To our customers,

## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

Phase-out/Discontinued

THYRISTORS

# 5P4SM, 5P6SM, 5P4SMA, 5P6SMA

## 5 A MOLD ISOLATED THYRISTOR

### DESCRIPTION

The 5P□SM and 5P□SMA are P gate all diffused mold type Thyristor granted 5 Amps On-state Average Current ($T_C$ = 94 °C), with rated voltages up to 600 volts.

### FEATURES

- Mold Isolated package.
- 80 A surge current.
- High Voltage. : $V_{DRM}$, $V_{RRM}$ = 400 V (5P4SM, 5P4SMA)
  $V_{DRM}$, $V_{RRM}$ = 600 V (5P6SM, 5P6SMA)

### APPLICATIONS

- Motor speed control for household appliance.
- Temperature control for heater and constant temperature box.
- Constant voltage power source and battery charger.
- Automotive application such as regulator.
- Various solid state relay, etc.

### MAXIMUM RATINGS

| CHARACTERISTIC | SYMBOL | 5P4SM, 5P4SMA | 5P6SM, 5P6SMA | UNIT | NOTE |
|---|---|---|---|---|---|
| Non-Repetitive Peak Reverse Voltage | $V_{RSM}$ | 500 | 700 | V | |
| Non-Repetitive Peak Off-State Voltage | $V_{DSM}$ | 500 | 700 | V | |
| Repetitive Peak Reverse Voltage | $V_{RRM}$ | 400 | 600 | V | |
| Repetitive Peak Off-State Voltage | $V_{DRM}$ | 400 | 600 | V | |
| Average On-State Current | $I_{T(AV)}$ | 5 ($T_C$ = 94 °C, $\theta$ = 180° Single phase half wave) | | A | See Fig. 11 |
| Surge On-State Current | $I_{TSM}$ | 80 | | A | See Fig. 2 |
| Fusing Current | $\int i_T^2 dt$ | 28 (1 ms ≦ t ≦ 10 ms) | | $A^2s$ | |
| Peak Gate Power Dissipation | $P_{GM}$ | 5 (f ≧ 50 Hz, Duty ≦ 10 %) | | W | See Fig. 3 |
| Average Gate Power Dissipation | $P_{G(AV)}$ | 0.5 | | W | |
| Peak Gate Forward Current | $I_{FGM}$ | 2 (f ≧ 50 Hz, Duty ≦ 10 %) | | A | |
| Peak Gate Reverse Voltage | $V_{RGM}$ | 10 | | V | |
| Junction Temperature | $T_j$ | −40 to +125 | | °C | |
| Storage Temperature | $T_{stg}$ | −55 to +150 | | °C | |
| Isolation Voltage | − | 1500 (AC 1 min) | | $V_{RMS}$ | Only 5P□SM |

Phase-out/Discontinued

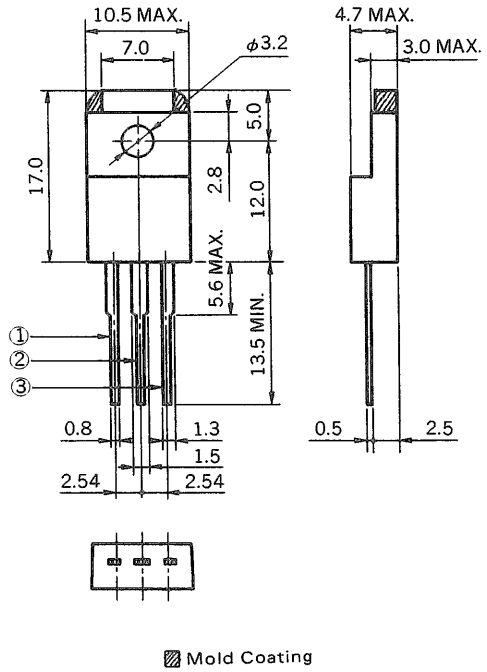
## ELECTRICAL CHARACTERISTICS ($T_j$ = 25 °C)

| CHARACTERISTIC | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|---|
| Repetitive Peak Reverse Current | $I_{RRM}$ | $V_{RM} = V_{RRM}$, $T_j$ = 125 °C | – | – | 2 | mA | |
| Repetitive Peak Off-State Current | $I_{DRM}$ | $V_{DM} = V_{DRM}$, $T_j$ = 125 °C | – | – | 2 | mA | |
| On-State Voltage | $V_{TM}$ | $I_{TM}$ = 10 A | – | – | 1.4 | V | See Fig. 1 |
| Gate-Trigger Current | $I_{GT}$ | $V_{DM}$ = 6 V, $R_L$ = 100 Ω | – | – | 10 | mA | See Fig. 4 |
| Gate-Trigger Voltage | $V_{GT}$ | $V_{DM}$ = 6 V, $R_L$ = 100 Ω | – | – | 1.5 | V | |
| Gate Non-Trigger Voltage | $V_{GD}$ | $V_{DM} = \frac{1}{2} V_{DRM}$, $T_j$ = 125 °C | 0.2 | – | – | V | |
| Critical Rate of Rise of Off-State Voltage | dv/dt | $V_{DM} = V_{DRM}$, $T_j$ = 125 °C | – | 40 | – | V/μs | |
| Holding Current | $I_H$ | $V_D$ = 24 V | – | 6 | – | mA | |
| Circuit Commuted Turn-Off Time | $t_q$ | $I_{TM}$ = 5 A, $V_R \geqq$ 25 V<br>$V_{DM} = \frac{2}{3} V_{DRM}$, diR/dt = 15 A/μs<br>dv/dt = 10 V/μs, $T_j$ = 125 °C | – | 50 | – | μs | |
| Thermal Resistance | $R_{th}$ | Junction to case | – | – | 4.2 | °C/W | See Fig. 13 |

## PACKAGE DIMENSIONS

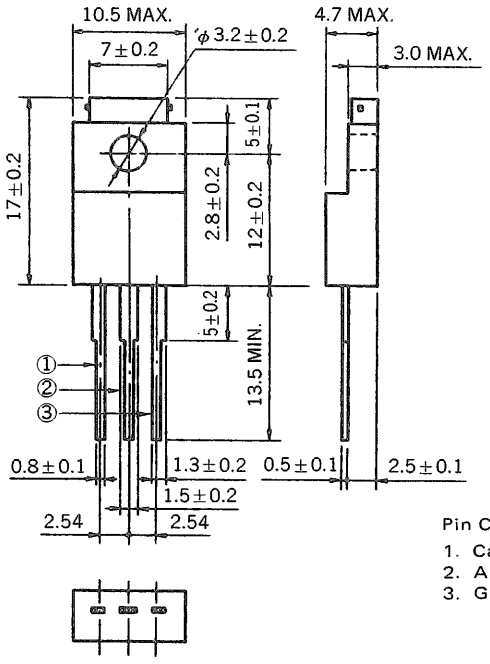
(Unit : mm)

### 5P4SM, 5P4SMA




▨ Mold Coating

### 5P6SM, 5P6SMA




Pin Connection
1. Cathode
2. Anode
3. Gate

Phase-out/Discontinued

## CHARACTERISTICS ($T_j$ = 25 °C)

Fig. 1 $i_T - V_T$ CHARACTERISTICS

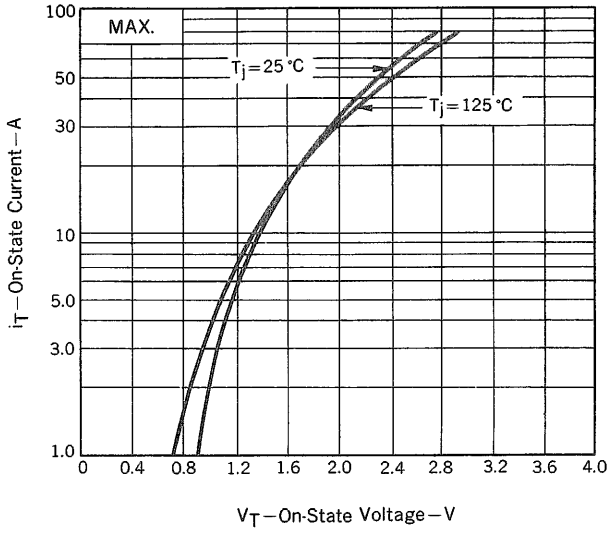



Fig. 2 $I_{TSM}$ RATING

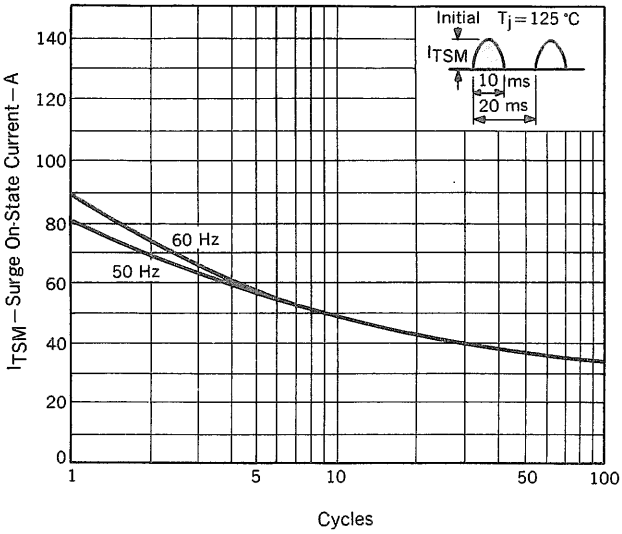



Fig. 3 $V_G - I_G$ RATING

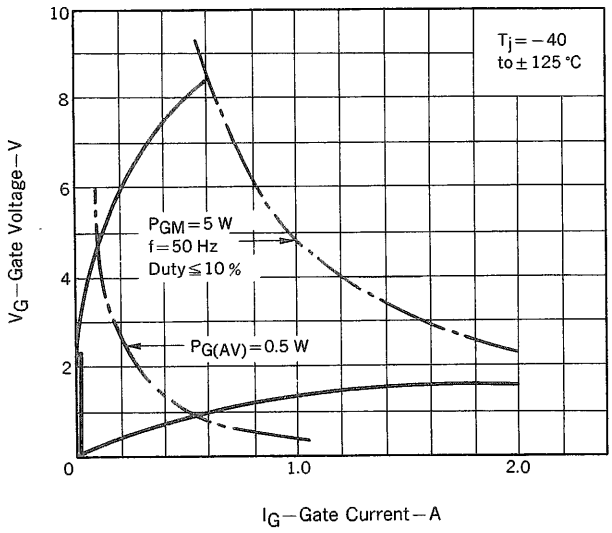



Fig. 4 $V_{GT} - I_{GT}$ CHARACTERISTIC

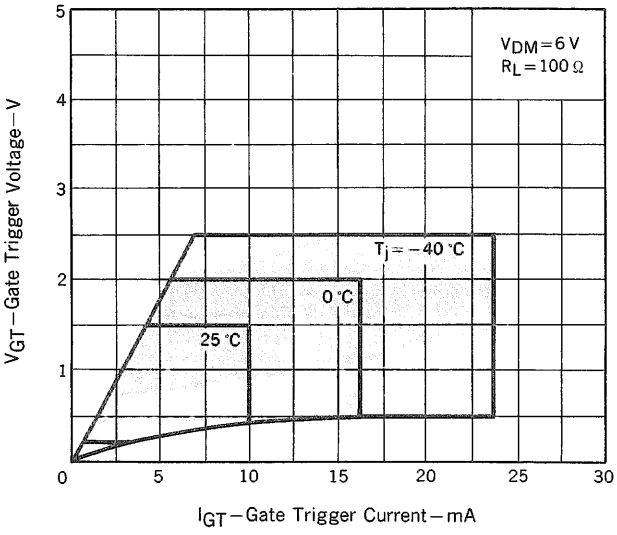



Fig. 5 $I_{GT} - T_a$ TYPICAL DISTRIBUTION

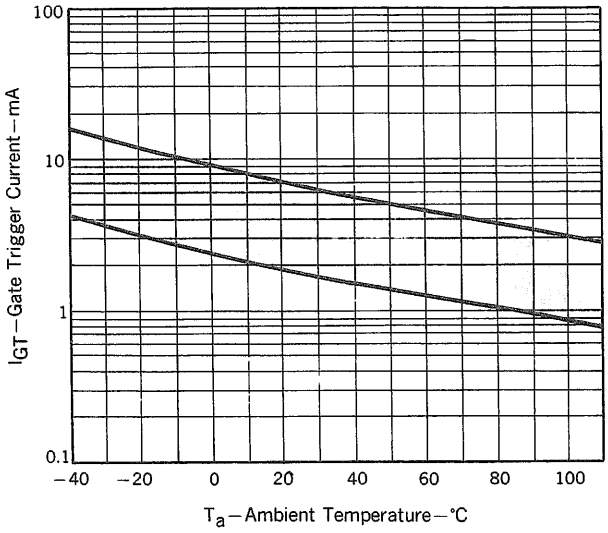
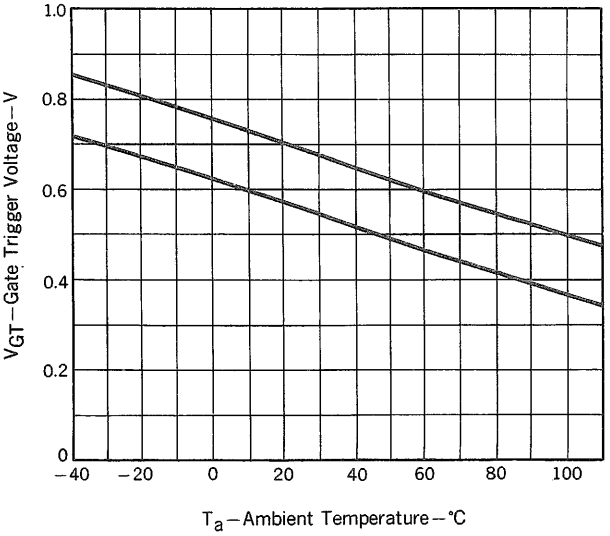



Fig. 6 $V_{GT} - T_a$ TYPICAL DISTRIBUTION



Phase-out/Discontinued

Fig. 7 $I_{GT} - \tau$ TYPICAL DISTRIBUTION

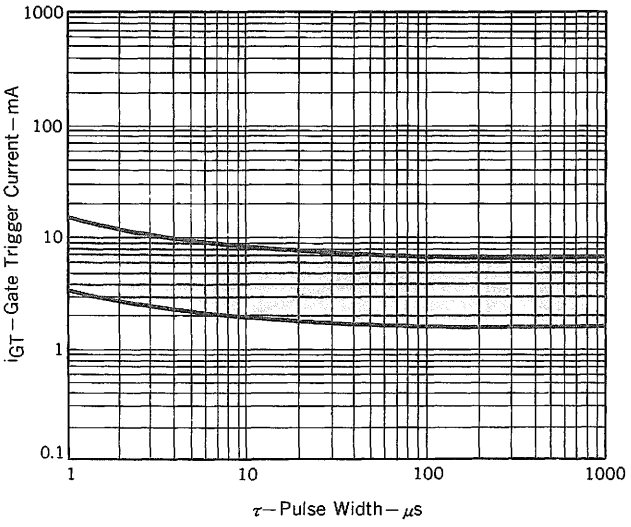



Fig. 8 $v_{GT} - \tau$ TYPICAL DISTRIBUTION

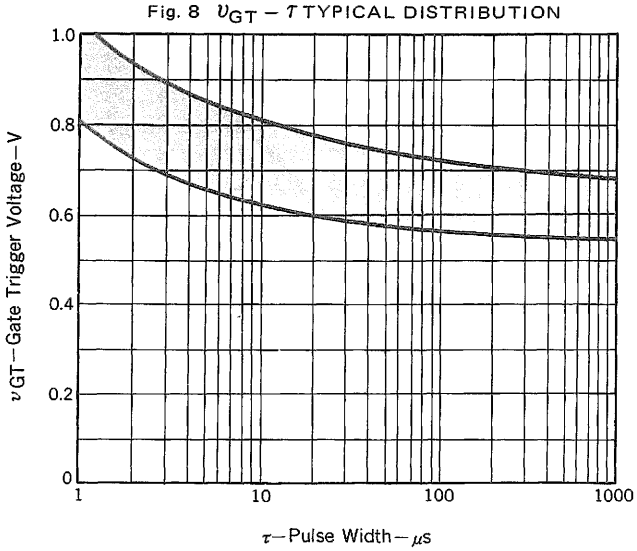



Fig. 9 $I_H - T_a$ TYPICAL DISTRIBUTION

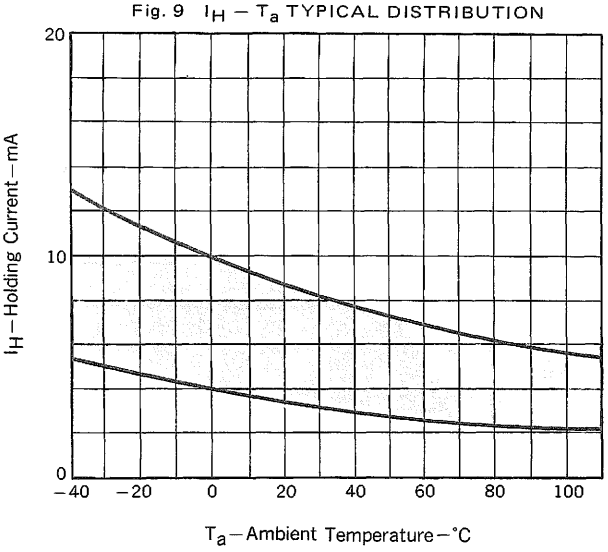
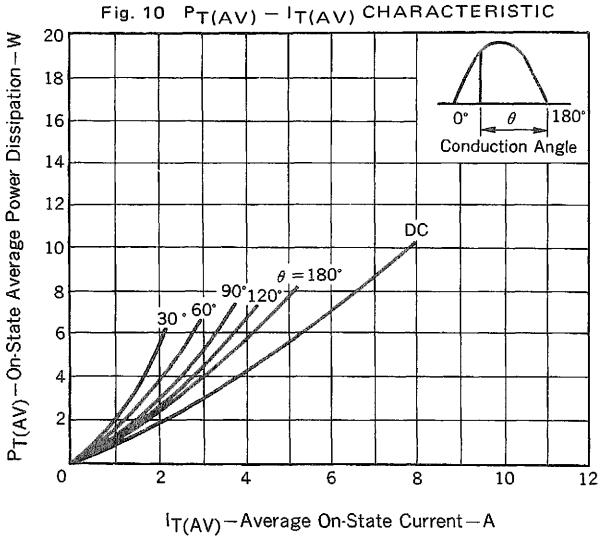



Fig. 10 $P_{T(AV)} - I_{T(AV)}$ CHARACTERISTIC



Phase-out/Discontinued

Fig. 11 $T_c - I_{T(AV)}$ RATING

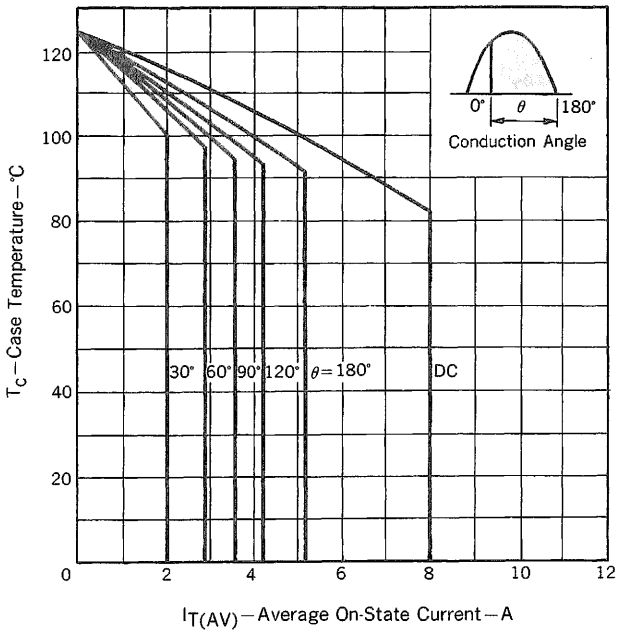



Fig. 12 $T_a - I_{T(AV)}$ RATING

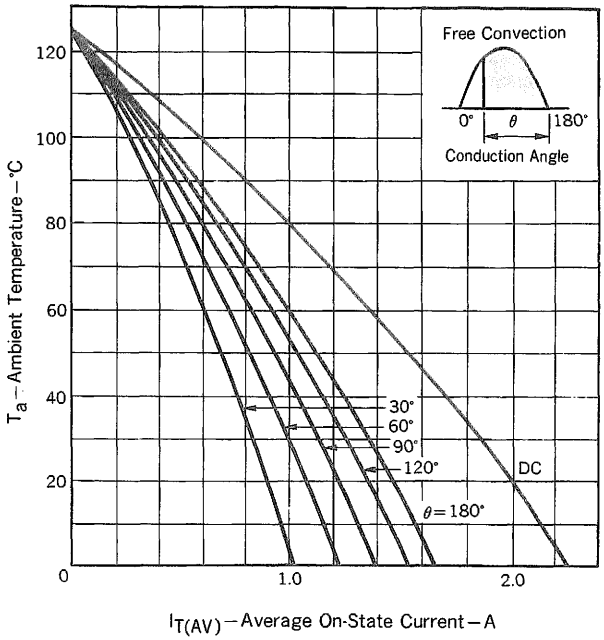
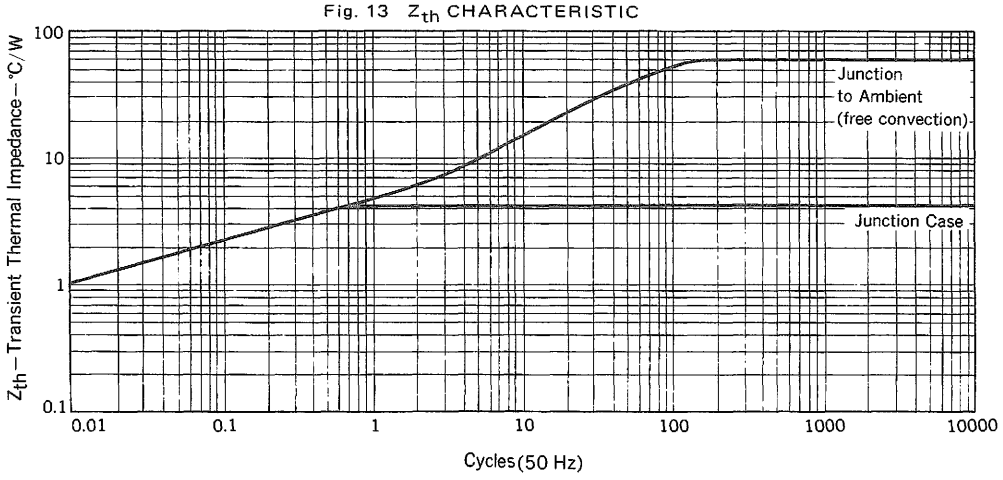



Fig. 13 $Z_{th}$ CHARACTERISTIC



Phase-out/Discontinued

## NOTICE FOR INSTALLATION

1. Electrode leads are not granted to be bent because of wet-proof. However it is required inevitably that a mechanical stress should not be put on mold case. Fix tightly between the mold case and the area to be formed or dent.
2. Electrode leads are not granted to be bent more than twice over 90° and avoid the bending within 1.5 mm from the neck of the mold case.
3. The surface of heat sink for thermal radiator is to be smooth without any foreign matter.
4. Suitable torque value is around 3kg-cm.

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