

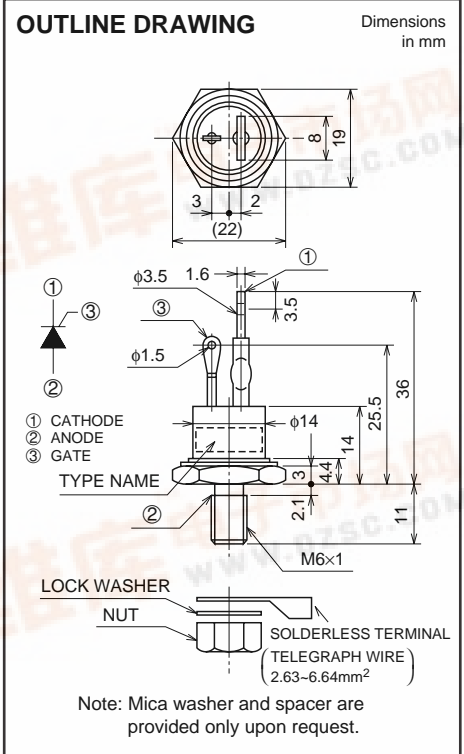
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MITSUBISHI SEMICONDUCTOR (HIGH-SPEED SWITCHING THYRISTOR)

# CR20EY

MEDIUM POWER, INVERTER USE  
NON-INSULATED TYPE, GLASS PASSIVATION TYPE



## APPLICATION

Inverter, DC choppers, pulse generator

## MAXIMUM RATINGS

| Symbol | Parameter                             | Voltage class |     |     | Unit |
|--------|---------------------------------------|---------------|-----|-----|------|
|        |                                       | 8             | 12  | 16  |      |
| VRRM   | Repetitive peak reverse voltage       | 400           | 600 | 800 | V    |
| VRSM   | Non-repetitive peak reverse voltage   | 480           | 720 | 850 | V    |
| VDRM   | Repetitive peak off-state voltage     | 400           | 600 | 800 | V    |
| VDSM   | Non-repetitive peak off-state voltage | 480           | 720 | 800 | V    |

| Symbol      | Parameter                                 | Conditions  | Ratings    | Unit             |
|-------------|---|---|------------|------------------|
| $I_T$ (RMS) | RMS on-state current                      |   | 31.5       | A                |
| $I_T$ (AV)  | Average on-state current                  | Commercial frequency, sine half wave, 180° conduction, $T_c=74^\circ\text{C}$                         | 20         | A                |
| $I_{TSM}$   | Surge on-state current                    | 60Hz sine half wave 1 full cycle, peak value, non-repetitive  | 300        | A                |
| $I_t^2$     | $I_t^2$ for fusing                        | Value corresponding to 1 cycle of half wave 60Hz, surge on-state current                              | 380        | A <sup>2</sup> s |
| di/dt       | Critical rate of rise of on-state current | $V_D=1/2V_{DRM}$ , $I_{TM}=60\text{A}$ , $I_G=0.1\text{A}$ , $T_j=25^\circ\text{C}$ , $f=60\text{Hz}$ | 100        | A/ $\mu\text{s}$ |
| PGM         | Peak gate power dissipation               |   | 5.0        | W                |
| PG (AV)     | Average gate power dissipation            |   | 0.5        | W                |
| VFGM        | Peak gate forward voltage                 |   | 10         | V                |
| VRGM        | Peak gate reverse voltage                 |   | 5          | V                |
| IFGM        | Peak gate forward current                 |   | 2          | A                |
| $T_j$       | Junction temperature                      |   | -30 ~ +125 | $^\circ\text{C}$ |
| $T_{stg}$   | Storage temperature                       |   | -30 ~ +125 | $^\circ\text{C}$ |
| —           | Mounting torque                           |   | 30         | kg·cm            |
| —           | Weight                                    | Typical value   | 2.94       | N·m              |
| —           | Weight                                    | Typical value   | 20         | g                |



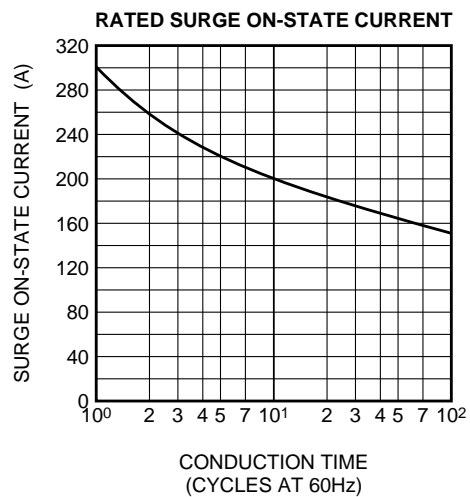
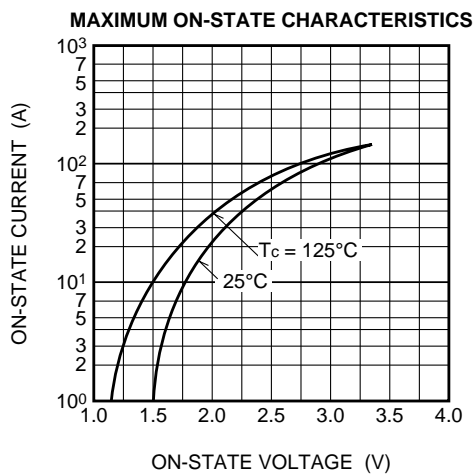
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## ELECTRICAL CHARACTERISTICS

| Symbol               | Parameter                                  | Test conditions   | Limits |      |      | Unit |
|----------------------|--|---|--------|------|------|------|
|                      |  |   | Min.   | Typ. | Max. |      |
| I <sub>RRM</sub>     | Repetitive peak reverse current            | T <sub>j</sub> =125°C, V <sub>RRM</sub> applied   | —      | —    | 6.0  | mA   |
| I <sub>DRM</sub>     | Repetitive peak off-state current          | T <sub>j</sub> =125°C, V <sub>DRM</sub> applied   | —      | —    | 6.0  | mA   |
| V <sub>TM</sub>      | On-state voltage                           | T <sub>c</sub> =25°C, I <sub>TM</sub> =60A, Instantaneous value   | —      | —    | 2.5  | V    |
| dv/dt                | Critical rate of rise of off-state voltage | T <sub>j</sub> =125°C, V <sub>D</sub> =2/3V <sub>DRM</sub>  | 100    | —    | —    | V/μs |
| V <sub>GT</sub>      | Gate trigger voltage                       | T <sub>j</sub> =25°C, V <sub>D</sub> =6V, I <sub>T</sub> =0.5A  | —      | —    | 3.0  | V    |
| V <sub>GD</sub>      | Gate non-trigger voltage                   | T <sub>j</sub> =125°C, V <sub>D</sub> =1/2V <sub>DRM</sub>  | 0.25   | —    | —    | V    |
| I <sub>GT</sub>      | Gate trigger current                       | T <sub>j</sub> =25°C, V <sub>D</sub> =6V, I <sub>T</sub> =0.5A  | —      | —    | 50   | mA   |
| t <sub>gt</sub>      | Turn-on time                               | T <sub>j</sub> =25°C, V <sub>D</sub> =100V, I <sub>T</sub> =15A, I <sub>G</sub> =0.1A                               | —      | —    | 10   | μs   |
| t <sub>q</sub>       | Turn-off time                              | I <sub>T</sub> =20A, V <sub>R</sub> =50V, V <sub>D</sub> =1/2V <sub>DRM</sub> , T <sub>j</sub> =125°C, dv/dt=20V/μs | —      | —    | 15   | μs   |
| R <sub>th(j-c)</sub> | Thermal resistance                         | Junction to case  | —      | —    | 1.0  | °C/W |
| R <sub>th(c-f)</sub> | Contact thermal resistance                 | Case to fin, greased  | —      | —    | 0.40 | °C/W |

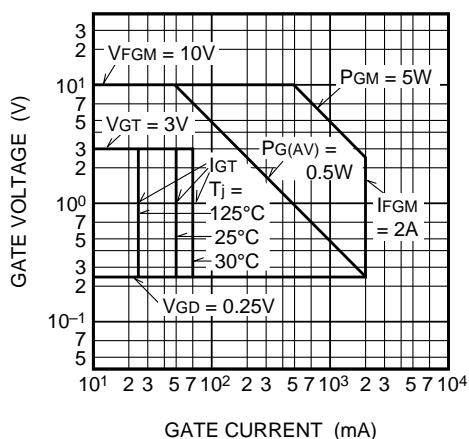
## PERFORMANCE CURVES



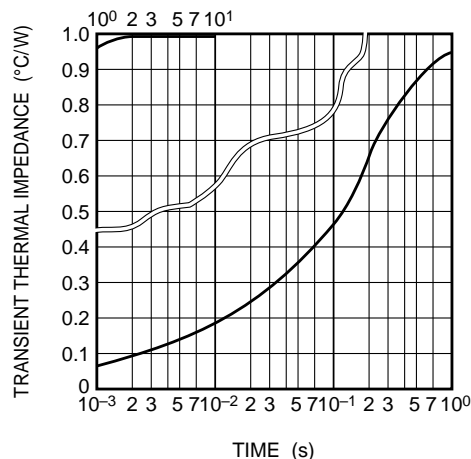
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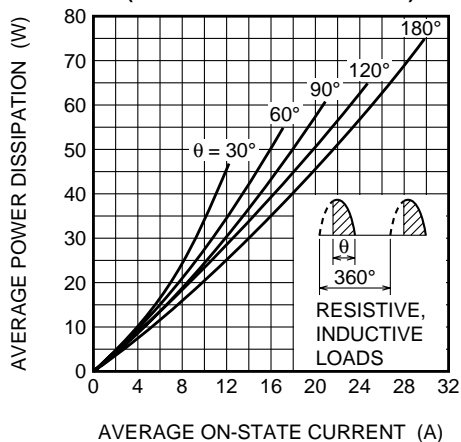
**GATE CHARACTERISTICS**



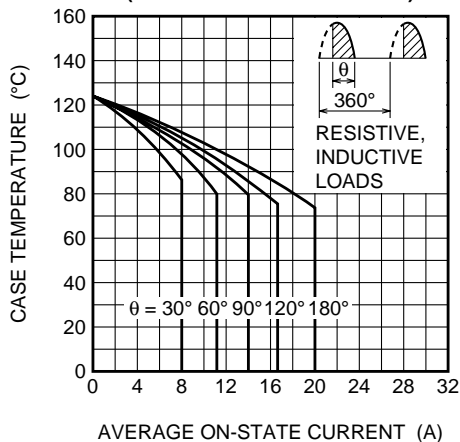
**MAXIMUM TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)**



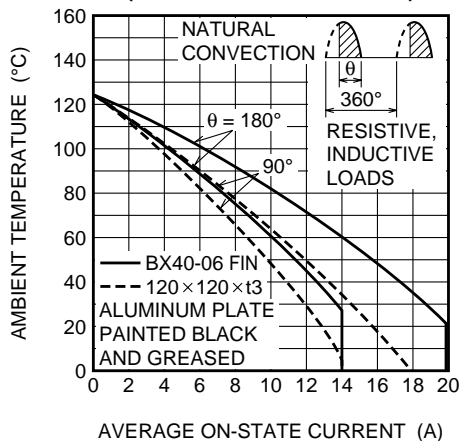
**MAXIMUM AVERAGE POWER DISSIPATION (SINGLE-PHASE HALF WAVE)**



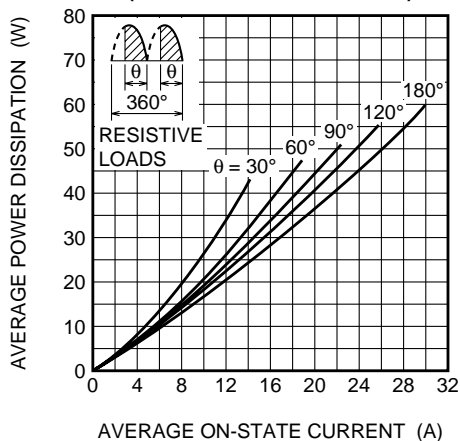
**ALLOWABLE CASE TEMPERATURE VS. AVERAGE ON-STATE CURRENT (SINGLE-PHASE HALF WAVE)**



**ALLOWABLE AMBIENT TEMPERATURE VS. AVERAGE ON-STATE CURRENT (SINGLE-PHASE HALF WAVE)**



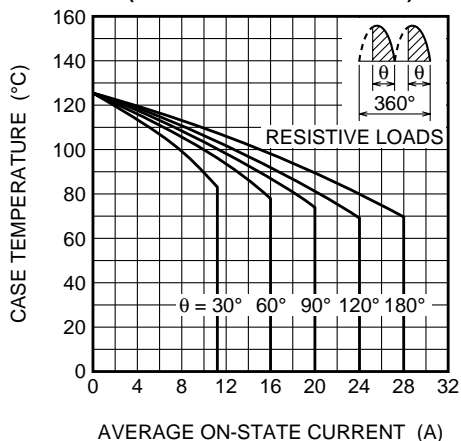
**MAXIMUM AVERAGE POWER DISSIPATION (SINGLE-PHASE FULL WAVE)**



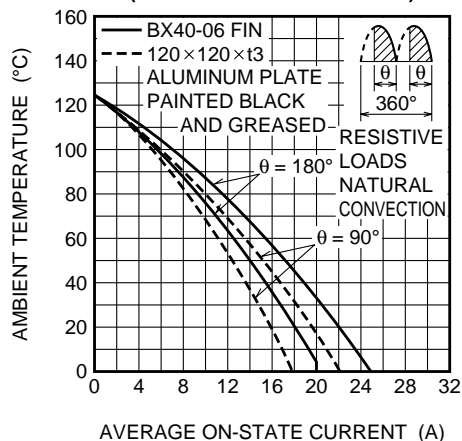
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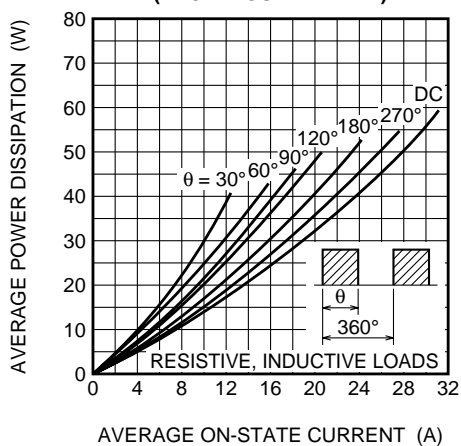
ALLOWABLE CASE TEMPERATURE VS. AVERAGE ON-STATE CURRENT (SINGLE-PHASE FULL WAVE)



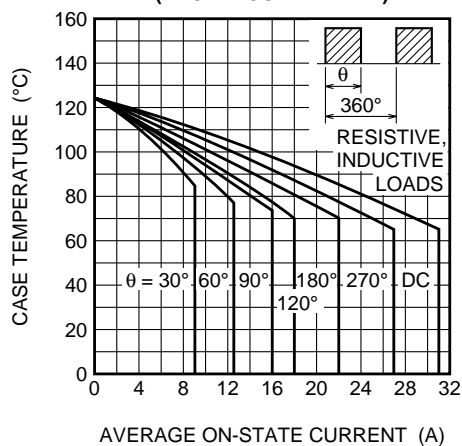
ALLOWABLE AMBIENT TEMPERATURE VS. AVERAGE ON-STATE CURRENT (SINGLE-PHASE FULL WAVE)



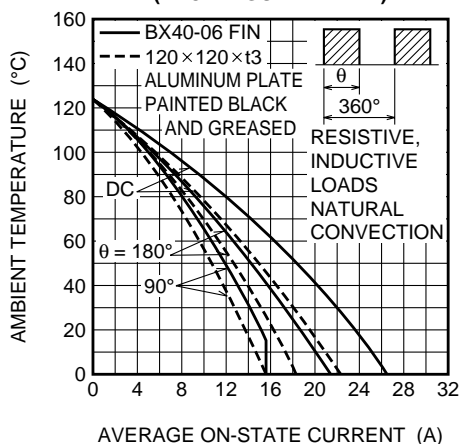
MAXIMUM AVERAGE POWER DISSIPATION (RECTANGULAR WAVE)



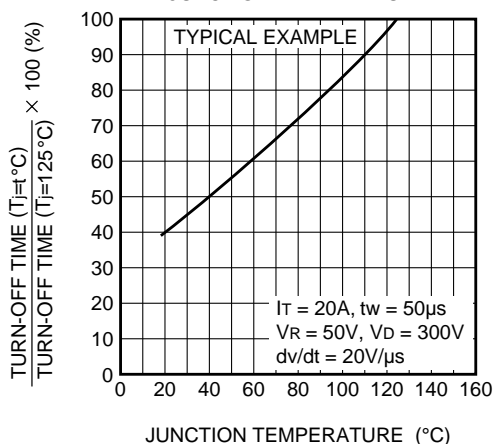
ALLOWABLE CASE TEMPERATURE VS. AVERAGE ON-STATE CURRENT (RECTANGULAR WAVE)



ALLOWABLE AMBIENT TEMPERATURE VS. AVERAGE ON-STATE CURRENT (RECTANGULAR WAVE)



TURN-OFF TIME VS. JUNCTION TEMPERATURE



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