example : Printer, FAX, Optical storage unit

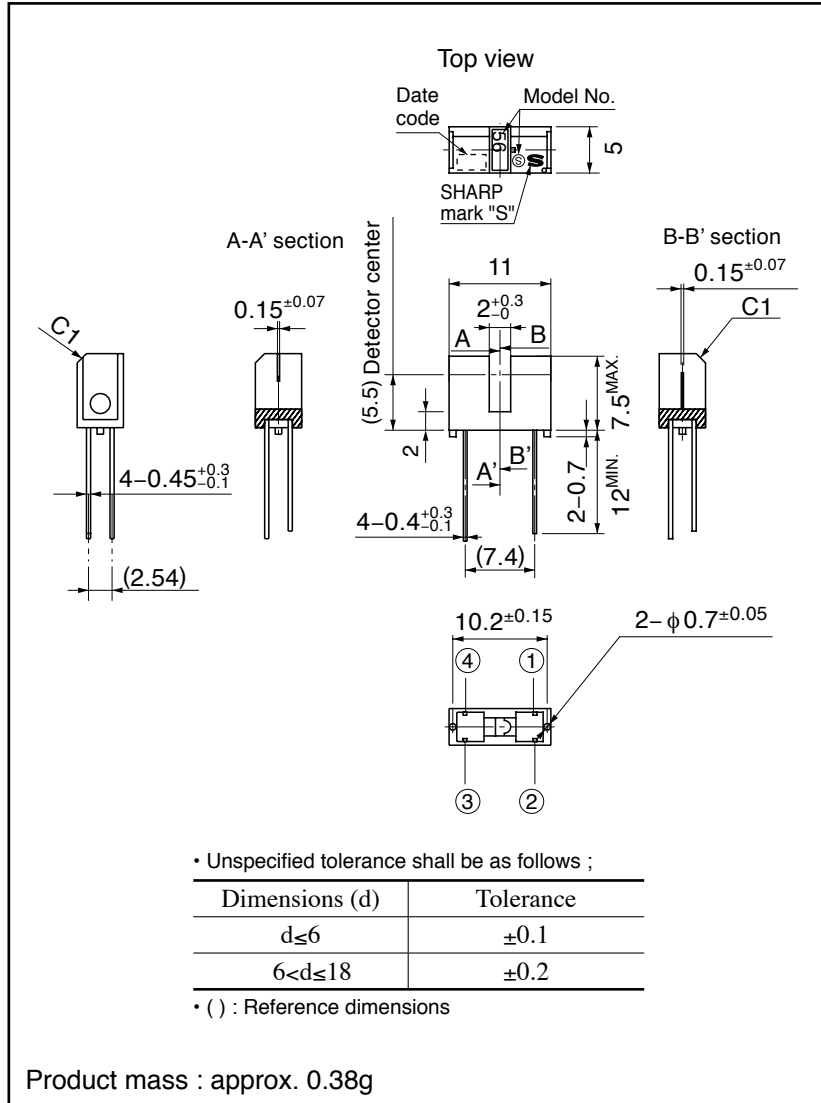
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## Internal Connection Diagram



## Outline Dimensions

(Unit : mm)



Dip soldering material : Sn-3Ag-0.5Cu

**Date code (2 digit)**

| 1st digit          |      | 2nd digit           |      |
|--------------------|------|---------------------|------|
| Year of production |      | Month of production |      |
| A.D.               | Mark | Month               | Mark |
| 2000               | 0    | 1                   | 1    |
| 2001               | 1    | 2                   | 2    |
| 2002               | 2    | 3                   | 3    |
| 2003               | 3    | 4                   | 4    |
| 2004               | 4    | 5                   | 5    |
| 2005               | 5    | 6                   | 6    |
| 2006               | 6    | 7                   | 7    |
| 2007               | 7    | 8                   | 8    |
| 2008               | 8    | 9                   | 9    |
| 2009               | 9    | 10                  | X    |
| 2010               | 0    | 11                  | Y    |
| :                  | :    | 12                  | Z    |

repeats in a 10 year cycle

**Country of origin**

Japan or Indonesia

(Indicated on the packing case)

## ■ Absolute Maximum Ratings (T<sub>a</sub>=25°C)

| Parameter                |                                | Symbol           | Rating      | Unit |
|--------------------------|--------------------------------|------------------|-------------|------|
| Input                    | *1 Forward current             | I <sub>F</sub>   | 50          | mA   |
|                          | *2 Peak forward current        | I <sub>FM</sub>  | 1           | A    |
|                          | Reverse voltage                | V <sub>R</sub>   | 6           | V    |
|                          | Power dissipation              | P                | 75          | mW   |
| Output                   | Collector-emitter voltage      | V <sub>CEO</sub> | 35          | V    |
|                          | Emitter-collector voltage      | V <sub>ECO</sub> | 6           | V    |
|                          | Collector current              | I <sub>C</sub>   | 20          | mA   |
|                          | *1 Collector power dissipation | P <sub>C</sub>   | 75          | mW   |
| Operating temperature    |                                | T <sub>opr</sub> | -25 to +85  | °C   |
| Storage temperature      |                                | T <sub>stg</sub> | -40 to +100 | °C   |
| *3 Soldering temperature |                                | T <sub>sol</sub> | 260         | °C   |

\*1 Refer to Fig. 1, 2, 3

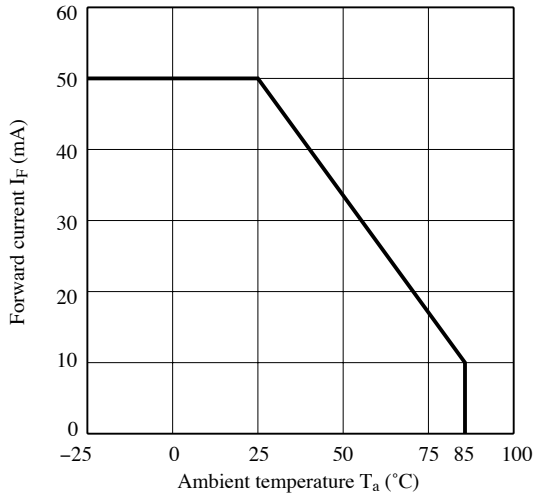
\*2 Pulse width ≤ 100μs, Duty ratio=0.01

\*3 For 5s or less

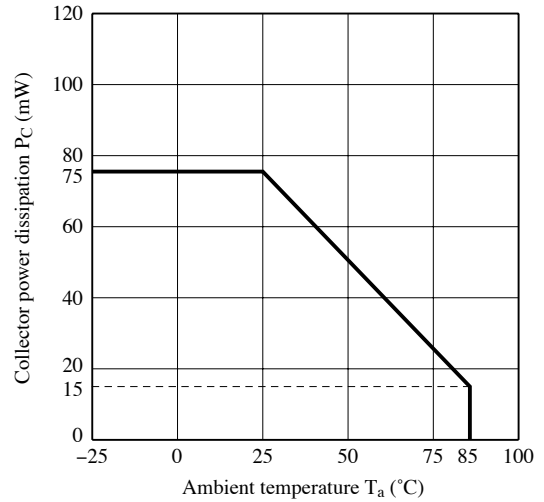
## ■ Electro-optical Characteristics (T<sub>a</sub>=25°C)

| Parameter                |                                      | Symbol               | Condition                                    | MIN.  | TYP. | MAX. | Unit |    |
|--------------------------|--------------------------------------|----------------------|--|---|------|------|------|----|
| Input                    | Forward voltage                      | V <sub>F</sub>       | I <sub>F</sub> =20mA                         | -   | 1.2  | 1.4  | V    |    |
|                          | Peak forward voltage                 | V <sub>FM</sub>      | I <sub>FM</sub> =0.5A                        | -   | 3    | 4    | V    |    |
|                          | Reverse current                      | I <sub>R</sub>       | V <sub>R</sub> =3V                           | -   | -    | 10   | μA   |    |
| Output                   | Collector dark current               | I <sub>CEO</sub>     | V <sub>CE</sub> =20V                         | -   | 1    | 100  | nA   |    |
| Transfer characteristics | Collector current                    | I <sub>C</sub>       | V <sub>CE</sub> =5V, I <sub>F</sub> =20mA    | 0.4   | -    | -    | mA   |    |
|                          | Collector-emitter saturation voltage | V <sub>CE(sat)</sub> | I <sub>F</sub> =40mA, I <sub>C</sub> =0.25mA | -   | -    | 0.4  | V    |    |
|                          | Response time                        | Rise time            | t <sub>r</sub>                               | V <sub>CE</sub> =2V, I <sub>C</sub> =0.5mA, R <sub>L</sub> =1kΩ | -    | 38   | 90   | μs |
|                          |                                      | Fall time            | t <sub>f</sub>                               |   | -    | 48   | 110  |    |

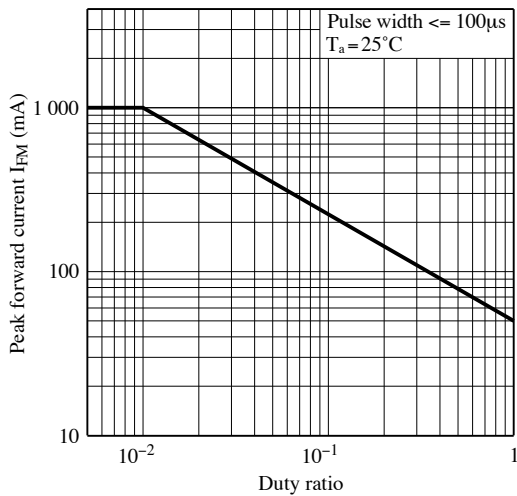
**Fig.1 Forward Current vs. Ambient Temperature**



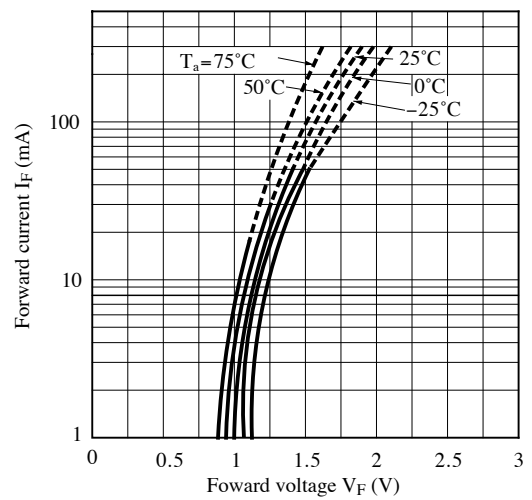
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



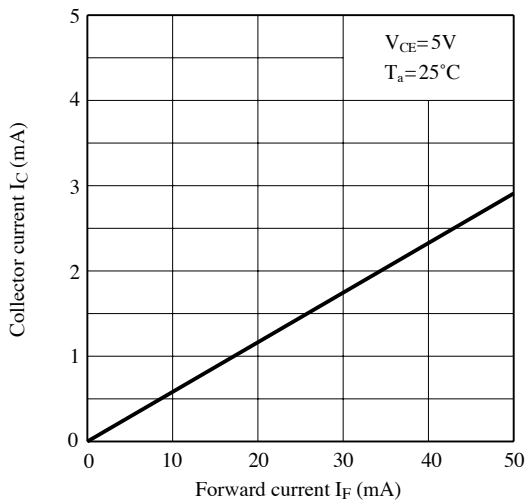
**Fig.3 Peak Forward Current vs. Duty Ratio**



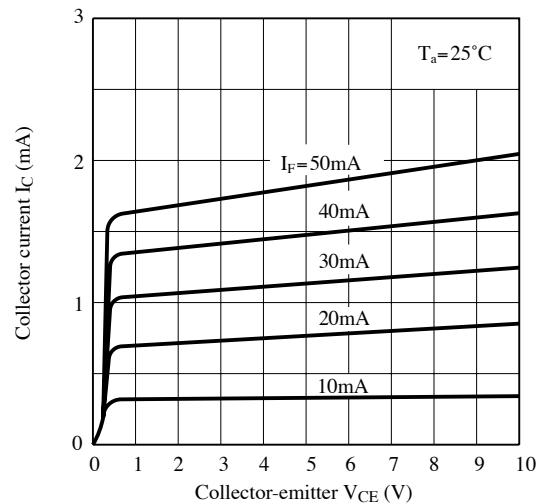
**Fig.4 Forward Current vs. Forward Voltage**



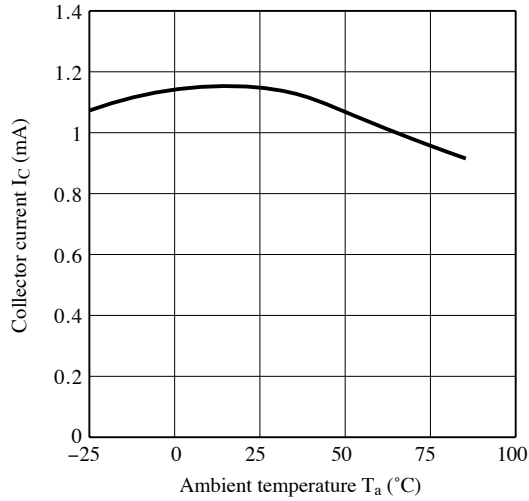
**Fig.5 Collector Current vs. Forward Current**



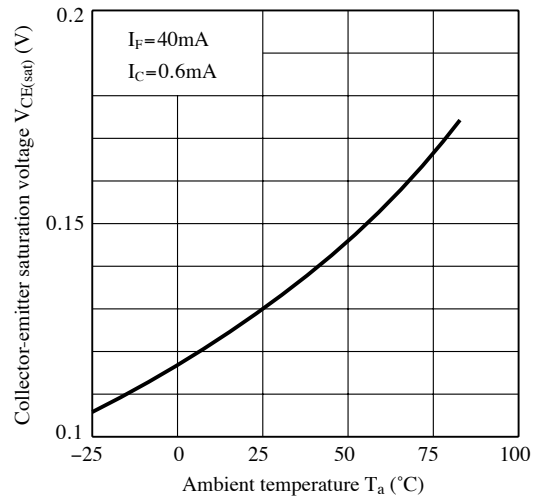
**Fig.6 Collector Current vs. Collector-emitter Voltage**



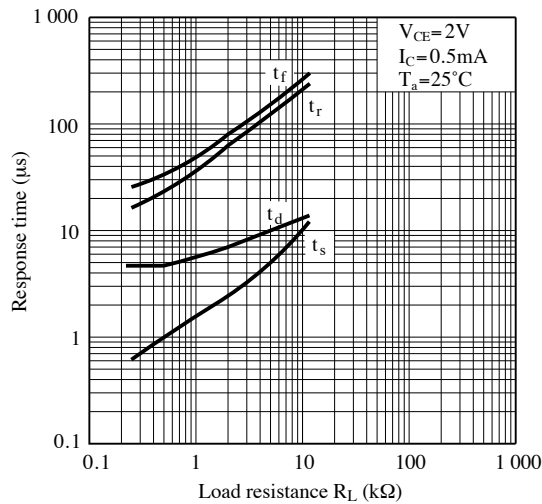
**Fig.7 Collector Current vs. Ambient Temperature**



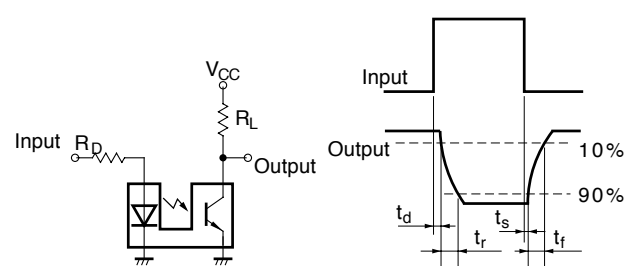
**Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature**



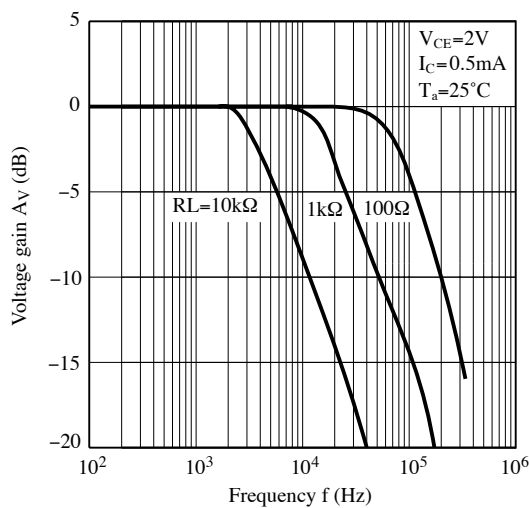
**Fig.9 Response Time vs. Load Resistance**



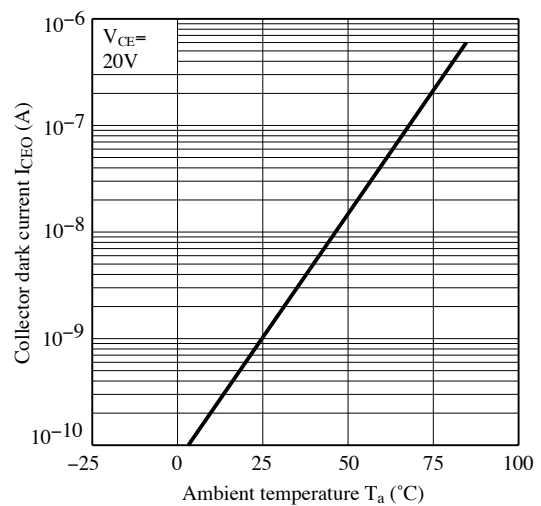
**Fig.10 Test Circuit for Response Time**



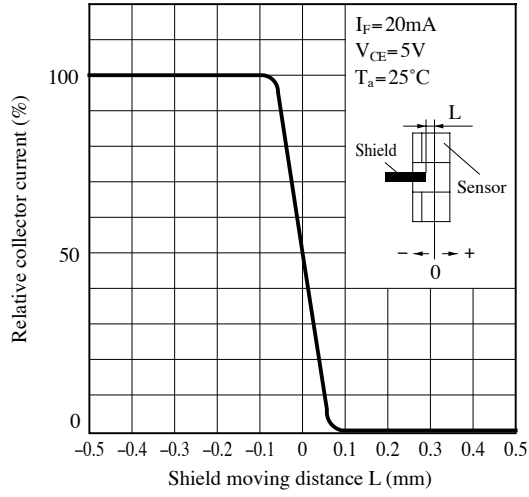
**Fig.11 Frequency Response**



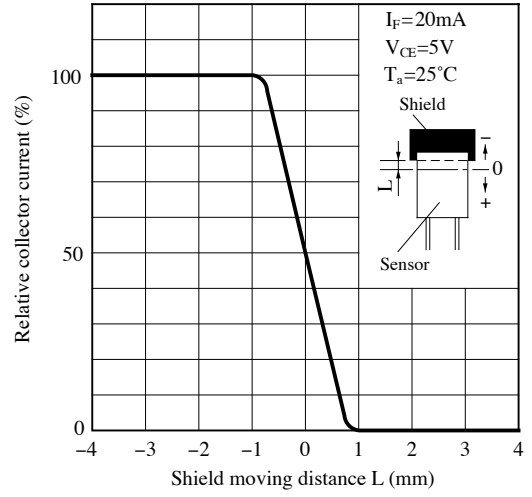
**Fig.12 Collector Dark Current vs. Ambient Temperature**



**Fig.13 Relative Collector Current vs. Shield Distance (1)**



**Fig.14 Relative Collector Current vs. Shield Distance (2)**



Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

■ **Design Considerations**

● **Design guide**

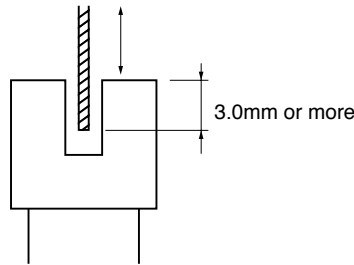
1) Prevention of detection error

To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

2) Position of opaque board

Opaque board shall be installed at place 3mm or more from the top of elements.

(Example)



This product is not designed against irradiation and incorporates non-coherent IRED.

● **Degradation**

In general, the emission of the IRED used in photocouplers will degrade over time.

In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

● **Parts**

This product is assembled using the below parts.

• Photodetector (qty. : 1)

| Category        | Material     | Maximum Sensitivity wavelength (nm) | Sensitivity wavelength (nm) | Response time (μs) |
|-----------------|--------------|-------------------------------------|-----------------------------|--------------------|
| Phototransistor | Silicon (Si) | 800                                 | 400 to 1 200                | 3                  |

• Photo emitter (qty. : 1)

| Category                               | Material                | Maximum light emitting wavelength (nm) | I/O Frequency (MHz) |
|--|-------------------------|--|---------------------|
| Infrared emitting diode (non-coherent) | Gallium arsenide (GaAs) | 950                                    | 0.3                 |

• Material

|                   |                            |
|-------------------|----------------------------|
| Case              | Lead frame plating         |
| Black noryl resin | Solder dip. (Sn-3Ag-0.5Cu) |



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**■ Manufacturing Guidelines****● Soldering Method****Flow Soldering:**

Soldering should be completed below 260°C and within 5 s.

Please take care not to let any external force exert on lead pins.

Please don't do soldering with preheating, and please don't do soldering by reflow.

**Hand soldering**

Hand soldering should be completed within 3 s when the point of solder iron is below 350°C.

Please solder within one time.

Please don't touch the terminals directly by soldering iron.

Soldered product shall treat at normal temperature.

**Other notice**

Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the cooling and soldering conditions.

**Flux**

Some flux, which is used in soldering, may crack the package due to synergistic effect of alcohol in flux and the rise in temperature by heat in soldering. Therefore, in using flux, please make sure that it does not have any influence on appearance and reliability of the photointerrupter.

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**● Cleaning instructions****Solvent cleaning :**

Solvent temperature should be 45°C or below. Immersion time should be 3 minutes or less.

**Ultrasonic cleaning :**

The affect to device by ultrasonic cleaning is different 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.

**Recommended solvent materials :**

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol.

**● Presence of ODC**

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 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).

**■ Package specification****● Case package**

## Package materials

Anti-static plastic bag : Polyethylene

Moltopren : Urethane

Partition : Corrugated fiberboard

Packing case : Corrugated fiberboard

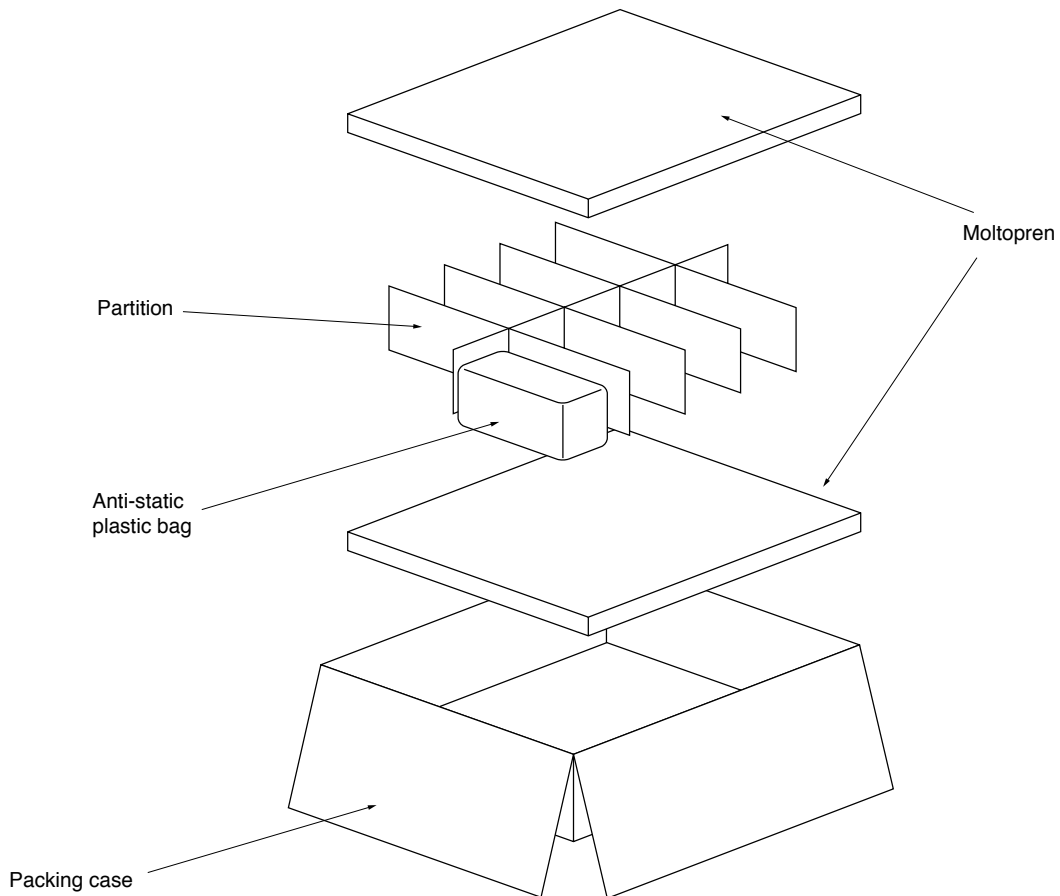
## Package method

100 pcs of products shall be packaged in a plastic bag, Ends shall be fixed by stoppers. The bottom of the packing case is covered with moltopren, and the partition is set in the packing case. Each partition should have 1 plastic bag.

The 10 plastic bags containing a product are put in the packing case.

Moltopren should be located after all product are settled (1 packing contains 1 000 pcs).

## Packing composition



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- 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

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- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
- 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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