

THYRISTORS

AC12DSMA, AC12FSMA

12 A RESIN INSULATION TYPE TRIAC

DESCRIPTION

The AC12DSMA and AC12FSMA are resin insulation type TRIACs with an effective current of 12 A ($T_c = 74^\circ\text{C}$).

These products are covered with resin mold on the entire case and are electrically insulated with electrodes, giving them a considerable advantage over conventional TRIACs when mounting on a heatsink board or performing high-density mounting.

These products features ratings and electrical characteristics equal to TO-220AB package TRIAC and a high reliability design.

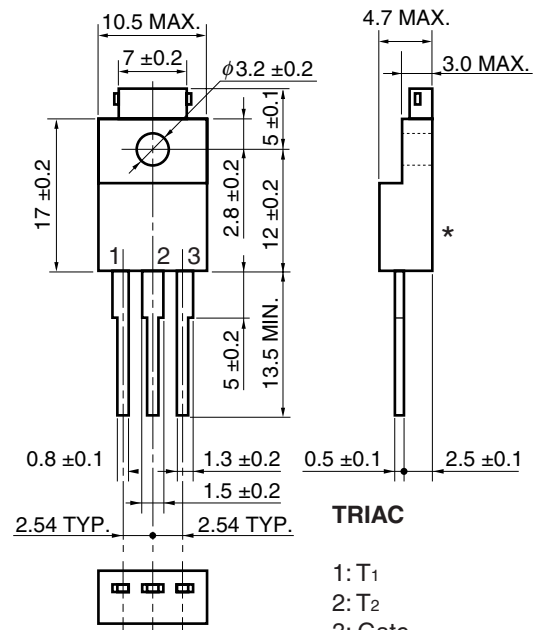
FEATURES

- Insulation type TRIAC fully covered with resin on the entire case other than electrode leads
- Insulation voltage and conduction equal to conventional mica and polyester film
- Can be replaced with TO-220AB package
- High allowable on-current when using a single unit

APPLICATIONS

Non-contact switches of motor speed control, heater temperature control, lamp light control

★ PACKAGE DRAWING (Unit: mm)



★: T_c test bench-mark

Standard weight: 2 g

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

MAXIMUM RATINGS

| Parameter | Symbol | AC12DSMA | AC12FSMA | Unit | Remarks |
|--|---------------------|--|----------|------------------|---|
| Non-repetitive Peak Off-state Voltage | V _{DSM} | 500 | 700 | V | – |
| Repetitive Peak Off-state Voltage | V _{DRM} | 400 | 600 | V | – |
| Effective On-state Current | I _{T(RMS)} | 12 (T _c = 74°C) | | A | Refer to Figure 11 and 12 . |
| Surge On-state Current | I _{TSM} | 100 (50 Hz 1 cycle) 110 (60 Hz 1 cycle) | | A | Refer to Figure 2 . |
| Fusing Current | $\int i_T^2 dt$ | 45 (1 ms ≤ t ≤ 10 ms) | | A ² s | – |
| Critical Rate Rise of On-state Current | di _T /dt | 50 | | A/μs | – |
| Peak Gate Power Dissipation | P _{GM} | 5.0 (f ≥ 50 Hz, Duty ≤ 10%) | | W | – |
| Average Gate Power Dissipation | P _{G(AV)} | 0.5 | | W | – |
| Peak Gate Current | I _{GM} | ±3 (f ≥ 50 Hz, Duty ≤ 10%) | | A | – |
| Junction Temperature | T _j | –40~+125 | | °C | – |
| Storage Temperature | T _{stg} | –55~+150 | | °C | – |

ELECTRICAL CHARACTERISTICS (T_j = 25°C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit | Remarks | |
|---|--------|----------------------|---|------------------------|------|------|------|-----------------------------|----------------------------|
| Repetitive Peak Off-state Current | | I _{DRM} | V _{DM} = V _{DRM} | T _j = 25°C | – | – | 100 | μA | – |
| | | | | T _j = 125°C | – | – | 2 | mA | – |
| On-state Voltage | | V _{TM} | I _{TM} = 10 A | – | – | 1.3 | V | Refer to Figure 1 . | |
| Gate Trigger Current | Mode I | I _{GT} | V _{DM} = 12 V, R _L = 30 Ω | T ₂₊ , G+ | – | – | 20 | mA | Refer to Figure 4 . |
| | II | | | T _{2–} , G+ | – | – | – | | |
| | III | | | T _{2–} , G– | – | – | 20 | | |
| | IV | | | T ₂₊ , G– | – | – | 20 | | |
| Gate Trigger Voltage | Mode I | V _{GT} | V _{DM} = 12 V, R _L = 30 Ω | T ₂₊ , G+ | – | – | 1.5 | V | Refer to Figure 4 . |
| | II | | | T _{2–} , G+ | – | – | – | | |
| | III | | | T _{2–} , G– | – | – | 1.5 | | |
| | IV | | | T ₂₊ , G– | – | – | 1.5 | | |
| Gate Non-trigger Voltage | | V _{GD} | T _j = 125°C, V _{DM} = $\frac{1}{2}$ V _{DRM} | 0.3 | – | – | V | – | |
| Holding Current | | I _H | V _{DM} = 24 V, I _{TM} = 10 A | – | 30 | – | mA | – | |
| Critical Rate Rise of Off-state Voltage | | dv/dt | T _j = 125°C, V _{DM} = $\frac{2}{3}$ V _{DRM} | – | 100 | – | V/μs | – | |
| Commutating Critical Rate Rise of Off-state Voltage | | (dv/dt) _c | T _j = 125°C, (di _T /dt) _c = –6 A/ms, V _D = 400 V | 10 | – | – | V/μs | – | |
| Thermal Resistance ^{Note} | | R _{th(j-c)} | Junction-to-case AC | – | – | 3.5 | °C/W | Refer to Figure 13 . | |

Note The thermal resistance with a 50 Hz or 60 Hz sine wave current, as shown in the following expression:

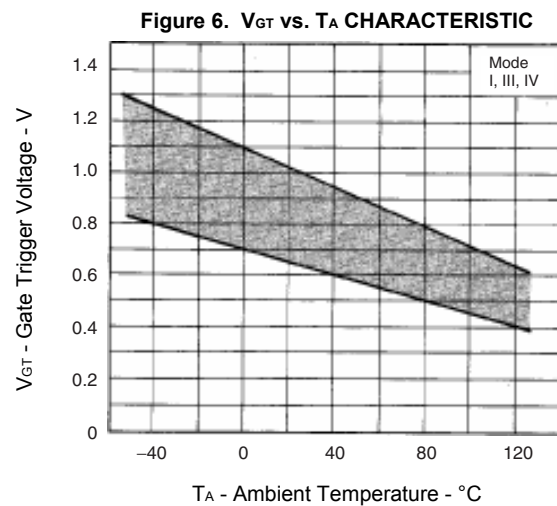
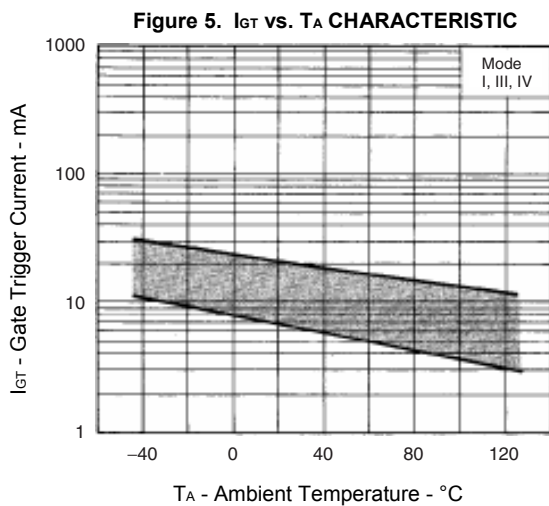
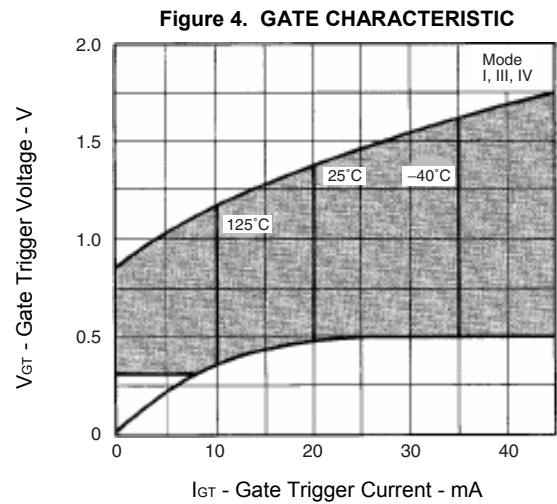
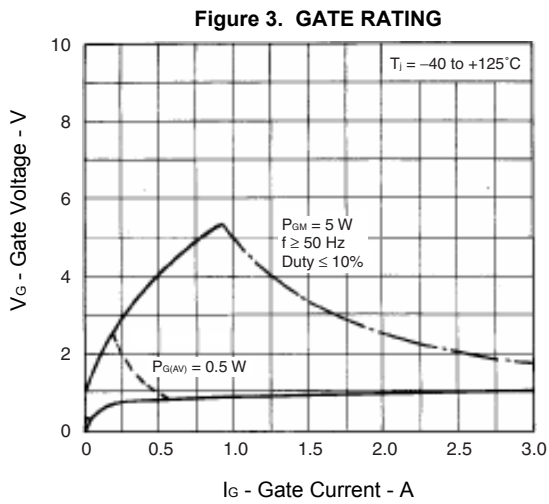
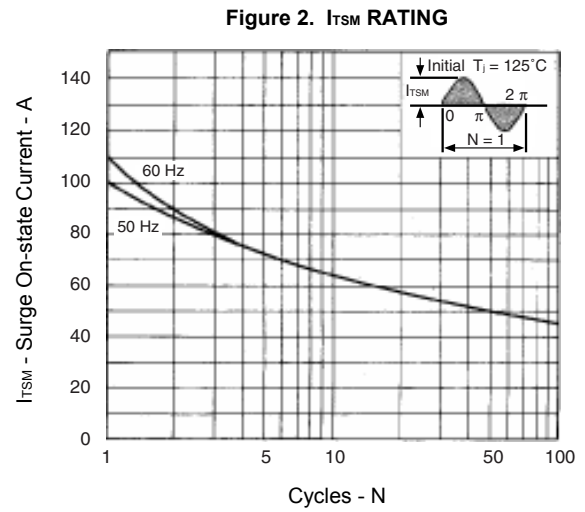
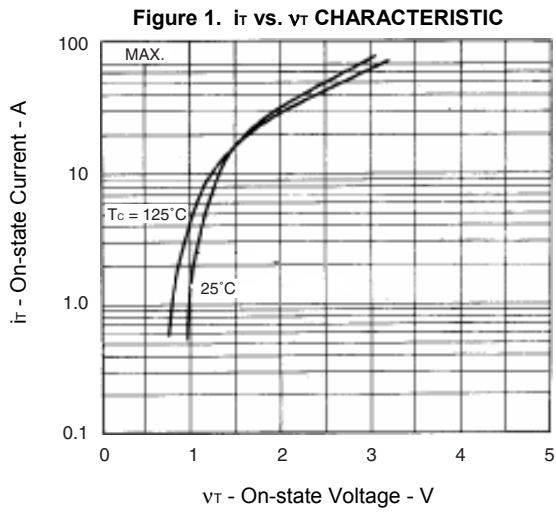
$$R_{th(j-c)} = \frac{T_{j(max)} - T_c}{P_{T(AV)}}$$

T_{j(max)}: Maximum junction temperature

T_c: Case temperature

P_{T(AV)}: Average on-dissipation

TYPICAL CHARACTERISTICS



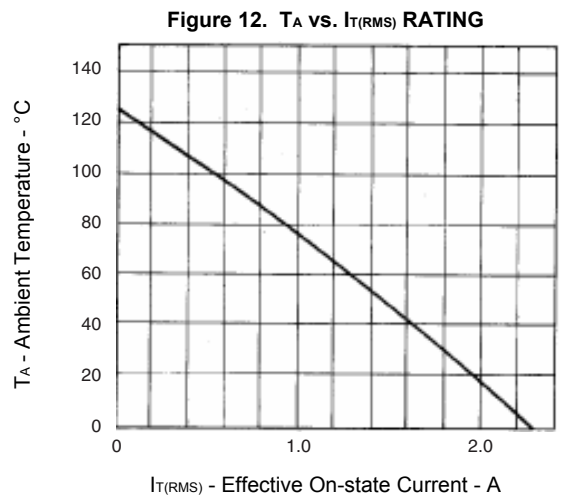
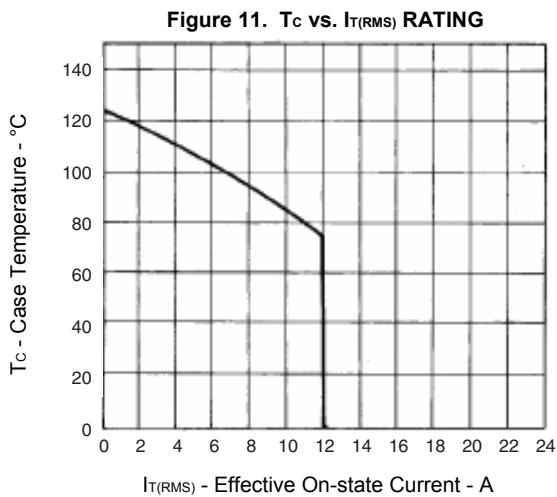
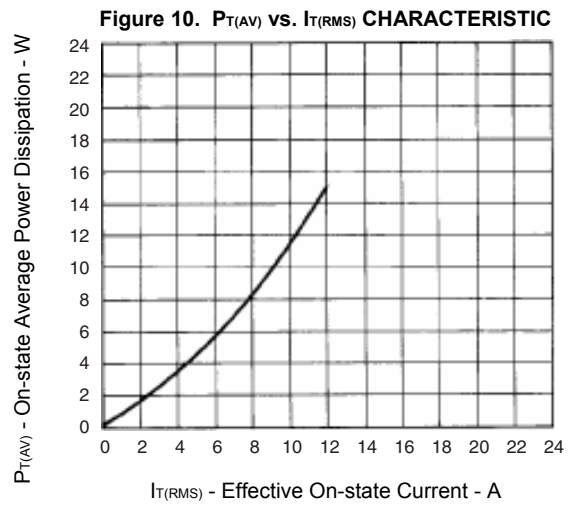
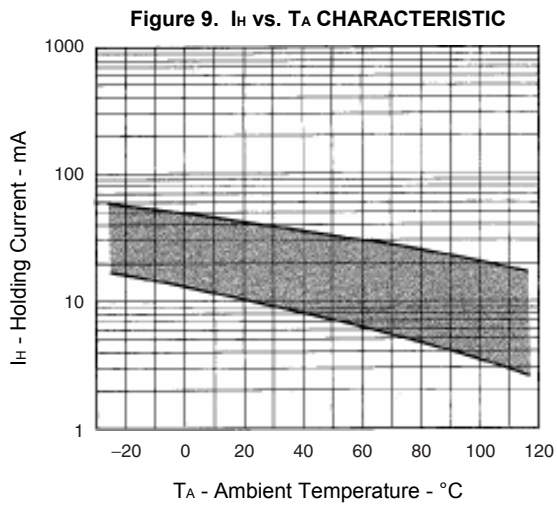
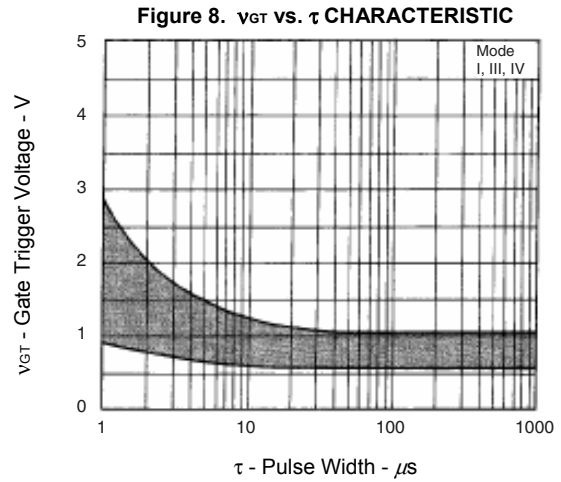
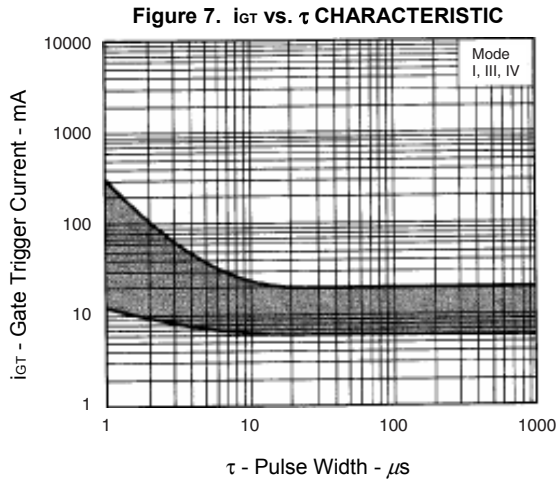
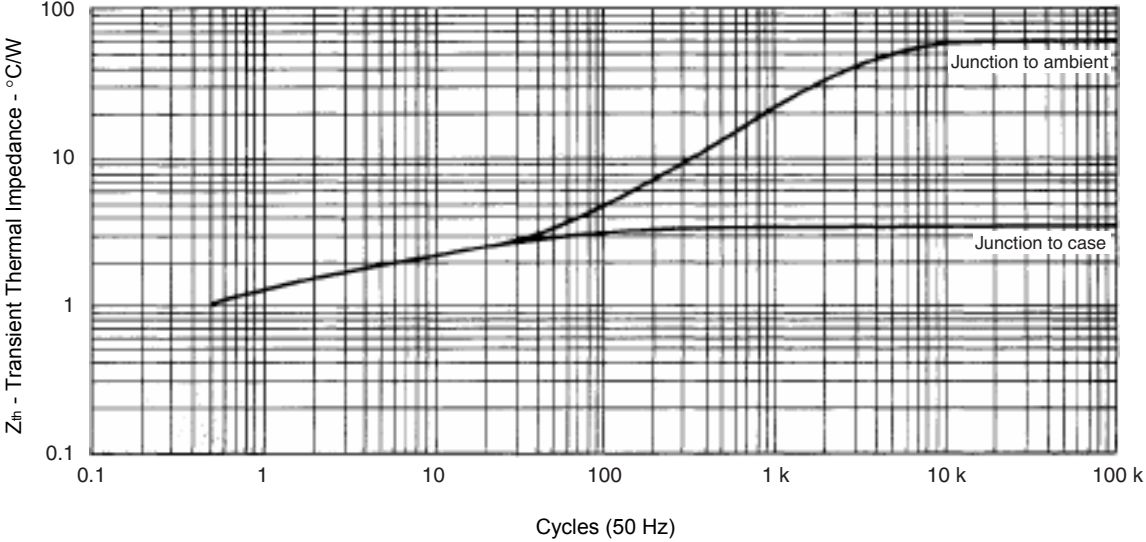


Figure 13. Z_{th} CHARACTERISTIC



- **The information in this document is current as of June, 2004. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**

- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).