● 5 A Continuous On-State Current
● 30 A Surge-Current
● Glass Passivated Wafer
● 400 V to 800 V Off-State Voltage
● Max $I_{GT}$ of 200 $\mu$A

absolute maximum ratings over operating case temperature (unless otherwise noted)

<table>
<thead>
<tr>
<th>RATING</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive peak off-state voltage (see Note 1)</td>
<td>$V_{DRM}$</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Repetitive peak reverse voltage</td>
<td>$V_{RRM}$</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Continuous on-state current at (or below) 80°C case temperature (see Note 2)</td>
<td>$I_{T(RMS)}$</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>Average on-state current (180° conduction angle) at (or below) 80°C case temperature (see Note 3)</td>
<td>$I_{T(AV)}$</td>
<td>3.2</td>
<td>A</td>
</tr>
<tr>
<td>Surge on-state current (see Note 4)</td>
<td>$I_{TM}$</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>Peak positive gate current (pulse width $\leq$ 300 $\mu$s)</td>
<td>$I_{GM}$</td>
<td>0.2</td>
<td>A</td>
</tr>
<tr>
<td>Peak gate power dissipation (pulse width $\leq$ 300 $\mu$s)</td>
<td>$P_{GM}$</td>
<td>1.3</td>
<td>W</td>
</tr>
<tr>
<td>Average gate power dissipation (see Note 5)</td>
<td>$P_{G(AV)}$</td>
<td>0.3</td>
<td>W</td>
</tr>
<tr>
<td>Operating case temperature range</td>
<td>$T_C$</td>
<td>-40 to +110</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>$T_{stag}$</td>
<td>-40 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>Lead temperature 1.6 mm from case for 10 seconds</td>
<td>$T_L$</td>
<td>230</td>
<td>°C</td>
</tr>
</tbody>
</table>

NOTES:
1. These values apply when the gate-cathode resistance $R_{GK} = 1$ kΩ.
2. These values apply for continuous dc operation with resistive load. Above 80°C derate linearly to zero at 110°C.
3. This value may be applied continuously under single phase 50 Hz half-sine-wave operation with resistive load. Above 80°C derate linearly to zero at 110°C.
4. This value applies for one 50 Hz half-sine-wave when the device is operating at (or below) the rated value of peak reverse voltage and on-state current. Surge may be repeated after the device has returned to original thermal equilibrium.
5. This value applies for a maximum averaging time of 20 ms.
electrical characteristics at 25°C case temperature (unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{DRM}$ Repetitive peak off-state current</td>
<td>$V_D = \text{rated } V_{DRM}$ $R_{GK} = 1 , \text{kΩ}$ $T_C = 110°C$</td>
<td>400</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>$I_{RRM}$ Repetitive peak reverse current</td>
<td>$V_R = \text{rated } V_{RRM}$ $I_G = 0$ $T_C = 110°C$</td>
<td>1</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$I_{GT}$ Gate trigger current</td>
<td>$V_{AA} = 6 , V$ $R_L = 100 , \text{Ω}$ $t_{p(g)} \geq 20 , \mu s$</td>
<td>60</td>
<td>1</td>
<td>200</td>
<td>µA</td>
</tr>
<tr>
<td>$V_{GT}$ Gate trigger voltage</td>
<td>$V_{AA} = 6 , V$ $R_L = 100 , \text{Ω}$ $t_{p(g)} \geq 20 , \mu s$</td>
<td>0.4</td>
<td>0.6</td>
<td>1</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{AA} = 6 , V$ $R_L = 100 , \text{Ω}$ $t_{p(g)} \geq 20 , \mu s$</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_H$ Holding current</td>
<td>$V_{AA} = 6 , V$ initiating $I_T = 10 , \text{mA}$ $R_{GK} = 1 , \text{kΩ}$ $T_C = -40°C$</td>
<td>8</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>$V_{AA} = 6 , V$ initiating $I_T = 10 , \text{mA}$ $R_{GK} = 1 , \text{kΩ}$ $T_C = 110°C$</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{TM}$ Peak on-state voltage</td>
<td>$I_{TM} = 5 , A$ (See Note 6)</td>
<td></td>
<td></td>
<td>1.7</td>
<td>V</td>
</tr>
<tr>
<td>$dv/dt$ Critical rate of rise of off-state voltage</td>
<td>$V_D = \text{rated } V_D$ $R_{GK} = 1 , \text{kΩ}$ $T_C = 110°C$</td>
<td>10</td>
<td></td>
<td></td>
<td>V/μs</td>
</tr>
</tbody>
</table>

**NOTE 6**: This parameter must be measured using pulse techniques, $t_p = 300 \, \mu s$, duty cycle $\leq 2 \%$. Voltage sensing-contacts, separate from the current carrying contacts, are located within 3.2 mm from the device body.

**thermal characteristics**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{JUC}$ Junction to case thermal resistance</td>
<td></td>
<td></td>
<td>3.5</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{JUA}$ Junction to free air thermal resistance</td>
<td></td>
<td></td>
<td>62.5</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

**resistive-load-switching characteristics at 25°C case temperature**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{gt}$ Gate-controlled turn-on time</td>
<td>$I_T = 5 , A$ $I_G = 10 , \text{mA}$ See Figure 1</td>
<td>1.75</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>$t_{q}$ Circuit-commutated turn-off time</td>
<td>$I_T = 5 , A$ $I_{RRM} = 8 , A$ See Figure 2</td>
<td>7.7</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
</tbody>
</table>
PARAMETER MEASUREMENT INFORMATION

**Figure 1. Gate-controlled turn-on time**

![Gate-controlled turn-on time diagram](image)

**Figure 2. Circuit-commutated turn-off time**

![Circuit-commutated turn-off time diagram](image)

**NOTES:**
A. Resistor R1 is adjusted for the specified value of $I_{RM}$.  
B. Resistor R2 value is $30/I_H$, where $I_H$ is the holding current value of thyristor TH1.  
C. Thyristor TH1 is the same device type as the DUT.  
D. Pulse Generators, G1 and G2, are synchronised to produce an on-state anode current waveform with the following characteristics:  
   - $t_p = 50 \mu s$ to $300 \mu s$  
   - duty cycle = 1%  
E. Pulse Generators, G1 and G2, have output pulse amplitude, $V_{G}$, of $\geq 20 V$ and duration of $10 \mu s$ to $20 \mu s$.  

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**PRODUCT INFORMATION**

**Power Innovations**
TYPICAL CHARACTERISTICS

AVERAGE ANODE ON-STATE CURRENT
DERATING CURVE

![Continuous DC](image)

\[ I_{T(AV)} - \text{Maximum Average Anode Forward Current - A} \]

\[ T_C - \text{Case Temperature - °C} \]

\[ \Phi = 180° \]

\[ 0° \leq \phi \leq 180° \]

Conduction Angle

\[ I_{T(\text{MAX})} - \text{Maximum Average Anode Forward Current - A} \]

\[ T_{C} - \text{Case Temperature - °C} \]

Figure 3.

MAX CONTINUOUS ANODE POWER DISSIPATED
VS CONTINUOUS ON-STATE CURRENT

![Graph](image)

\[ P_A - \text{Max Continuous Anode Power Dissipated - W} \]

\[ I_r - \text{Continuous On-State Current - A} \]

\[ T_j = 110°C \]

Figure 4.

SURGE ON-STATE CURRENT
VS CYCLES OF CURRENT DURATION

![Graph](image)

\[ I_{(t)} - \text{Peak Half-Sine-Wave Current - A} \]

\[ T_c \leq 80°C \]

No Prior Device Conduction
Gate Control Guaranteed

Consecutive 50 Hz Half-Sine-Wave Cycles

Figure 5.

TRANSIENT THERMAL RESISTANCE
VS CYCLES OF CURRENT DURATION

![Graph](image)

\[ R_{th(j)} - \text{Transitient Thermal Resistance - °C/W} \]

Consecutive 50 Hz Half-Sine-Wave Cycles

Figure 6.
TYPICAL CHARACTERISTICS

GATE TRIGGER CURRENT

vs

CASE TEMPERATURE

TC20AA

\[ V_{AA} = 6 \text{ V} \]
\[ R_L = 100 \text{ } \Omega \]
\[ t_{pg(min)} \geq 20 \text{ } \mu s \]

GATE TRIGGER VOLTAGE

vs

CASE TEMPERATURE

TC20AB

\[ V_{AA} = 6 \text{ V} \]
\[ R_G \geq 1 \text{ k} \Omega \]
\[ t_{pg(min)} \geq 20 \text{ } \mu s \]

GATE FORWARD VOLTAGE

vs

GATE FORWARD CURRENT

TC20AC

\[ I_A = 0 \]
\[ T_C = 25 \text{ } ^\circ \text{C} \]
\[ t_p = 300 \text{ } \mu s \]
\[ \text{Duty Cycle} \leq 2 \% \]

HOLDING CURRENT

vs

CASE TEMPERATURE

TC20AD

\[ V_{AA} = 6 \text{ V} \]
\[ R_G = 1 \text{ k} \Omega \]
Initiating \( I_T = 10 \text{ mA} \)
TYPICAL CHARACTERISTICS

PEAK ON-STATE VOLTAGE

VS

PEAK ON-STATE CURRENT

Figure 11.

GATE-CONTROLLED TURN-ON TIME

VS

GATE CURRENT

Figure 12.

CIRCUIT-COMMUTATED TURN-OFF TIME

VS

CASE TEMPERATURE

Figure 13.
MECHANICAL DATA

TO-220
3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.

ALL LINEAR DIMENSIONS IN MILLIMETERS

NOTES:
A. The centre pin is in electrical contact with the mounting tab.
B. Mounting tab corner profile according to package version.
C. Typical fixing hole centre stand off height according to package version.
Version 1, 18.0 mm. Version 2, 17.6 mm.
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