NGTB03N60R2DT4G

IGBT
600V, 4.5A, N-Channel

Features
- Reverse Conducting IGBT
- IGBT \( V_{CE(sat)} = 1.7V \) (typ) \([I_C=3A, \ V_{GE}=15V]\)
- IGBT \( t_f=75\text{ns} \) (typ)
- Diode \( V_F=1.5V \) (typ) \([I_F=3A]\)
- Diode \( t_{rr}=65\text{ns} \) (typ)
- 5\( \mu \text{s} \) Short Circuit Capability

Applications
- General Purpose Inverter

Specifications

Absolute Maximum Ratings at \( T_a=25^\circ\text{C} \), Unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector to Emitter Voltage</td>
<td>( V_{CES} )</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Gate to Emitter Voltage</td>
<td>( V_{GES} )</td>
<td>( \pm 20 )</td>
<td>V</td>
</tr>
<tr>
<td>Collector Current (DC) Limited by ( T_{j\text{max}} )</td>
<td>( I_C )</td>
<td>9</td>
<td>A</td>
</tr>
<tr>
<td>Collector Current (Peak)</td>
<td>( I_{CP} )</td>
<td>12</td>
<td>A</td>
</tr>
<tr>
<td>Diode Average Output Current</td>
<td>( I_O )</td>
<td>4.5</td>
<td>A</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>( P_D )</td>
<td>49</td>
<td>W</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>( T_j )</td>
<td>175</td>
<td>( ^\circ\text{C} )</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>-55 to +175</td>
<td>( ^\circ\text{C} )</td>
</tr>
</tbody>
</table>

Note:
- 1 Collector Current is calculated from the following formula.
  \[ I_C(T_C) = \frac{R_{th(j-c)} \cdot V_{CE(sat)} - I_C(T_C)}{R_{th(j-c)}} \]
- 2 Our condition is radiation from backside.
  The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminum.

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ORDERING INFORMATION
See detailed ordering and shipping information on page 8 of this data sheet.
### Electrical Characteristics at Ta=25°C, Unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector to Emitter Breakdown Voltage</td>
<td>V_{BR(CES)}</td>
<td>I_{C}=1mA, V_{GE}=0V</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Collector to Emitter Cut off Current</td>
<td>I_{CES}</td>
<td>V_{CE}=600V, V_{GE}=0V</td>
<td>10</td>
<td>µA</td>
</tr>
<tr>
<td>Gate to Emitter Leakage Current</td>
<td>I_{GES}</td>
<td>V_{GE}=±20V, V_{CE}=0V</td>
<td>±100</td>
<td>mA</td>
</tr>
<tr>
<td>Gate to Emitter Threshold Voltage</td>
<td>V_{GE(th)}</td>
<td>V_{CE}=20V, I_{C}=80µA</td>
<td>4.5</td>
<td>V</td>
</tr>
<tr>
<td>Collector to Emitter Saturation Voltage</td>
<td>V_{CE(sat)}</td>
<td>V_{GE}=15V, I_{C}=3A</td>
<td>1.7</td>
<td>V</td>
</tr>
<tr>
<td>Forward Diode Voltage</td>
<td>V_{F}</td>
<td>I_{F}=3A</td>
<td>1.5</td>
<td>V</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>C_{ies}</td>
<td>V_{CE}=20V, f=1MHz</td>
<td>415</td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>C_{oes}</td>
<td></td>
<td>17</td>
<td>pF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance</td>
<td>C_{res}</td>
<td></td>
<td>10</td>
<td>pF</td>
</tr>
<tr>
<td>Turn-ON Delay Time</td>
<td>t_{d(on)}</td>
<td>V_{CC}=300V, I_{C}=3A</td>
<td>27</td>
<td>ns</td>
</tr>
<tr>
<td>Rise Time</td>
<td>t_{r}</td>
<td>V_{CC}=300V, I_{C}=3A</td>
<td>17</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-ON Time</td>
<td>t_{on}</td>
<td>R_{G}=30Ω, L=500µH</td>
<td>85</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-OFF Delay Time</td>
<td>t_{d(off)}</td>
<td>V_{OLAMP}=400V, T_{c}=25°C</td>
<td>50</td>
<td>ns</td>
</tr>
<tr>
<td>Fall Time</td>
<td>t_{f}</td>
<td>V_{OLAMP}=400V, T_{c}=25°C</td>
<td>75</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-OFF Time</td>
<td>t_{off}</td>
<td>V_{OLAMP}=400V, T_{c}=25°C</td>
<td>172</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-ON Energy</td>
<td>E_{on}</td>
<td></td>
<td>50</td>
<td>µJ</td>
</tr>
<tr>
<td>Turn-OFF Energy</td>
<td>E_{off}</td>
<td></td>
<td>27</td>
<td>µJ</td>
</tr>
<tr>
<td>Total Gate Charge</td>
<td>Q_{g}</td>
<td></td>
<td>17</td>
<td>nC</td>
</tr>
<tr>
<td>Gate to Emitter Charge</td>
<td>Q_{ge}</td>
<td>V_{CE}=300V, V_{GE}=15V, I_{C}=3A</td>
<td>4.4</td>
<td>nC</td>
</tr>
<tr>
<td>Gate to Collector “Miller” Charge</td>
<td>Q_{gc}</td>
<td></td>
<td>7.6</td>
<td>nC</td>
</tr>
<tr>
<td>Diode Reverse Recovery Time</td>
<td>t_{rr}</td>
<td>I_{F}=3A,di/dt=200A/µs, V_{CC}=300V, See Fig.3</td>
<td>65</td>
<td>ns</td>
</tr>
</tbody>
</table>

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### Thermal Characteristics at Ta=25°C, Unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance IGBT (Junction to Case)</td>
<td>R_{th(j-c)}(IGBT)</td>
<td>T_{c}=25°C (Our ideal heat dissipation condition)</td>
<td>3.06</td>
<td>°C/W</td>
</tr>
<tr>
<td>Thermal Resistance (Junction to Ambient)</td>
<td>R_{th(a)}</td>
<td></td>
<td>100</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

Note: 2 Our condition is radiation from backside.  
The method is applying silicone grease to the backside of the device and attaching  
the device to water-cooled radiator made of aluminum.
Fig.1 Switching Time Test Circuit

Fig.2 Timing Chart

Fig.3 Reverse Recovery Time Test Circuit
Package Dimensions

DPAK (SINGLE GAUGE)
CASE 369C
ISSUE F

NOTES:
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

SOLDERING FOOTPRINT*

*This information is generic. Please refer to device data sheet for actual part marking.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

www.onsemi.com
### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Device</th>
<th>Marking</th>
<th>Package</th>
<th>Shipping (Qty / Packing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGTB03N60R2DT4G</td>
<td>AYWWT</td>
<td>DPAK (SINGLE GAUGE)</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td></td>
<td>GTB</td>
<td>(Pb-Free / Halogen Free)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0360RG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D. [http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF](http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF)