

Thyristor · Triac

R07ZZ0003EJ0302


Precautions on Handling

Rev.3.02

Dec. 21, 2020

■ In order to use low and medium power semiconductors safely

Please read and follow these “Precautions on Handling” carefully before using the low and medium power Thyristor and Triac.

 Cautions	
Packing	<ul style="list-style-type: none"> · The packing of our products shall withstand certain environmental conditions. However, depending on the circumstances, the outer carton or the inner packing might be broken, and the product might be exposed. Please do not expose the outer carton to external shocks, rainwater, pollution, and other factors.
Transportation	<ul style="list-style-type: none"> (1) During transport, keep the packing cartons in the correct orientation. If the carton is upside down or leaning against something and an abnormal force is applied, the devices may be damaged. (2) Do not throw or drop the cartons. The devices may be damaged. (3) If getting wet, the devices may fail during use. When transporting in the rain or snow, make sure to protect the carton from moisture.
Storage	<ul style="list-style-type: none"> · The products should be stored within the normal temperature and humidity range (i.e., at 15 to 35°C and 45 to 75% R.H.). In an environment far above or below this range, the product performance and reliability may be deteriorated.
Long-term Storage	<ul style="list-style-type: none"> (1) When storing for one year or longer, provide humidity removing measures. When using products after long-term storage, be sure to check that the exterior is free from flaw, dirt, rust, and so on. (2) If stored in a highly unfavorable environment or over three years under the normal storing conditions (those specified in the previous section), be sure to check that the exterior is free from flaw, dirt, rust, and so on and inspect solderability and electric characteristics.
Operating Environment	<ul style="list-style-type: none"> · Do not use the products where they may be exposed to water or organic solvents, where corrosive gases are generated, or where explosive gases or dust are present. Because use in such places may cause serious accidents.
Flammability	<ul style="list-style-type: none"> · The molding resin is a flame retardant material certified to UL Standard UL94 V-0, but it is not non-flammable.
Anti-electrostatic Measure	<ul style="list-style-type: none"> · To prevent destruction and deterioration due to static electricity, be sure to observe the following precautions. (1) Precautions to prevent electrostatic destruction <ul style="list-style-type: none"> If static electricity or excessive voltage charged on the human body or packing material is applied between the terminals, the device may be destroyed or deteriorated. The basis of anti-electrostatic measures is to suppress the generation of static electricity as much as possible and to release the charge as soon as possible. (a) For transportation and storage, do not use containers that are easy to accumulate static electricity. (b) Keep the devices in the conductive bag or tube until immediately before use. Never touch the terminals with bare hands. (c) During assembly, ground the equipment and human body. It is recommended to lay conductive rugs over the workbench and the surrounding floor and ground them. The electrostatic level of the work environment should not exceed 100 V. (d) If the terminals of the device mounted on the circuit board are open, the device may be destroyed or degraded by the static electricity on the board. (e) When using a soldering iron, ground the tip.

Cautions

Mounting

■ Forming and cutting electrode leads

· To prevent the devices from destruction or deterioration due to the forming and cutting of the electrode leads, observe the following instructions.

- (1) It is desirable to use a dedicated forming machine to avoid stress. Alternatively, prepare two flat nose pliers, fix the base of the lead by one pliers, and bend the lead on the tip side by another pliers.
- (2) When bending the lead, bend it at a point at least 2 mm away from the body.
- (3) When laterally bending, do not exceed 30°. (For longitudinal bending, the angle should be within 90°.)

However, it is highly advisable to use the Renesas standard formed products whenever possible.

■ Attaching to the heatsink

- (1) To maximize the heat dissipation effect, the contact area should be as large as possible to minimize the contact thermal resistance. The mounting surface of the heatsink should have a surface finish 6 S or smoother, and a warp of $\pm 100 \mu\text{m}$ or less. The holes on the heatsink for mounting should not exceed the screw diameter + 0.5 mm, and chamfers on the hole should be less than 1% of the diameter.
- (2) For tightening, use a torque wrench etc. and tighten to the specified torque (Table 1 below). Excessive tightening torque may cause package damage and destruction or deterioration of the device.
- (3) The grease should be applied thinly and uniformly over the entire contact area of the device. The thickness of the grease should be 100 to 200 μm in consideration of the accuracy of the surface roughness of the device and heatsink. Applying grease to contact surface of the heatsink helps to prevent corrosion of the contact area. However, use grease that does not deteriorate within the operating temperature range and does not age.

Table 1 Tightening Torque

Package	Renesas Package Code	Screw Diameter	Tightening Torque Recommendation	
			N • m	(kgf • cm)
			TO-220ABA	PRSS0004AT-A
TO-220F	PRSS0003AA-A	M3	0.49	(5)
TO-220FPA	PRSS0003AP-A	M3	0.49	(5)
TO-3P	PRSS0004ZE-A	M3	0.59	(6)

■ Polarity

· To prevent destruction or deterioration of the device due to wrong insertion, make sure that the leads are inserted into the circuit board according to the pin arrangement described in the outline drawing.

Cautions

Mounting (cont'd)	<p>■ Soldering</p> <ul style="list-style-type: none"> · To prevent the devices from destruction, deterioration and impaired reliability due to the mechanical and/or thermal stress, observe the following instructions. (1) Solder only after attaching the device to the heatsink. (2) Resistance to soldering heat <ul style="list-style-type: none"> ① Manual soldering 350°C max., 3 s max. ② Flow soldering (Wave soldering) for through-hole type devices 260°C max., 10 s max. ③ Reflow soldering for surface mount type devices The recommended soldering method for surface mount devices is reflow soldering. The recommended temperature profile depends on the product. Please contact us. <p>■ Cleaning the circuit board</p> <ul style="list-style-type: none"> · When cleaning the circuit board after soldering, observe the following instructions to prevent the devices from destruction, deterioration and impaired reliability due to the mechanical stress. (1) When using an ultrasonic cleaner, make sure that the ratings are as follows. <ul style="list-style-type: none"> Frequency: 28 kHz max Ultrasonic output: 20 W/l max Cleaning time: 30 s max The ultrasonic vibrator should not be in contact with the circuit board and devices. Do not allow the devices to be resonant at the vibrating frequency.
Maximum Rating	<ul style="list-style-type: none"> · To prevent devices from destruction, deterioration and impaired reliability, use devices always within the maximum ratings. · The maximum ratings indicate the absolute maximums of temperature, current, voltage, power dissipation, and so on, which must not be surpassed even for an instant.
Dielectric strength	<p>■ Guarantees of isolation for insulated package products</p> <ul style="list-style-type: none"> · As for insulated package products, the isolation voltage is specified as absolute maximum rating. This value must not be exceeded during operation even for a moment. · Please note that this rated value is the condition at the time of shipping inspection. The dielectric strength of devices might decrease due to stress in handling and mounting processes. Therefore, the finished products should be judged before shipping whether they meet requirements of safe isolation for electrical equipment. · For safety, it's advisable that a heatsink should be electrically floating.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
 2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
 4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
 5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
 6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
 - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
 - "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
- Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
 8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
 9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
 10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
 11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
 12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
 13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/.