NEC

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°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.

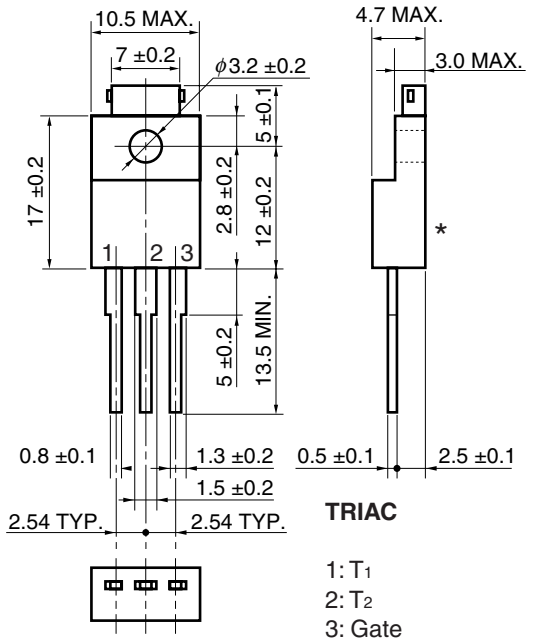
### FEATURES

- 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)




**TRIAC**

1: $T_1$
2: $T_2$
3: Gate

⋆: $T_C$ test bench-mark

Standard weight: 2 g



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**The mark ★ shows major revised points.**

## 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)<br>110 (60 Hz 1 cycle) | | A | Refer to **Figure 2**. |
| Fusing Current | $\int i_T^2 dt$ | 45 (1 ms ≤ t ≤ 10 ms) | | $A^2s$ | – |
| 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, | $T_2$+, G+ | – | – | 20 | mA | Refer to **Figure 4**. |
| | II | | $R_L$ = 30 Ω | $T_2$–, G+ | – | – | – | | |
| | III | | | $T_2$–, G– | – | – | 20 | | |
| | IV | | | $T_2$+, G– | – | – | 20 | | |
| Gate Trigger Voltage | Mode I | $V_{GT}$ | $V_{DM}$ = 12 V, | $T_2$+, G+ | – | – | 1.5 | V | Refer to **Figure 4**. |
| | II | | $R_L$ = 30 Ω | $T_2$–, 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,<br>$(di_T/dt)c$ = –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 1. $i_T$ vs. $v_T$ CHARACTERISTIC**

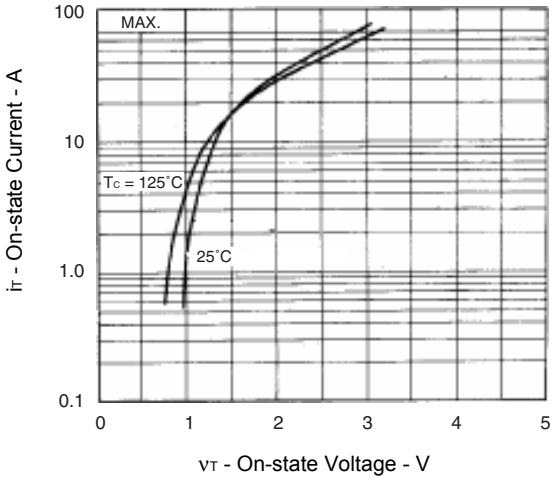



**Figure 2. $I_{TSM}$ RATING**

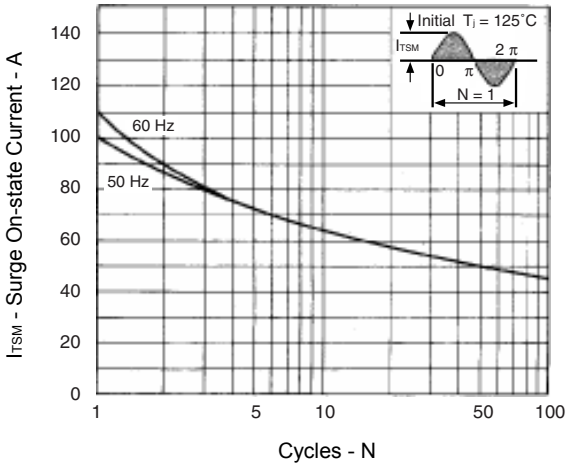



**Figure 3. GATE RATING**

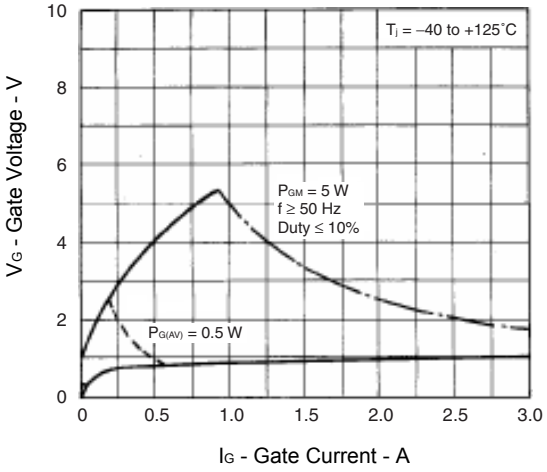



**Figure 4. GATE CHARACTERISTIC**

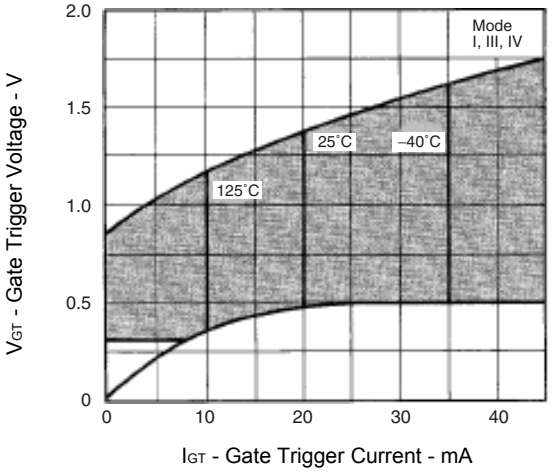



**Figure 5. $I_{GT}$ vs. $T_A$ CHARACTERISTIC**

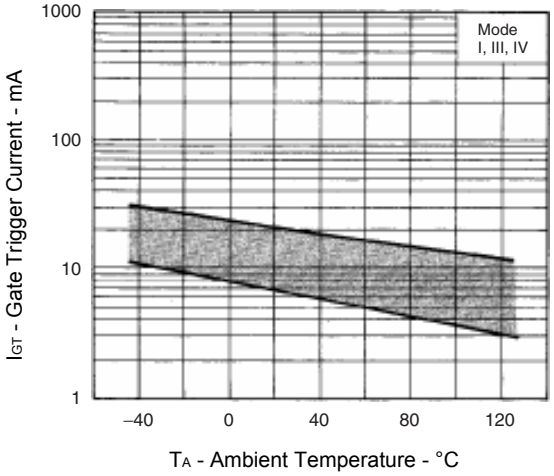



**Figure 6. $V_{GT}$ vs. $T_A$ CHARACTERISTIC**

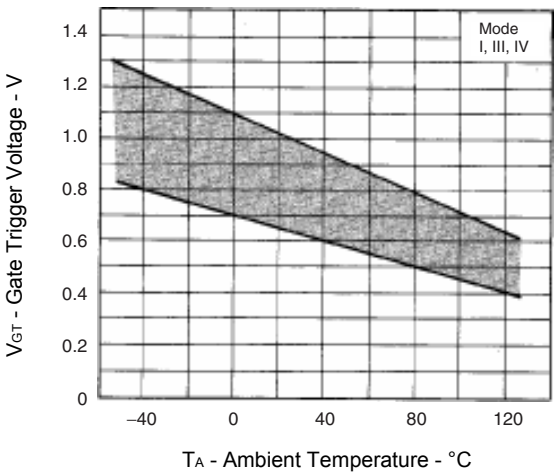


**Figure 7. $i_{GT}$ vs. $\tau$ CHARACTERISTIC**

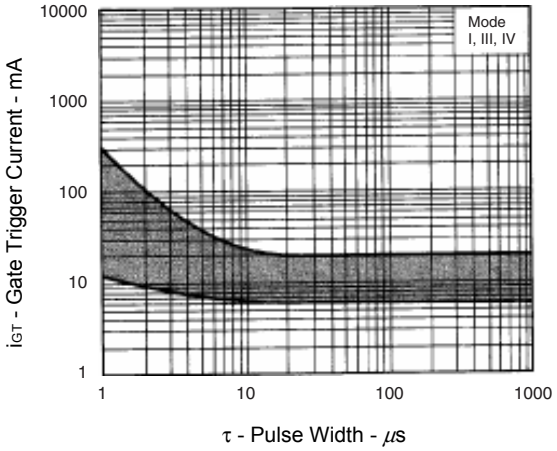



**Figure 8. $v_{GT}$ vs. $\tau$ CHARACTERISTIC**

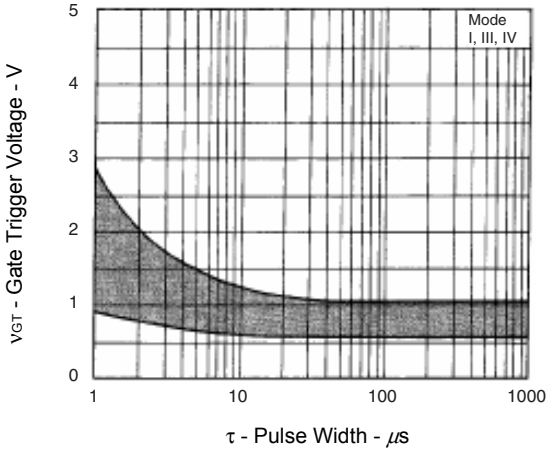



**Figure 9. $I_H$ vs. $T_A$ CHARACTERISTIC**

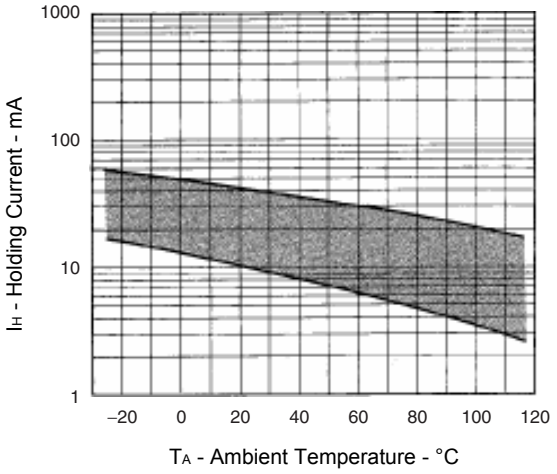



**Figure 10. $P_{T(AV)}$ vs. $I_{T(RMS)}$ CHARACTERISTIC**

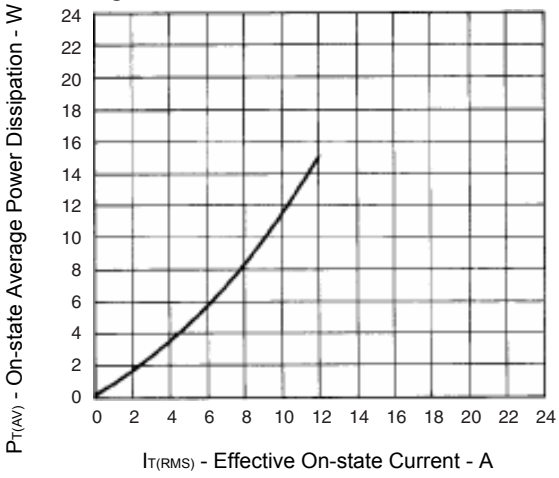



**Figure 11. $T_C$ vs. $I_{T(RMS)}$ RATING**

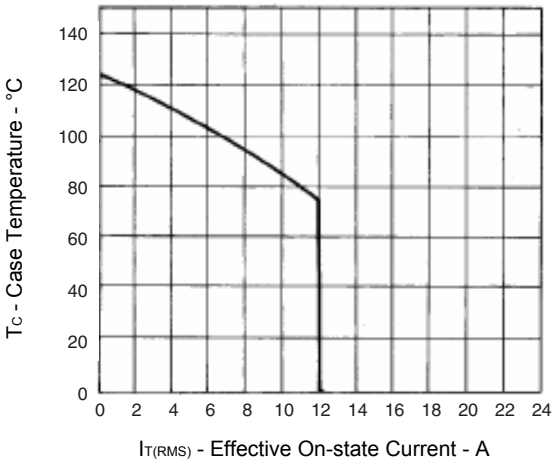



**Figure 12. $T_A$ vs. $I_{T(RMS)}$ RATING**

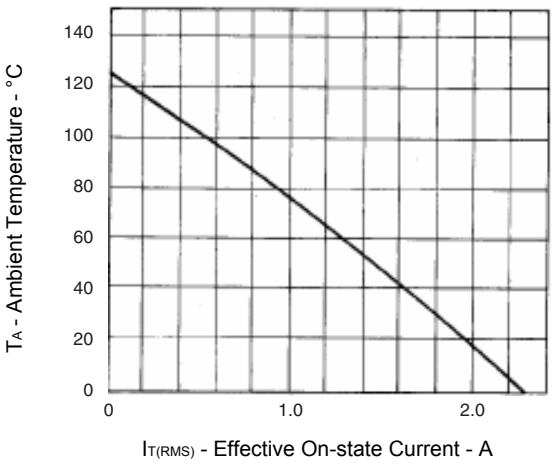
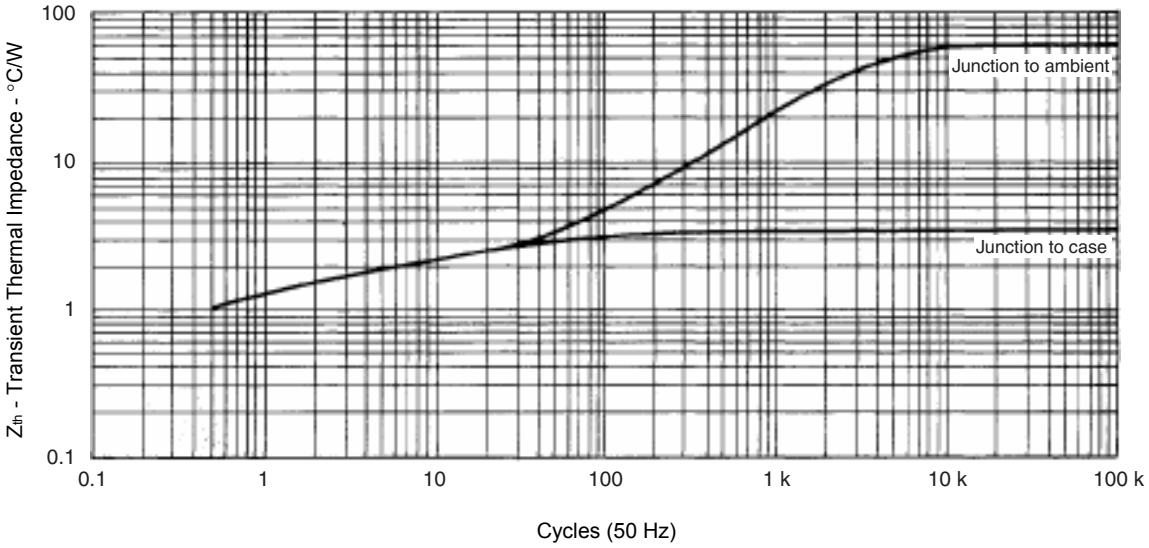


**Figure 13. $Z_{th}$ CHARACTERISTIC**



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