### Maximum Ratings

$T_j = 25 \, ^\circ\text{C}$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buck Switch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>$V_{GES}$</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>$I_c$</td>
<td>$T_j = T_{jmax}$</td>
<td>128</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak collector current</td>
<td>$I_{CM}$</td>
<td>$\leq$ limited by $T_{jmax}$</td>
<td>450</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>$P_{sw}$</td>
<td>$T_j = T_{jmax}$</td>
<td>279</td>
<td>W</td>
</tr>
<tr>
<td>Gate-emitter voltage</td>
<td>$V_{GES}$</td>
<td></td>
<td>420</td>
<td>V</td>
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<tr>
<td>Short circuit ratings</td>
<td>$t_{sc}$</td>
<td>$V_{CE} = 15 , \text{V}$, $V_{CC} = 400 , \text{V}$, $T_j \leq 150 , ^\circ\text{C}$</td>
<td>5</td>
<td>µs</td>
</tr>
<tr>
<td>Maximum junction temperature</td>
<td>$T_{jmax}$</td>
<td></td>
<td>175</td>
<td>^\circ\text{C}</td>
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</table>
### Maximum Ratings

$T_j = 25 \, ^\circ C$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td><strong>Buck Diode</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak repetitive reverse voltage</td>
<td>$V_{RRM}$</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Continuous (direct) forward current</td>
<td>$I_c$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>125</td>
<td>A</td>
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<tr>
<td>Surge (non-repetitive) forward current</td>
<td>$I_{FSM}$</td>
<td>$t_s = 10 , ms$ sine Wave $T_j = 100 , ^\circ C$</td>
<td>1280</td>
<td>A</td>
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<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>241</td>
<td>W</td>
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<tr>
<td>Maximum junction temperature</td>
<td>$T_{jmax}$</td>
<td></td>
<td>175</td>
<td>^\circ C</td>
</tr>
<tr>
<td><strong>Boost Switch</strong></td>
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<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>$V_{CES}$</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>$I_c$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>173</td>
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<td>Repetitive peak collector current</td>
<td>$I_{CEM}$</td>
<td>$t_s$ limited by $T_{jmax}$</td>
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<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
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<td>W</td>
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<td>Gate-emitter voltage</td>
<td>$V_{GES}$</td>
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<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Short circuit ratings</td>
<td>$I_{SC}$</td>
<td>$V_{OS} = 15 , V$ $V_{CC} = 360 , V$ $T_j = 150 , ^\circ C$</td>
<td>6</td>
<td>µs</td>
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<tr>
<td>Maximum junction temperature</td>
<td>$T_{jmax}$</td>
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<td>175</td>
<td>^\circ C</td>
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<tr>
<td><strong>Boost Diode</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak repetitive reverse voltage</td>
<td>$V_{RRM}$</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Continuous (direct) forward current</td>
<td>$I_c$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>$I_{CEM}$</td>
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<td>200</td>
<td>A</td>
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<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>203</td>
<td>W</td>
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<tr>
<td>Maximum junction temperature</td>
<td>$T_{jmax}$</td>
<td></td>
<td>175</td>
<td>^\circ C</td>
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<tr>
<td><strong>Boost Sw.Inv.Diode</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak repetitive reverse voltage</td>
<td>$V_{RRM}$</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Continuous (direct) forward current</td>
<td>$I_c$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
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<td>A</td>
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<tr>
<td>Repetitive peak forward current</td>
<td>$I_{CEM}$</td>
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<td>200</td>
<td>A</td>
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<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j = T_{jmax}$ $T_i = 80 , ^\circ C$</td>
<td>204</td>
<td>W</td>
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<tr>
<td>Maximum junction temperature</td>
<td>$T_{jmax}$</td>
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<td>175</td>
<td>^\circ C</td>
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</tbody>
</table>
Maximum Ratings

$\theta_i = 25 \, ^\circ C$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td><strong>Module Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Thermal Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{\text{stg}}$</td>
<td>-40...+125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Operation temperature under switching condition</td>
<td>$T_{\text{jop}}$</td>
<td>-40...(\theta_{\text{in}} - 25)</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td><strong>Isolation Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation voltage</td>
<td>$V_{\text{isol}}$</td>
<td>DC Test Voltage*</td>
<td>$t_p = 2 , \text{s}$</td>
<td>6000</td>
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<tr>
<td></td>
<td></td>
<td>AC Voltage</td>
<td>$t_p = 1 , \text{min}$</td>
<td>2500</td>
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<tr>
<td>Creepage distance</td>
<td></td>
<td></td>
<td></td>
<td>min. 12,7</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
<td></td>
<td>11,83</td>
</tr>
<tr>
<td>Comparative Tracking Index</td>
<td>CTI</td>
<td></td>
<td></td>
<td>&gt; 200</td>
</tr>
</tbody>
</table>

*100 % tested in production
### Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V&lt;sub&gt;GE&lt;/sub&gt;</td>
<td>[V]</td>
<td></td>
<td>25</td>
<td>4,2</td>
</tr>
<tr>
<td>V&lt;sub&gt;GS&lt;/sub&gt;</td>
<td>[V]</td>
<td></td>
<td>15 150</td>
<td>1,38 1,89 2,25</td>
</tr>
<tr>
<td>V&lt;sub&gt;CE&lt;/sub&gt;</td>
<td>[V]</td>
<td></td>
<td>25</td>
<td>7,6</td>
</tr>
<tr>
<td>V&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>[V]</td>
<td></td>
<td>20 0 25</td>
<td>300</td>
</tr>
<tr>
<td>V&lt;sub&gt;F&lt;/sub&gt;</td>
<td>[V]</td>
<td></td>
<td>0</td>
<td>none</td>
</tr>
<tr>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>[A]</td>
<td></td>
<td>0 650 150</td>
<td>25</td>
</tr>
<tr>
<td>I&lt;sub&gt;D&lt;/sub&gt;</td>
<td>[A]</td>
<td></td>
<td>25</td>
<td>940</td>
</tr>
<tr>
<td>I&lt;sub&gt;F&lt;/sub&gt;</td>
<td>[A]</td>
<td></td>
<td>25</td>
<td>480</td>
</tr>
<tr>
<td>T&lt;sub&gt;j&lt;/sub&gt;</td>
<td>[°C]</td>
<td></td>
<td>25</td>
<td>274</td>
</tr>
<tr>
<td>C&lt;sub&gt;ies&lt;/sub&gt;</td>
<td>[pF]</td>
<td></td>
<td>0 25</td>
<td>300</td>
</tr>
<tr>
<td>C&lt;sub&gt;oes&lt;/sub&gt;</td>
<td>[pF]</td>
<td></td>
<td>0 25</td>
<td>300</td>
</tr>
<tr>
<td>C&lt;sub&gt;res&lt;/sub&gt;</td>
<td>[pF]</td>
<td></td>
<td>0 25</td>
<td>300</td>
</tr>
</tbody>
</table>

### Buck Switch

#### Static

- **Gate-emitter threshold voltage**
  - Symbol: V<sub>GE(th)</sub>
  - Conditions: V<sub>CE</sub> = V<sub>CE</sub>
  - Value: 0,0024 V

- **Collector-emitter saturation voltage**
  - Symbol: V<sub>CEsat</sub>
  - Conditions: 15 150
  - Value: 1,38 1,89 2,25 V

- **Collector-emitter cut-off current**
  - Symbol: I<sub>ces</sub>
  - Conditions: 0 650 150
  - Value: 7,6 µA

- **Gate-emitter leakage current**
  - Symbol: I<sub>ges</sub>
  - Conditions: 20 0 25
  - Value: 300 nA

- **Input capacitance**
  - Symbol: C<sub>in</sub>
  - Conditions: /= 1 Mhz
  - Value: 9240 pF

- **Output capacitance**
  - Symbol: C<sub>out</sub>
  - Conditions: /= 1 Mhz
  - Value: 480 pF

- **Reverse transfer capacitance**
  - Symbol: C<sub>res</sub>
  - Conditions: /= 1 Mhz
  - Value: 274 pF

- **Gate charge**
  - Symbol: Q<sub>g</sub>
  - Conditions: 15 480 150
  - Value: 940 nC

### Thermal

- **Thermal resistance junction to sink**
  - Symbol: R<sub>th(j-s)</sub>
  - Conditions: λ_paste = 3,4 W/mK (PSX)
  - Value: 0,34 K/W

### Dynamic

- **Turn-on delay time**
  - Symbol: t<sub>on</sub>
  - Conditions: 4 Ω
  - Value: 0,084  mWs

- **Rise time**
  - Symbol: t<sub>r</sub>
  - Conditions: 4 Ω
  - Value: 0,084  mWs

- **Turn-off delay time**
  - Symbol: t<sub>off</sub>
  - Conditions: 4 Ω
  - Value: 0,084  mWs

- **Fall time**
  - Symbol: t<sub>f</sub>
  - Conditions: 4 Ω
  - Value: 0,084  mWs

- **Turn-on energy (per pulse)**
  - Symbol: E<sub>on</sub>
  - Conditions: Q<sub>on</sub> = 4,8 µC
  - Value: 1,815  mWs

- **Turn-off energy (per pulse)**
  - Symbol: E<sub>off</sub>
  - Conditions: Q<sub>off</sub> = 9,1 µC
  - Value: 2,442  mWs
# Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward voltage</td>
<td>$V_C$</td>
<td>160</td>
<td>25 125 150</td>
<td>1,52 1,47 1,45</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_L$</td>
<td>650</td>
<td>25</td>
<td>8,4</td>
</tr>
</tbody>
</table>

## Static

### Buck Diode

**Forward voltage**

- $V_C$: 160 V
- $I_L$: 25, 125, 150 A
- $V_C$: 1,52 V
- $I_L$: 1,47 V
- $V_C$: 1,45 V
- $I_L$: 8,4 μA

**Reverse leakage current**

- $I_L$: 650 μA
- $V_C$: 25 V
- $I_L$: 8,4 μA

## Thermal

**Thermal resistance junction to sink**

- $R_{th(j-s)}$: 0,39 K/W
- $I_{aux} = 3,4$ W/mK (PSX)
- $T_j$: 25, 125, 150 °C
- $I_{aux}$: 100 A
- $T_j$: 143 A
- $I_{aux}$: 152 A

## Dynamic

**Peak recovery current**

- $I_{aux}$: 100 A
- $T_j$: 25, 125, 150 °C
- $I_{aux}$: 100 A
- $T_j$: 143 A
- $I_{aux}$: 152 A

**Reverse recovery time**

- $t_{rr}$: 66 ns
- $T_j$: 25 125 150 °C
- $t_{rr}$: 95 ns
- $T_j$: 105 ns

**Recovered charge**

- $Q_r$: 4,759 μC
- $t_{rr}$: 350 ns
- $Q_r$: 9,056 μC
- $t_{rr}$: 150 ns
- $Q_r$: 10,295 μC
- $t_{rr}$: 150 ns

**Reverse recovered energy**

- $E_{rec}$: 1,035 mWs
- $Q_r$: 25 μC
- $E_{rec}$: 2,055 mWs
- $Q_r$: 125 μC
- $E_{rec}$: 2,344 mWs
- $Q_r$: 207 μC

**Peak rate of fall of recovery current**

- $(dI_{aux}/dt)_{max}$: 2725 A/μs
- $Q_r$: 25 μC
- $(dI_{aux}/dt)_{max}$: 2076 A/μs
- $Q_r$: 125 μC
- $(dI_{aux}/dt)_{max}$: 1787 A/μs
- $Q_r$: 150 μC
# Characteristic Values

## Boost Switch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate-emitter threshold voltage</td>
<td>$V_{GE(th)}$</td>
<td>$V_{GE} = V_{CE}$</td>
<td>0,0024</td>
<td>V</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>$V_{CISAT}$</td>
<td>15 150</td>
<td>25 150</td>
<td>V</td>
</tr>
<tr>
<td>Collector-emitter cut-off current</td>
<td>$I_{CSS}$</td>
<td>0 600</td>
<td>25</td>
<td>µA</td>
</tr>
<tr>
<td>Gate-emitter leakage current</td>
<td>$I_{GSS}$</td>
<td>20 0</td>
<td>25</td>
<td>nA</td>
</tr>
<tr>
<td>Internal gate resistance</td>
<td>$r_g$</td>
<td>none</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{iss}$</td>
<td>$f = 1$ Mhz</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oss}$</td>
<td>9240</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{res}$</td>
<td>274</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Gate charge</td>
<td>$Q_g$</td>
<td>15 480 150</td>
<td>25</td>
<td>nC</td>
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</table>

## Dynamic

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on delay time</td>
<td>$t_{on}$</td>
<td>±15 350</td>
<td>25 150</td>
<td>ns</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td>$R_{on} = 4$ Ω</td>
<td>25 150</td>
<td></td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>$t_{off}$</td>
<td>±15 350</td>
<td>25 150</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td>$R_{off} = 4$ Ω</td>
<td>25 150</td>
<td></td>
</tr>
<tr>
<td>Turn-on energy (per pulse)</td>
<td>$E_{on}$</td>
<td>$Q_{on} = 5,9$ µC</td>
<td>25 150</td>
<td>mWs</td>
</tr>
<tr>
<td>Turn-off energy (per pulse)</td>
<td>$E_{off}$</td>
<td>$Q_{off} = 12,9$ µC</td>
<td>25 150</td>
<td></td>
</tr>
</tbody>
</table>
### Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Symbol</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Static</td>
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</tr>
<tr>
<td>Forward voltage $V_{G}$</td>
<td></td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Reverse leakage current $I_{R}$</td>
<td>650</td>
<td>25</td>
<td>48</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink $R_{th(j-s)}$</td>
<td>λpaste = 3,4 W/mK (PSX)</td>
<td>0,47</td>
<td>K/W</td>
</tr>
<tr>
<td>Dynamic</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Peak recovery current $I_{RRM}$</td>
<td>≤15</td>
<td>350</td>
<td>150</td>
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<tr>
<td>Reverse recovery time $t_{rr}$</td>
<td>≥25</td>
<td>133</td>
<td>290</td>
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<tr>
<td>Recovered charge $Q_{rd}$</td>
<td>$\frac{di}{dt} = 7150 \text{ A/μs}$</td>
<td>5,92</td>
<td>12,85</td>
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<tr>
<td>Reverse recovered energy $E_{rec}$</td>
<td>$\frac{di}{dt} = 5023 \text{ A/μs}$</td>
<td>1,65</td>
<td>3,68</td>
</tr>
<tr>
<td>Peak rate of fall of recovery current $</td>
<td>\frac{di}{dt}</td>
<td>_{max}$</td>
<td>$\leq 7150 \text{ A/μs}$</td>
</tr>
<tr>
<td>Boost Sw.Inv.Diode</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage $V_{G}$</td>
<td></td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink $R_{th(j-s)}$</td>
<td>λpaste = 3,4 W/mK (PSX)</td>
<td>0,46</td>
<td>K/W</td>
</tr>
</tbody>
</table>

### Boost Diode

**Boost Sw.Inv.Diode**

**Thermistor**

- Rated resistance $R$
- Deviation of $R_{100}$ $\Delta R_{100}$
- Power dissipation $P$
- Power dissipation constant
- $B$-value $B_{(25/100)}$
- $B$-value $B_{(25/100)}$
- Vincotech NTC Reference
Buck Switch Characteristics

**Figure 1.** IGBT

Typical output characteristics

\[ I_C = f(V_{CE}) \]

\[ t_p = 250 \, \mu s, \quad 25 \, ^\circ C \]

\[ V_{GE} = 15 \, V, \quad 150 \, ^\circ C \]

\[ V_{CE} = 0 \, V \]

**Figure 2.** IGBT

Typical output characteristics

\[ I_C = f(V_{CE}) \]

\[ t_p = 250 \, \mu s, \quad 25 \, ^\circ C \]

\[ V_{CE} = 0 \, V \]

\[ V_{GE} \text{ from 7 V to 17 V in steps of 1 V} \]

**Figure 3.** IGBT

Typical transfer characteristics

\[ I_C = f(V_{GE}) \]

\[ t_p = 100 \, \mu s, \quad 25 \, ^\circ C \]

\[ V_{CE} = 0 \, V \]

\[ R_{th(j-s)} = 0.34 \, K/W \]

**Figure 4.** IGBT

Transient thermal impedance as function of pulse duration

\[ Z_{th(j-s)} = f(t_p) \]

\[ D = \frac{t_p}{T} \]

<table>
<thead>
<tr>
<th>( R ) (K/W)</th>
<th>( t ) (s)</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>1,76E-02</td>
<td>6,24E-04</td>
</tr>
</tbody>
</table>
Buck Switch Characteristics

**figure 5.** IGBT Safe operating area

\[ f_c = f(V_{CE}) \]

- **D** = single pulse
- **T_s** = 80 °C
- **V_{CE}** = ±15 V
- **T_J** = \( T_{jmax} \)
Buck Diode Characteristics

**Figure 1. FWD**

Typical forward characteristics

\[ I_F = f(V_F) \]

**Figure 2. FWD**

Transient thermal impedance as a function of pulse width

\[ Z_{th(j-s)} = f(t_p) \]

- \( t_p = 250 \mu s \)
- \( T_j: 25 \degree C \)
- \( R_{th(j-s)} = 0.39 \) K/W
- \( 125 \degree C \)
- \( 150 \degree C \)

<table>
<thead>
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<th>( R_{th(j-s)} ) (K/W)</th>
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<td>2.42E-03</td>
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<tr>
<td>3.61E-02</td>
<td>3.36E-04</td>
</tr>
</tbody>
</table>

\( D = \frac{t_p}{T_j} \) K/W
Boost Switch Characteristics

**Figure 1.** IGBT
Typical output characteristics
\[ I_C = f(V_{CE}) \]

**Figure 2.** IGBT
Typical output characteristics
\[ I_C = f(V_{CE}) \]

**Figure 3.** IGBT
Typical transfer characteristics
\[ I_C = f(V_{GE}) \]

**Figure 4.** IGBT
Transient thermal impedance as function of pulse duration
\[ Z_{th(j-s)} = f(t_p) \]

- \[ t_p = 250 \mu s \]
- \[ V_{CE} = 15 \text{ V} \]
- \[ T_j = 125 \degree C \]
- \[ V_{GE} \text{ from 7 V to 17 V in steps of 1 V} \]

**IGBT thermal model values**

- \( R_{th(j-s)} = 0,29 \) K/W
- [Thermal resistance values]

---

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Boost Switch Characteristics

**Figure 5.** IGBT
Gate voltage vs gate charge
\[ V_{GE} = f(Q_G) \]

**Figure 6.** IGBT
Safe operating area
\[ I_C = f(V_{CE}) \]

**Figure 7.** IGBT
Short circuit duration as a function of \( V_{GE} \)
\[ t_{pSC} = f(V_{GE}) \]

**Figure 8.** IGBT
Typical short circuit current as a function of \( V_{GE} \)
\[ I_{SC} = f(V_{GE}) \]

- \( I_C = 150 \) A
- \( V_{CE} \leq 400 \) V
- \( T_j \leq 150 ^\circ C \)
- \( V_{GE} = \pm 15 \) V
- \( T_j = T_{jmax} \)
- \( n = \) single pulse
- \( T_s = 80 ^\circ C \)
Boost Diode Characteristics

**Figure 1.** Typical forward characteristics

\[ I_F = f(V_F) \]

**Figure 2.** Transient thermal impedance as a function of pulse width

\[ Z_{th}(j\omega) = f(T_j) \]

**FWD thermal model values**

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Boost Sw.Inv.Diode Characteristics

**figure 1.**
Typical forward characteristics

\[ I_F = f(V_F) \]

**figure 2.**
Transient thermal impedance as a function of pulse width

\[ Z_{th(j-s)} = f(t_p) \]

- \( t_p = 250 \mu s \)
- \( T_j = 25 ^\circ C \)
- \( 125 ^\circ C \)
- \( 150 ^\circ C \)

- \( D = t_p / T \)
- \( R_{th(j-s)} = 0,46 \) K/W

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Thermistor Characteristics

**figure 1.**
Typical NTC characteristic as a function of temperature

\[ R = f(T) \]
Buck Switching Characteristics

Figure 1. IGBT
Typical switching energy losses as a function of collector current

\[ E = E(I_C) \]

With an inductive load at
- \( V_{in} = 350 \text{ V} \)
- \( I_s = 150 \text{ °C} \)
- \( R_{on} = 4 \text{ Ω} \)
- \( R_{off} = 4 \text{ Ω} \)

Figure 2. IGBT
Typical switching energy losses as a function of gate resistor

\[ E = E(R_g) \]

With an inductive load at
- \( V_{in} = 350 \text{ V} \)
- \( I_s = 150 \text{ °C} \)
- \( I_g = 150 \text{ A} \)

Figure 3. FWD
Typical reverse recovered energy loss as a function of collector current

\[ E_{rec} = E(I_C) \]

With an inductive load at
- \( V_{in} = 350 \text{ V} \)
- \( I_s = 150 \text{ °C} \)
- \( R_{on} = 4 \text{ Ω} \)

Figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor

\[ E_{rec} = E(R_g) \]

With an inductive load at
- \( V_{in} = 350 \text{ V} \)
- \( I_s = 150 \text{ °C} \)
Buck Switching Characteristics

**Figure 5.** Typical switching times as a function of collector current

$t = f(I_C)$

With an inductive load at

- $T_j = 150 \degree C$
- $V_{CE} = 350 \text{ V}$
- $V_{IN} = \pm 15 \text{ V}$
- $R_{gon} = 4 \text{ } \Omega$
- $I_C = 150 \text{ A}$

**Figure 6.** Typical switching times as a function of gate resistor

$t = f(R_g)$

With an inductive load at

- $T_j = 150 \degree C$
- $V_{CE} = 350 \text{ V}$
- $V_{IN} = \pm 15 \text{ V}$
- $R_{gon} = 4 \text{ } \Omega$

**Figure 7.** Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

With an inductive load at

- $T_j = 25 \degree C$
- $V_{CE} = 350 \text{ V}$
- $V_{IN} = \pm 15 \text{ V}$
- $R_{gon} = 4 \text{ } \Omega$

**Figure 8.** Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} = f(R_{gon})$

With an inductive load at

- $T_j = 125 \degree C$
- $V_{CE} = 150 \text{ V}$
- $V_{IN} = \pm 15 \text{ V}$
- $I_C = 150 \text{ A}$
Buck Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current

\[ Q_r = f(I_C) \]

With an inductive load at
- \( V_{DC} = 350 \, V \)
- \( T_j = 25 \, ^\circ C \)
- \( R_{gon} = 4 \, \Omega \)

Figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor

\[ Q_r = f(R_{gon}) \]

With an inductive load at
- \( V_{DC} = 350 \, V \)
- \( T_j = 25 \, ^\circ C \)
- \( I_L = 150 \, A \)

Figure 11. FWD
Typical peak reverse recovery current as a function of collector current

\[ I_{RM} = f(I_C) \]

With an inductive load at
- \( V_{DC} = 350 \, V \)
- \( T_j = 25 \, ^\circ C \)
- \( R_{gon} = 4 \, \Omega \)

Figure 12. FWD
Typical peak reverse recovery current as a function of IGBT turn on gate resistor

\[ I_{RM} = f(R_{gon}) \]

With an inductive load at
- \( V_{DC} = 350 \, V \)
- \( T_j = 25 \, ^\circ C \)
- \( I_L = 150 \, A \)
Buck Switching Characteristics

**Figure 13.** FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

\[
\frac{dI_F}{dt}, \frac{dI_{rr}}{dt} = f(I_C)
\]

With an inductive load at 25 °C

\[
V_{CE} = 350 \text{ V} \quad \quad T_j = 125 \text{ °C}
\]

\[
V_{GSS} = \pm15 \text{ V} \quad \quad R_{gon} = 4 \text{ Ω}
\]

**Figure 14.** FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

\[
\frac{dI_F}{dt}, \frac{dI_{rr}}{dt} = f(R_{gon})
\]

With an inductive load at 25 °C

\[
V_{CE} = 350 \text{ V} \quad \quad T_j = 125 \text{ °C}
\]

\[
V_{GSS} = \pm15 \text{ V} \quad \quad I_C = 150 \text{ A}
\]

**Figure 15.** IGBT

Reverse bias safe operating area

\[
I_C = f(V_{CE})
\]

With an inductive load at

\[
T_j = 125 \text{ °C}
\]

\[
R_{pass} = 4 \text{ Ω}
\]

\[
R_{goff} = 4 \text{ Ω}
\]
**Buck Switching Definitions**

**General conditions**

<table>
<thead>
<tr>
<th>$T_1$</th>
<th>$125$ °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{goff}$</td>
<td>$4$ Ω</td>
</tr>
<tr>
<td>$R_{gon}$</td>
<td>$4$ Ω</td>
</tr>
</tbody>
</table>

**Figure 1. IGBT**

Turn-off Switching Waveforms & definition of $t_{doff}$, $t_{Eoff}$ ($t_{Eoff}$ = integrating time for $E_{off}$)

- $V_{GE}(0\%) = -15$ V
- $V_{CE}(0\%) = 15$ V
- $I_C(100\%) = 150$ A
- $t_{doff} = 188$ ns

**Figure 2. IGBT**

Turn-on Switching Waveforms & definition of $t_{don}$, $t_{Eon}$ ($t_{Eon}$ = integrating time for $E_{on}$)

- $V_{GE}(0\%) = -15$ V
- $V_{CE}(0\%) = 15$ V
- $I_C(100\%) = 150$ A
- $t_{don} = 150$ ns

**Figure 3. IGBT**

Turn-off Switching Waveforms & definition of $t_f$

- $V_{CE}(1\%) = 350$ V
- $I_C(1\%) = 150$ A
- $t_f = 15$ ns

**Figure 4. IGBT**

Turn-on Switching Waveforms & definition of $t_r$

- $V_{CE}(1\%) = 350$ V
- $I_C(1\%) = 150$ A
- $t_r = 32$ ns
Buck Switching Characteristics

Figure 5. Turn-off Switching Waveforms & definition of $t_{Qr}$

- $V_F(100\%) = 350 \text{ V}$
- $I_F(100\%) = 150 \text{ A}$
- $I_{RRM}(100\%) = 143 \text{ A}$
- $t_{rr} = 95 \text{ ns}$

Figure 6. Turn-on Switching Waveforms & definition of $t_{Qr} = \text{integrating time for } Q_r$

- $I_F(100\%) = 150 \text{ A}$
- $Q_r(10\%) = 9.06 \mu\text{C}$
Boost Switching Characteristics

**Figure 1. IGBT**
Typical switching energy losses as a function of collector current

\[ E = f(I_C) \]

With an inductive load at
- \( V_{IN} = 350 \, \text{V} \)
- \( V_{IN} = \pm 15 \, \text{V} \)
- \( R_{gon} = 4 \, \Omega \)
- \( I_C = 150 \, \text{A} \)

**Figure 2. IGBT**
Typical switching energy losses as a function of gate resistor

\[ E = f(R_g) \]

With an inductive load at
- \( V_{IN} = 350 \, \text{V} \)
- \( V_{IN} = \pm 15 \, \text{V} \)
- \( R_{gon} = 4 \, \Omega \)
- \( I_C = 150 \, \text{A} \)

---

**Figure 3. FWD**
Typical reverse recovered energy loss as a function of collector current

\[ E_{rec} = f(I_C) \]

With an inductive load at
- \( V_{IN} = 350 \, \text{V} \)
- \( V_{IN} = \pm 15 \, \text{V} \)
- \( R_{gon} = 4 \, \Omega \)

---

**Figure 4. FWD**
Typical reverse recovered energy loss as a function of gate resistor

\[ E_{rec} = f(R_g) \]

With an inductive load at
- \( V_{IN} = 350 \, \text{V} \)
- \( V_{IN} = \pm 15 \, \text{V} \)
- \( I_C = 150 \, \text{A} \)
Boost Switching Characteristics

**Figure 5.** Typical switching times as a function of collector current

$t_{d(on)} = f(I_C)$

$t_{d(off)} = f(I_C)$

With an inductive load at:
- $T_J = 150 \degree C$
- $V_{DS} = 350 \, V$
- $V_{GS} = \pm 15 \, V$
- $R_{G(on)} = 4 \, \Omega$
- $I_C = 150 \, A$

**Figure 6.** Typical switching times as a function of gate resistor

$t_{d(on)} = f(R_{G})$

$t_{d(off)} = f(R_{G})$

With an inductive load at:
- $T_J = 150 \degree C$
- $V_{DS} = 350 \, V$
- $V_{GS} = \pm 15 \, V$
- $R_{G(on)} = 4 \, \Omega$
- $I_C = 150 \, A$

**Figure 7.** Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

With an inductive load at:
- $T_J = 25 \degree C$
- $V_{DS} = 350 \, V$
- $V_{GS} = \pm 15 \, V$
- $R_{G(on)} = 4 \, \Omega$
- $I_C = 150 \, A$

**Figure 8.** Typical reverse recovery time as a function of IGBT turn-on gate resistor

$t_{rr} = f(R_{G(on)})$

With an inductive load at:
- $T_J = 25 \degree C$
- $V_{DS} = 350 \, V$
- $V_{GS} = \pm 15 \, V$
- $R_{G(on)} = 4 \, \Omega$
- $I_C = 150 \, A$
Boost Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current

\[ Q_r = f(I_C) \]

Figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor

\[ Q_r = f(R_{gon}) \]

With an inductive load at

- \[ V_{DC} = 350 \text{ V} \]
- \[ T_J = 25^\circ \text{C} \]
- \[ 150^\circ \text{C} \]
- \[ V_{GE} = \pm 15 \text{ V} \]
- \[ R_{gon} = 4 \text{ Ω} \]
- \[ I_C = 150 \text{ A} \]

Figure 11. FWD
Typical peak reverse recovery current as a function of collector current

\[ I_{RM} = f(I_C) \]

Figure 12. FWD
Typical peak reverse recovery current as a function of IGBT turn on gate resistor

\[ I_{RM} = f(R_{gon}) \]

With an inductive load at

- \[ V_{DC} = 350 \text{ V} \]
- \[ T_J = 25^\circ \text{C} \]
- \[ 150^\circ \text{C} \]
- \[ V_{GE} = \pm 15 \text{ V} \]
- \[ R_{gon} = 4 \text{ Ω} \]
- \[ I_C = 150 \text{ A} \]
Boost Switching Characteristics

**Figure 13.** FWD
Typical rate of fall of forward and reverse recovery current as a function of collector current
\[ \frac{d\phi_{F}}{dt}, \frac{d\phi_{rr}}{dt} = f(I_C) \]
With an inductive load at
- \( V_{in} = 350 \, \text{V} \)
- \( T_{j} = 25 \, ^\circ\text{C} \)
- \( R_{gon} = 4 \, \Omega \)
- \( I_C = 150 \, \text{A} \)

**Figure 14.** FWD
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
\[ \frac{d\phi_{F}}{dt}, \frac{d\phi_{rr}}{dt} = f(R_{gon}) \]
With an inductive load at
- \( V_{in} = 350 \, \text{V} \)
- \( T_{j} = 150 \, ^\circ\text{C} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( R_{gon} = 4 \, \Omega \)
- \( I_C = 150 \, \text{A} \)

**Figure 15.** IGBT
Reverse bias safe operating area
\[ I_C = f(V_{CE}) \]
At
- \( T_{j} = 150 \, ^\circ\text{C} \)
- \( R_{on} = 4 \, \Omega \)
- \( R_{off} = 4 \, \Omega \)
Boost Switching Definitions

General conditions

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<th>Parameter</th>
<th>Value</th>
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<td>$T_J$</td>
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<tr>
<td>$R_{GON}$</td>
<td>4 Ω</td>
</tr>
<tr>
<td>$R_{GOFF}$</td>
<td>4 Ω</td>
</tr>
</tbody>
</table>

**Figure 1.** IGBT

Turn-off Switching Waveforms & definition of $t_{Eoff}$ ($t_{Eoff}$ = integrating time for $E_{off}$)

- $V_{GE}(0\%) = -15$ V
- $I_{C}(100\%) = 150$ A
- $t_{doff} = 245$ ns

**Figure 2.** IGBT

Turn-on Switching Waveforms & definition of $t_{Eon}$ ($t_{Eon}$ = integrating time for $E_{on}$)

- $V_{GE}(0\%) = -15$ V
- $V_{CE}(100\%) = 350$ V
- $I_{C}(100\%) = 150$ A
- $t_{don} = 151$ ns

**Figure 3.** IGBT

Turn-off Switching Waveforms & definition of $I_{C}$

- $V_{CE}(100\%) = 350$ V
- $I_{C}(100\%) = 150$ A
- $t_{f} = 78$ ns

**Figure 4.** IGBT

Turn-on Switching Waveforms & definition of $I_{C}$

- $V_{CE}(100\%) = 350$ V
- $I_{C}(100\%) = 150$ A
- $t_{r} = 36$ ns
Boost Switching Characteristics

**Figure 5.** Turn-off Switching Waveforms & definition of $t_{Qr}$

- $V_F(100\%) = 350 \text{ V}$
- $I_F(100\%) = 150 \text{ A}$
- $I_{RRM}(100\%) = 114 \text{ A}$
- $t_{rr} = 290 \text{ ns}$

**Figure 6.** Turn-on Switching Waveforms & definition of $t_{Qr}$ ($t_{Qr}$ = integrating time for $Q_r$)

- $V_F(100\%) = 350 \text{ V}$
- $I_F(100\%) = 150 \text{ A}$
- $I_{RRM}(100\%) = 114 \text{ A}$
- $Q_r(100\%) = 13 \mu\text{C}$
### Pinout

![Diagrame Image](image)

### Identification

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<td>75 A</td>
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<td>Boost Switch</td>
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Handling instruction

Handling instructions for flow 1 packages see vincotech.com website.

Package data

Package data for flow 1 packages see vincotech.com website.

UL recognition and file number

This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

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<th>Date:</th>
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<td>21 Feb. 2019</td>
<td>Update of D9-D16 diodes; DS update</td>
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As used herein:
1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.