

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


BCR20KM

MEDIUM POWER USE

INSULATED TYPE, PLANAR PASSIVATION TYPE

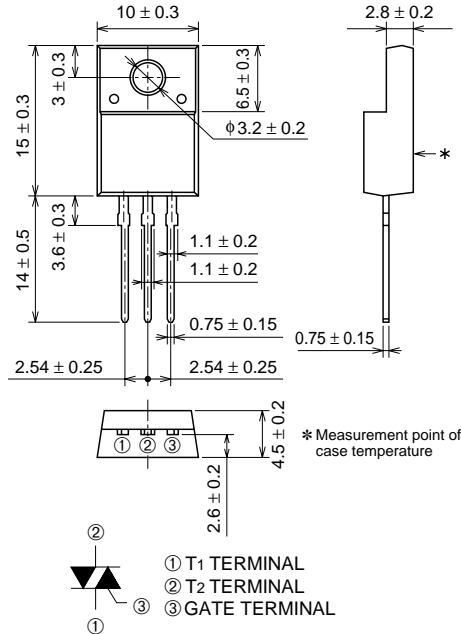
Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

BCR20KM



- IT (RMS) 20A
- VDRM 600V
- IFGT I, IRGT I, IRGT III 20mA
- V_{iso} 2000V
- UL Recognized: Yellow Card No.E80276(N)
File No. E80271

OUTLINE DRAWING Dimensions in mm



* Measurement point of case temperature

TO-220FN

① T1 TERMINAL
② T2 TERMINAL
③ GATE TERMINAL

APPLICATION

Vacuum cleaner, light dimmer, copying machine, other control of motor and heater

MAXIMUM RATINGS

Symbol	Parameter	Voltage class	
		12	Unit
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
IT (RMS)	RMS on-state current	Commercial frequency, sine full wave 360° conduction, T _c =85°C	20	A
ITSM	Surge on-state current	60Hz sinewave 1 full cycle, peak value, non-repetitive	200	A
I ² _t	I ² _t for fusing	Value corresponding to 1 cycle of half wave 60Hz, surge on-state current	167	A ² s
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	2.0	g
V _{iso}	Isolation voltage	T _a =25°C, AC 1 minute, T1 · T2 · G terminal to case	2000	V

*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
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	
VTM	On-state voltage	T _c =25°C, I _{TM} =30A, Instantaneous measurement	—	—	1.5	V	
VFGT I	Gate trigger voltage *2	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	I	—	—	1.5	V
VRGT I			II	—	—	1.5	V
VRGT III			III	—	—	1.5	V
IFGT I	Gate trigger current *2	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	I	—	—	20	mA
IRGT I			II	—	—	20	mA
IRGT III			III	—	—	20	mA
VGD	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	—	—	2.0	°C/W	
(dv/dt) _c	Critical-rate of rise off-state commutating voltage*4	T _j =125°C	10	—	—	V/μs	

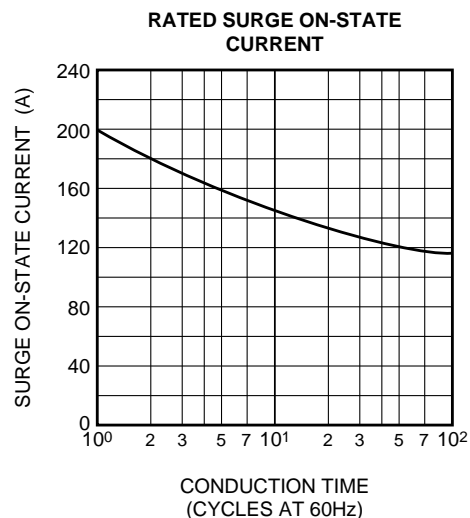
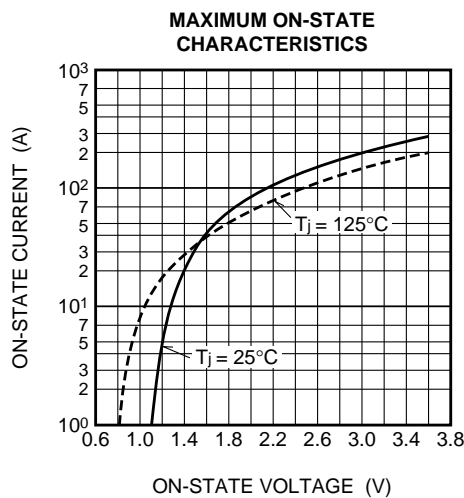
*2. Measurement using the gate trigger characteristics measurement circuit.

*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.

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 =-10A/ms 3. Peak off-state voltage V _D =400V	

PERFORMANCE CURVES



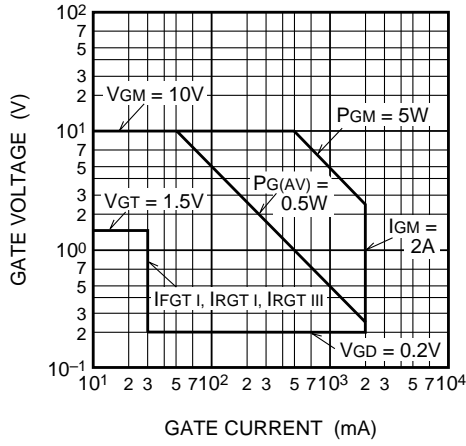
BCR20KM

MEDIUM POWER USE

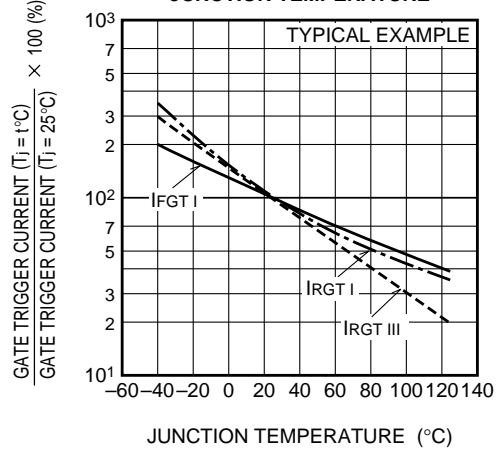
INSULATED TYPE, PLANAR PASSIVATION TYPE

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

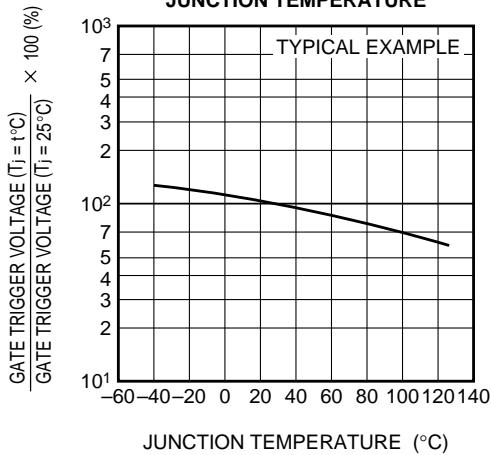
GATE CHARACTERISTICS (I, II AND III)



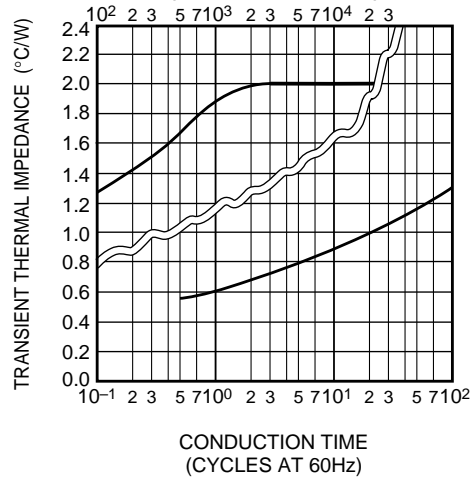
GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE



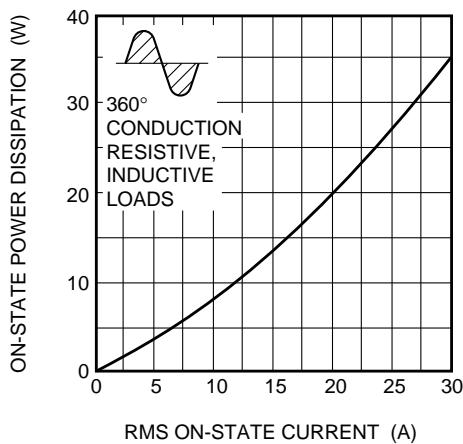
GATE TRIGGER VOLTAGE VS. JUNCTION TEMPERATURE



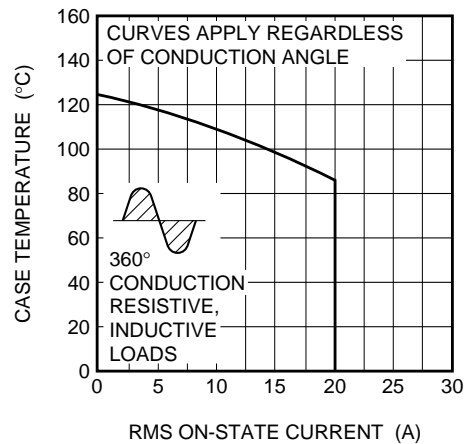
MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



MAXIMUM ON-STATE POWER DISSIPATION



ALLOWABLE CASE TEMPERATURE VS. RMS ON-STATE CURRENT

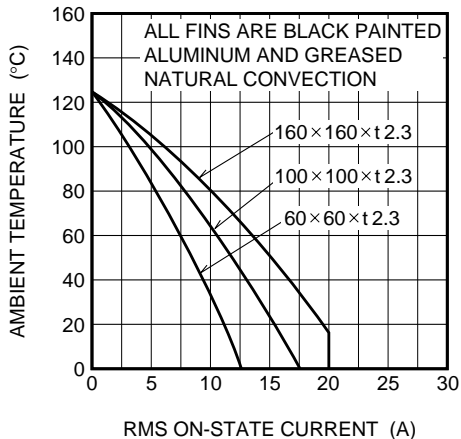


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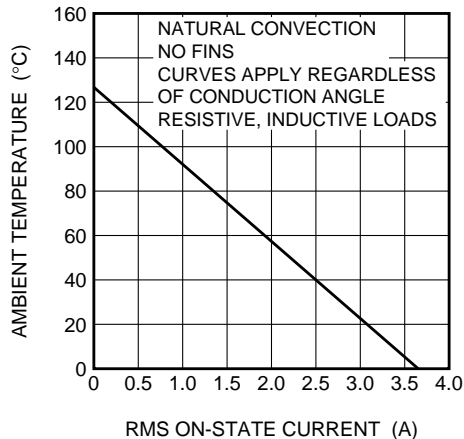
Refer to the page 6 as to the product guaranteed maximum junction temperature 150°C

MEDIUM POWER USE
INSULATED TYPE, PLANAR PASSIVATION TYPE

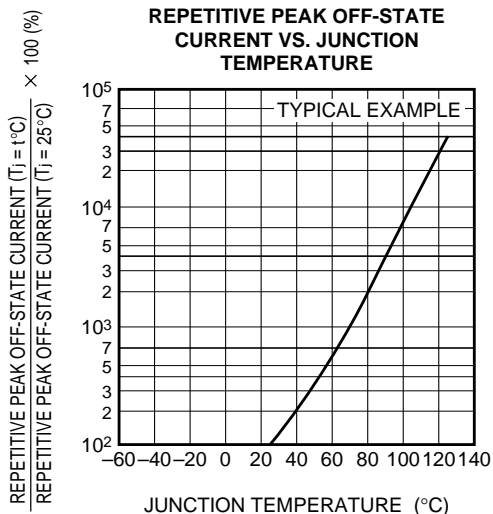
ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT



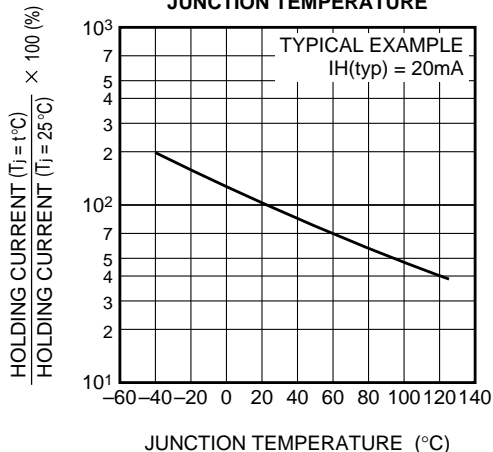
ALLOWABLE AMBIENT TEMPERATURE VS. RMS ON-STATE CURRENT



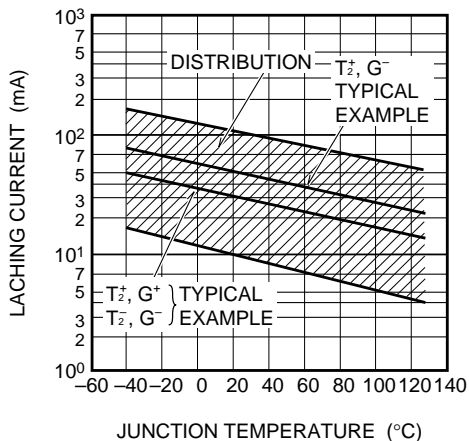
REPETITIVE PEAK OFF-STATE CURRENT VS. JUNCTION TEMPERATURE



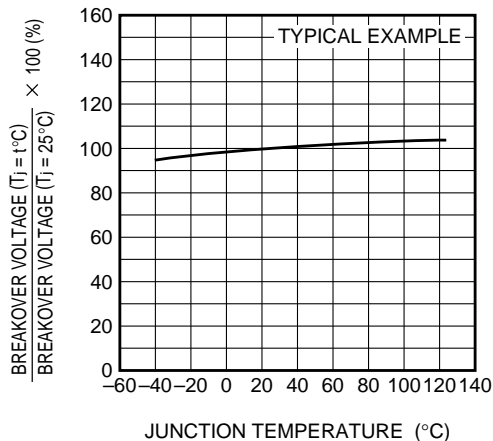
HOLDING CURRENT VS. JUNCTION TEMPERATURE



LATCHING CURRENT VS. JUNCTION TEMPERATURE



BREAKOVER VOLTAGE VS. JUNCTION TEMPERATURE



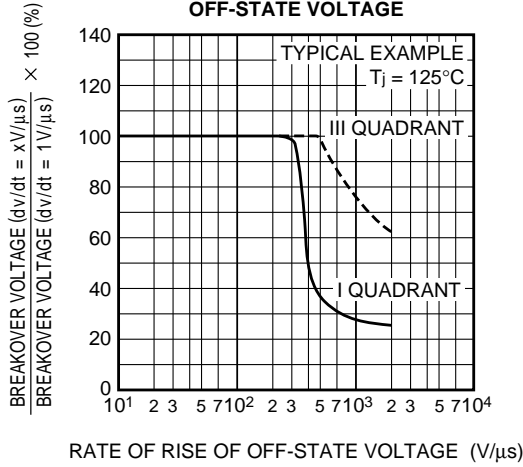
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MEDIUM POWER USE

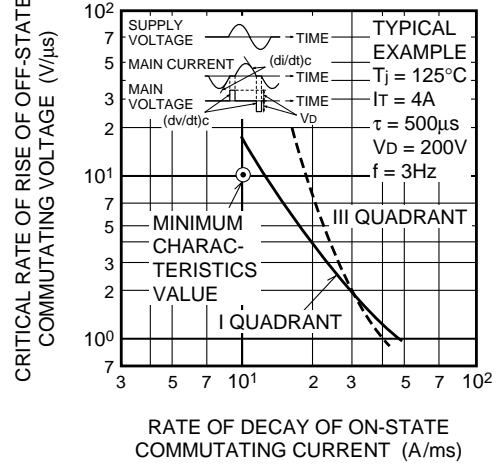
INSULATED TYPE, PLANAR PASSIVATION TYPE

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

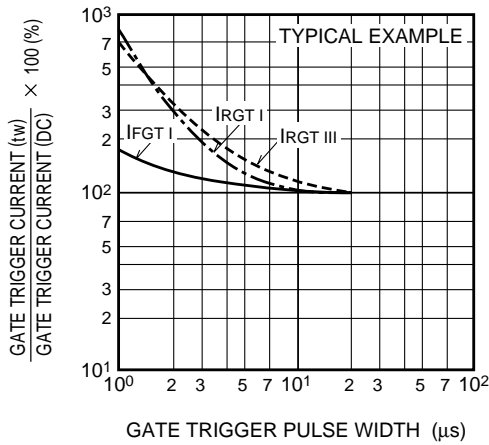
BREAKOVER VOLTAGE VS. RATE OF RISE OF OFF-STATE VOLTAGE



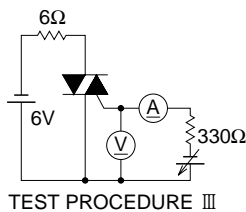
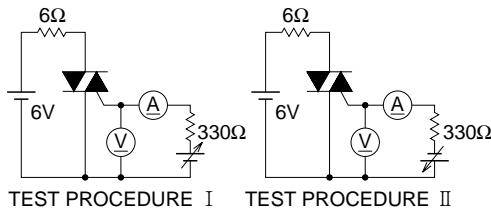
COMMUTATION CHARACTERISTICS



GATE TRIGGER CURRENT VS. GATE CURRENT PULSE WIDTH



GATE TRIGGER CHARACTERISTICS TEST CIRCUITS




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MEDIUM POWER USE

INSULATED TYPE, PLANAR PASSIVATION TYPE

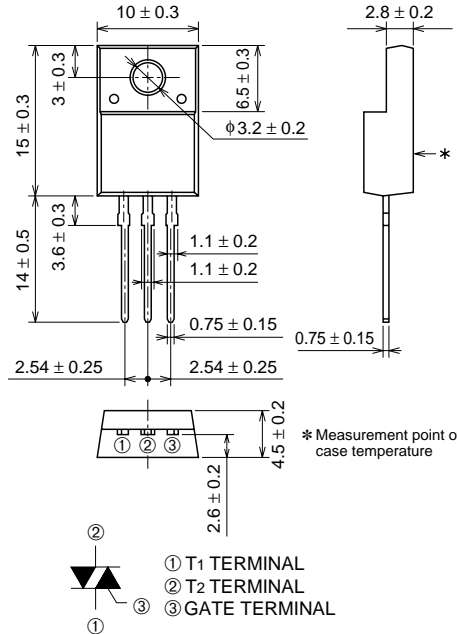
The product guaranteed maximum junction temperature 150°C (See warning.)

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- IT (RMS) 20A
- VDRM 600V
- IFGT I , IRGT I , IRGT III 20mA
- V_{iso} 2000V
- UL Recognized: Yellow Card No.E80276(N)
File No. E80271

OUTLINE DRAWING Dimensions in mm



* Measurement point of case temperature

TO-220FN

① T1 TERMINAL
② T2 TERMINAL
③ GATE TERMINAL

APPLICATION

Vacuum cleaner, light dimmer, copying machine, other control of motor and heater

(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	
		12	Unit
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 =110°C	20	A
I _{TSM}	Surge on-state current	60Hz sinewave 1 full cycle, peak value, non-repetitive	200	A
I _t ²	I _t ² for fusing	Value corresponding to 1 cycle of half wave 60Hz, surge on-state current	167	A ² s
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	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.

Mar. 2002

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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			Unit	
			Min.	Typ.	Max.		
IDRM	Repetitive peak off-state current	T _j =125°C/150°C, V _{DRM} applied	—	—	2.0/3.0	mA	
VTM	On-state voltage	T _c =25°C, I _{TM} =30A, Instantaneous measurement	—	—	1.5	V	
VFGT I	Gate trigger voltage *2	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	I	—	—	1.5	V
VRGT I			II	—	—	1.5	V
VRGT III			III	—	—	1.5	V
IFGT I	Gate trigger current *2	T _j =25°C, V _D =6V, R _L =6Ω, R _G =330Ω	I	—	—	20	mA
IRGT I			II	—	—	20	mA
IRGT III			III	—	—	20	mA
VGD	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	—	—	2.0	°C/W	
(dv/dt) _c	Critical-rate of rise off-state commutating voltage*4	T _j =125°C/150°C	10/1	—	—	V/μs	

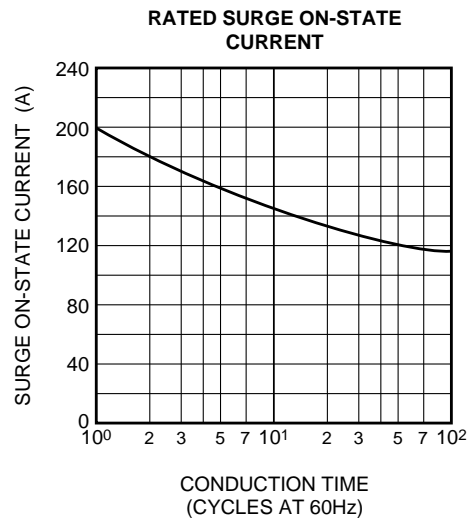
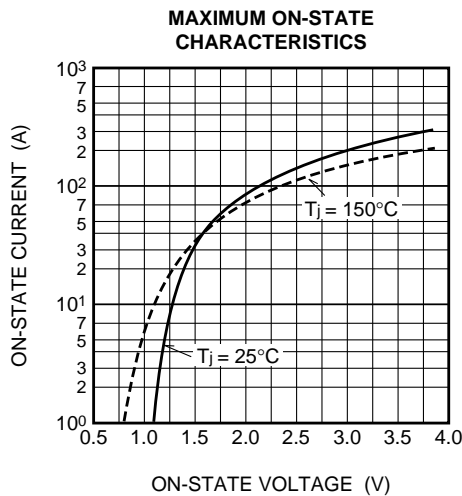
*2. Measurement using the gate trigger characteristics measurement circuit.

*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.

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 =-10A/ms 3. Peak off-state voltage V _D =400V	

PERFORMANCE CURVES



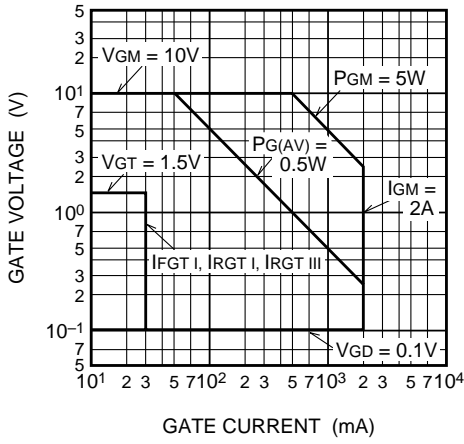
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MEDIUM POWER USE

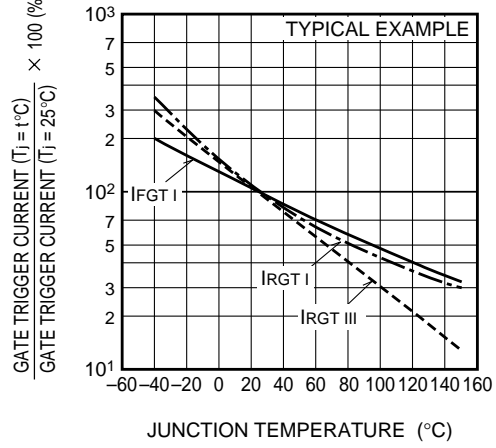
INSULATED TYPE, PLANAR PASSIVATION TYPE

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

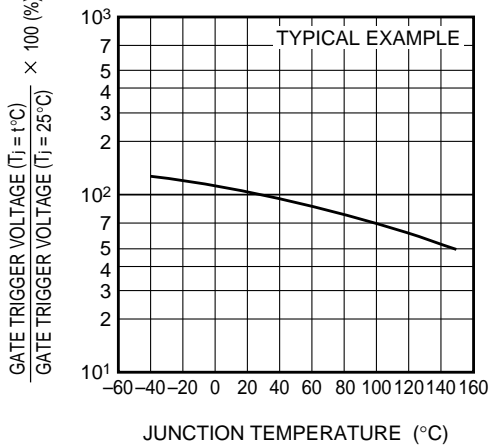
**GATE CHARACTERISTICS
(I, II AND III)**



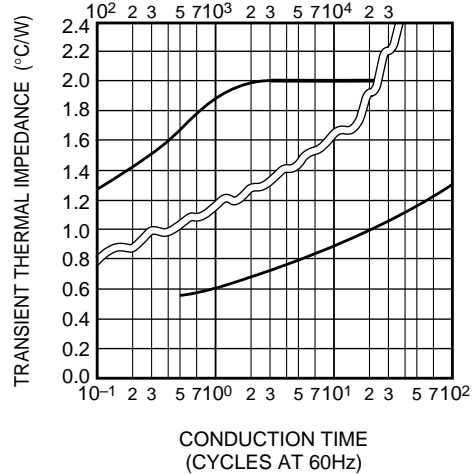
**GATE TRIGGER CURRENT VS.
JUNCTION TEMPERATURE**



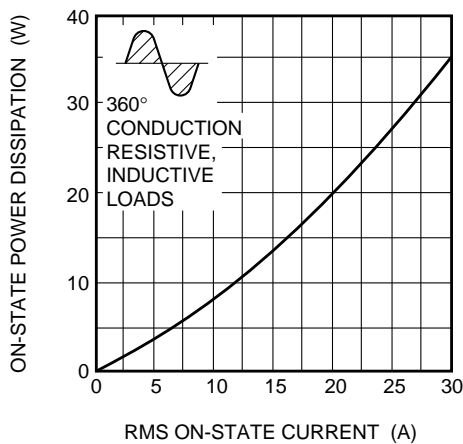
**GATE TRIGGER VOLTAGE VS.
JUNCTION TEMPERATURE**



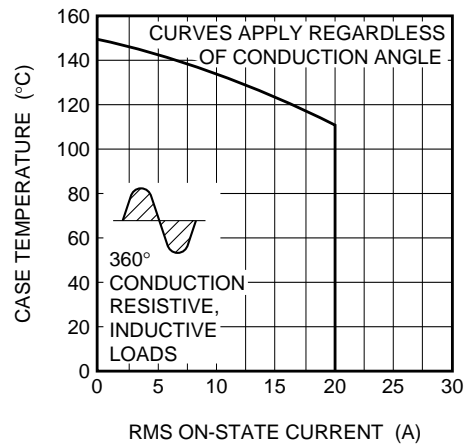
**MAXIMUM TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(JUNCTION TO CASE)**



**MAXIMUM ON-STATE POWER
DISSIPATION**



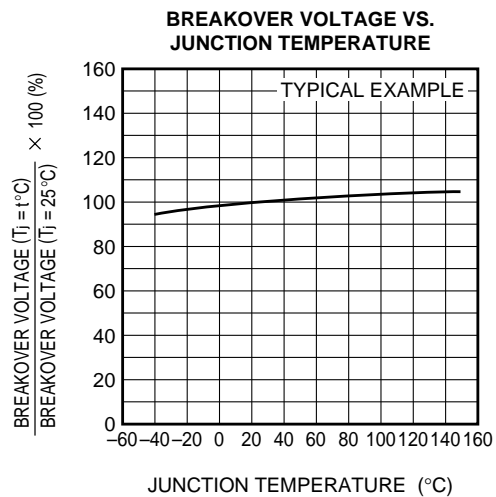
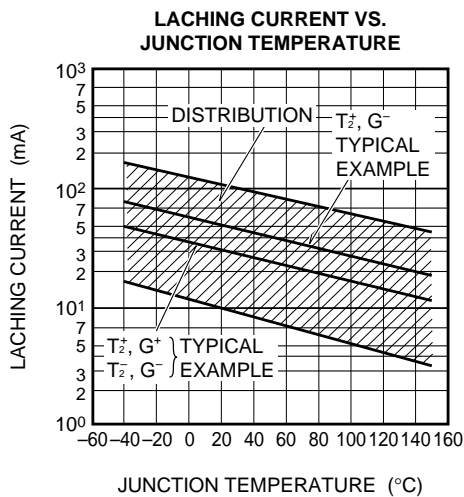
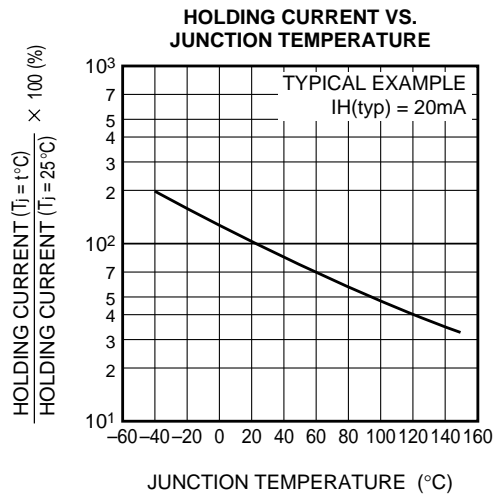
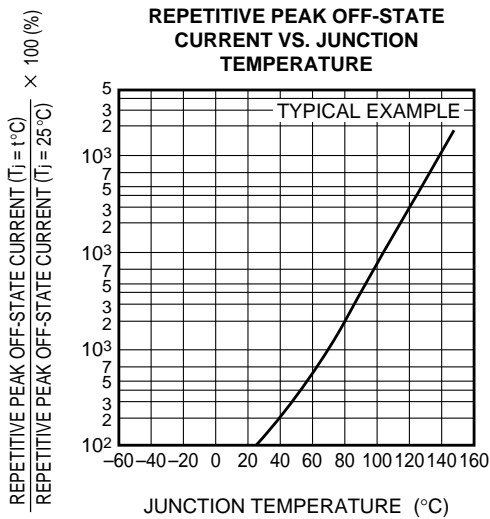
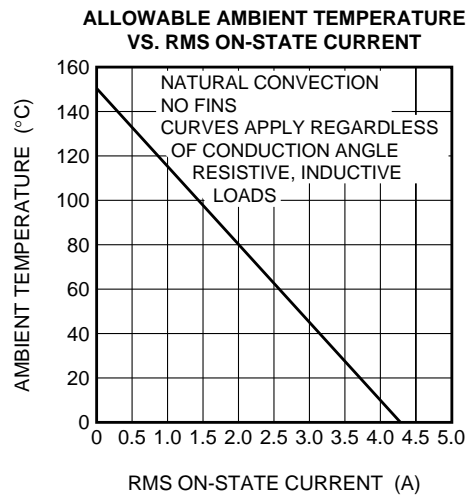
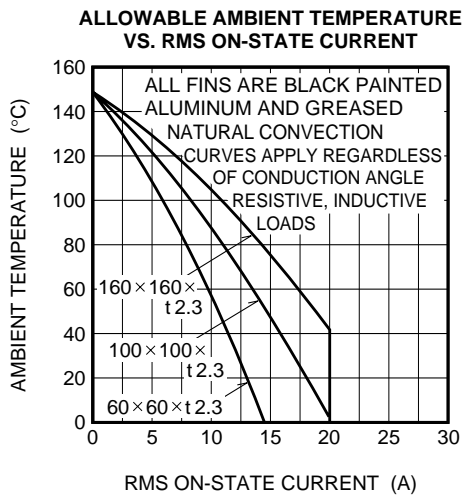
**ALLOWABLE CASE TEMPERATURE
VS. RMS ON-STATE CURRENT**



BCR20KM

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

MEDIUM POWER USE
INSULATED TYPE, PLANAR PASSIVATION TYPE

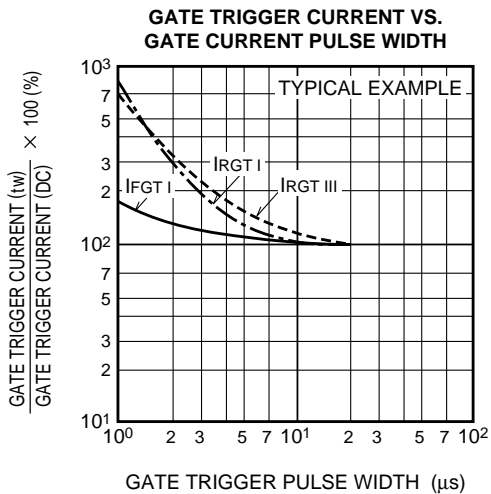
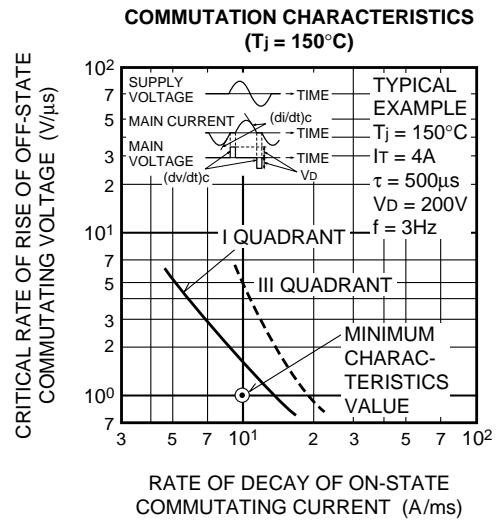
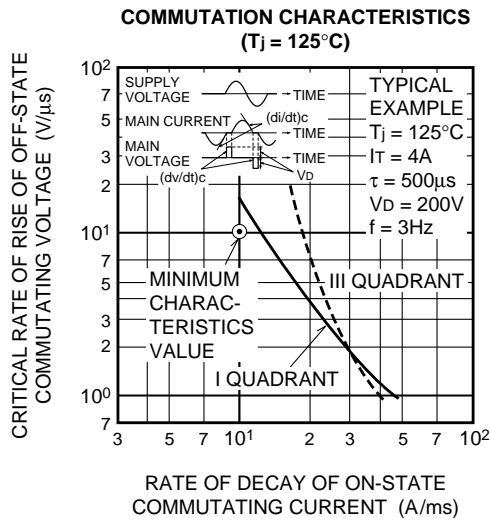
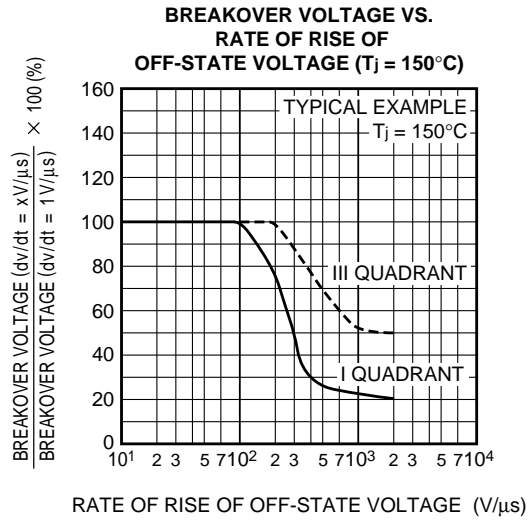
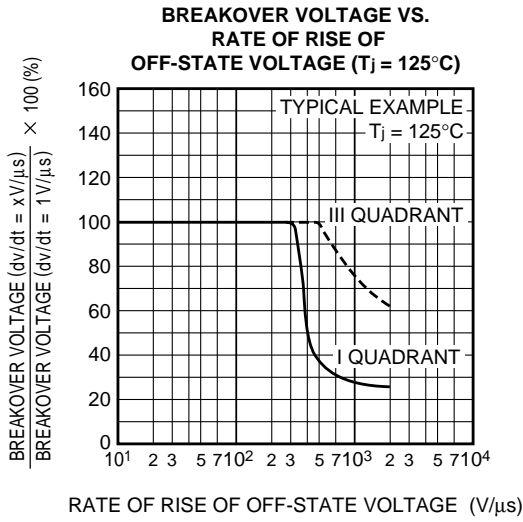


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MEDIUM POWER USE

INSULATED TYPE, PLANAR PASSIVATION TYPE

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

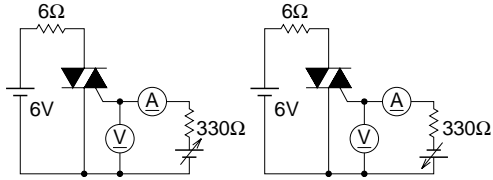


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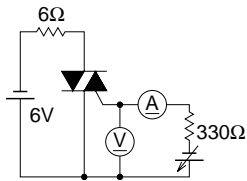
The product guaranteed maximum junction temperature 150°C (See warning.)

MEDIUM POWER USE
INSULATED TYPE, PLANAR PASSIVATION TYPE

GATE TRIGGER CHARACTERISTICS TEST CIRCUITS

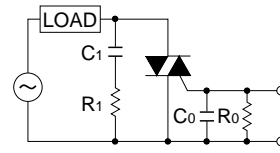


TEST PROCEDURE I TEST PROCEDURE II



TEST PROCEDURE III

RECOMMENDED CIRCUIT VALUES AROUND THE TRIAC



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