P-N-P SILICON REVERSE-BLOCKING TRIODE THYRISTORS

- 5 A DC
- 30 V to 400 V
- 30 A Surge-Current
- Max IGT of 200 μA

mechanical data

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

<table>
<thead>
<tr>
<th>Rating</th>
<th>TIC105Y</th>
<th>TIC105F</th>
<th>TIC105A</th>
<th>TIC105D</th>
<th>TIC105C</th>
<th>TIC105D0</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive Peak Off-State Voltage, V_{DSAM} (See Note 1)</td>
<td>30</td>
<td>80</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Repetitive Peak Reverse Voltage, V_{RSR}</td>
<td>30</td>
<td>80</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Continuous On-State Current at (or below) 85°C Case Temperature (See Note 2)</td>
<td>8</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average On-State Current (150° Conduction Angle)</td>
<td>2.2</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>worst before 85°C Case Temperature (See Note 3)</td>
<td>30</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Igt of the Current (See Note 4)</td>
<td>0.2</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Gate Power Dissipation (Pulse Width ≤ 300 μs)</td>
<td>1.3</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Gate Power Dissipation (See Note 5)</td>
<td>0.3</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Case Temperature Range</td>
<td>-40 to 110</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-40 to 125</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit Temperature 175 inch from Case for 10 Seconds</td>
<td>230</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. These values apply when the gate-ohmite resistance R_GK = 1 kΩ.
2. These values apply for continuous dc operation with resistive load. Above 85°C derate according to Figure 3.
3. This value may be applied continuously under single-phase 60-Hz half-wave operation with resistive load. Above 85°C derate according to Figure 3.
4. This value applies for 60-Hz half-wave wave when the device is operating at (or below) rated values 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 10.5 ms.
SERIES TIC106  
P-N-P-N SILICON REVERSE-BLOCKING TRIODE THYRISTORS

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>Ioff</td>
<td>VD = Rated VDRM, Rg = 1 kΩ, TC = 110°C</td>
<td>400</td>
<td>μA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IHBM</td>
<td>VR = Rated VRBM, Ig = 0, TC = 110°C</td>
<td>1</td>
<td>mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGTR</td>
<td>VTR = Gated VTH, Ig = 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VGTG</td>
<td>VAA = 5 V, IL = 100 μA, TC = 110°C</td>
<td>1.2</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VAA = 5 V, IL = 100 μA, TC = 110°C</td>
<td>0.4</td>
<td>0.5</td>
<td>1</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VAA = 5 V, IL = 100 μA, TC = 110°C</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IH</td>
<td>VAA = 5 V, Rg = 1 kΩ, Isat = 10 mA, TC = 110°C</td>
<td>8</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>VAA = 5 V, Rg = 1 kΩ, Isat = 10 mA, TC = 110°C</td>
<td>5</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>VRBM</td>
<td>ITRM = 5 A, See Note 5</td>
<td>1.7</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>div/tr</td>
<td>VD = Rated VD, Rg = 1 kΩ, TC = 110°C</td>
<td>10</td>
<td></td>
<td></td>
<td>V/μA</td>
</tr>
</tbody>
</table>

thermal characteristics

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RjCc</td>
<td>2.5</td>
<td>°C/W</td>
</tr>
<tr>
<td>RjCf</td>
<td>0.25</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

NOTE 5: This parameter must be measured using pulse techniques, tC = 300 μs, duty cycle < 2%. Voltage-sensing contacts, sensing from the current-carrying contacts, are located within 0.125 inch from the device body.


### Switching Characteristics at 25°C Case Temperature

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>τ&lt;sub&gt;G&lt;/sub&gt; (Gate-Controlled Turn-On Time)</td>
<td>V&lt;sub&gt;AA&lt;/sub&gt; = 30 V, R&lt;sub&gt;L&lt;/sub&gt; = 6 Ω, R&lt;sub&gt;GK&lt;/sub&gt;(off) = 5 kΩ, V&lt;sub&gt;in&lt;/sub&gt; = 80 V. See Figure 1</td>
</tr>
<tr>
<td>τ&lt;sub&gt;q&lt;/sub&gt; (Circuit-Commuted Turn-On Time)</td>
<td>V&lt;sub&gt;AA&lt;/sub&gt; = 30 V, R&lt;sub&gt;L&lt;/sub&gt; = 6 Ω, I&lt;sub&gt;RM&lt;/sub&gt; = 8 A, See Figure 2</td>
</tr>
</tbody>
</table>

### Parameter Measurement Information

#### Voltage Waveforms

**Figure 1 - Gate-Controlled Turn-On Time**

**Figure 2 - Circuit-Commuted Turn-Off Time**

**Test Circuit**

**NOTES**

A. V<sub>in</sub> is measured with gate and cathode terminals open.

B. The input waveform of Figure 1 has the following characteristics: t<sub>1</sub> < 60 ns, t<sub>2</sub> < 30 ns.

C. Waveforms are monitored on an oscilloscope with the following characteristics: t<sub>1</sub> < 14 ns, R<sub>I</sub> > 10 MΩ, C<sub>in</sub> < 12 pF.

D. R<sub>GK</sub>(off) includes the total resistance of the generator and the external resistor.

E. Pulse generators for V<sub>1</sub> and V<sub>2</sub> are synchronized to provide an enabling current waveform with the following characteristics:

   L<sub>1</sub> < 50 to 300 μs, duty cycle = 1%. The pulse widths of V<sub>1</sub> and V<sub>2</sub> are > 10 μs.

F. Resistor R<sub>1</sub> is adjusted for I<sub>RM</sub> = 8 A.
SERIES 11C106
P-N-P-N SILICON REVERSE-BLOCKING TRIODE THYRISTORS

THERMAL INFORMATION

AVERAGE ANODE
FORWARD CURRENT DERATING CURVE

MAXIMUM CONTINUOUS ANODE POWER DISSIPATION
VS
CONTINUOUS ANODE FORWARD CURRENT

Tc = Case Temperature - °C
FIGURE 3

IF = Continuous Anode Forward Current - A
FIGURE 4

SURGE ON-STATE CURRENT
VS
CYCLES OF CURRENT DURATION

TRANSIENT THERMAL RESISTANCE
VS
CYCLES OF CURRENT DURATION

Tc < 80°
See Note 7

Rth JC = Transient Thermal Resistance - °C/W
FIGURE 5

N = Peak Half-Sine Wave Current - A

Consecutive 60-Hz Half-Sine-Wave Cycles
TYPICAL CHARACTERISTICS

GATE TRIGGER CURRENT
vs CASE TEMPERATURE

GATE TRIGGER VOLTAGE
vs CASE TEMPERATURE

GATE FORWARD VOLTAGE
vs GATE FORWARD CURRENT

HOLDING CURRENT
vs CASE TEMPERATURE

NOTE: This parameter must be measured using pulse techniques. tW = 300 μs, duty cycle < 2%. Values shown are average, separate from the current-carrying contacts, are located within 0.125 inch from the device body.

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TYPICAL CHARACTERISTICS

PEAK ON-STATE VOLTAGE
VS

PEAK-ON STATE CURRENT
IA

FIGURE 11

GATE-CONTROLLED TURN-ON TIME

GATE CURRENT

FIGURE 12

CIRCUIT-COMMUTATED TURN-OFF TIME

CASE TEMPERATURE

FIGURE 13

NOTE 8: This parameter must be measured using pulse techniques. T1 = 300 μs, duty cycle ≤ 2%. Voltage-sensing contacts, aware from the current-carrying contacts, are located within 0.125 inch from the device body.

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