### SCRs
#### Commercial Nanosecond Switching
##### Planar

**Features**
- Rise Time: 1.5ns
- Delay Time: 10ns
- Recovery Time: 0.5μs
- Pulse Current: to 100A
- Turn-on with 20ns, 10mA gate pulse

**Description**
The Microsemi Nanosecond Thyristor Switch combines the turnon speed of logic level transistors with the high current switching capability inherent in SCRs. With this device, engineers can now design circuits capable of switching pulse currents of 1A in less than 10ns or up to 30A in less than 20ns.

The GA300, GB300 Series is specifically designed for use as switching elements in high speed laser diode pulse drivers. Other applications include electronic crowbars, harmonic wave-form generators, line drivers and general purpose replacements for avalanche transistors. For applications requiring higher voltage levels, Microsemi has developed several “series string” circuits which allow the series connection of an unlimited number of devices for voltages as high as 2000V with no significant decrease in speed.
The circuits are described in Microsemi’s Design Note #112.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th></th>
<th>GA300</th>
<th>GA301</th>
<th>GB300</th>
<th>GB301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive Peak Off-State Voltage, $V_{ON}$</td>
<td>60V</td>
<td>60V</td>
<td>60V</td>
<td>60V</td>
</tr>
<tr>
<td>Repetitive Peak On-State Current, $I_{ON}$</td>
<td>up to 100A</td>
<td>up to 100A</td>
<td>250mA</td>
<td>250mA</td>
</tr>
<tr>
<td>Peak Gate Current, $I_{GM}$</td>
<td>250mA</td>
<td>250mA</td>
<td>30mA</td>
<td>30mA</td>
</tr>
<tr>
<td>Average Gate Current, $I_{G}$</td>
<td>25mA</td>
<td>25mA</td>
<td>3mA</td>
<td>3mA</td>
</tr>
<tr>
<td>Reverse Gate Voltage, $V_{GE}$</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-65°C to +150°C</td>
<td>-65°C to +150°C</td>
<td>-65°C to +150°C</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

### Mechanical Specifications

**GA300**
- **B**: 0.17" (4.32 mm)
- **C**: 0.10" (2.54 mm)
- **D**: 0.20" (5.08 mm)
- **G**: Anode

**GB300**
- **A**: 0.20" (5.08 mm)
- **B**: 0.095" (2.413 mm)
- **C**: 0.300" (7.62 mm)
- **D**: 0.570" (14.48 mm)
- **G**: Anode

**NOTE:** Anode connected to case.

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*Microsemi Corp. Watertown*
**ELECTRICAL SPECIFICATIONS (at 25°C unless noted)**

<table>
<thead>
<tr>
<th>Test</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Units</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay Time</td>
<td>$t_a$</td>
<td>20</td>
<td>30</td>
<td></td>
<td>ns</td>
<td>$I_0 = 20mA, I_1 = 1A$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>$I_0 = 5mA, I_1 = 1A$</td>
</tr>
<tr>
<td>Rise Time (Note 1)</td>
<td>$t_r$</td>
<td>15</td>
<td>25</td>
<td></td>
<td>ns</td>
<td>$V_{p} = 60V, I_1 = 1A$</td>
</tr>
<tr>
<td>GA300, 300A, GB300, 300A</td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>$V_{p} = 60V, I_1 = 30A$</td>
</tr>
<tr>
<td>Rise Time (Note 1)</td>
<td>$t_r$</td>
<td>15</td>
<td>25</td>
<td></td>
<td>ns</td>
<td>$V_{p} = 100V, I_1 = 1A$</td>
</tr>
<tr>
<td>GA301, 301A, GB301, 301A</td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>$V_{p} = 100V, I_1 = 30A$</td>
</tr>
<tr>
<td>Circuit Commutated Turn-off Time</td>
<td>$t_a$</td>
<td>0.8</td>
<td>2.0</td>
<td></td>
<td>us</td>
<td>$I_1 = 1A, I_2 = 1A, R_{DS} = 1K$</td>
</tr>
<tr>
<td>GA300, 301, GB300, 301</td>
<td></td>
<td></td>
<td>0.8</td>
<td></td>
<td></td>
<td>$I_1 = 3A, I_2 = 1A, R_{DS} = 5K$</td>
</tr>
<tr>
<td>Gate Trigger-on Pulse Width</td>
<td>$t_{op}$</td>
<td>0.02</td>
<td>0.03</td>
<td></td>
<td>us</td>
<td>$I_2 = 10mA, I_2 = 1A$</td>
</tr>
<tr>
<td>Off-state Current</td>
<td>$I_{off}$</td>
<td>0.01</td>
<td>0.1</td>
<td></td>
<td>mA</td>
<td>$V_{on} = $ Rated, $R_{DS} = 1K, T = 25°C$</td>
</tr>
<tr>
<td>Reverse Current (Note 2)</td>
<td>$I_{rev}$</td>
<td>1.0</td>
<td>10</td>
<td></td>
<td>mA</td>
<td>$V_{on} = 30V, R_{DS} = 1K$</td>
</tr>
<tr>
<td>Gate Trigger Voltage</td>
<td>$V_{GT}$</td>
<td>0.4</td>
<td>0.6</td>
<td>0.75</td>
<td>V</td>
<td>$V_{p} = 5V, R_{DS} = 100G, T = 25°C$</td>
</tr>
<tr>
<td>Gate Trigger Current</td>
<td>$I_{GT}$</td>
<td>0.10</td>
<td>0.2</td>
<td></td>
<td>mA</td>
<td>$V_{p} = 5V, R_{DS} = 100G, T = 125°C$</td>
</tr>
<tr>
<td>On-state Voltage</td>
<td>$V_{p}$</td>
<td>0.1</td>
<td>0.2</td>
<td></td>
<td>V</td>
<td>$I_1 = 2A$</td>
</tr>
<tr>
<td>Off-state Voltage - Critical Rate of Rise</td>
<td>$dv/dt$</td>
<td>15</td>
<td>30</td>
<td></td>
<td>V/us</td>
<td>$V_{on} = 30V, R_{DS} = 1K$</td>
</tr>
<tr>
<td>Reverse Gate Currents</td>
<td>$I_{rev}$</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Holding Current</td>
<td>$I_{H}$</td>
<td>0.3</td>
<td>2.0</td>
<td>5.0</td>
<td>mA</td>
<td>$V_{p} = 5V, R_{DS} = 1K, T = 25°C$</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>0.05</td>
<td>0.4</td>
<td>mA</td>
<td>$V_{p} = 5V, R_{DS} = 1K, T = 25°C$</td>
</tr>
</tbody>
</table>

Notes: 1. $I_0 = 20mA$, Pulse Test, Duty Cycle < 1%.
2. Pulse test intended to guarantee reverse anode voltage capability for pulse commutation. Device should not be operated in the reverse blocking mode on a continuous basis.

**Switching Speed vs. Current**

**Peak Current vs. Pulse Width**

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**Notes:**
1. $V_{on} = $ Rated $V_{on}$
2. $I_{rev} = 3mA$
3. $I_{rev} = 20ms$ typically for all types independent of anode current.
4. $I_0 = 20mA$.

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**Notes:**
1. Data based on On-State Voltage graph at $T = 25°C$.
2. $V_{on} = $ Rated $V_{on}$
3. Peak Voltage may be applied immediately after current pulse termination.
4. $I_{rev} = 3mA$.
5. Duty Cycle = .0005% or less.
6. $T_a = 75°C$. 
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