

Metal, ceramic, plastic package products

This document describes general precautions for using Hamamatsu opto-semiconductors of metal, ceramic, and plastic packages (hereafter called "the product"). For precautions on handling image sensors, unsealed products (opto-semiconductors whose chip is exposed), refer to precautions of "image sensors", "unsealed products" available from Hamamatsu respectively.

If the product comes with special precautions on the delivery specification sheet, then be sure to strictly comply with those instructions.

1. Handling

It is necessary to strictly observe the following precautions even after installed into the equipment in addition to handling the product.

(1) Basic precautions

- Using tweezers or gloves is recommended when touching the product. Touching the product with bare hands may cause characteristics deterioration, plating corrosion, or problems with solder wettability.
- Perform work in a clean place.

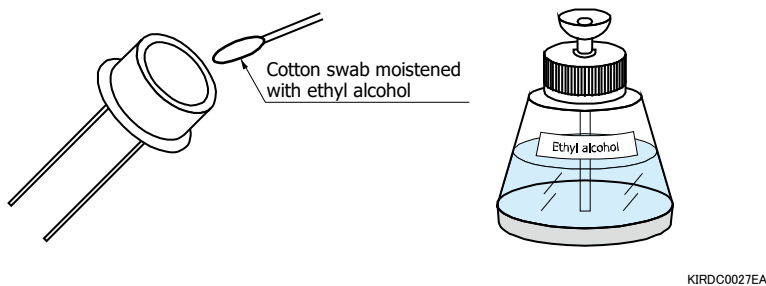
(2) Window

- Dirt, stains, or scratches on the window may cause electrical and optical characteristics to deteriorate. Dirt, stains, or scratches on the window may also cause a drop in light transmittance, causing the sensitivity to lower. When used for ultraviolet light detection, there is an example that oil from the fingers can cause a 30% drop in sensitivity. Additionally, if very small light spots are detected, then scratches on the window may be a problem.
- Do not apply strong friction or pressure so as to prevent the window from being scratched or cracked. Do not allow sharp or hard objects to come in contact with the window. In particular, plastic package type or resin sealed type is vulnerable to scratches, so handle them carefully.
- Use an air blower to remove dust adhering to the window. It is recommended to use an ionizer together.
- If oil or grease that cannot be removed using the air blower adheres to the window, then gently wipe it away with a cotton swab and the like moistened with ethyl alcohol so that the window is not scratched. Rubbing strongly or wiping the same section over and over may lead to scratches, causing the electrical and optical characteristics, or the reliability to lower.
- When cleaning the window surface, do not rub it with dry cloth or cotton swab. Doing so may cause scratches or static electricity, resulting in malfunctions.
- Take precautions to protect the window from contamination or scratches when packing or shipping equipment, in which the product is installed.

(3) Vibration, impact, and stress

- If vibrations are applied to the product for long periods or if impacts are applied to the product with a high frequency, the package may be broken, causing the characteristics to deteriorate.
- When using the product with external stress applied, the inside or connection section of the product may break.
- For some products with optical filter, if excessive force or continuous vibration is applied to the filter section, the filter may come off.

[Figure 1] Remove dirt from the window by gently wiping with a cotton swab, etc. moistened with ethyl alcohol.



(4) Cleaning

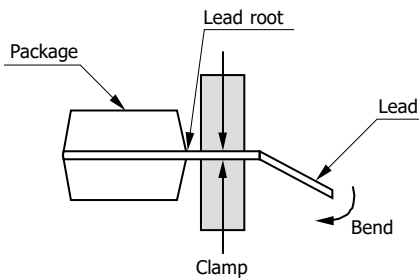
Avoid use of solvents as much as possible for cleaning. If such use is unavoidable, then keep the following points in mind.

- Use alcohol solvents such as ethyl alcohol. Some solvents may damage plastic packages and cause package swelling.
- Before actual cleaning, check for any problems by testing out the cleaning methods in advance.
- Ultrasonic and steam cleaning may cause fatal damage to the product, so do not use such methods. Soak washing is recommended.
- If mounting components on a printed circuit board using non-cleaning solder, do not try to clean away the flux. Cleaning away the flux may cause problems, such as electrical leaks between terminals and operating failures.

(5) Handling component leads

- During the design stage, make sure the lead insertion hole spacing on the printed circuit board match the lead spacing of the product. Do not attempt to forcibly insert the leads into the holes if the insertion hole spacing does not match the product lead spacing.
- Do lead forming and trimming before starting soldering. Clamp the roots of the leads, and form or trim the leads so that any mechanical stress is not applied to the leads within the package. Forming the leads from their roots may cause package cracks and other problems. If trimming the leads after soldering is unavoidable, then do so after the soldered section has been solidified.

[Figure 2] Lead forming



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(6) Temperature and humidity

- For some products with optical filter, the light transmittance may lower due to moisture absorption.
- When the plastic package type or resin sealed type is left under high temperature environment for long periods, the resin may turn yellow, causing the transmittance of short-wavelength light to lower.

(7) High-power light irradiation

- When the high-power light is irradiated on the plastic package type or resin sealed type, the resin may be damaged by its heat.
- The element temperature may increase by high-power light irradiation. So, appropriate measures, such as heat dissipation are needed.
- Incidence of the strong background light or the light from a portion other than the light input window may adversely affect the output of the product. Take these points into consideration in the optical design phase.

(8) Ultraviolet light irradiation

- When the high-power ultraviolet light is irradiated on the product for long periods, this may cause the product characteristics to deteriorate, such as lowering of transmittance of the window or lowering of sensitivity of the photosensitive area. To prevent deterioration of the product characteristics, turn off the light source when the measurement is not performed, use the mechanical shutter, or do not expose the product to the ultraviolet light as much as possible. For products with the window adhered by resin, when the ultraviolet light is irradiated on the window adhesion portion, the resin deteriorates or the outgas is generated, causing lowering of the photodiode sensitivity to promote. Put ideas into the optical system so that the ultraviolet light is irradiated on the window adhesion portion as little as possible.

(9) X-ray irradiation

- When the high-power X-ray is irradiated on the product for long periods, this may cause the product characteristics to deteriorate, such as lowering of light emission output of the scintillator, lowering of sensitivity of the photosensitive area, circuit section failure, or dark current increase. Therefore, cover sections other than the photosensitive area with shielding materials or take similar measures so as to irradiate the photosensitive area with the X-ray as exclusively as possible. Additionally, to prevent deterioration of the product characteristics, turn off the X-ray source when the measurement is not performed, use the mechanical shutter, or expose the product to the X-ray as little as possible.

(10) Electrical connection

- When the power is turned on, a surge (phenomenon that abnormally high voltage occurs instantaneously) may occur depending on the power supply, causing damage to the product. So, select an appropriate power supply.

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- For products with multiple biases applied, the bias application order may be specified individually.

(11) External noise

- If the product is used in an environment where there are many electrical external noises, this may cause the product to malfunction. Take noise prevention measures for peripheral equipment.

(12) Various stresses

- Reducing (derating) stresses (temperature, humidity, voltage, current, electric power, etc.) to be applied to the product will extend the product service life (lower the failure ratio). It is recommended to reduce potential failures by setting values lower than the absolute maximum ratings stated in the datasheet. Additionally, avoid unnecessarily high stresses.

2. Storage

- Do not let the product get wet or be exposed to direct sunlight, harmful gases, or dust. Also avoid storing it in locations where sudden temperature changes may occur.
- For products packed in moisture-proof bags, do not open the bag until just before product use so as to prevent oxidation or contamination on the leads and moisture absorption by the package. Even if still packed in the moisture-proof bag, do not let the bag get wet or be exposed to direct sunlight, harmful gases or dust, or do not store it in locations where sudden temperature changes may occur. Also avoid humidity rise which may occur such as by turning off the night-time air conditioning.
- Do not lay a heavy object or load on the product or the bag. Also avoid stacking the products or bags when storing them.
- If storing the product in another case, then use a container not easily charged with static electricity.
- Placing the product in an unsatisfactory environment (exceeding recommended storage conditions [Table 1]) may cause poor solderability, rust on product leads, or a drop in electrical characteristics. If there are storage conditions listed on the datasheet or delivery specification sheet, then be sure to comply with them.
- For products packed in moisture-proof bags, if there is a problem with the sealing of the moisture-proof packing, then the silica gel color will change from navy blue to red due to moisture absorption. So, check for color change of the silica gel when opening. If any fault is found, contact Hamamatsu.
- For tape packing products, tape unwound from a reel must not be left in that state for long periods. Additionally, do not bend the tape more than necessary.

[Table 1] Recommended storage conditions

Product		Storage conditions	Remark
Product not packed in moisture-proof bag		Temperature: 15 °C to 35 °C Humidity: 45% to 75%	
Product packed in moisture-proof bag	Unopened product	Temperature: 15 °C to 35 °C Humidity: 75% or less Period: within 12 months	A sharp item coming in contact with the moisture-proof bag might open a hole in it, so use caution.
	Opened product	Temperature: 15 °C to 35 °C Storage in a low-humidity desiccator Period: within 3 months	

3. Soldering

The correct soldering time and temperature differ depending on the type of package. Additionally, effects on the product may also vary depending on the printed circuit board, soldering iron, or flow bath, etc. When setting soldering conditions, such as soldering time or temperature, conduct appropriate experiments in advance while referring to the recommended soldering condition examples [Table 2] to check that no problem occurs in the product. If soldering conditions are listed in the datasheet or delivery specification sheet, then please comply with those conditions.

[Table 2] Recommended soldering condition examples

Package	Soldering temperature	Soldering time	Remark
Metal	260 °C or less	Within 10 seconds	
Ceramic	260 °C or less	Within 5 seconds	Solder the leads at a point at least 1.5 mm away from the package body. [Figure 3]
Plastic	230 °C or less	Within 5 seconds	Solder the leads at a point at least 1 mm away from the package body.

(1) Points requiring special caution

- Take adequate care to make sure that the soldering iron tip temperature and the soldering time are correct.
- Do not attempt soldering at high temperatures or long periods.
- Take measures to prevent solder or flux from flying outward and sticking to the window, contaminating it.

(2) Flux

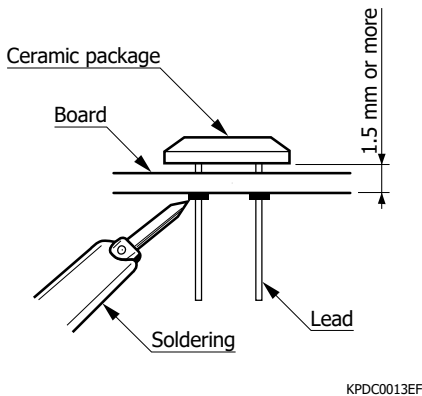
- Use non-cleaning solder or rosin type flux. Using flux with relatively strong acid or alkali levels or inorganic flux may cause corrosion on the leads.

(3) When using a soldering iron

- To prevent effects from electrostatic charges, use a grounded soldering iron whose insulation resistance is 10 MΩ or more.
- Set the soldering iron tip temperature by referring to the recommended soldering condition examples [Table 2].
- Do not let the soldering iron directly contact the package section of the product. Direct contact with the soldering iron may cause mechanical or optical damage.

- Do the soldering so that no stress is applied to the package section of the product. Soldering in a state where stress is applied will cause residual stress after the soldering that tends to cause deterioration.

[Figure 3] Soldering ceramic packages



(4) Flow (dipping) soldering

- Do flow soldering by dipping just the lead portion into a tank of solder. Do not dip the package into the solder tank. Dipping the package into the solder may cause mechanical and optical damage.
- Do flow soldering while being careful not to apply external force to the leads and package. If flow soldering is done while external force is applied, the product may easily deteriorate due to the residual stress.

4. Static electricity management

The solid state division product or packing comes with an electrostatic warning label [Figure 4]. Handling of the products requires taking precautions on the following points to avoid damage and product deterioration due to static electricity.

[Figure 4] Electrostatic warning label (example)



(1) Workplace and facilities, etc.

- Lay a conductive mat (750 k Ω to 1 G Ω) on the surface of the workbench and ground it.
- Use conductive flooring material or lay a conductive mat on the workplace floor and ground it.
- Ground all manufacturing equipment and inspection devices.
- Keep moisture at approximately 50%. Low humidity tends to cause static electricity and high humidity is prone to moisture absorption.

(2) Handling

- Using an ionizer or similar item to eliminate electrical charges is recommended when handling the product.
- Wear anti-static clothing and conductive shoes (100 k Ω to 100 M Ω).
- Attach a wrist strap directly to the skin, and ground the strap. Be sure that a wrist strap to be used has protective resistance and that the resistance value measured while being attached is 750 k Ω to 35 M Ω . If the wrist strap does not include protective resistance, there is a risk of electric shock hazard due to electric leak.

Also wear conductive finger sacks or gloves.

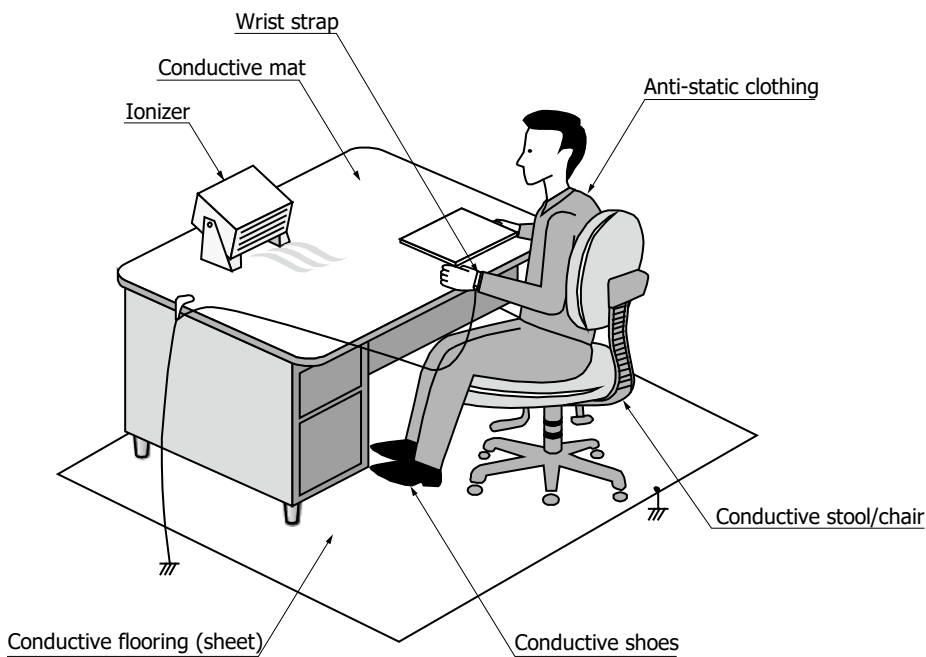
- Tools such as tweezers used to handle the product may sometimes become electrically charged. Connect a ground line as needed.
- Use a soldering iron with an insulation resistance of 10 MΩ or higher. The soldering iron tip should be grounded.
- If the product is induction-charged and contacts with a metal, excessive current may flow due to electrostatic discharge, causing damage to the product. To prevent induction charging, keep objects (insulators such as plastic and vinyl, PC display monitors and keyboards, etc. that may possibly be electrically charged) away from the product. The product may be induction-charged even by just bringing such objects close to the product. If keeping such objects near the product is unavoidable, then use an ionizer, etc. to remove electrostatic charges from the objects that are apt to be electrostatically charged.
- Friction on the product may cause electrostatic charges. If such friction is unavoidable, then remove the electrostatic charges using an ionizer, etc.
- Peripheral devices must be properly grounded so that no surges are applied to the product by a leakage voltage. Do not allow a voltage exceeding the absolute maximum ratings to be applied to the product from the measurement instrument, etc. (This tends to occur during ON/OFF switching of power sources, so use caution.) If there is the possibility of a surge voltage, insert a filter (made up of a resistor and capacitor) to protect the product. During operation do not attach or detach any connector, etc. that are connected to the power supply line or output line.

(3) Carrying, storage, and packing

- Place the product on a conductive foam by inserting the leads into the foam (for shorting leads) and then put it in a conductive case. The PC board to mount the product should also be put in a conductive case. Also, avoid using plastic or styrofoam as they may generate static electricity by vibration during shipping, etc. causing breakdown or deterioration of the product.
- Use a conductive carrying case and storage shelf.
- Avoid storing the product near equipment that may generate high voltage or high electromagnetic fields.

Note: It is not always necessary to provide all the anti-electrostatic measures stated above. Implement these measures according to the extent of deterioration or damage that may occur.

[Figure 5] Electrostatic countermeasure example

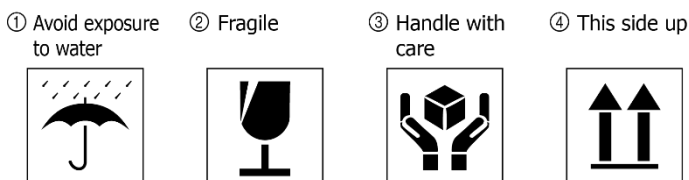


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5. Handling in cardboard boxes

The product comes shipped in cardboard boxes. When handling cardboard boxes, comply with warning labels displayed on the cardboard box.

[Figure 6] Warning labels on cardboard box



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