

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

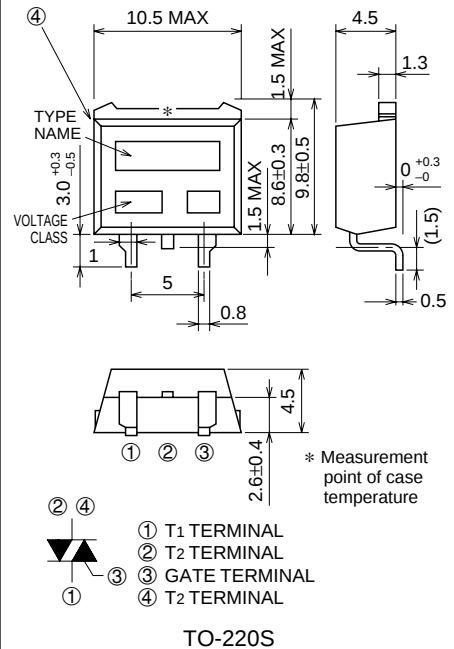
BCR12CS

MEDIUM POWER USE

NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

Refer to the page 6 as to the product guaranteed
maximum junction temperature 150°C**BCR12CS**

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

OUTLINE DRAWINGDimensions
in mm**APPLICATION**

Contactless AC switches, light dimmer, 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, $T_c=98^\circ\text{C}$ *3	12	A
I_{TSM}	Surge on-state current	60Hz sinewave 1 full cycle, peak value, non-repetitive	120	A
I^2_t	I^2_t for fusing	Value corresponding to 1 cycle of half wave 60Hz, surge on-state current	60	A ² s
PGM	Peak gate power dissipation		5	W
PG (AV)	Average gate power dissipation		0.5	W
VGM	Peak gate voltage		10	V
IGM	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.

Mar. 2002

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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.	
IdRM	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	T _J =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	—	—	1.5	V
V _{RGT} I			—	—	1.5	V
V _{RGT} III			—	—	1.5	V
I _{FGT} I	Gate trigger current *2	T _J =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	—	—	20	mA
I _{RGT} I			—	—	20	mA
I _{RGT} III			—	—	20	mA
V _{GD}	Gate non-trigger voltage	T _J =125°C, V _D =1/2V _{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.

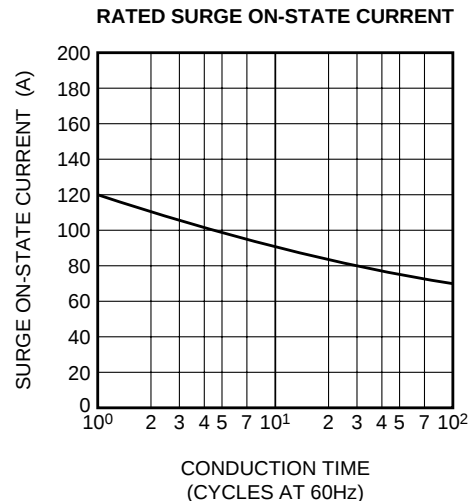
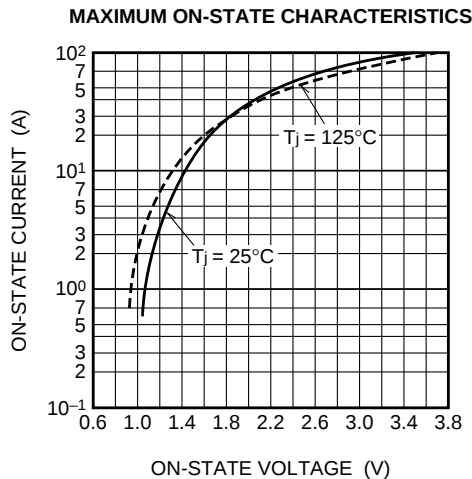
*3. Case temperature is measured on the T2 terminal.

*4. The contact thermal resistance R_{th} (c-j) 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 2. Rate of decay of on-state commutating current (di/dt) _c =-6.0A/ms 3. Peak off-state voltage V _D =400V	

PERFORMANCE CURVES

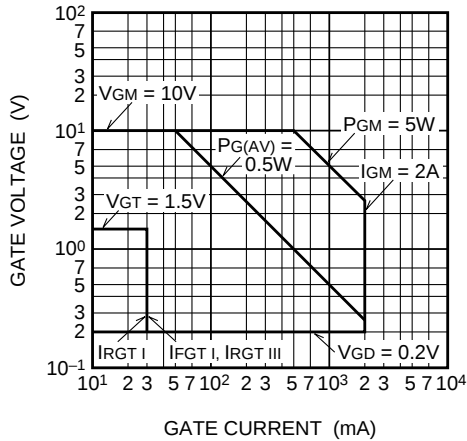


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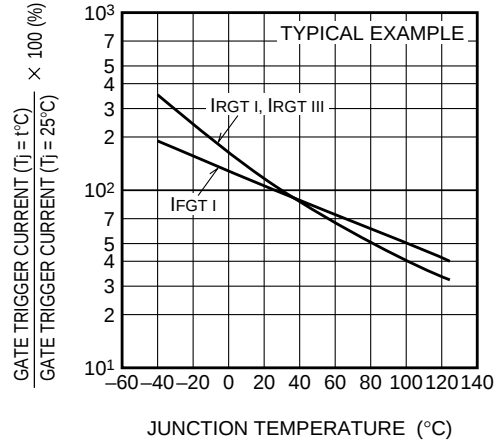
Refer to the page 6 as to the product guaranteed
maximum junction temperature 150°C

MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

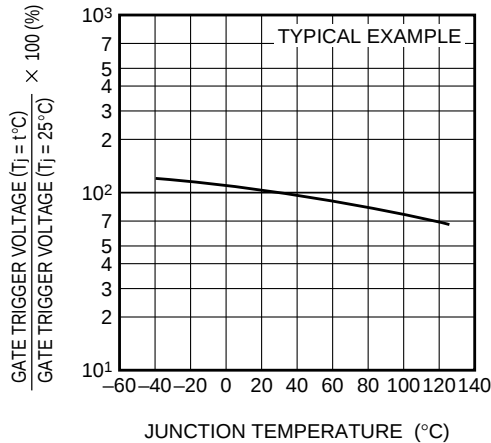
**GATE CHARACTERISTICS
(I, II AND III)**



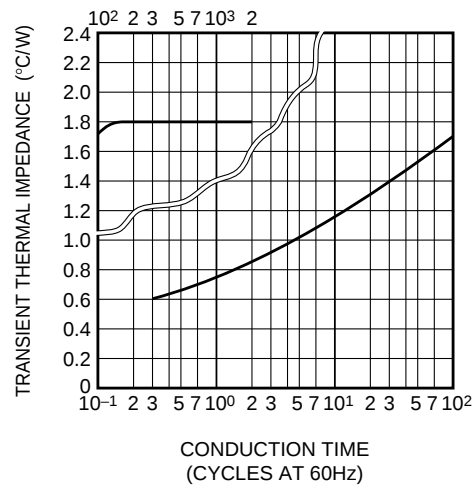
**GATE TRIGGER CURRENT VS.
JUNCTION TEMPERATURE**



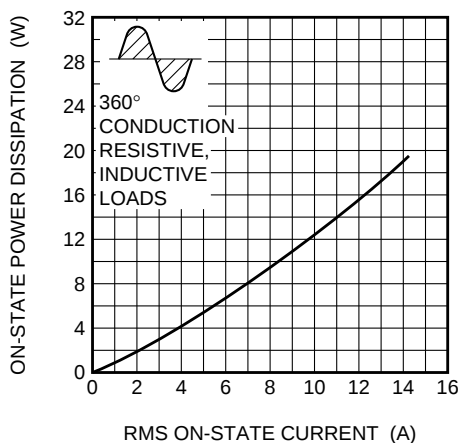
**GATE TRIGGER VOLTAGE VS.
JUNCTION TEMPERATURE**



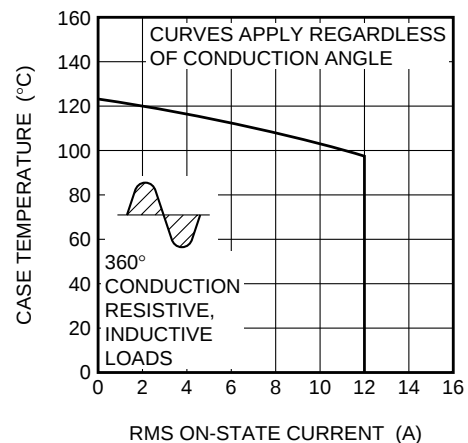
**MAXIMUM TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(JUNCTION TO CASE)**



**MAXIMUM ON-STATE POWER
DISSIPATION**



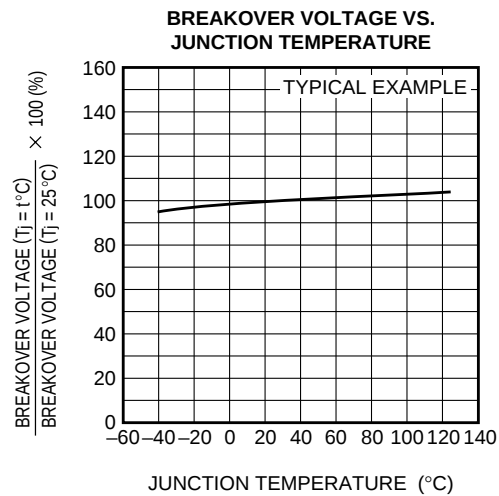
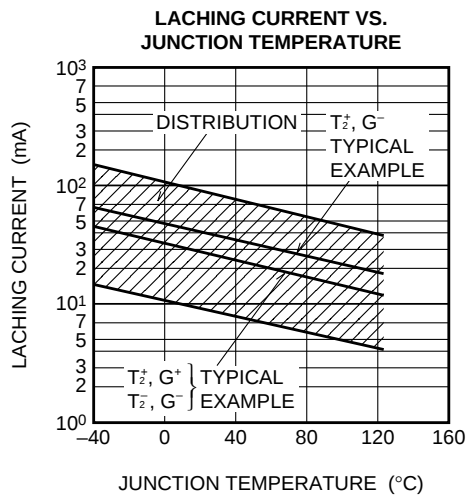
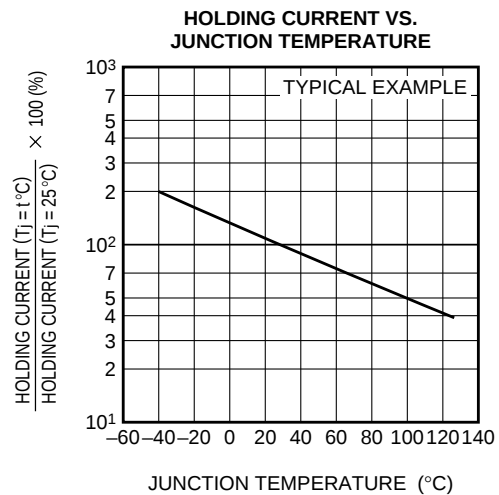
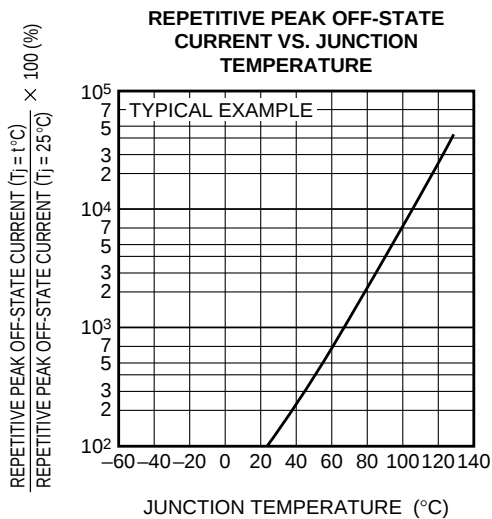
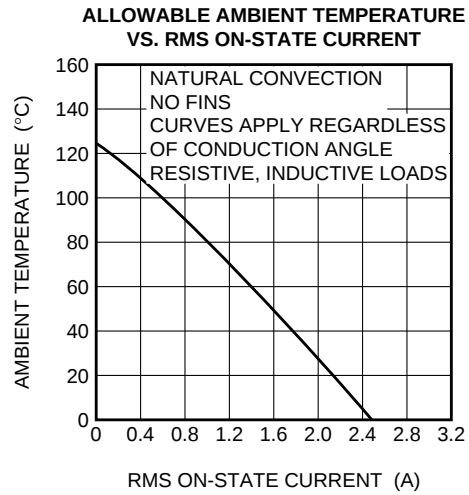
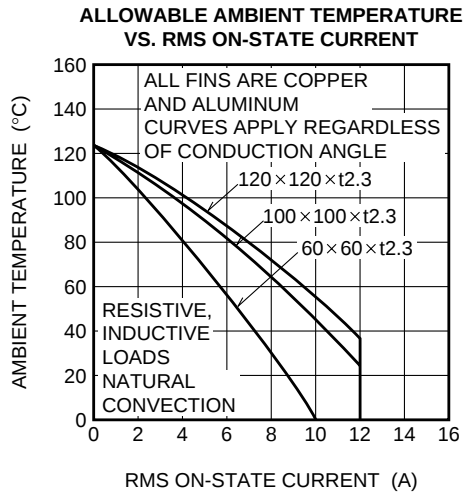
**ALLOWABLE CASE TEMPERATURE
VS. RMS ON-STATE CURRENT**



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

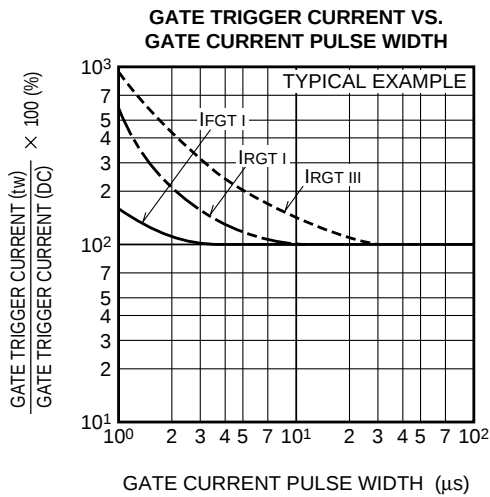
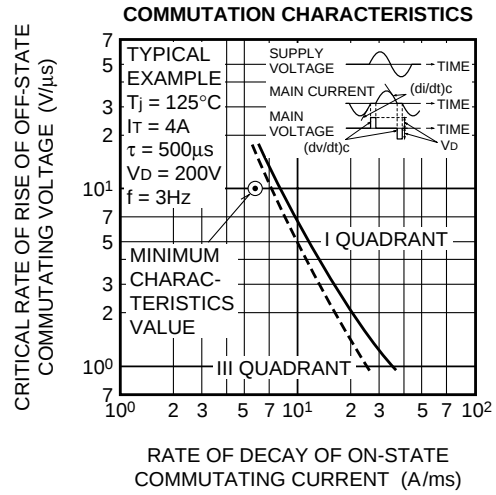
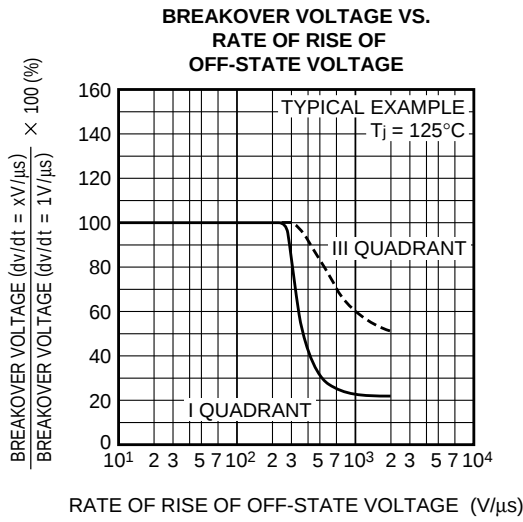
MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE



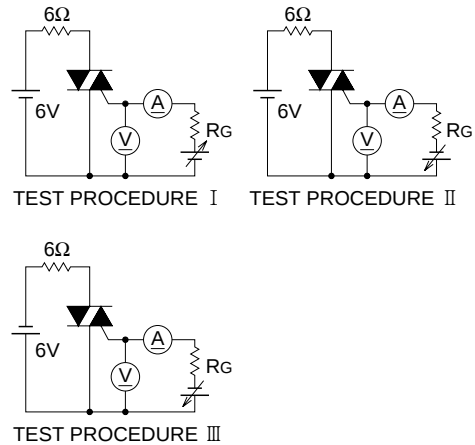
BCR12CS

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

MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE



GATE TRIGGER CHARACTERISTICS TEST CIRCUITS



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MEDIUM POWER USE

NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

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

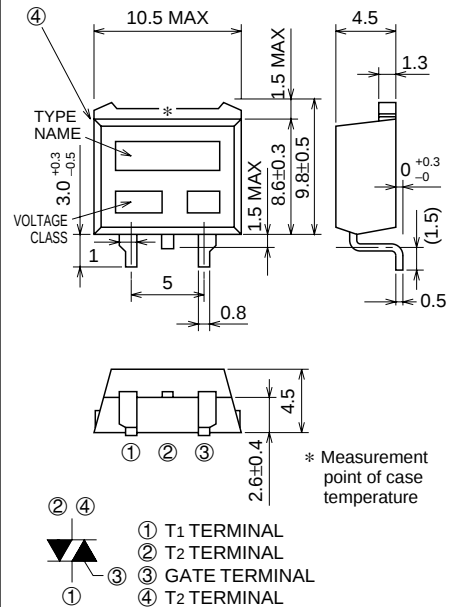
BCR12CS



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

OUTLINE DRAWING

Dimensions
in mm



TO-220S

APPLICATION

Contactless AC switches, light dimmer, 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, $T_c=123^{\circ}\text{C}$ *3	12	A
I_{TSM}	Surge on-state current	60Hz sinewave 1 full cycle, peak value, non-repetitive	120	A
I^2_t	I^2_t for fusing	Value corresponding to 1 cycle of half wave 60Hz, surge on-state current	60	A ² s
PGM	Peak gate power dissipation		5	W
PG (AV)	Average gate power dissipation		0.5	W
VGM	Peak gate voltage		10	V
IGM	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.

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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.	
IdRM	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	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	—	—	1.5	V
V _{RGT} I			—	—	1.5	V
V _{RGT} III			—	—	1.5	V
I _{FGT} I	Gate trigger current *2	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	—	—	20	mA
I _{RGT} I			—	—	20	mA
I _{RGT} III			—	—	20	mA
V _{GD}	Gate non-trigger voltage	T _j =125°C/150°C, V _D =1/2V _{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.

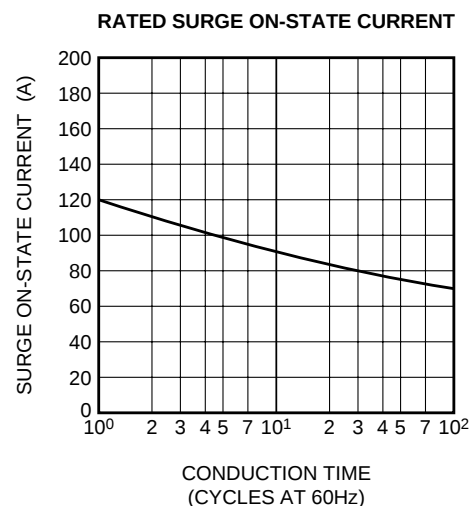
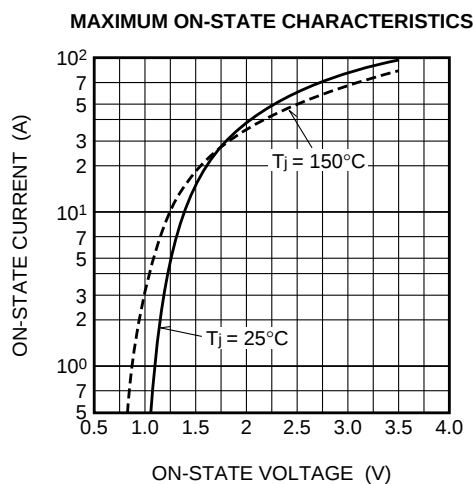
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*5. Test conditions of the critical-rate of rise of off-state commutating voltage is shown in the table below.

Test conditions	Commutating voltage and current waveforms (inductive load)
1. Junction temperature T _j =125°C/150°C 2. Rate of decay of on-state commutating current (di/dt) _c =-6.0A/ms 3. Peak off-state voltage V _D =400V	

PERFORMANCE CURVES

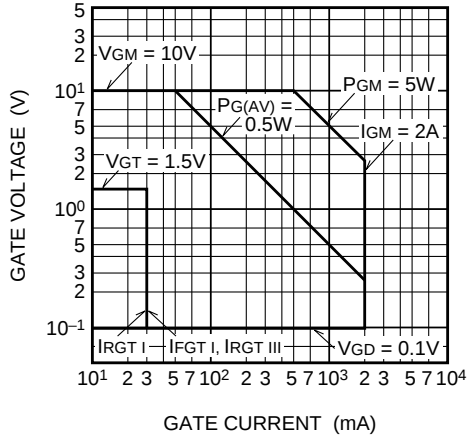


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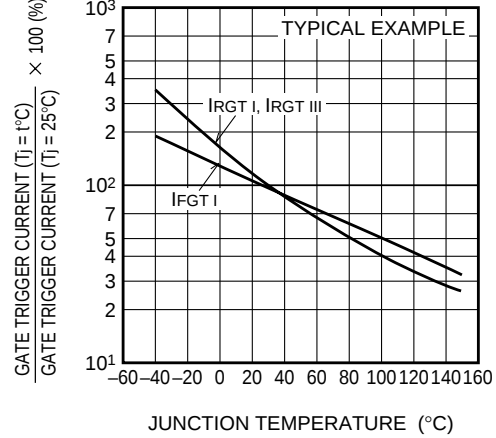
The product guaranteed maximum junction temperature 150°C (See warning.)

MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

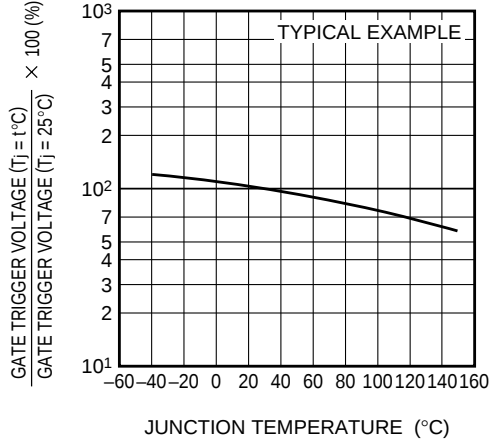
**GATE CHARACTERISTICS
(I, II AND III)**



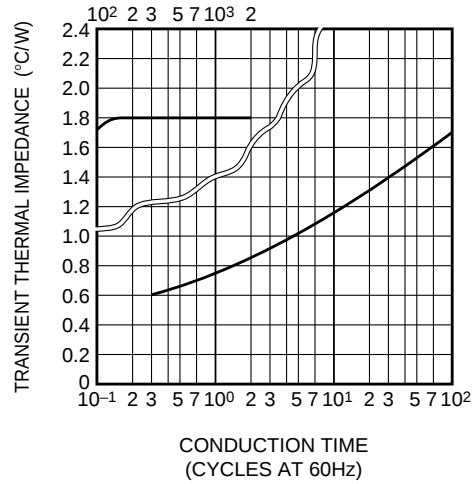
**GATE TRIGGER CURRENT VS.
JUNCTION TEMPERATURE**



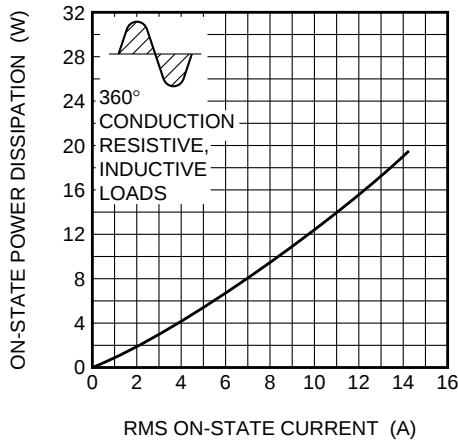
**GATE TRIGGER VOLTAGE VS.
JUNCTION TEMPERATURE**



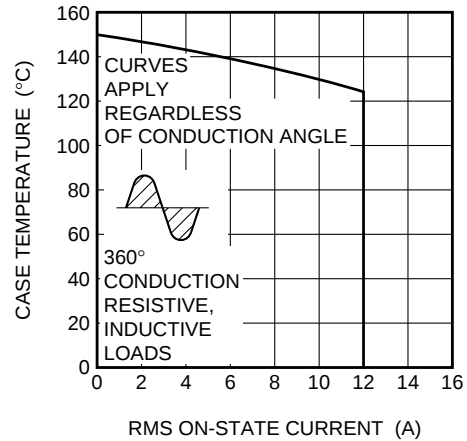
**MAXIMUM TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(JUNCTION TO CASE)**



**MAXIMUM ON-STATE POWER
DISSIPATION**



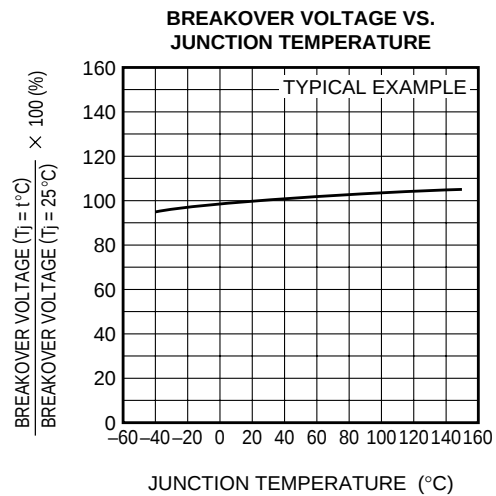
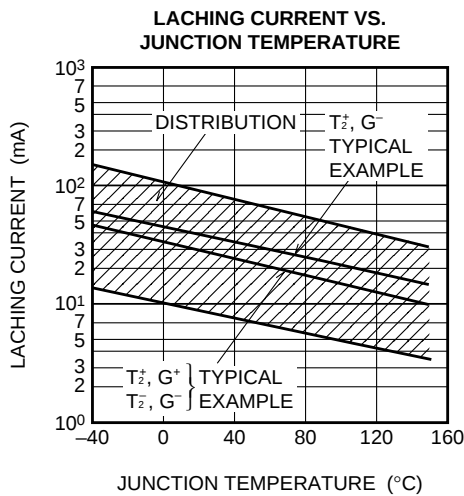
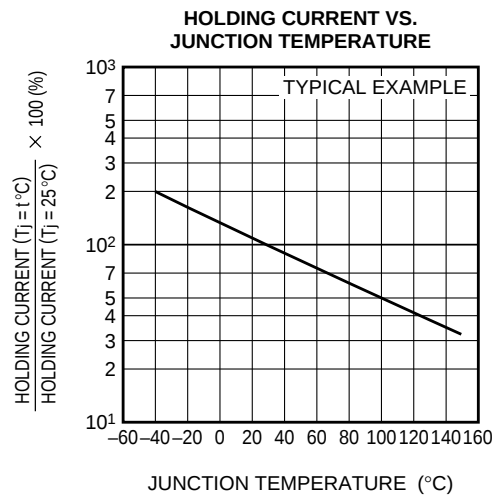
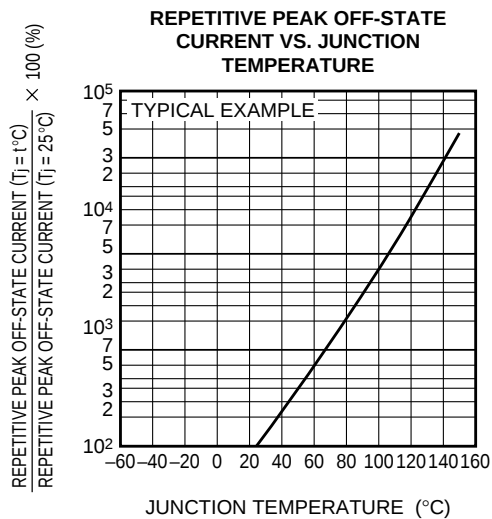
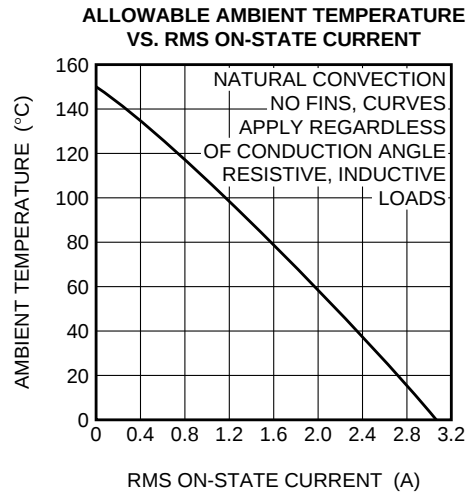
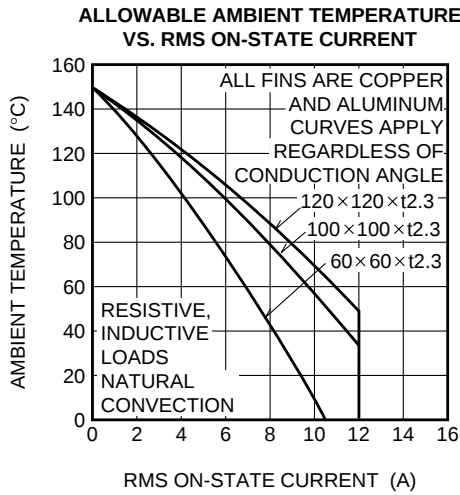
**ALLOWABLE CASE TEMPERATURE
VS. RMS ON-STATE CURRENT**



BCR12CS

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

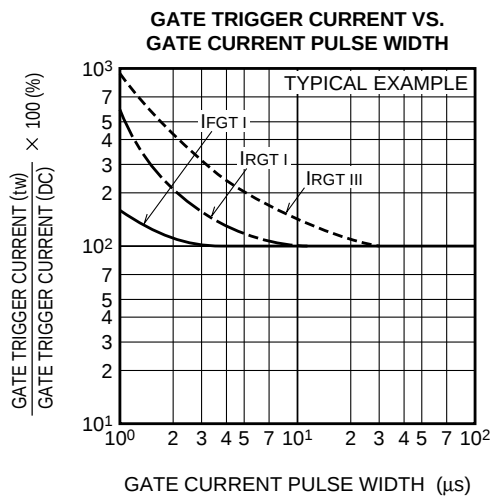
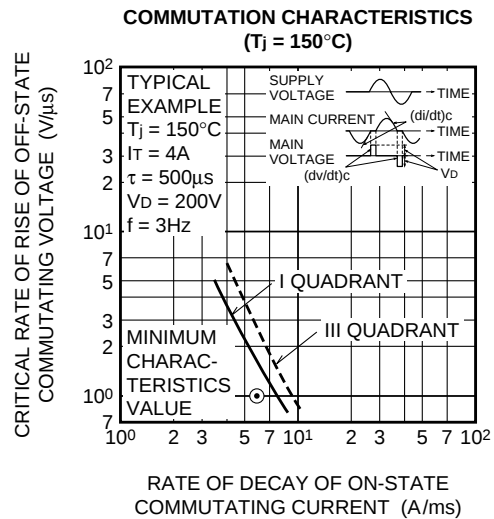
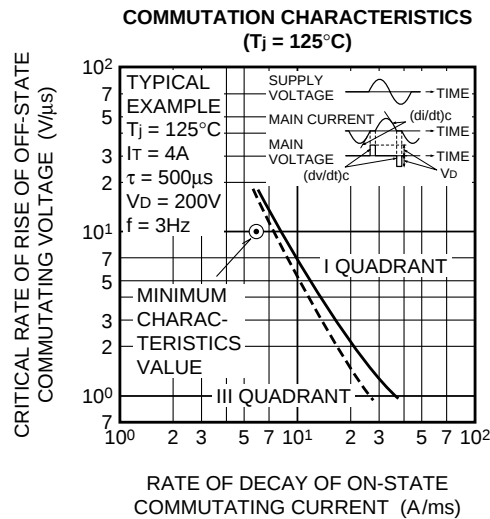
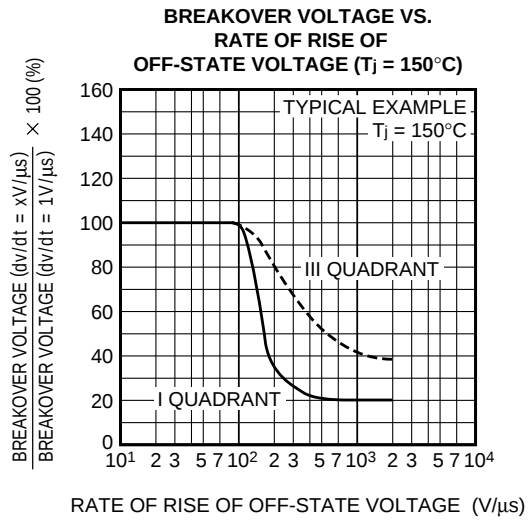
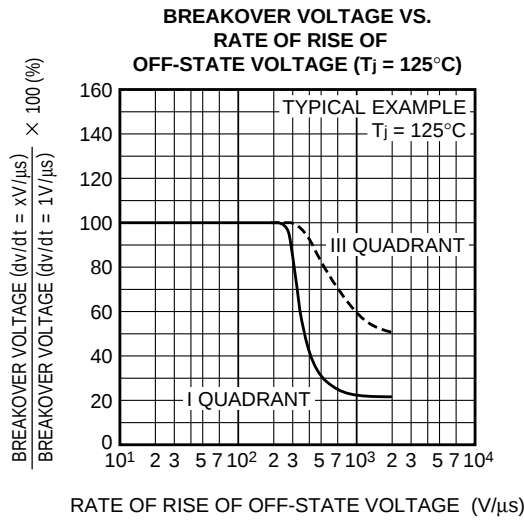
MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE



BCR12CS

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

MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

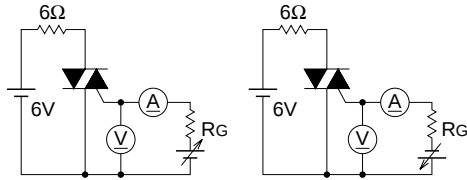


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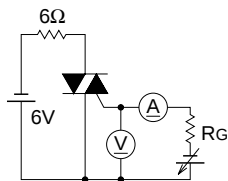
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MEDIUM POWER USE
NON-INSULATED TYPE, PLANAR PASSIVATION TYPE

GATE TRIGGER CHARACTERISTICS TEST CIRCUITS

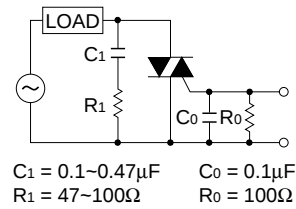


TEST PROCEDURE I TEST PROCEDURE II



TEST PROCEDURE III

RECOMMENDED CIRCUIT VALUES AROUND THE TRIAC



$C_1 = 0.1 \sim 0.47 \mu\text{F}$ $C_0 = 0.1 \mu\text{F}$
 $R_1 = 47 \sim 100 \Omega$ $R_0 = 100 \Omega$