# BCR12CS

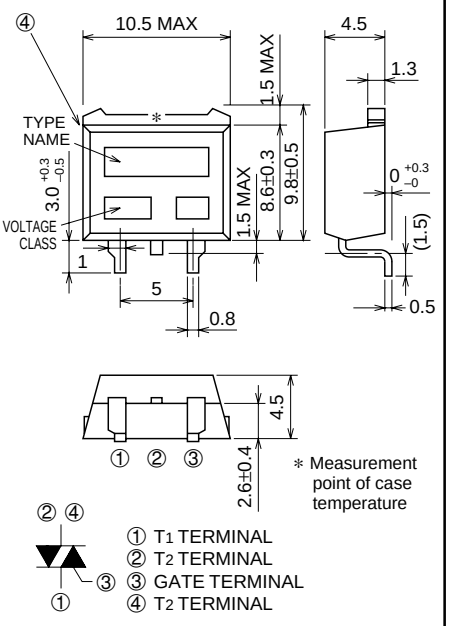
Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

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

**BCR12CS**

- **$I_{T\ (RMS)}$ ..... 12A**
- **$V_{DRM}$ ..... 600V**
- **$I_{FGT\ I}$, $I_{RGT\ I}$, $I_{RGT\ III}$ ..... 20mA**

**OUTLINE DRAWING** Dimensions in mm




## APPLICATION

Contactless AC switches, light drimmer, electric flasher unit,
control of household equipment such as TV sets · stereo · refrigerator · washing machine · infrared kotatsu · carpet · electric fan, 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, $T_C$=98°C *3 | 12 | A |
| $I_{TSM}$ | Surge on-state current | 60Hz sinewave 1 full cycle, peak value, non-repetitive | 120 | A |
| $I^2t$ | $I^2t$ for fusing | Value corresponding to 1 cycle of half wave 60Hz, surge on-state current | 60 | $A^2s$ |
| $P_{GM}$ | Peak gate power dissipation | | 5 | W |
| $P_{G\ (AV)}$ | Average gate power dissipation | | 0.5 | 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 | 1.2 | g |

*1. Gate open.



MITSUBISHI ELECTRIC

# BCR12CS

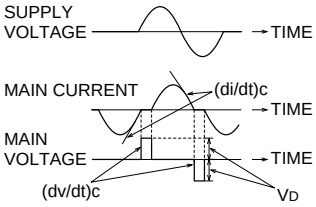
Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

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

## ELECTRICAL CHARACTERISTICS

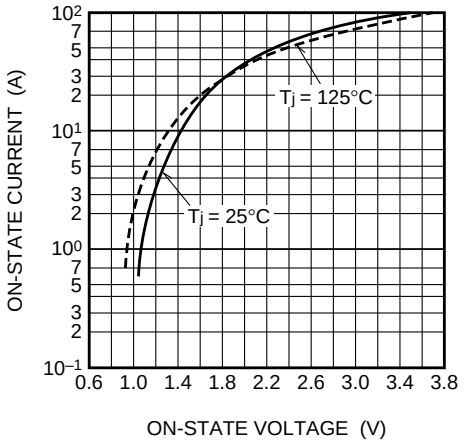
| Symbol | Parameter | | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| $I_{DRM}$ | Repetitive peak off-state current | | $T_j$=125°C, $V_{DRM}$ applied | — | — | 2.0 | mA |
| $V_{TM}$ | On-state voltage | | $T_C$=25°C, $I_{TM}$=20A, Instantaneous measurement | — | — | 1.6 | 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 | mA |
| $I_{RGT\ I}$ | | Ⅱ | | — | — | 20 | mA |
| $I_{RGT\ III}$ | | Ⅲ | | — | — | 20 | 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 | — | — | 1.8 | °C/W |
| $(dv/dt)_c$ | Critical-rate of rise of off-state commutating voltage | *5 | $T_j$=125°C | 10 | — | — | V/μs |

*2. Measurement using the gate trigger characteristics measurement circuit.
*3. Case temperature is measured on the T2 terminal.
*4. The contact thermal resistance $R_{th\ (c-f)}$ in case of greasing is 1.0°C/W.
*5. Test conditions of the critical-rate of rise of off-state commutating voltage is shown in the table below.

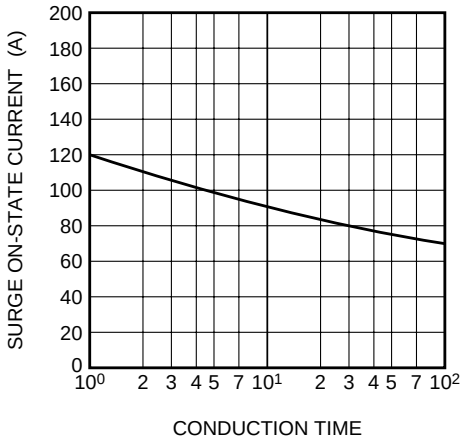
| Test conditions | Commutating voltage and current waveforms (inductive load) |
|---|---|
| 1. Junction temperature $T_j$=125°C<br>2. Rate of decay of on-state commutating current $(di/dt)_c$=–6.0A/ms<br>3. Peak off-state voltage $V_D$=400V |  |

## PERFORMANCE CURVES

**MAXIMUM ON-STATE CHARACTERISTICS**




**RATED SURGE ON-STATE CURRENT**

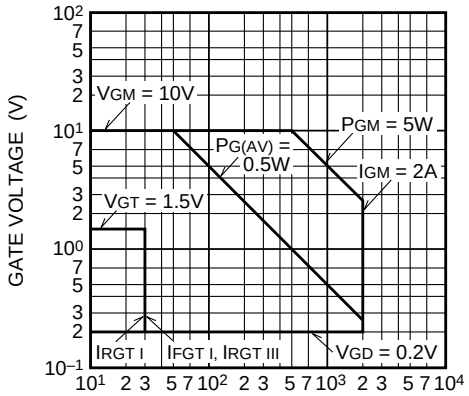




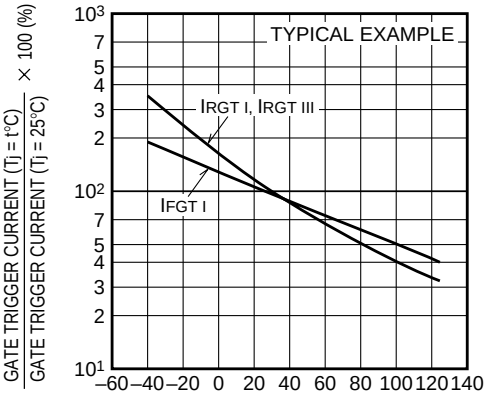

MITSUBISHI ELECTRIC

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

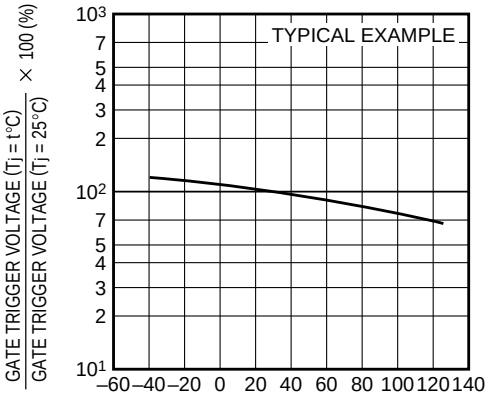
**GATE CHARACTERISTICS (I, II AND III)**



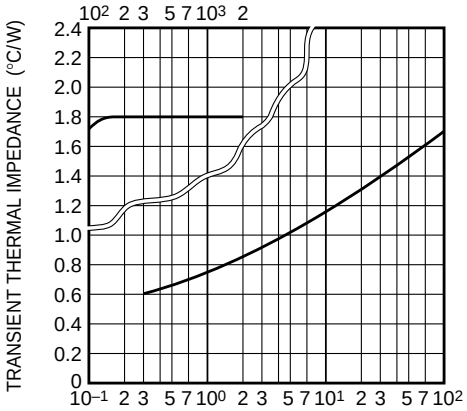

**GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE**



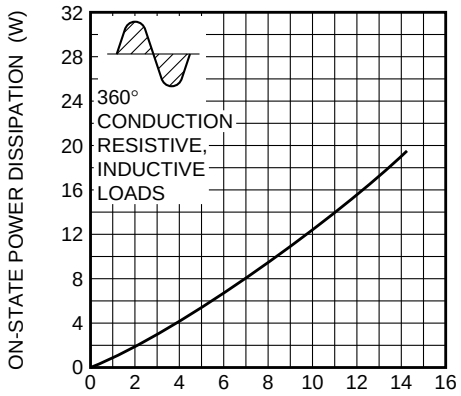

**GATE TRIGGER VOLTAGE VS. JUNCTION TEMPERATURE**



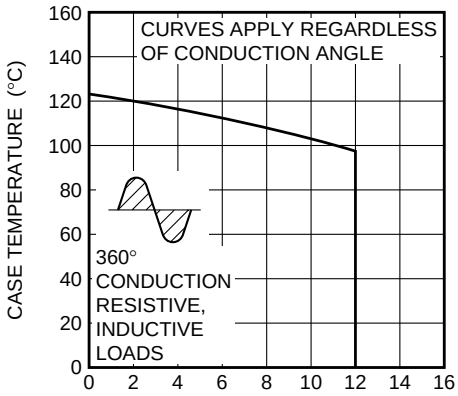

**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)**




**MAXIMUM ON-STATE POWER DISSIPATION**

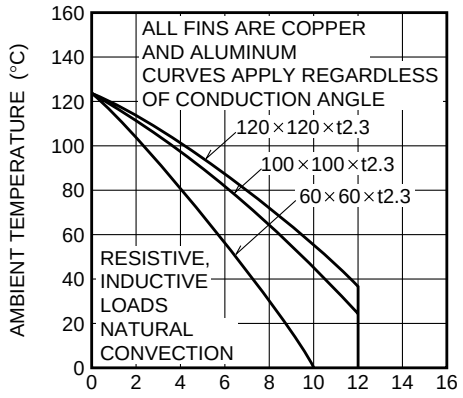



**ALLOWABLE CASE TEMPERATURE VS. RMS ON-STATE CURRENT**

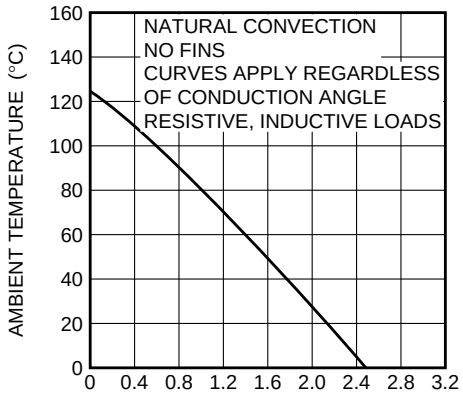


Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

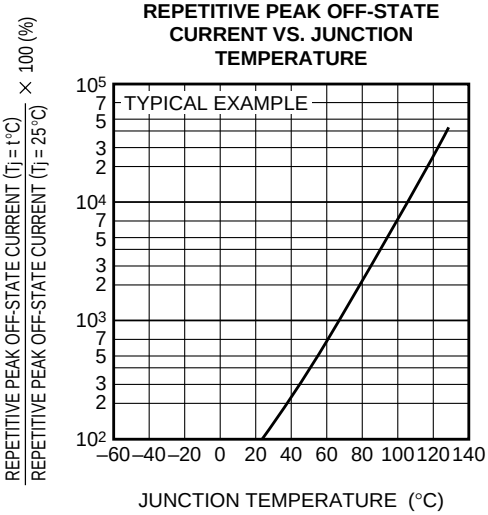
**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



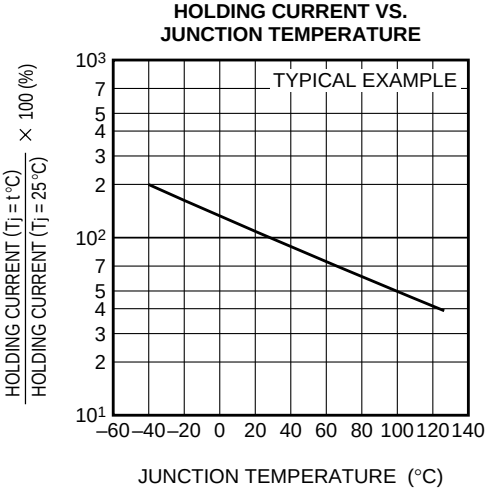

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



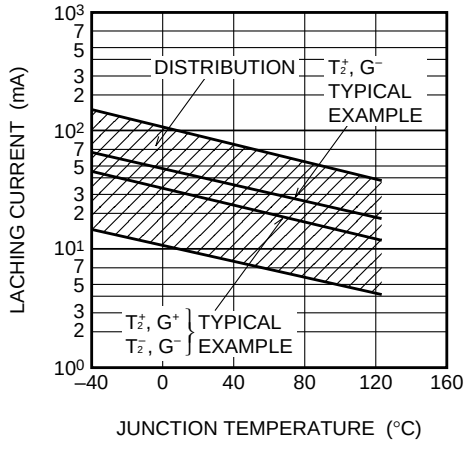

**REPETITIVE PEAK OFF-STATE CURRENT VS. JUNCTION TEMPERATURE**



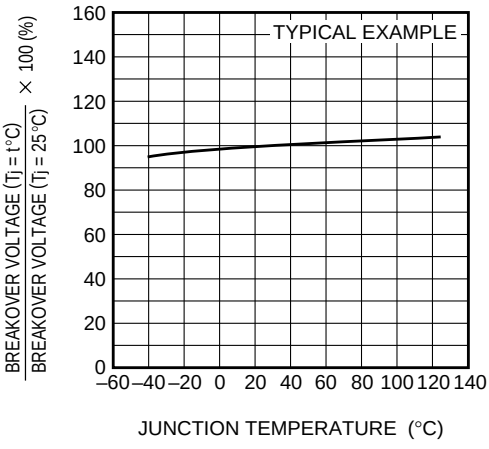

**HOLDING CURRENT VS. JUNCTION TEMPERATURE**




**LACHING CURRENT VS. JUNCTION TEMPERATURE**




**BREAKOVER VOLTAGE VS. JUNCTION TEMPERATURE**

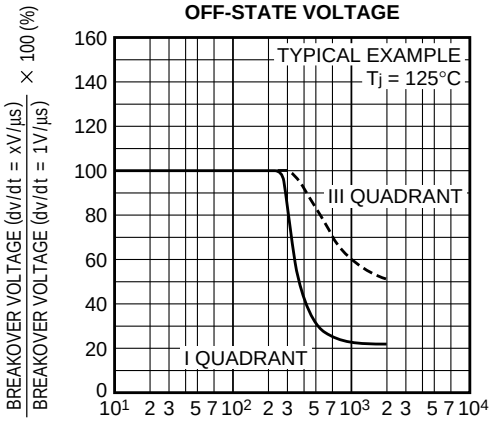


# BCR12CS

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

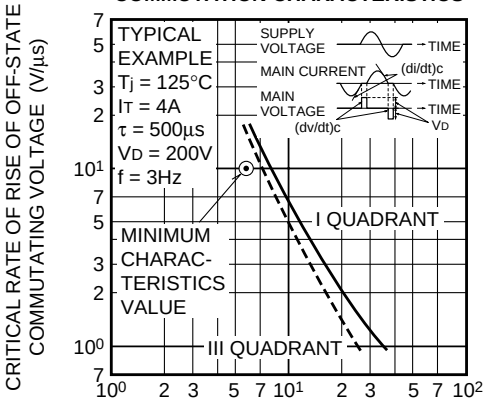
**MEDIUM POWER USE**
**NON-INSULATED TYPE, PLANAR PASSIVATION TYPE**

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



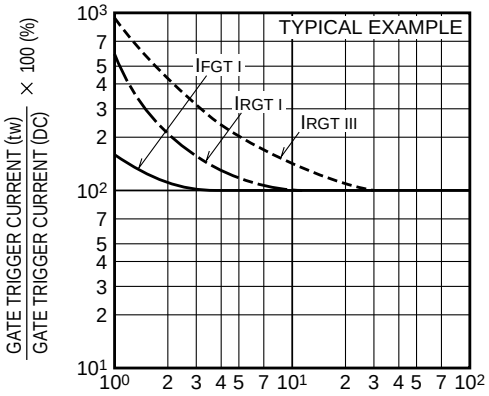

RATE OF RISE OF OFF-STATE VOLTAGE (V/μs)

**COMMUTATION CHARACTERISTICS**



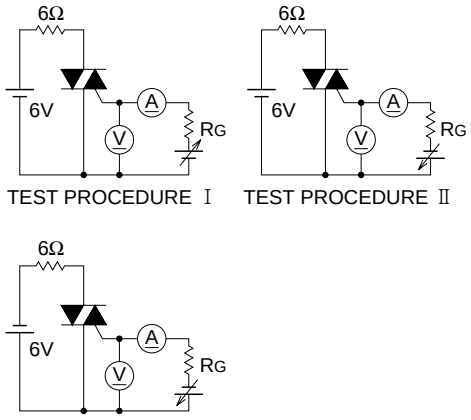

RATE OF DECAY OF ON-STATE COMMUTATING CURRENT (A/ms)

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




GATE CURRENT PULSE WIDTH (μs)

**GATE TRIGGER CHARACTERISTICS TEST CIRCUITS**




TEST PROCEDURE Ⅰ　TEST PROCEDURE Ⅱ

TEST PROCEDURE Ⅲ



MITSUBISHI ELECTRIC

# BCR12CS

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

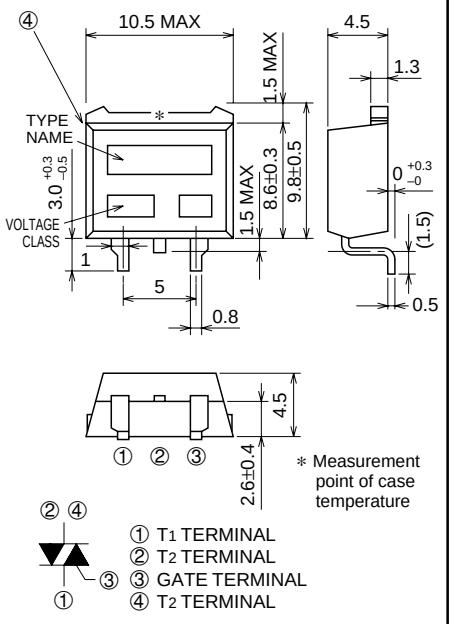
**MEDIUM POWER USE**
**NON-INSULATED TYPE, PLANAR PASSIVATION TYPE**

**BCR12CS**

- **$I_{T\ (RMS)}$ ..... 12A**
- **$V_{DRM}$ ..... 600V**
- **$I_{FGT\ I}$, $I_{RGT\ I}$, $I_{RGT\ III}$ ..... 20mA**

**OUTLINE DRAWING**

Dimensions in mm




## APPLICATION

Contactless AC switches, light drimmer, electric flasher unit,
control of household equipment such as TV sets · stereo · refrigerator · washing machine · infrared kotatsu · carpet · electric fan, 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, $T_C$=123°C *3 | 12 | A |
| $I_{TSM}$ | Surge on-state current | 60Hz sinewave 1 full cycle, peak value, non-repetitive | 120 | A |
| $I^2t$ | $I^2t$ for fusing | Value corresponding to 1 cycle of half wave 60Hz, surge on-state current | 60 | $A^2s$ |
| $P_{GM}$ | Peak gate power dissipation | | 5 | W |
| $P_{G\ (AV)}$ | Average gate power dissipation | | 0.5 | 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 | 1.2 | g |

*1. Gate open.



MITSUBISHI ELECTRIC

# BCR12CS

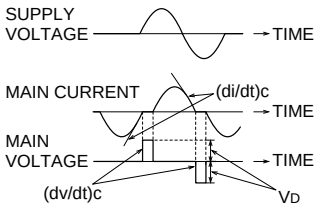
The product guaranteed maximum junction temperature 150°C (See warning.)

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

## ELECTRICAL CHARACTERISTICS

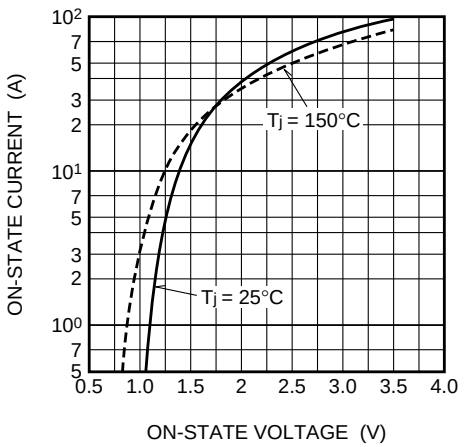
| Symbol | Parameter | | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| $I_{DRM}$ | Repetitive peak off-state current | | $T_j$=150°C, $V_{DRM}$ applied | — | — | 2.0 | mA |
| $V_{TM}$ | On-state voltage | | $T_C$=25°C, $I_{TM}$=20A, Instantaneous measurement | — | — | 1.6 | 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 | mA |
| $I_{RGT\ I}$ | | Ⅱ | | — | — | 20 | mA |
| $I_{RGT\ III}$ | | Ⅲ | | — | — | 20 | 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 | — | — | 1.8 | °C/W |
| $(dv/dt)_c$ | Critical-rate of rise of off-state commutating voltage *5 | | $T_j$=125°C/150°C | 10/1 | — | — | V/μs |

*2. Measurement using the gate trigger characteristics measurement circuit.
*3. Case temperature is measured on the T2 terminal.
*4. The contact thermal resistance $R_{th\ (c-f)}$ in case of greasing is 1.0°C/W.
*5. Test conditions of the critical-rate of rise of off-state commutating voltage is shown in the table below.

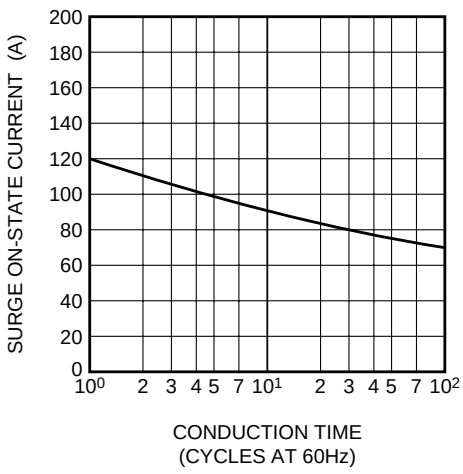
| Test conditions | Commutating voltage and current waveforms (inductive load) |
|---|---|
| 1. Junction temperature $T_j$=125°C/150°C<br>2. Rate of decay of on-state commutating current $(di/dt)_c$=–6.0A/ms<br>3. Peak off-state voltage $V_D$=400V |  |

## PERFORMANCE CURVES

**MAXIMUM ON-STATE CHARACTERISTICS**




**RATED SURGE ON-STATE CURRENT**





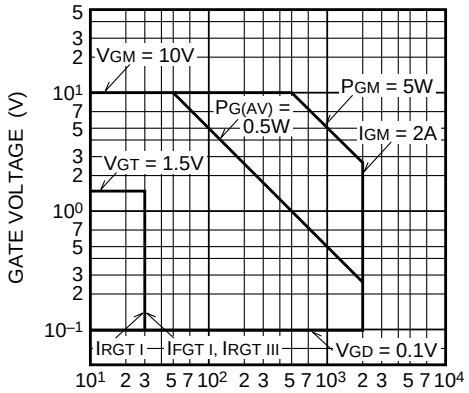

MITSUBISHI ELECTRIC

# BCR12CS

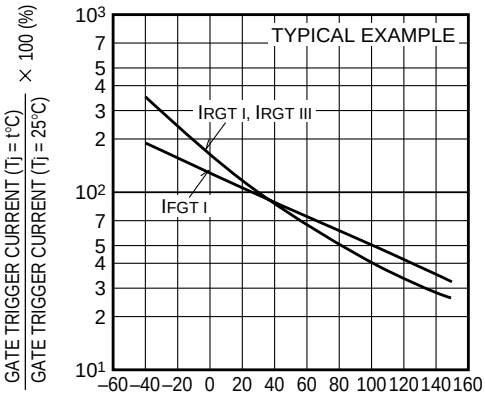
The product guaranteed maximum junction temperature 150°C (See warning.)

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

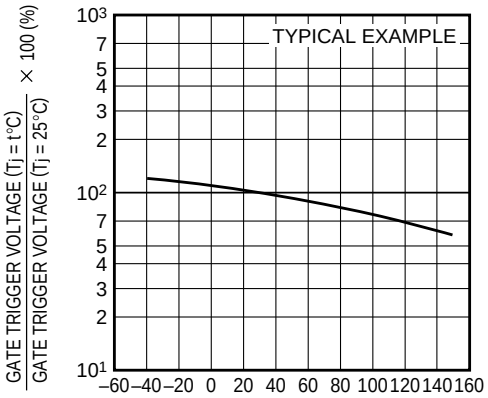
**GATE CHARACTERISTICS (I, II AND III)**



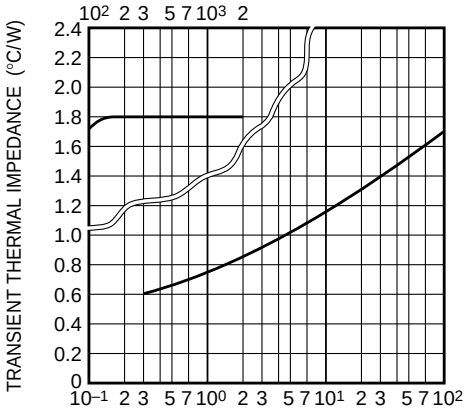

**GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE**



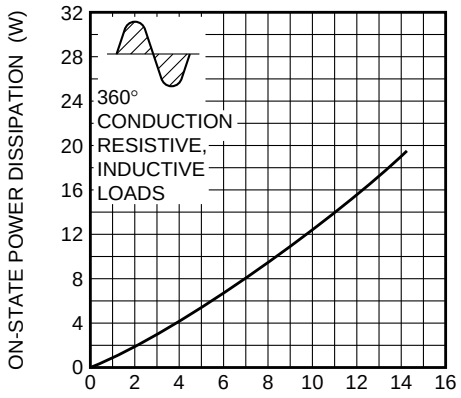

**GATE TRIGGER VOLTAGE VS. JUNCTION TEMPERATURE**



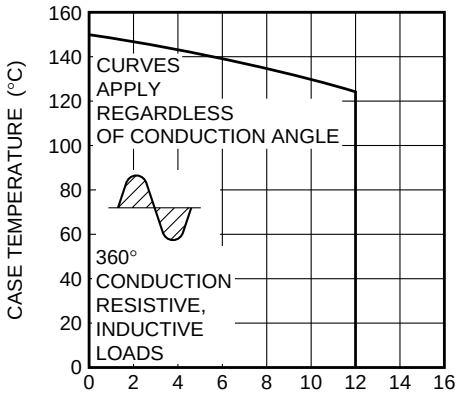

**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)**




**MAXIMUM ON-STATE POWER DISSIPATION**




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





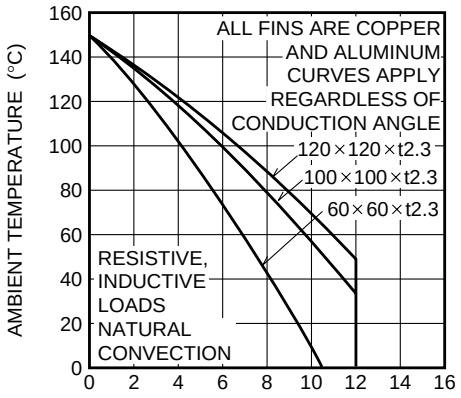

MITSUBISHI ELECTRIC

# BCR12CS

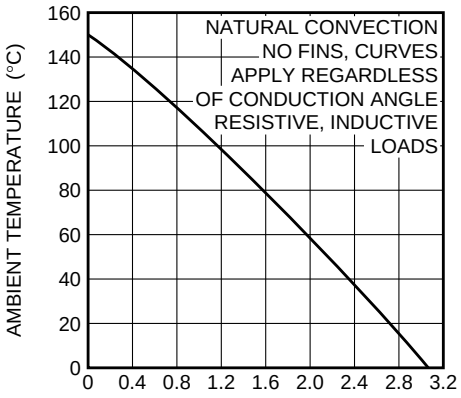
The product guaranteed maximum junction temperature 150°C (See warning.)

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

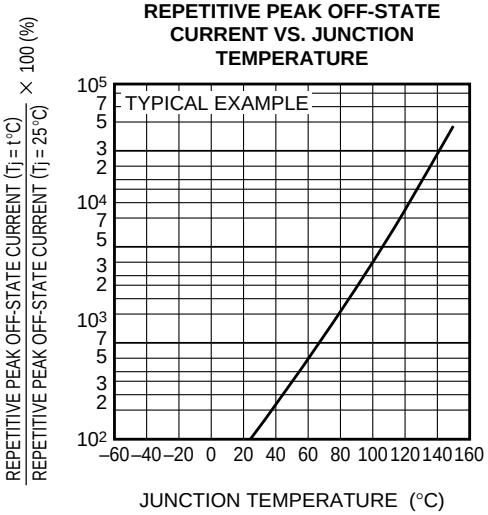
**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



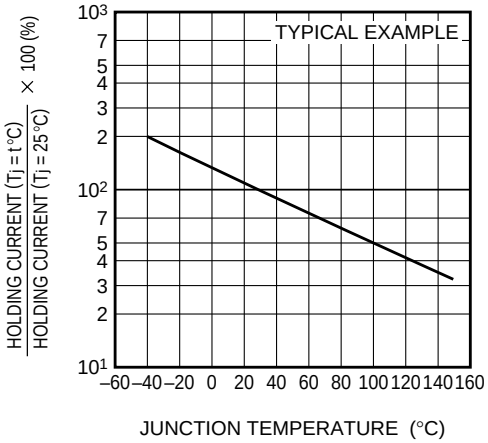

**ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT**



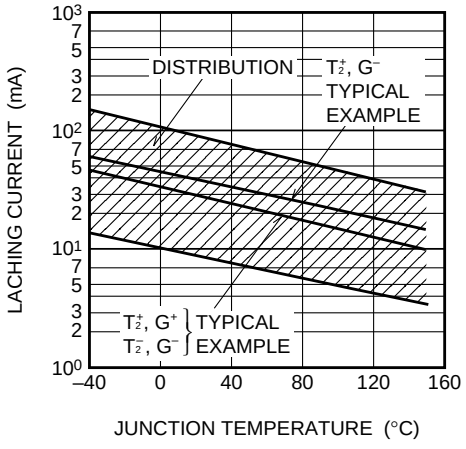

**REPETITIVE PEAK OFF-STATE CURRENT VS. JUNCTION TEMPERATURE**



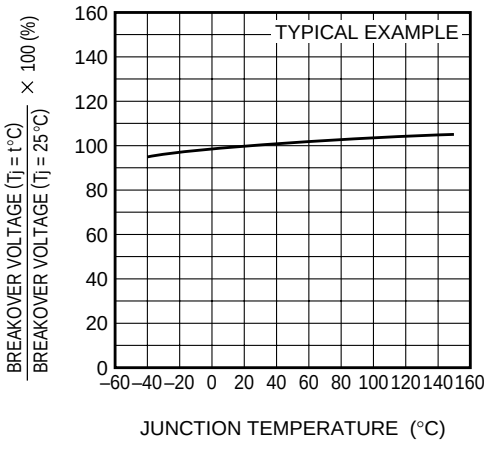

**HOLDING CURRENT VS. JUNCTION TEMPERATURE**




**LACHING CURRENT VS. JUNCTION TEMPERATURE**




**BREAKOVER VOLTAGE VS. JUNCTION TEMPERATURE**





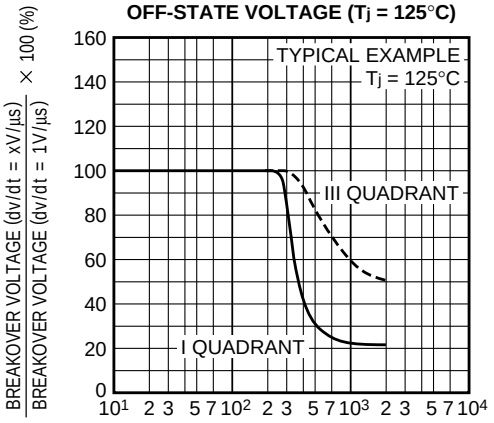

MITSUBISHI ELECTRIC

# BCR12CS

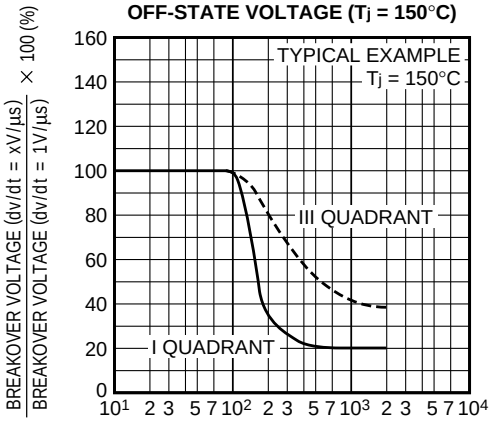
The product guaranteed maximum junction temperature 150°C (See warning.)

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

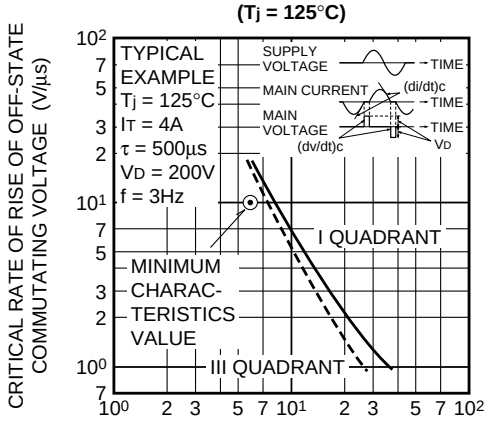
**BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE ($T_j$ = 125°C)**



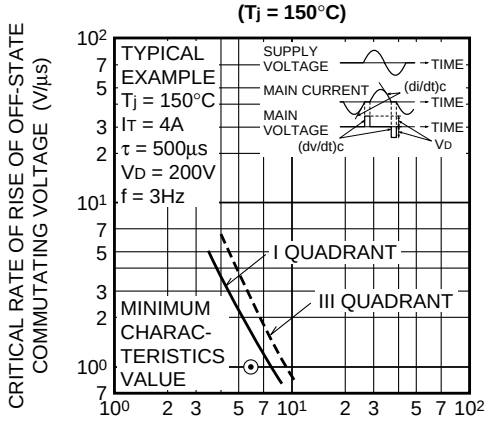

**BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE ($T_j$ = 150°C)**



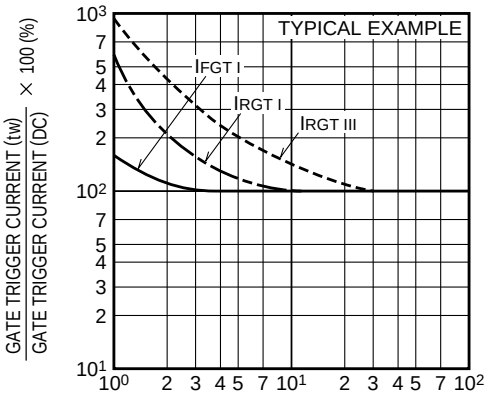

**COMMUTATION CHARACTERISTICS ($T_j$ = 125°C)**




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




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





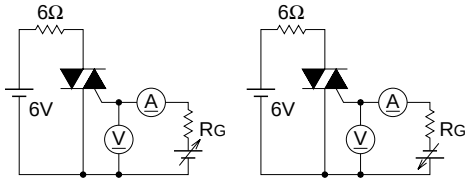

MITSUBISHI ELECTRIC

# BCR12CS

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

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

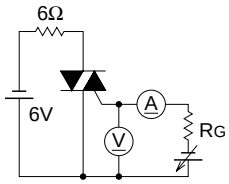
**GATE TRIGGER CHARACTERISTICS TEST CIRCUITS**




TEST PROCEDURE Ⅰ

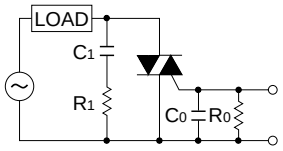



TEST PROCEDURE Ⅱ




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



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