To all our customers

# Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

# BCR5PM

Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

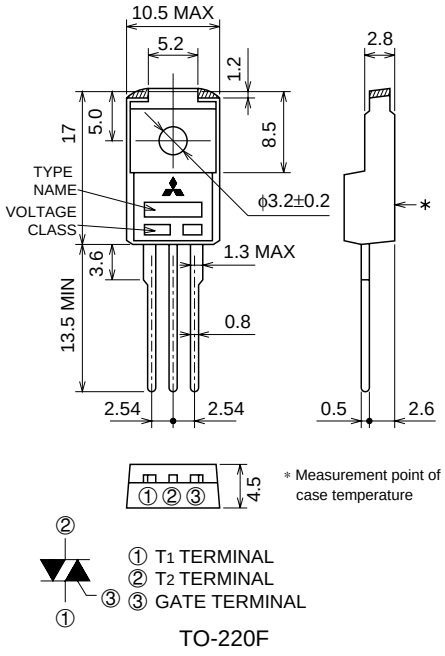
**MEDIUM POWER USE**
**INSULATED TYPE, PLANAR PASSIVATION TYPE**

**BCR5PM**

- **$I_{T\,(RMS)}$ ..... 5A**
- **$V_{DRM}$ ..... 600V**
- **$I_{FGT\,I}$, $I_{RGT\,I}$, $I_{RGT\,III}$ ..... 20mA (10mA) *5**
- **$V_{iso}$ ..... 2000V**
- **UL Recognized: Yellow Card No.E80276(N)**
  **File No. E80271**

**OUTLINE DRAWING**

Dimensions in mm




TO-220F

## APPLICATION

Switching mode power supply, light dimmer, electric flasher unit,
control of household equipment such as TV sets · stereo · refrigerator · washing machine · infrared kotatsu · carpet, solenoid drivers, small motor control,
copying machine, electric tool,
other general purpose control applications

## MAXIMUM RATINGS

| Symbol | Parameter | Voltage class | Unit |
|---|---|---|---|
| | | 12 | |
| $V_{DRM}$ | Repetitive peak off-state voltage *1 | 600 | V |
| $V_{DSM}$ | Non-repetitive peak off-state voltage *1 | 720 | V |

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $I_{T\,(RMS)}$ | RMS on-state current | Commercial frequency, sine full wave 360° conduction, $T_c$=95°C | 5 | A |
| $I_{TSM}$ | Surge on-state current | 60Hz sinewave 1 full cycle, peak value, non-repetitive | 50 | A |
| $I^2t$ | $I^2t$ for fusing | Value corresponding to 1 cycle of half wave 60Hz, surge on-state current | 10.4 | $A^2s$ |
| $P_{GM}$ | Peak gate power dissipation | | 3 | W |
| $P_{G\,(AV)}$ | Average gate power dissipation | | 0.3 | W |
| $V_{GM}$ | Peak gate voltage | | 10 | V |
| $I_{GM}$ | Peak gate current | | 2 | A |
| $T_j$ | Junction temperature | | –40 ~ +125 | °C |
| $T_{stg}$ | Storage temperature | | –40 ~ +125 | °C |
| — | Weight | Typical value | 2.0 | g |
| $V_{iso}$ | Isolation voltage | $T_a$=25°C, AC 1 minute, $T_1$ · $T_2$ · G terminal to case | 2000 | V |

*1. Gate open.



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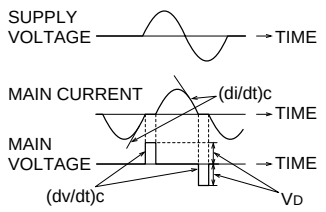
Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

## ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | | Test conditions | Limits Min. | Limits Typ. | Limits Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{DRM}$ | Repetitive peak off-state current | | $T_j$=125°C, $V_{DRM}$ applied | — | — | 2.0 | mA |
| $V_{TM}$ | On-state voltage | | $T_c$=25°C, $I_{TM}$=7A, Instantaneous measurement | — | — | 1.8 | V |
| $V_{FGT\ I}$ | Gate trigger voltage *2 | I | $T_j$=25°C, $V_D$=6V, $R_L$=6Ω, $R_G$=330Ω | — | — | 1.5 | V |
| $V_{RGT\ I}$ | | II | | — | — | 1.5 | V |
| $V_{RGT\ III}$ | | III | | — | — | 1.5 | V |
| $I_{FGT\ I}$ | Gate trigger current *2 | I | $T_j$=25°C, $V_D$=6V, $R_L$=6Ω, $R_G$=330Ω | — | — | 20*5 | mA |
| $I_{RGT\ I}$ | | II | | — | — | 20*5 | mA |
| $I_{RGT\ III}$ | | III | | — | — | 20*5 | mA |
| $V_{GD}$ | Gate non-trigger voltage | | $T_j$=125°C, $V_D$=1/2$V_{DRM}$ | 0.2 | — | — | V |
| $R_{th\ (j-c)}$ | Thermal resistance | | Junction to case *3 | — | — | 4.0 | °C/W |
| $(dv/dt)_c$ | Critical-rate of rise of off-state commutating voltage *4 | | $T_j$=125°C | 5 | — | — | V/μs |

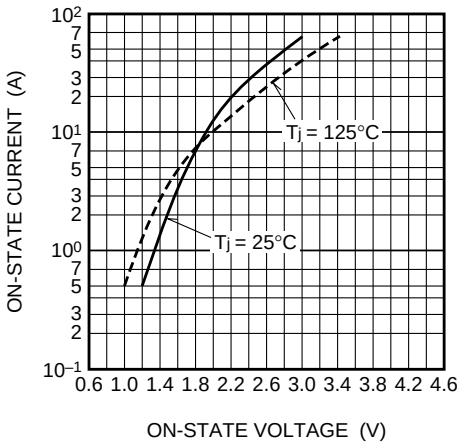
*2. Measurement using the gate trigger characteristics measurement circuit.
*3. The contact thermal resistance $R_{th\ (c-f)}$ in case of greasing is 0.5°C/W.
*4. Test conditions of the critical-rate of rise of off-state commutating voltage is shown in the table below.
*5. High sensitivity ($I_{GT}$≤10mA) is also available. ($I_{GT}$ item ①)

| Test conditions | Commutating voltage and current waveforms (inductive load) |
|---|---|
| 1. Junction temperature $T_j$=125°C<br>2. Rate of decay of on-state commutating current $(di/dt)_c$=–2.5A/ms<br>3. Peak off-state voltage $V_D$=400V |  |



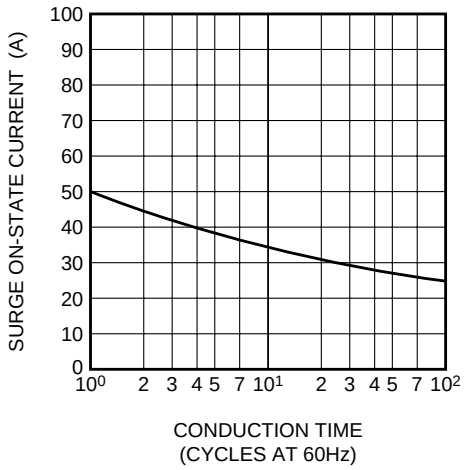
## PERFORMANCE CURVES

**MAXIMUM ON-STATE CHARACTERISTICS**



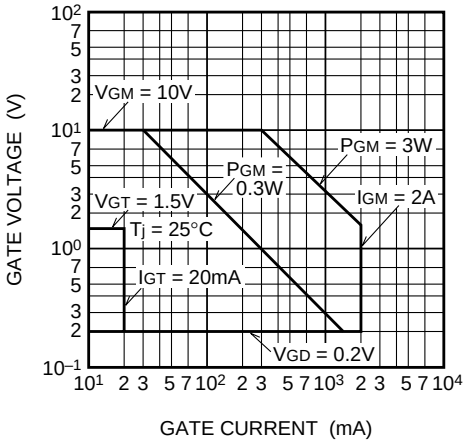


**RATED SURGE ON-STATE CURRENT**

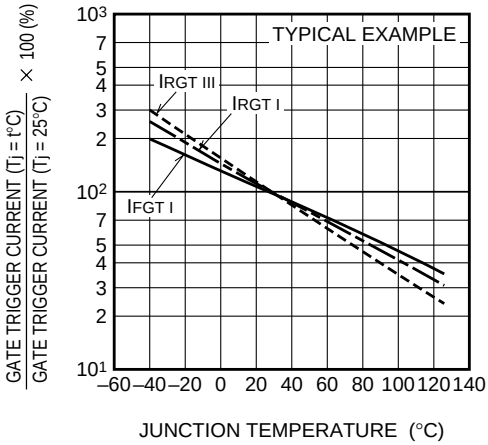


Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

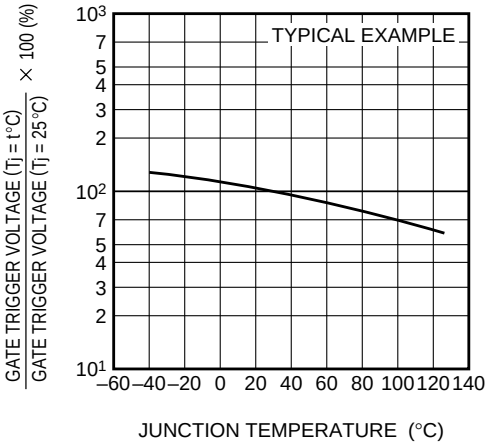
**GATE CHARACTERISTICS (I, II AND III)**



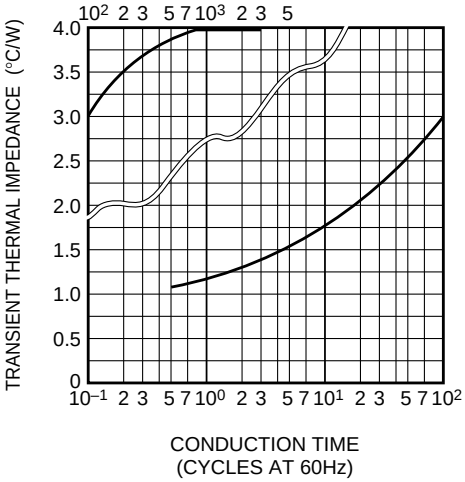

**GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE**



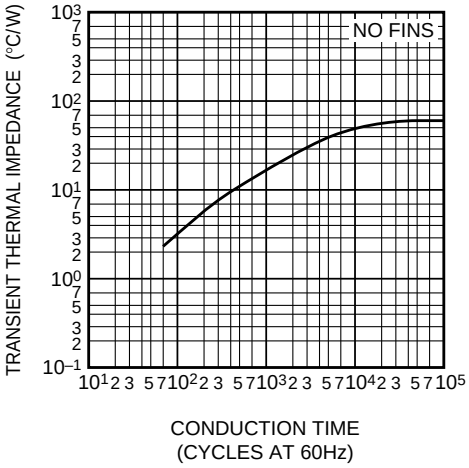

**GATE TRIGGER VOLTAGE VS. JUNCTION TEMPERATURE**



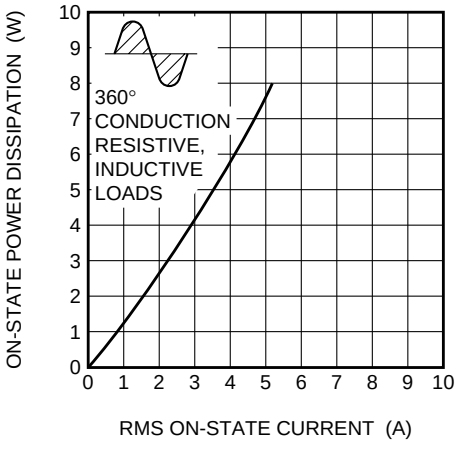

**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)**




**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO AMBIENT)**

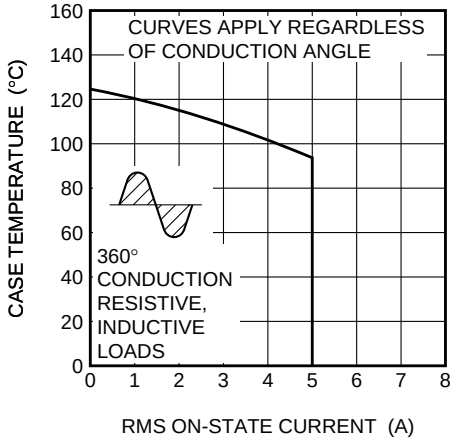



**MAXIMUM ON-STATE POWER DISSIPATION**

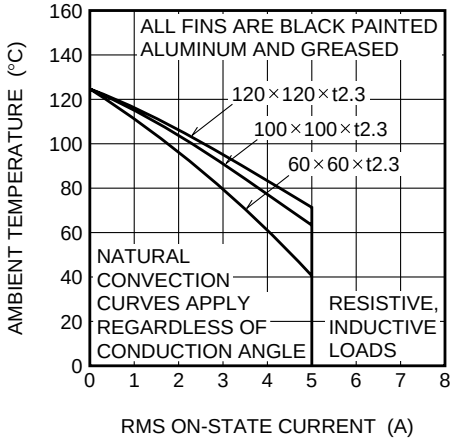


Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

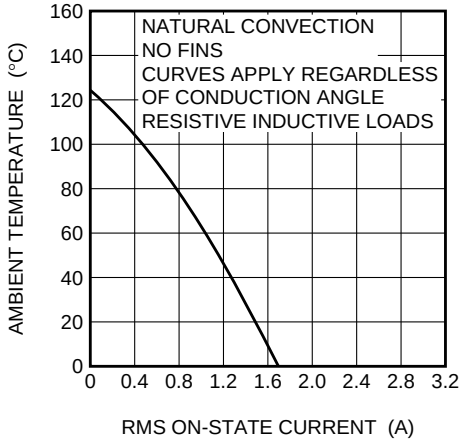
**ALLOWABLE CASE TEMPERATURE VS. RMS ON-STATE CURRENT**



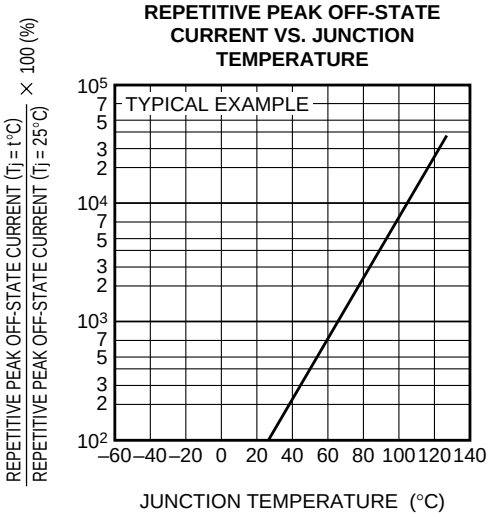

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



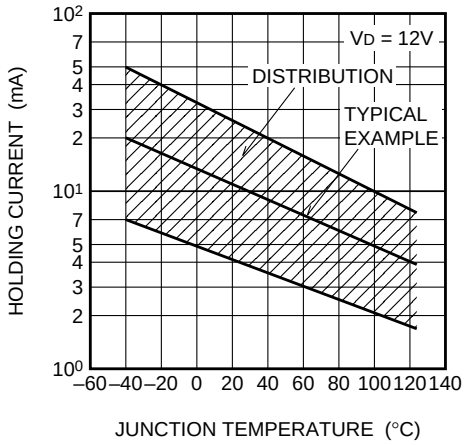

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



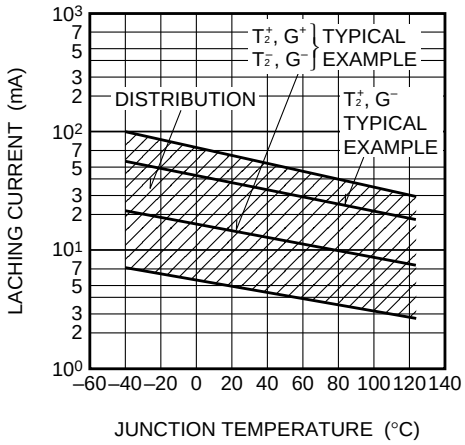

**REPETITIVE PEAK OFF-STATE CURRENT VS. JUNCTION TEMPERATURE**




**HOLDING CURRENT VS. JUNCTION TEMPERATURE**

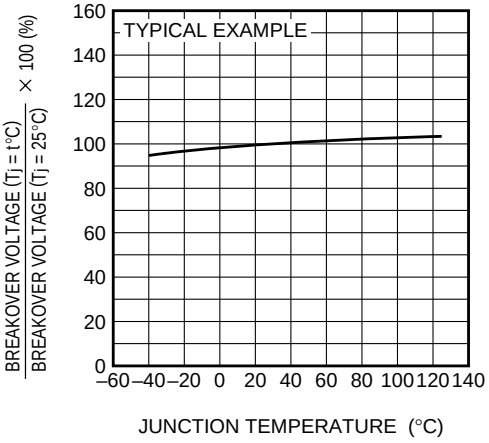



**LACHING CURRENT VS. JUNCTION TEMPERATURE**

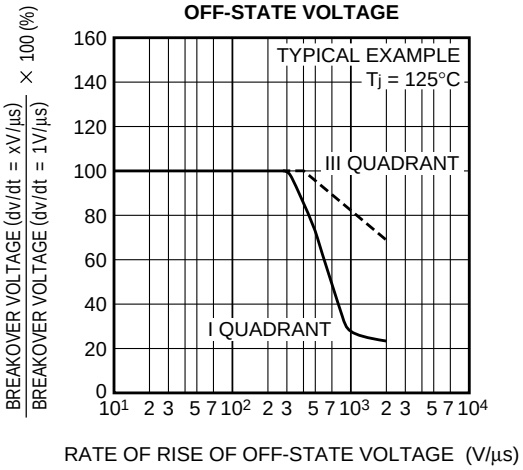


Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

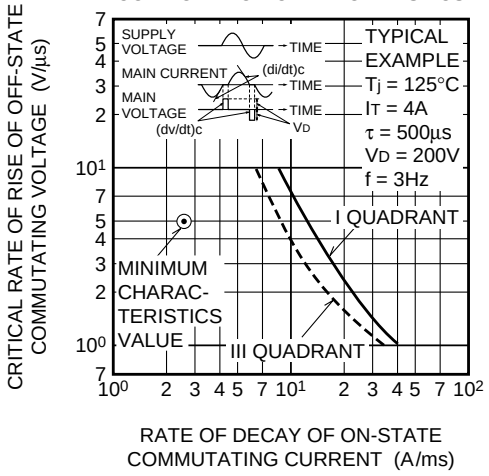
**BREAKOVER VOLTAGE VS. JUNCTION TEMPERATURE**



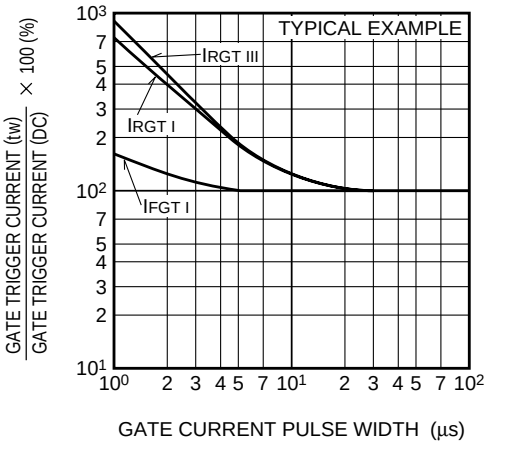

**BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE**



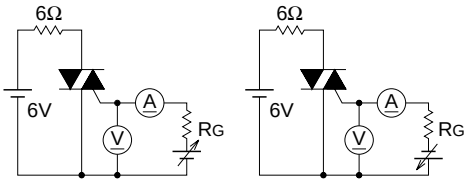

**COMMUTATION CHARACTERISTICS**



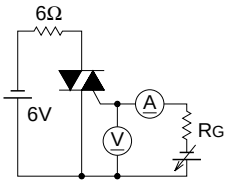

**GATE TRIGGER CURRENT VS. GATE CURRENT PULSE WIDTH**




**GATE TRIGGER CHARACTERISTICS TEST CIRCUITS**




TEST PROCEDURE Ⅰ TEST PROCEDURE Ⅱ




TEST PROCEDURE Ⅲ

# BCR5PM

The product guaranteed maximum junction temperature 150°C (See warning.)

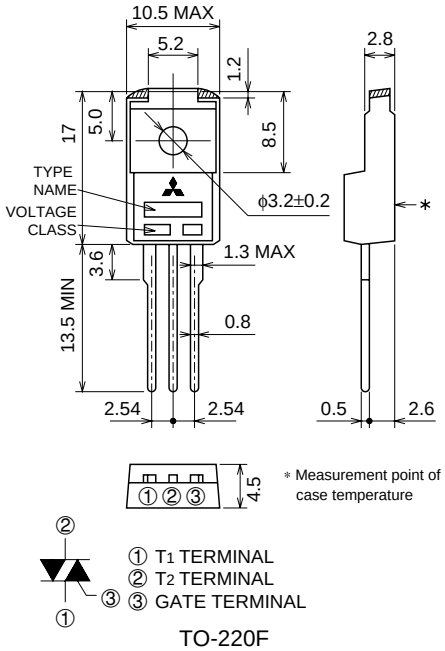
**MEDIUM POWER USE**
**INSULATED TYPE, PLANAR PASSIVATION TYPE**

**BCR5PM**

- **$I_{T\,(RMS)}$ ..... 5A**
- **$V_{DRM}$ ..... 600V**
- **$I_{FGT\,I}$, $I_{RGT\,I}$, $I_{RGT\,III}$ ..... 20mA (10mA) *5**
- **$V_{iso}$ ..... 2000V**
- **UL Recognized: Yellow Card No.E80276(N)**
  **File No. E80271**

**OUTLINE DRAWING**

Dimensions in mm




TO-220F

## APPLICATION

Switching mode power supply, light dimmer, electric flasher unit, control of household equipment such as TV sets · stereo · refrigerator · washing machine · infrared kotatsu · carpet, solenoid drivers, small motor control, copying machine, electric tool, other general purpose control applications

(Warning)
1. Refer to the recommended circuit values around the triac before using.
2. Be sure to exchange the specification before using. If not exchanged, general triacs will be supplied.

## MAXIMUM RATINGS

| Symbol | Parameter | Voltage class | Unit |
|---|---|---|---|
| | | 12 | |
| $V_{DRM}$ | Repetitive peak off-state voltage *1 | 600 | V |
| $V_{DSM}$ | Non-repetitive peak off-state voltage *1 | 720 | V |

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $I_{T\,(RMS)}$ | RMS on-state current | Commercial frequency, sine full wave 360° conduction, $T_c$=120°C | 5 | A |
| $I_{TSM}$ | Surge on-state current | 60Hz sinewave 1 full cycle, peak value, non-repetitive | 50 | A |
| $I^2t$ | $I^2t$ for fusing | Value corresponding to 1 cycle of half wave 60Hz, surge on-state current | 10.4 | $A^2s$ |
| $P_{GM}$ | Peak gate power dissipation | | 3 | W |
| $P_{G\,(AV)}$ | Average gate power dissipation | | 0.3 | W |
| $V_{GM}$ | Peak gate voltage | | 10 | V |
| $I_{GM}$ | Peak gate current | | 2 | A |
| $T_j$ | Junction temperature | | –40 ~ +150 | °C |
| $T_{stg}$ | Storage temperature | | –40 ~ +150 | °C |
| — | Weight | Typical value | 2.0 | g |
| $V_{iso}$ | Isolation voltage | $T_a$=25°C, AC 1 minute, $T_1$ · $T_2$ · G terminal to case | 2000 | V |

*1. Gate open.



RENESAS
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# BCR5PM

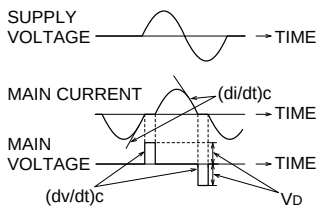
The product guaranteed maximum junction temperature 150°C (See warning.)

**MEDIUM POWER USE**
**INSULATED TYPE, PLANAR PASSIVATION TYPE**

## ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | | Test conditions | Limits Min. | Limits Typ. | Limits Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{DRM}$ | Repetitive peak off-state current | | $T_j$=150°C, $V_{DRM}$ applied | — | — | 2.0 | mA |
| $V_{TM}$ | On-state voltage | | $T_c$=25°C, $I_{TM}$=7A, Instantaneous measurement | — | — | 1.8 | V |
| $V_{FGT\ I}$ | Gate trigger voltage *2 | I | $T_j$=25°C, $V_D$=6V, $R_L$=6Ω, $R_G$=330Ω | — | — | 1.5 | V |
| $V_{RGT\ I}$ | | II | | — | — | 1.5 | V |
| $V_{RGT\ III}$ | | III | | — | — | 1.5 | V |
| $I_{FGT\ I}$ | Gate trigger current *2 | I | $T_j$=25°C, $V_D$=6V, $R_L$=6Ω, $R_G$=330Ω | — | — | 20*5 | mA |
| $I_{RGT\ I}$ | | II | | — | — | 20*5 | mA |
| $I_{RGT\ III}$ | | III | | — | — | 20*5 | mA |
| $V_{GD}$ | Gate non-trigger voltage | | $T_j$=125°C/150°C, $V_D$=1/2$V_{DRM}$ | 0.2/0.1 | — | — | V |
| $R_{th\ (j-c)}$ | Thermal resistance | | Junction to case *3 | — | — | 4.0 | °C/W |
| $(dv/dt)_c$ | Critical-rate of rise of off-state commutating voltage *4 | | $T_j$=125°C/150°C | 5/1 | — | — | V/µs |

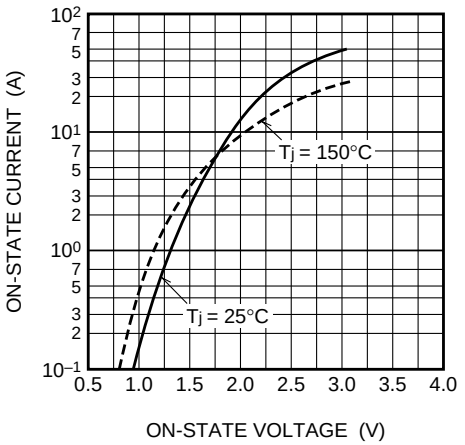
*2. Measurement using the gate trigger characteristics measurement circuit.
*3. The contact thermal resistance $R_{th\ (c-f)}$ in case of greasing is 0.5°C/W.
*4. Test conditions of the critical-rate of rise of off-state commutating voltage is shown in the table below.
*5. High sensitivity ($I_{GT}$≤10mA) is also available. ($I_{GT}$ item ①)

| Test conditions | Commutating voltage and current waveforms (inductive load) |
|---|---|
| 1. Junction temperature $T_j$=125°C/150°C<br>2. Rate of decay of on-state commutating current $(di/dt)_c$=–2.5A/ms<br>3. Peak off-state voltage $V_D$=400V |  |



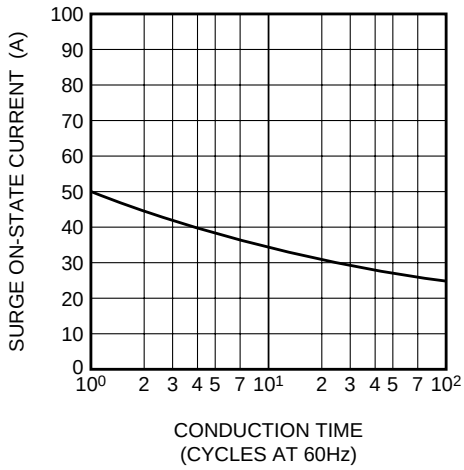
## PERFORMANCE CURVES

**MAXIMUM ON-STATE CHARACTERISTICS**





**RATED SURGE ON-STATE CURRENT**







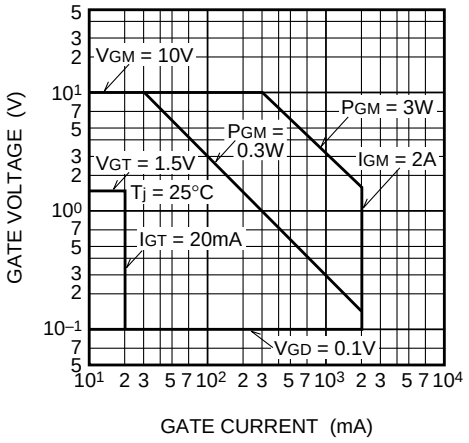
RENESAS
Renesas Technology Corp.

# BCR5PM

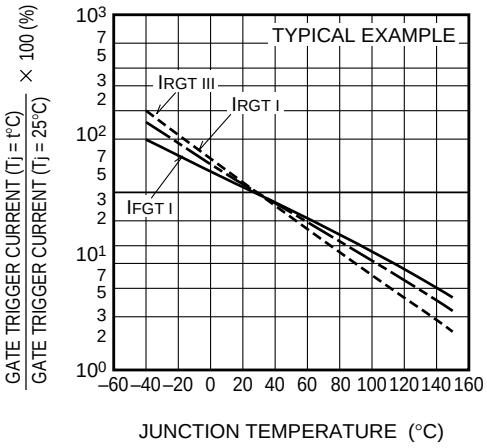
The product guaranteed maximum junction temperature 150°C (See warning.)

**MEDIUM POWER USE**
**INSULATED TYPE, PLANAR PASSIVATION TYPE**

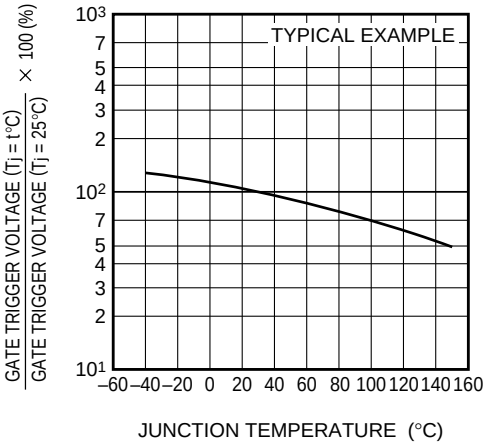
**GATE CHARACTERISTICS (I, II AND III)**



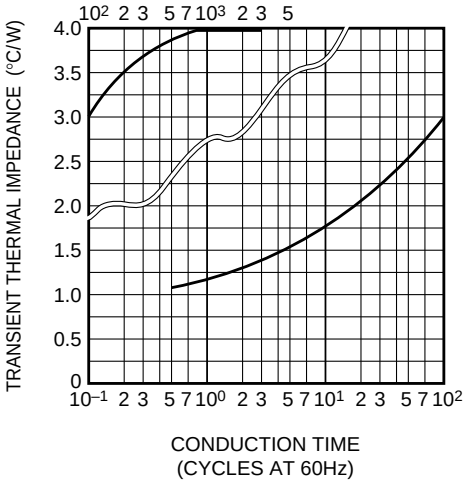

**GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE**



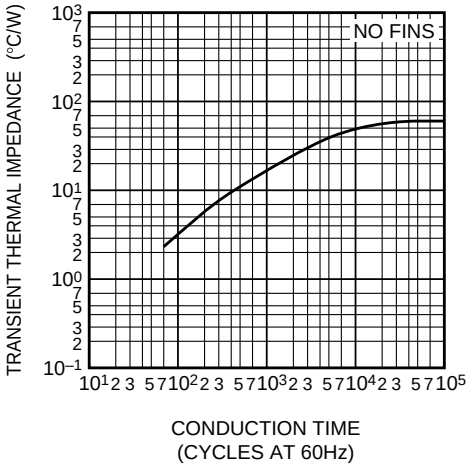

**GATE TRIGGER VOLTAGE VS. JUNCTION TEMPERATURE**



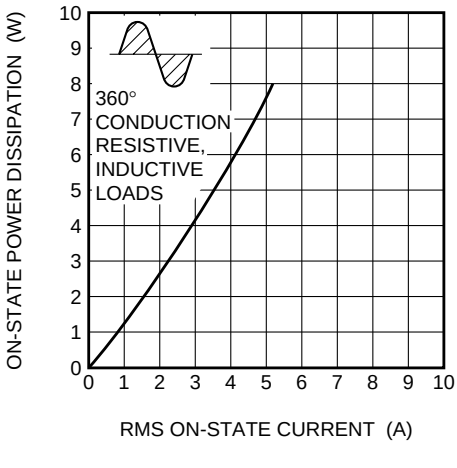

**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)**




**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO AMBIENT)**




**MAXIMUM ON-STATE POWER DISSIPATION**

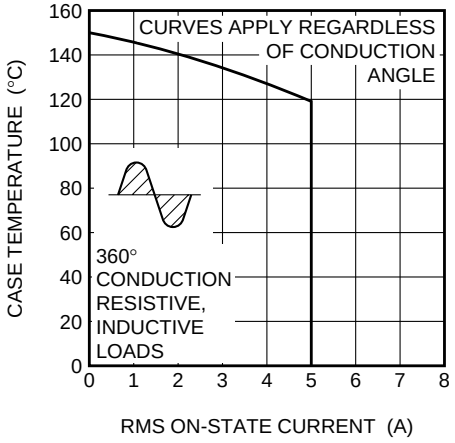




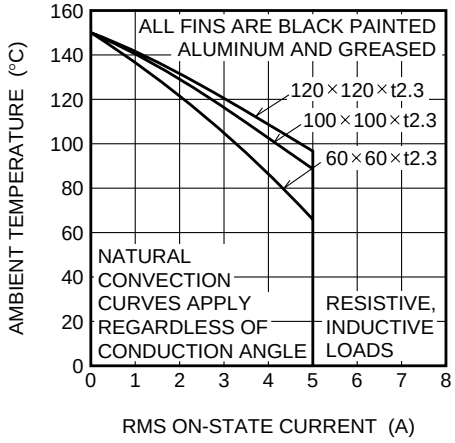

RENESAS
Renesas Technology Corp.

The product guaranteed maximum junction temperature 150°C (See warning.)

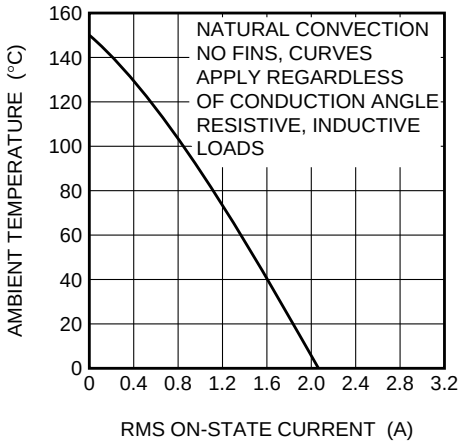
**ALLOWABLE CASE TEMPERATURE VS. RMS ON-STATE CURRENT**



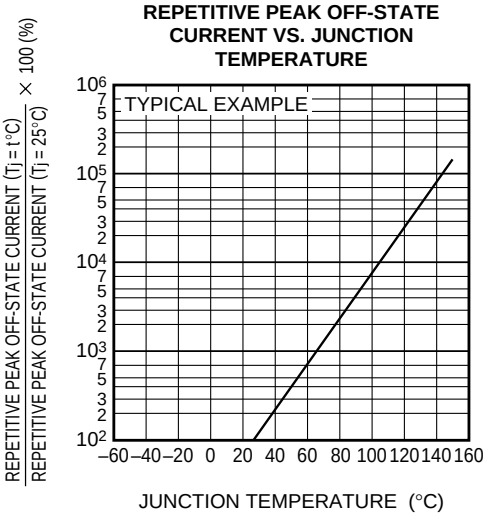

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



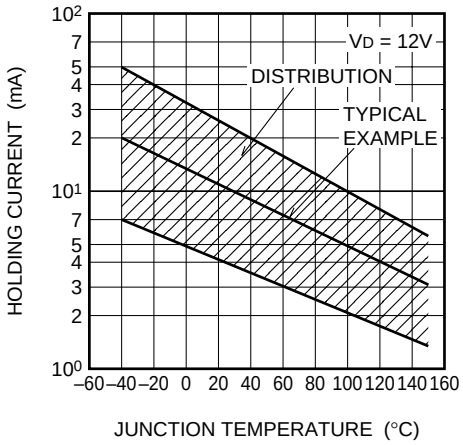

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



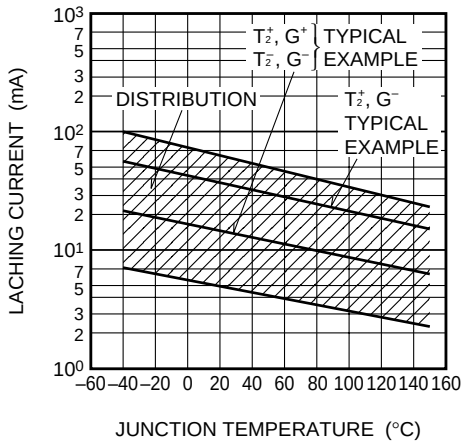

**REPETITIVE PEAK OFF-STATE CURRENT VS. JUNCTION TEMPERATURE**




**HOLDING CURRENT VS. JUNCTION TEMPERATURE**




**LACHING CURRENT VS. JUNCTION TEMPERATURE**

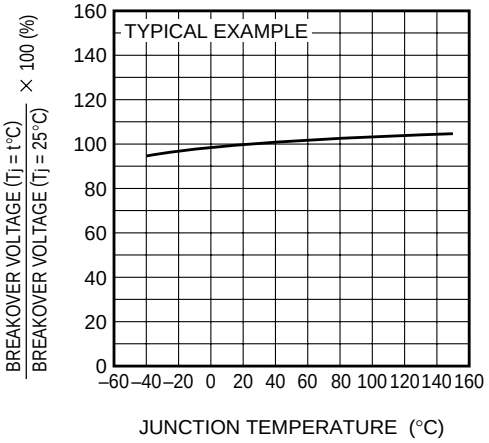


# BCR5PM

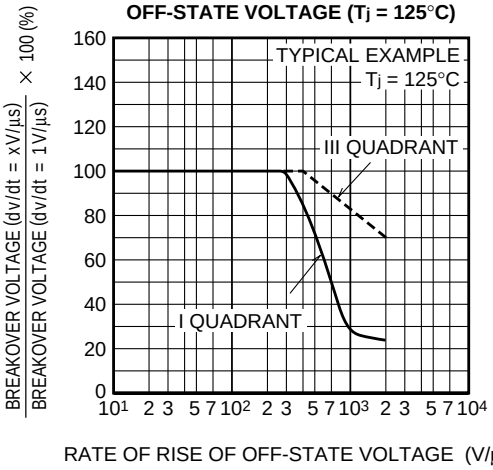
The product guaranteed maximum junction temperature 150°C (See warning.)

**MEDIUM POWER USE**
**INSULATED TYPE, PLANAR PASSIVATION TYPE**

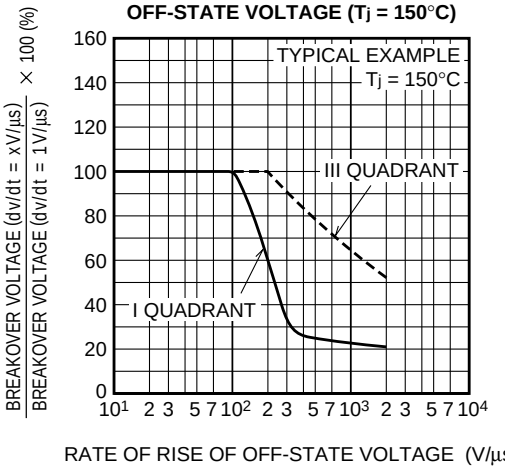
**BREAKOVER VOLTAGE VS. JUNCTION TEMPERATURE**



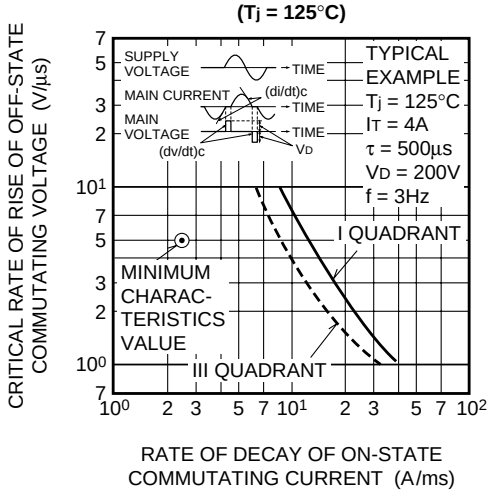

**BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE ($T_j$ = 125°C)**



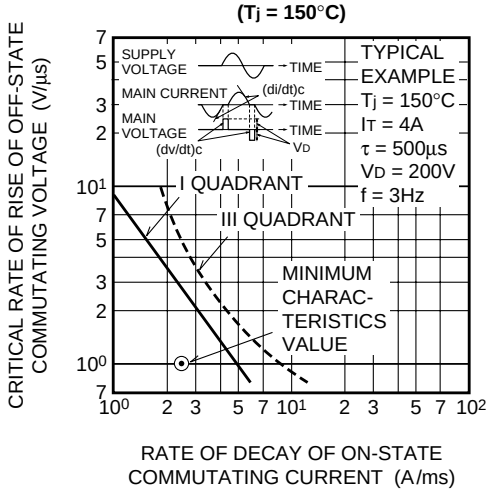

**BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE ($T_j$ = 150°C)**



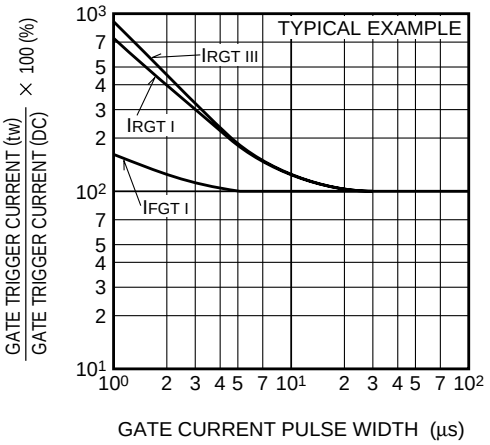

**COMMUTATION CHARACTERISTICS ($T_j$ = 125°C)**




**COMMUTATION CHARACTERISTICS ($T_j$ = 150°C)**




**GATE TRIGGER CURRENT VS. GATE CURRENT PULSE WIDTH**

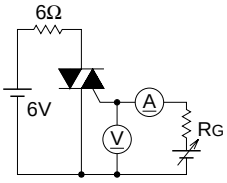




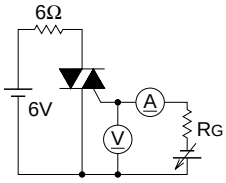

RENESAS
Renesas Technology Corp.

The product guaranteed maximum junction temperature 150°C (See warning.)

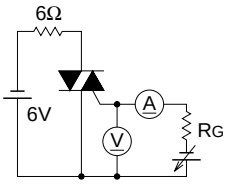
**GATE TRIGGER CHARACTERISTICS TEST CIRCUITS**




TEST PROCEDURE Ⅰ

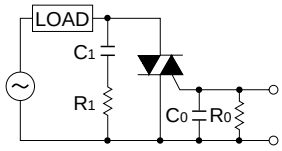



TEST PROCEDURE Ⅱ




TEST PROCEDURE Ⅲ

**RECOMMENDED CIRCUIT VALUES AROUND THE TRIAC**




$C_1$ = 0.1~0.47μF $C_0$ = 0.1μF
$R_1$ = 47~100Ω $R_0$ = 100Ω