**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>
</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>$V_{CE}$</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>$I_C$</td>
<td>$T_j = T_{j_{max}}$, $T_i = 80 , ^\circ C$</td>
<td>104</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak collector current</td>
<td>$I_{PK}$</td>
<td>$I_j$ limited by $T_{j_{max}}$</td>
<td>450</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j = T_{j_{max}}$, $T_i = 80 , ^\circ C$</td>
<td>145</td>
<td>W</td>
</tr>
<tr>
<td>Gate-emitter voltage</td>
<td>$V_{GES}$</td>
<td></td>
<td>$\pm 20$</td>
<td>V</td>
</tr>
<tr>
<td>Maximum junction temperature</td>
<td>$T_{j_{max}}$</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>
### Maximum Ratings

\( T \) = 25 °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 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_{F} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>101</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>( I_{CRM} )</td>
<td>( t_p ) limited by ( T_{jmax} )</td>
<td>300</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>( P_{tot} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>127</td>
<td>W</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>( T_{jmax} )</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td><strong>Boost Switch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>( V_{ces} )</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>( I_C )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>104</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak collector current</td>
<td>( I_{CRM} )</td>
<td>( t_p ) limited by ( T_{jmax} )</td>
<td>450</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>( P_{tot} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>145</td>
<td>W</td>
</tr>
<tr>
<td>Gate-emitter voltage</td>
<td>( V_{ges} )</td>
<td></td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Maximum junction temperature</td>
<td>( T_{jmax} )</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
<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_{F} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>101</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>( I_{CRM} )</td>
<td>( t_p ) limited by ( T_{jmax} )</td>
<td>300</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>( P_{tot} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>127</td>
<td>W</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>( T_{jmax} )</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td><strong>Boost Sw.Inv.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_{F} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>106</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>( I_{CRM} )</td>
<td>( t_p ) limited by ( T_{jmax} )</td>
<td>300</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>( P_{tot} )</td>
<td>( T_1 = T_{jmax} ), ( T_s = 80 ^\circ \text{C} )</td>
<td>149</td>
<td>W</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>( T_{jmax} )</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>
### Maximum Ratings

$T = 25 \, ^\circ\text{C}$, 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>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>$T_{stg}$</td>
<td>-40…+125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Operation temperature under switching condition</td>
<td>$T_{jop}$</td>
<td>-40…($T_{jmax}$ - 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>$V_{isol}$</td>
<td>DC Test Voltage* $t_p = 2 , \text{s}$</td>
<td>6000</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC Voltage $t_p = 1 , \text{min}$</td>
<td>2500</td>
<td>V</td>
</tr>
<tr>
<td>Creepage distance</td>
<td></td>
<td>solder pins / press-fit pins</td>
<td>min. 12,7 / min. 12,7</td>
<td>mm</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td>solder pins / press-fit pins</td>
<td>8,07 / 11,83</td>
<td>mm</td>
</tr>
<tr>
<td>Comparative Tracking Index</td>
<td>CTI</td>
<td></td>
<td>&gt; 200</td>
<td></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></td>
<td></td>
<td>$V_{GS}$ $[V]$</td>
<td>$V_{CE}$ $[V]$</td>
<td>$I_{C}$ $[A]$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>0,0015</td>
<td>25</td>
<td>3,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter cut-off current</td>
<td>$I_{CES}$</td>
<td>0</td>
<td>650</td>
<td>25</td>
</tr>
<tr>
<td>Gate-emitter leakage current</td>
<td>$I_{GES}$</td>
<td>20</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Internal gate resistance</td>
<td>$r_{g}$</td>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{ies}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oes}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{res}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate charge</td>
<td>$Q_{g}$</td>
<td>15</td>
<td>520</td>
<td>150</td>
</tr>
</tbody>
</table>

### Buck Switch

#### Static

- **Gate-emitter threshold voltage**
  - $V_{GE(th)}$
  - $V_{CE} = V_{GS}$
  - 0,0015
  - 25
  - 3,2
  - 4
  - 4,8
  - V

- **Collector-emitter saturation voltage**
  - $V_{CEsat}$
  - 15
  - 150
  - 25
  - 125
  - 150
  - 1,43
  - 1,52
  - 1,55
  - V

- **Collector-emitter cut-off current**
  - $I_{CES}$
  - 0
  - 650
  - 25
  - 100
  - µA

- **Gate-emitter leakage current**
  - $I_{GES}$
  - 20
  - 0
  - 25
  - 200
  - nA

- **Internal gate resistance**
  - $r_{g}$
  - none

- **Input capacitance**
  - $C_{ies}$
  - 9000

- **Output capacitance**
  - $C_{oes}$
  - 260

- **Reverse transfer capacitance**
  - $C_{res}$
  - 34

- **Gate charge**
  - $Q_{g}$
  - 15
  - 520
  - 150
  - 25
  - 328
  - nC

### Thermal

- **Thermal resistance junction to sink**
  - $R_{th(j-s)}$
  - phase-change material
  - $\lambda = 3,4$ W/mK
  - 0,65
  - K/W

### Dynamic

- **Turn-on delay time**
  - $t_{d(on)}$
  - $R_{th(j-s)} = 2$ Ω
  - $R_{th(j-s)} = 2$ Ω
  - 25
  - 125
  - 150
  - 48
  - 50
  - 49

- **Rise time**
  - $t_{r}$
  - 25
  - 125
  - 150
  - 9
  - 10
  - 10

- **Turn-off delay time**
  - $t_{d(off)}$
  - $R_{th(j-s)} = 2$ Ω
  - -5/+15
  - 350
  - 90
  - 25
  - 125
  - 150
  - 147
  - 170
  - 176

- **Fall time**
  - $t_{f}$
  - 25
  - 125
  - 150
  - 11
  - 19
  - 22

- **Turn-on energy (per pulse)**
  - $E_{on}$
  - $Q_{rFWD} = 3,3$ µC
  - $Q_{rFWD} = 6,8$ µC
  - 25
  - 125
  - 150
  - 0,346
  - 0,608
  - 0,705

- **Turn-off energy (per pulse)**
  - $E_{off}$
  - 25
  - 125
  - 150
  - 1,066
  - 1,561
  - 1,737

Copyright Vincotech
### 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>$V_F$</td>
<td>150</td>
<td>1,56, 1,50, 1,48</td>
<td>V</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_r$</td>
<td>650</td>
<td>7,6</td>
<td>µA</td>
</tr>
</tbody>
</table>

#### Static

- **Forward voltage**
- **Reverse leakage current**

#### Thermal

- **Thermal resistance junction to sink**

#### Dynamic

- **Peak recovery current**
- **Reverse recovery time**
- **Recovered charge**
- **Reverse recovered energy**
- **Peak rate of fall of recovery current**
### 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>Boost Switch</td>
<td>Static</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate-emitter threshold voltage</td>
<td>$V_{GE(th)}$</td>
<td>$V_{CE} = V_{CE}$</td>
<td>0,0015</td>
<td>25</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>$V_{CEsat}$</td>
<td>15</td>
<td>150</td>
<td>25</td>
</tr>
<tr>
<td>Collector-emitter cut-off current</td>
<td>$I_{CES}$</td>
<td>0</td>
<td>650</td>
<td>25</td>
</tr>
<tr>
<td>Gate-emitter leakage current</td>
<td>$I_{GES}$</td>
<td>20</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Internal gate resistance</td>
<td>$r_g$</td>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{Ian}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{out}$</td>
<td>$f = 1$ MHz</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{res}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate charge</td>
<td>$Q_t$</td>
<td>15</td>
<td>520</td>
<td>150</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink</td>
<td>$R_{th(j-s)}$</td>
<td>phase-change material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-on delay time</td>
<td>$t_{(on)}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td>$R_{on} = 2 \Omega$</td>
<td>$R_{off} = 2 \Omega$</td>
<td></td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>$t_{(off)}$</td>
<td></td>
<td>-5 / 15</td>
<td>350</td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-on energy (per pulse)</td>
<td>$E_{on}$</td>
<td>$Q_{WVD} = 3,5 \mu$C</td>
<td>$Q_{RWO} = 6,8 \mu$C</td>
<td></td>
</tr>
<tr>
<td>Turn-off energy (per pulse)</td>
<td>$E_{off}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 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>Boost Diode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>$V_{f}$</td>
<td>150 25 125 150</td>
<td>1.56 1.50 1.48</td>
<td>V</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_{r}$</td>
<td>650 25</td>
<td>7.6</td>
<td>µA</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink</td>
<td>$R_{th(j-s)}$</td>
<td>phase-change material $\lambda = 3.4$ W/mK</td>
<td>0.75</td>
<td>K/W</td>
</tr>
<tr>
<td>Dynamic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak recovery current</td>
<td>$I_{\text{max}}$</td>
<td>-5 / 15 350 90</td>
<td>101 127 133</td>
<td>A</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>$t_{rr}$</td>
<td>25 125 150</td>
<td>54 88 101</td>
<td>ns</td>
</tr>
<tr>
<td>Recovered charge</td>
<td>$Q_{r}$</td>
<td>di/dt = 9576 A/µs</td>
<td>3.474 6.778 7.836</td>
<td>µC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>di/dt = 6720 A/µs</td>
<td>125 150</td>
<td>7333</td>
</tr>
<tr>
<td>Reverse recovered energy</td>
<td>$E_{\text{rec}}$</td>
<td>25 125 150</td>
<td>0.807 1.467 1.668</td>
<td>mWs</td>
</tr>
<tr>
<td>Peak rate of fall of recovery current</td>
<td>$(di_{rf}/dt)_{\text{max}}$</td>
<td>25 125 150</td>
<td>283 1335 1270</td>
<td>A/µs</td>
</tr>
<tr>
<td>Boost Sw.Inv.Diode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>$V_{f}$</td>
<td>150 25 125 150</td>
<td>1.85 1.66</td>
<td>V</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_{r}$</td>
<td>650 25 150</td>
<td>1.8</td>
<td>µA</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink</td>
<td>$R_{th(j-s)}$</td>
<td>phase-change material $\lambda = 3.4$ W/mK</td>
<td>0.64</td>
<td>K/W</td>
</tr>
</tbody>
</table>
## 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>Thermistor</td>
<td></td>
<td></td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Rated resistance</td>
<td>$R$</td>
<td></td>
<td>100</td>
<td>-5</td>
</tr>
<tr>
<td>Deviation of $R_{100}$</td>
<td>$\Delta R_{100}$</td>
<td>$R_{100} = 1484 \Omega$</td>
<td>100</td>
<td>-5</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P$</td>
<td></td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Power dissipation constant</td>
<td>$B_{(25/50)}$</td>
<td>Tol. ±1 %</td>
<td>25</td>
<td>3962</td>
</tr>
<tr>
<td>B-value</td>
<td>$B_{(25/100)}$</td>
<td>Tol. ±1 %</td>
<td>25</td>
<td>4000</td>
</tr>
<tr>
<td>Vincotech NTC Reference</td>
<td></td>
<td></td>
<td>I</td>
<td></td>
</tr>
</tbody>
</table>
Buck Switch Characteristics

**Figure 1.** IGBT

Typical output characteristics

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

- \( t_p = 250 \mu s \)
- \( V_{CE} = 15 \) V
- \( T_J: 25^\circ C \) (solid blue)
- \( T_J: 125^\circ C \) (solid black)
- \( T_J: 150^\circ C \) (solid red)

\( V_{GE}: \) from 7 V to 17 V in steps of 1 V

**Figure 2.** IGBT

Typical output characteristics

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

- \( t_p = 250 \mu s \)
- \( T_J: 150^\circ C \)

**Figure 3.** IGBT

Typical transfer characteristics

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

- \( t_p = 100 \mu s \)
- \( V_{GE} = 10 \) V
- \( T_J: 25^\circ C \) (solid blue)
- \( T_J: 125^\circ C \) (solid black)
- \( T_J: 150^\circ C \) (solid red)

**Figure 4.** IGBT

Transient thermal impedance as function of pulse duration

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

- \( D = t_p / T \)
- \( R_{h(j)} = 0.65 \) K/W

IGBT thermal model values

- \( R (K/W) \)
- \( t (s) \)
- 1,13E-01 8,46E-01
- 2,91E-01 1,23E-01
- 1,38E-01 3,33E-02
- 6,68E-02 8,32E-03
- 1,32E-02 2,63E-03
- 3,21E-02 3,23E-04
Buck Switch Characteristics

**figure 5.**
Gate voltage vs gate charge

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

**figure 6.**
Safe operating area

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

- \( I_C = 150 \text{ A} \)
- \( V_{CE} = 130 \text{ V} \)
- \( V_{CE} = 520 \text{ V} \)
- \( D = \text{single pulse} \)
- \( T_s = 80 \text{ °C} \)
- \( V_{CE} = \pm 15 \text{ V} \)
- \( T_i = T_{j_{max}} \)
Buck Diode Characteristics

Typical forward characteristics

\[ I_F = f(V_F) \]

Transient thermal impedance as a function of pulse width

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

\[ t_p = 250 \mu s \]

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

\[ R_{th(j-s)} = 0.75 \text{ K/W} \]

FWD thermal model values

<table>
<thead>
<tr>
<th>( R ) (K/W)</th>
<th>( \tau ) (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.88E-02</td>
<td>7.46E+00</td>
</tr>
<tr>
<td>7.02E-02</td>
<td>1.27E+00</td>
</tr>
<tr>
<td>1.95E-01</td>
<td>2.04E-01</td>
</tr>
<tr>
<td>2.65E-01</td>
<td>6.33E-02</td>
</tr>
<tr>
<td>1.21E-01</td>
<td>1.27E-02</td>
</tr>
<tr>
<td>3.39E-02</td>
<td>3.05E-03</td>
</tr>
<tr>
<td>3.36E-02</td>
<td>3.74E-04</td>
</tr>
</tbody>
</table>
Boost Switch Characteristics

**figure 1.**
Typical output characteristics

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

\[ t_p = 250 \ \mu s \]
\[ V_{GE} = 15 \ \text{V} \]
\[ T_j: 25 \ ^\circ \text{C} \]
\[ 125 \ ^\circ \text{C} \]
\[ 150 \ ^\circ \text{C} \]

**figure 2.**
Typical output characteristics

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

\[ t_p = 250 \ \mu s \]
\[ V_{GE} \text{ from 7 V to 17 V in steps of 1 V} \]
\[ T_j: 150 \ ^\circ \text{C} \]

**figure 3.**
Typical transfer characteristics

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

\[ t_p = 100 \ \mu s \]
\[ V_{GE} = 10 \ \text{V} \]
\[ T_j: 25 \ ^\circ \text{C} \]
\[ 125 \ ^\circ \text{C} \]
\[ 150 \ ^\circ \text{C} \]

**figure 4.**
Transient thermal impedance as function of pulse duration

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

\[ D = t_p / T \]
\[ R_{th(a)} = 0.65 \ \text{K/W} \]

**IGBT thermal model values**

- \[ R \ (\text{K/W}) \]
- \[ t \ (\text{s}) \]
- \[ 1.13E-01 \]
- \[ 1.23E-01 \]
- \[ 1.33E-02 \]
- \[ 2.63E-03 \]
- \[ 3.21E-04 \]
Boost Switch Characteristics

**figures 5.**
Gated voltage vs gate charge

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

**figures 6.**
Safe operating area

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

- \( I_C = 150 \text{ A} \)
- \( D = \text{single pulse} \)
- \( T_s = 80 \text{ } ^\circ\text{C} \)
- \( V_{CE} = \pm 15 \text{ V} \)
- \( T_j = T_{j(max)} \)
Boost Diode Characteristics

**figure 1.** FWD
Typical forward characteristics

\[ J_s = f(V_F) \]

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

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

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

- \( D = t_p / T \)
- \( R_{th(j-s)} = 0,75 \, K/W \)

FWD thermal model values

<table>
<thead>
<tr>
<th>( K/W )</th>
<th>( \tau ) (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,88E-02</td>
<td>7,46E+00</td>
</tr>
<tr>
<td>7,02E-02</td>
<td>1,27E+00</td>
</tr>
<tr>
<td>1,95E-01</td>
<td>2,04E-01</td>
</tr>
<tr>
<td>2,65E-01</td>
<td>6,33E-02</td>
</tr>
<tr>
<td>1,21E-01</td>
<td>1,27E-02</td>
</tr>
<tr>
<td>3,39E-02</td>
<td>3,05E-03</td>
</tr>
<tr>
<td>3,36E-02</td>
<td>3,74E-04</td>
</tr>
</tbody>
</table>
Boost Sw.Inv.Diode Characteristics

**figure 1. FWD**

Typical forward characteristics

\[ I_{D} = f(V_{F}) \]

- \( t_{p} \): 250 \( \mu \)s
- \( T_{J} \): 25 \( ^{\circ} \)C
- \( T_{J} \): 150 \( ^{\circ} \)C

**figure 2. FWD**

Transient thermal impedance as a function of pulse width

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

\[ D = \frac{t_{p}}{T} \]

\[ R_{th(j-s)} = 0.64 \text{ K/W} \]

FWD thermal model values

<table>
<thead>
<tr>
<th>( R ) (K/W)</th>
<th>( \tau ) (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.14E-02</td>
<td>3.48E+00</td>
</tr>
<tr>
<td>1.03E-01</td>
<td>5.85E-01</td>
</tr>
<tr>
<td>2.81E-01</td>
<td>9.46E-02</td>
</tr>
<tr>
<td>1.21E-01</td>
<td>2.14E-02</td>
</tr>
<tr>
<td>4.83E-02</td>
<td>5.07E-03</td>
</tr>
<tr>
<td>2.26E-02</td>
<td>5.92E-04</td>
</tr>
</tbody>
</table>

Thermistor Characteristics

**figure 1. Thermistor**

Typical NTC characteristic as a function of temperature

\[ R = f(T) \]

- NTC-typical temperature characteristic
Buck Switching Characteristics

**Figure 1.** IGBT

Typical switching energy losses as a function of collector current

\[ E = f(I_C) \]

With an inductive load at

- \( V_{CI} = 350 \text{ V} \)
- \( T_J = 25 \text{ °C} \)
- \( T_J = 125 \text{ °C} \)
- \( T_J = 150 \text{ °C} \)

**Figure 2.** IGBT

Typical switching energy losses as a function of gate resistor

\[ E = f(R_g) \]

With an inductive load at

- \( V_{CI} = 350 \text{ V} \)
- \( V_{CI} = -5 / 15 \text{ V} \)
- \( I_C = 90 \text{ A} \)

**Figure 3.** FWD

Typical reverse recovered energy loss as a function of collector current

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

With an inductive load at

- \( V_{CI} = 350 \text{ V} \)
- \( V_{CI} = -5 / 15 \text{ V} \)
- \( R_{on} = 2 \Omega \)

**Figure 4.** FWD

Typical reverse recovered energy loss as a function of gate resistor

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

With an inductive load at

- \( V_{CI} = 350 \text{ V} \)
- \( V_{CI} = -5 / 15 \text{ V} \)
- \( I_C = 90 \text{ A} \)
Buck Switching Characteristics

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

\[ t = f(I_C) \]

With an inductive load at

- \( T_j = 150 ^\circ C \)
- \( V_{CE} = 350 \text{ V} \)
- \( V_{GS} = -5 / 15 \text{ V} \)
- \( R_{gon} = 2 \Omega \)
- \( R_{goff} = 2 \Omega \)

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

\[ t = f(R_g) \]

With an inductive load at

- \( T_j = 150 ^\circ C \)
- \( V_{CE} = 350 \text{ V} \)
- \( V_{GS} = -5 / 15 \text{ V} \)
- \( I_C = 90 \text{ A} \)

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

\[ t_{rr} = f(I_C) \]

At

- \( V_{CL} = 350 \text{ V} \)
- \( V_{CE} = -5 / 15 \text{ V} \)
- \( R_{gon} = 2 \Omega \)
- \( T_j = 25 ^\circ C \)

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

\[ t_{rr} = f(R_{gon}) \]

At

- \( V_{CL} = 350 \text{ V} \)
- \( V_{CE} = -5 / 15 \text{ V} \)
- \( I_C = 90 \text{ A} \)
- \( T_j = 125 ^\circ C \)
Buck Switching Characteristics

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

\[ Q_r = f(I_C) \]

<table>
<thead>
<tr>
<th>( V_{cc} )</th>
<th>( I_C )</th>
<th>( T_J )</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>25 °C</td>
</tr>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>150 °C</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>( V_{cc} )</th>
<th>( I_C )</th>
<th>( T_J )</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>25 °C</td>
</tr>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>150 °C</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>( V_{cc} )</th>
<th>( I_C )</th>
<th>( T_J )</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>25 °C</td>
</tr>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>150 °C</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>( V_{cc} )</th>
<th>( I_C )</th>
<th>( T_J )</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>25 °C</td>
</tr>
<tr>
<td>350 V</td>
<td>90 A</td>
<td>150 °C</td>
</tr>
</tbody>
</table>
Buck Switching Characteristics

Figure 13.
Typical rate of fall of forward and reverse recovery current as a function of collector current
\[
diF/dt, dirr/dt = f(Ic)
\]
At
\[V_{CE} = 350 \text{ V} \]
\[V_{on} = -5 / 15 \text{ V} \]
\[R_{on} = 2 \Omega \]
\[T_j = 25 \degree C \]
At
\[V_{CE} = 350 \text{ V} \]
\[V_{on} = -5 / 15 \text{ V} \]
\[R_{on} = 2 \Omega \]
\[T_j = 125 \degree C \]

Figure 14.
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn-on gate resistor
\[
diF/dt, dirr/dt = f(R_{on})
\]
At
\[V_{CE} = 350 \text{ V} \]
\[V_{on} = -5 / 15 \text{ V} \]
\[R_{on} = 2 \Omega \]
\[T_j = 150 \degree C \]
At
\[V_{CE} = 350 \text{ V} \]
\[V_{on} = -5 / 15 \text{ V} \]
\[R_{on} = 2 \Omega \]
\[T_j = 125 \degree C \]

Figure 15.
IGBT
Reverse bias safe operating area
\[
I_C = f(V_{CE})
\]
At
\[T_j = 175 \degree C \]
\[R_{on} = 2 \Omega \]
\[R_{on} = 2 \Omega \]
Buck Switching Definitions

General conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_J$</td>
<td>125 °C</td>
</tr>
<tr>
<td>$R_{ON}$</td>
<td>2 Ω</td>
</tr>
<tr>
<td>$R_{OFF}$</td>
<td>2 Ω</td>
</tr>
</tbody>
</table>

Figure 1. IGBT

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

- $V_{CE}(0\%) = -5$ V
- $V_{CE}(100\%) = 15$ V
- $I_C(100\%) = 90$ A
- $t_{doff} = 170$ ns

Figure 2. IGBT

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

- $V_{CE}(0\%) = -5$ V
- $V_{CE}(100\%) = 15$ V
- $I_C(100\%) = 90$ A
- $t_{don} = 50$ ns

Figure 3. IGBT

Turn-off Switching Waveforms & definition of $t_f$

- $V_{CE}(100\%) = 350$ V
- $I_C(90\%) = 90$ A
- $t_f = 19$ ns

Figure 4. IGBT

Turn-on Switching Waveforms & definition of $t_r$

- $V_{CE}(100\%) = 350$ V
- $I_C(90\%) = 90$ A
- $t_r = 10$ ns
Buck Switching Characteristics

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

<table>
<thead>
<tr>
<th>$V_{F}$ (100%)</th>
<th>350 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{F}$ (100%)</td>
<td>90 A</td>
</tr>
<tr>
<td>$I_{RSSX}$ (100%)</td>
<td>158 A</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>74 ns</td>
</tr>
</tbody>
</table>

Figure 6. FWD
Turn-on Switching Waveforms & definition of $t_{Qr}$ (Integrating Time For $Q_r$)

| $I_{RRM}$ (100%) | 158 A |
| $Q_r$ (100%) | 6.78 μC |
Boost Switching Characteristics

**Figure 1.** IGBT

Typical switching energy losses as a function of collector current

\[ E = E_{on} + E_{off} \]

With an inductive load at

- \( V_{ds} = 350 \) V
- \( T_j = 25 \) °C

- \( V_{ds} = 350 \) V
- \( T_j = 125 \) °C

- \( V_{ds} = -5 / 15 \) V
- \( T_j = 150 \) °C

\( R_{on} = 2 \) Ω

\( I_C = 90 \) A

**Figure 2.** IGBT

Typical switching energy losses as a function of gate resistor

\[ E = E_{on} + E_{off} \]

With an inductive load at

- \( V_{ds} = 350 \) V
- \( T_j = 25 \) °C

- \( V_{ds} = 350 \) V
- \( T_j = 125 \) °C

- \( V_{ds} = -5 / 15 \) V
- \( T_j = 150 \) °C

\( i_c = 90 \) A

**Figure 3.** FWD

Typical reverse recovered energy loss as a function of collector current

\[ E_{rec} = E_{rec} \]

With an inductive load at

- \( V_{ds} = 350 \) V
- \( T_j = 25 \) °C

- \( V_{ds} = 350 \) V
- \( T_j = 125 \) °C

- \( V_{ds} = -5 / 15 \) V
- \( T_j = 150 \) °C

\( R_{on} = 2 \) Ω

\( I_C = 90 \) A

**Figure 4.** FWD

Typical reverse recovered energy loss as a function of gate resistor

\[ E_{rec} = E_{rec} \]

With an inductive load at

- \( V_{ds} = 350 \) V
- \( T_j = 25 \) °C

- \( V_{ds} = 350 \) V
- \( T_j = 125 \) °C

- \( V_{ds} = -5 / 15 \) V
- \( T_j = 150 \) °C

\( i_c = 90 \) A
### Boost Switching Characteristics

#### Figure 5. IGBT

Typical switching times as a function of collector current

$\tau \sim (I_C)$

![Switching Times Graph](image)

With an inductive load at

- $T_j = 150 ^\circ C$
- $V_{CE} = 350 \, V$
- $V_{GE} = -5 / 15 \, V$
- $R_{gon} = 2 \, \Omega$
- $I_C = 90 \, A$

#### Figure 6. IGBT

Typical switching times as a function of gate resistor

$\tau \sim (R_g)$

![Switching Times Graph](image)

With an inductive load at

- $T_j = 150 ^\circ C$
- $V_{CE} = 350 \, V$
- $V_{GE} = -5 / 15 \, V$
- $R_{gon} = 2 \, \Omega$
- $I_C = 90 \, A$

#### Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} \sim (I_C)$

![Reverse Recovery Time Graph](image)

At

- $V_{CE} = 350 \, V$
- $V_{GE} = -5 / 15 \, V$
- $R_{sw} = 2 \, \Omega$
- $T_j = 25 \, ^\circ C$
- $R_{gon} = 2 \, \Omega$
- $I_C = 90 \, A$
- $T_j = 125 \, ^\circ C$
- $I_C = 90 \, A$
- $T_j = 150 \, ^\circ C$

#### Figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} \sim (R_{gon})$

![Reverse Recovery Time Graph](image)

At

- $V_{CE} = 350 \, V$
- $V_{GE} = -5 / 15 \, V$
- $R_{sw} = 2 \, \Omega$
- $I_C = 90 \, A$
- $T_j = 25 \, ^\circ C$
- $R_{gon} = 2 \, \Omega$
- $I_C = 90 \, A$
- $T_j = 125 \, ^\circ C$
- $I_C = 90 \, A$
- $T_j = 150 \, ^\circ C$
Boost Switching Characteristics

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

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

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

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

Figure 13. FWD
Typical rate of fall of forward and reverse recovery current as a function of collector current
\( \frac{di_F}{dt}, \frac{di_{rr}}{dt} = f(I_C) \)

\[
\begin{array}{c|c|c}
V_{DS} & I_C & T_J \\
\hline
350 V & 90 A & 150 °C \\
-5 V / 15 V & 2 \Omega & 175 °C \\
\end{array}
\]

Figure 14. FWD
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
\( \frac{di_F}{dt}, \frac{di_{rr}}{dt} = f(R_{gon}) \)

\[
\begin{array}{c|c|c}
V_{DS} & I_C & T_J \\
\hline
350 V & 90 A & 150 °C \\
-5 V / 15 V & 2 \Omega & 175 °C \\
\end{array}
\]

Figure 15. IGBT
Reverse bias safe operating area
\( I_C = f(V_{CE}) \)

\[
\begin{array}{c|c|c}
I_C (A) & V_{CE} (V) \\
\hline
250 & 350 V \\
300 & 350 V \\
350 & 350 V \\
400 & 350 V \\
450 & 350 V \\
500 & 350 V \\
550 & 350 V \\
600 & 350 V \\
650 & 350 V \\
700 & 350 V \\
750 & 350 V \\
800 & 350 V \\
850 & 350 V \\
900 & 350 V \\
950 & 350 V \\
1000 & 350 V \\
1050 & 350 V \\
1100 & 350 V \\
1150 & 350 V \\
1200 & 350 V \\
1250 & 350 V \\
\end{array}
\]
**Boost Switching Definitions**

**General conditions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_j$</td>
<td>125 °C</td>
</tr>
<tr>
<td>$R_{gm}$</td>
<td>2 Ω</td>
</tr>
<tr>
<td>$R_{off}$</td>
<td>2 Ω</td>
</tr>
</tbody>
</table>

![Figure 1. IGBT](image1.png)

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

- $V_{CE}(0\%) = -5$ V
- $V_{CE}(100\%) = 15$ V
- $I_C(100\%) = 90$ A
- $t_{doff} = 153$ ns

![Figure 2. IGBT](image2.png)

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

- $V_{CE}(0\%) = -5$ V
- $V_{CE}(100\%) = 15$ V
- $I_C(100\%) = 90$ A
- $t_{don} = 52$ ns

![Figure 3. IGBT](image3.png)

**Turn-off Switching Waveforms & definition of $t_f$**

- $I_C(10\%) = 11$ A
- $I_C(90\%) = 90$ A
- $I_C(60\%) = 35$ A
- $I_C(40\%) = 15$ A
- $t_f = 19$ ns

![Figure 4. IGBT](image4.png)

**Turn-on Switching Waveforms & definition of $t_r$**

- $I_C(10\%) = 11$ A
- $I_C(90\%) = 90$ A
- $I_C(60\%) = 35$ A
- $I_C(40\%) = 15$ A
- $t_r = 11$ ns
**Boost Switching Characteristics**

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

- $V_F (100\%) = 350$ V
- $I_F (100\%) = 90$ A
- $I_{RRM (100\%)} = 127$ A
- $t_{rr} = 88$ ns

### Figure 6.
**Turn-on Switching Waveforms & definition of $t_{Qr}$**

- $I_{rr} (100\%) = 6.78$ μC
**Ordering Code & Marking**

<table>
<thead>
<tr>
<th>Without thermal paste with 12 mm housing with solder pins</th>
<th>Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-FY07NIA150S502-L365F58</td>
<td></td>
</tr>
<tr>
<td>10-PY07NIA150S502-L365F58Y</td>
<td></td>
</tr>
</tbody>
</table>

**Text and Datamatrix**

<table>
<thead>
<tr>
<th>Type&amp;Ver</th>
<th>Lot number</th>
<th>Serial</th>
<th>Date code</th>
</tr>
</thead>
</table>

**Pin Table**

<table>
<thead>
<tr>
<th>Pin</th>
<th>X</th>
<th>Y</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>6.9</td>
<td>Therm1</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>0</td>
<td>Therm2</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>6.75</td>
<td>S4</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>7.9</td>
<td>G14</td>
</tr>
<tr>
<td>5</td>
<td>33</td>
<td>4.9</td>
<td>G18</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>5.75</td>
<td>S2</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>6.9</td>
<td>G12</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>3.9</td>
<td>G16</td>
</tr>
<tr>
<td>9</td>
<td>2.7</td>
<td>0</td>
<td>DC-</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>DC-</td>
</tr>
<tr>
<td>11</td>
<td>2.7</td>
<td>2.7</td>
<td>DC-</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>2.7</td>
<td>DC-</td>
</tr>
<tr>
<td>13</td>
<td>2.7</td>
<td>5.4</td>
<td>DC-</td>
</tr>
<tr>
<td>14</td>
<td>0</td>
<td>5.4</td>
<td>DC-</td>
</tr>
<tr>
<td>15</td>
<td>2.7</td>
<td>12.75</td>
<td>GND</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>12.75</td>
<td>GND</td>
</tr>
<tr>
<td>17</td>
<td>2.7</td>
<td>15.45</td>
<td>GND</td>
</tr>
<tr>
<td>18</td>
<td>0</td>
<td>15.45</td>
<td>GND</td>
</tr>
<tr>
<td>19</td>
<td>2.7</td>
<td>22.8</td>
<td>DC+</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>22.8</td>
<td>DC+</td>
</tr>
<tr>
<td>21</td>
<td>2.7</td>
<td>25.5</td>
<td>DC+</td>
</tr>
<tr>
<td>22</td>
<td>0</td>
<td>25.5</td>
<td>DC+</td>
</tr>
<tr>
<td>23</td>
<td>2.7</td>
<td>28.2</td>
<td>DC+</td>
</tr>
<tr>
<td>24</td>
<td>0</td>
<td>28.2</td>
<td>DC+</td>
</tr>
<tr>
<td>25</td>
<td>18.3</td>
<td>22.45</td>
<td>S1</td>
</tr>
<tr>
<td>26</td>
<td>21.3</td>
<td>21.3</td>
<td>G15</td>
</tr>
<tr>
<td>27</td>
<td>21.3</td>
<td>24.3</td>
<td>G11</td>
</tr>
<tr>
<td>28</td>
<td>43</td>
<td>22.15</td>
<td>S3</td>
</tr>
<tr>
<td>29</td>
<td>46</td>
<td>21</td>
<td>G17</td>
</tr>
<tr>
<td>30</td>
<td>46</td>
<td>24</td>
<td>G13</td>
</tr>
<tr>
<td>31</td>
<td>52</td>
<td>20.1</td>
<td>Ph</td>
</tr>
<tr>
<td>32</td>
<td>49.5</td>
<td>22.8</td>
<td>Ph</td>
</tr>
<tr>
<td>33</td>
<td>52.2</td>
<td>22.8</td>
<td>Ph</td>
</tr>
<tr>
<td>34</td>
<td>49.5</td>
<td>25.5</td>
<td>Ph</td>
</tr>
<tr>
<td>35</td>
<td>52.2</td>
<td>25.5</td>
<td>Ph</td>
</tr>
<tr>
<td>36</td>
<td>49.5</td>
<td>28.2</td>
<td>Ph</td>
</tr>
<tr>
<td>37</td>
<td>52.2</td>
<td>28.2</td>
<td>Ph</td>
</tr>
</tbody>
</table>
Parallel devices with separate control. Values apply to complete device.

### Identification

<table>
<thead>
<tr>
<th>ID</th>
<th>Component</th>
<th>Voltage</th>
<th>Current</th>
<th>Function</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>T11, T12, T15, T16</td>
<td>IGBT</td>
<td>650 V</td>
<td>150 A</td>
<td>Buck Switch</td>
<td>Parallel devices with separate control. Values apply to complete device.</td>
</tr>
<tr>
<td>D11, D12</td>
<td>FWD</td>
<td>650 V</td>
<td>150 A</td>
<td>Buck Diode</td>
<td></td>
</tr>
<tr>
<td>T13, T14, T17, T18</td>
<td>IGBT</td>
<td>650 V</td>
<td>150 A</td>
<td>Boost Switch</td>
<td>Parallel devices with separate control. Values apply to complete device.</td>
</tr>
<tr>
<td>D13, D14, D17, D18</td>
<td>FWD</td>
<td>650 V</td>
<td>150 A</td>
<td>Boost Diode</td>
<td></td>
</tr>
<tr>
<td>D44, D43, D48, D47</td>
<td>FWD</td>
<td>650 V</td>
<td>150 A</td>
<td>Boost Sw.Inv.Diode</td>
<td></td>
</tr>
<tr>
<td>Rt</td>
<td>NTC</td>
<td></td>
<td></td>
<td>Thermistor</td>
<td></td>
</tr>
</tbody>
</table>
DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together “information”) are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader’s sole responsibility to test and determine the suitability of the information and the product for reader’s intended use.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

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.