Vincotech

10-PY07N3A015SM-M892F08Y datasheet

**flow 3xNPC 1**

**Features**
- Neutral-point-Clamped inverter
- Ultra fast switching
- Low Inductance layout
- Very compact design
- Press-fit pins

**Target Applications**
- Solar inverters
- UPS
- SMPS

**Types**
- 10-PY07N3A015SM-M892F08Y

---

**Maximum Ratings**

**Buck IGBT**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-emitter break down voltage</td>
<td>$V_{CESS}$</td>
<td>$T_j=T_{j,max}$</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>DC collector current</td>
<td>$I_C$</td>
<td>$T_j=80^\circ C$</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j=80^\circ C$</td>
<td>27</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed collector current</td>
<td>$I_{CRM}$</td>
<td>$t_p$ limited by $T_{j,max}$</td>
<td>45</td>
<td>A</td>
</tr>
<tr>
<td>Turn off safe operating area</td>
<td>$V_{CES}$</td>
<td>$T_j=175^\circ C$</td>
<td>45</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j=T_{j,max}$</td>
<td>43</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j=80^\circ C$</td>
<td>66</td>
<td>W</td>
</tr>
<tr>
<td>Gate-emitter peak voltage</td>
<td>$V_{GE}$</td>
<td>$T_j=175^\circ C$</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j,max}$</td>
<td>$T_j=175^\circ C$</td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>

**Buck FWD**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Repetitive Reverse Voltage</td>
<td>$V_{BRM}$</td>
<td>$T_j=25^\circ C$</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Forward average current</td>
<td>$I_{FAM}$</td>
<td>$T_j=T_{j,max}$</td>
<td>22</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j=80^\circ C$</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>Surge forward current</td>
<td>$I_{FSM}$</td>
<td>$t_p=10ms$</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{tot}$</td>
<td>$T_j=T_{j,max}$</td>
<td>42</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_j=80^\circ C$</td>
<td>64</td>
<td>W</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j,max}$</td>
<td>$T_j=175^\circ C$</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boost IGBT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter break down voltage</td>
<td>$V_{CES}$</td>
<td></td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>DC collector current</td>
<td>$i_c$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>25</td>
<td>A</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>33</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulsed collector current</td>
<td>$I_{CEM}$</td>
<td>$t_o$ limited by $T_{j\text{max}}$</td>
<td>60</td>
<td>A</td>
</tr>
<tr>
<td>Turn off safe operating area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{st}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>59</td>
<td>W</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>90</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate-emitter peak voltage</td>
<td>$V_{GE}$</td>
<td></td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Short circuit ratings</td>
<td>$t_{SC}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>6</td>
<td>µs</td>
</tr>
<tr>
<td>$V_{CC}=15V$</td>
<td>360</td>
<td>µs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j\text{max}}$</td>
<td></td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td><strong>Boost Inverse Diode</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Repetitive Reverse Voltage</td>
<td>$V_{RSM}$</td>
<td>$T_j=25^\circ C$</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Forward average current</td>
<td>$I_{SAV}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>19</td>
<td>A</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>25</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>$I_{FFM}$</td>
<td>$t_o$ limited by $T_{j\text{max}}$</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{st}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>39</td>
<td>W</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>59</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j\text{max}}$</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td><strong>Boost FWD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Repetitive Reverse Voltage</td>
<td>$V_{RSM}$</td>
<td>$T_j=25^\circ C$</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Forward average current</td>
<td>$I_{SAV}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>19</td>
<td>A</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>25</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetitive peak forward current</td>
<td>$I_{FFM}$</td>
<td>$t_o$ limited by $T_{j\text{max}}$</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{st}$</td>
<td>$T_j=T_{j\text{max}}$</td>
<td>39</td>
<td>W</td>
</tr>
<tr>
<td>$T_h=80^\circ C$</td>
<td>59</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_c=80^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j\text{max}}$</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>
## Maximum Ratings

\( T_\text{j} = 25^\circ \text{C} \), 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>Thermal Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>( T_\text{stg} )</td>
<td></td>
<td>-40...+125 ( ^\circ \text{C} )</td>
<td></td>
</tr>
<tr>
<td>Operation temperature under switching condition</td>
<td>( T_\text{op} )</td>
<td></td>
<td>-40...+(( T_{\text{max}} - 25 )) ( ^\circ \text{C} )</td>
<td></td>
</tr>
<tr>
<td><strong>Insulation Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation voltage</td>
<td></td>
<td>( t=2\text{s} ) DC voltage</td>
<td>4000</td>
<td>( \text{V} )</td>
</tr>
<tr>
<td>Creepage distance</td>
<td></td>
<td></td>
<td>min 12,7</td>
<td>( \text{mm} )</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
<td>min 12,7</td>
<td>( \text{mm} )</td>
</tr>
<tr>
<td>Parameter</td>
<td>Symbol</td>
<td>Conditions</td>
<td>Value</td>
<td>Unit</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Buck IGBT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate emitter threshold voltage</td>
<td>V_GETH</td>
<td>V_GE=V_GE</td>
<td>0,004</td>
<td>V</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>V_CE(sat)</td>
<td></td>
<td>15</td>
<td>V</td>
</tr>
<tr>
<td>Collector-emitter cut-off current incl. Diode</td>
<td>I_F</td>
<td></td>
<td>0,04</td>
<td>mA</td>
</tr>
<tr>
<td>Gate-emitter leakage current</td>
<td>I_GL</td>
<td></td>
<td>200</td>
<td>nA</td>
</tr>
<tr>
<td>Integrated Gate resistor</td>
<td>R_Gi</td>
<td></td>
<td>none</td>
<td>Ω</td>
</tr>
<tr>
<td>Turn-on delay time</td>
<td>t_d(on)</td>
<td></td>
<td>±15</td>
<td>ns</td>
</tr>
<tr>
<td>Rise time</td>
<td>t_r1</td>
<td>R_Goff=32 Ω</td>
<td>350</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>t_d(off)</td>
<td>R_Gon=32 Ω</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Fall time</td>
<td>t_f</td>
<td></td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-on energy loss</td>
<td>E_on</td>
<td></td>
<td>73</td>
<td>mWs</td>
</tr>
<tr>
<td>Turn-off energy loss</td>
<td>E_off</td>
<td></td>
<td>72</td>
<td>mWs</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>C_i</td>
<td>f=1MHz</td>
<td>930</td>
<td>pF</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>C_o</td>
<td></td>
<td>240</td>
<td>pF</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>C_c</td>
<td></td>
<td>4</td>
<td>nC</td>
</tr>
<tr>
<td>Gate charge</td>
<td>Q_G</td>
<td></td>
<td>38</td>
<td>nC</td>
</tr>
<tr>
<td>Thermal resistance chip to heatsink</td>
<td>R_TJ</td>
<td>Phs-Change Material V=3,4W/mK</td>
<td>2,20</td>
<td>K/W</td>
</tr>
<tr>
<td><strong>Buck FWD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>V_F</td>
<td></td>
<td>15</td>
<td>V</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>I_r</td>
<td></td>
<td>±15</td>
<td>µA</td>
</tr>
<tr>
<td>Peak reverse recovery current</td>
<td>I_FMAX</td>
<td></td>
<td>17</td>
<td>A</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>t_r</td>
<td>R_Gon=32 Ω</td>
<td>±15</td>
<td>ns</td>
</tr>
<tr>
<td>Reverse recovered charge</td>
<td>Q_r</td>
<td></td>
<td>0,225</td>
<td>µC</td>
</tr>
<tr>
<td>Peak rate of fall of recovery current</td>
<td>(di/dt)_MAX</td>
<td></td>
<td>17,36</td>
<td>A/µs</td>
</tr>
<tr>
<td>Reverse recovered energy</td>
<td>E_REC</td>
<td></td>
<td>0,024</td>
<td>mWs</td>
</tr>
<tr>
<td>Thermal resistance chip to heatsink</td>
<td>R_TJ</td>
<td>Phs-Change Material V=3,4W/mK</td>
<td>1,65</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>Boost IGBT</td>
<td>$V_{GE}$</td>
<td>0,00029</td>
<td>5.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>$V_{ces}$</td>
<td>10</td>
<td>1.03</td>
<td>1.54</td>
</tr>
<tr>
<td>Collector-emitter cut-off incl diode</td>
<td>$I_{eas}$</td>
<td>800</td>
<td>0.01</td>
<td>mA</td>
</tr>
<tr>
<td>Gate-emitter leakage current</td>
<td>$I_{gs}$</td>
<td>20</td>
<td>200</td>
<td>nA</td>
</tr>
<tr>
<td>Integrated Gate resistor</td>
<td>$R_{gs}$</td>
<td>none</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>Turn-on delay time</td>
<td>$t_{on}$</td>
<td>15</td>
<td>350</td>
<td>15</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_{r}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>$t_{off}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_{f}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-on energy loss</td>
<td>$E_{on}$</td>
<td>0,210</td>
<td>K/W</td>
<td></td>
</tr>
<tr>
<td>Turn-off energy loss</td>
<td>$E_{off}$</td>
<td>0,395</td>
<td>K/W</td>
<td></td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{in}$</td>
<td>1,5</td>
<td>480</td>
<td>20</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{out}$</td>
<td>20</td>
<td>1100</td>
<td>pF</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{oss}$</td>
<td>30</td>
<td>120</td>
<td>nC</td>
</tr>
<tr>
<td>Gate charge</td>
<td>$Q_{g}$</td>
<td>15</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Thermal resistance chip to heatsink</td>
<td>$R_{th(j-s)}$</td>
<td>Phase-Change Material $\lambda=3.4,\text{W/mK}$</td>
<td>1.60</td>
<td>K/W</td>
</tr>
<tr>
<td>Boost Inverse Diode</td>
<td>$V_{F}$</td>
<td>10</td>
<td>1.68</td>
<td>1.56</td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>$R_{th(j-s)}$</td>
<td>Phase-Change Material $\lambda=3.4,\text{W/mK}$</td>
<td>2.44</td>
<td>K/W</td>
</tr>
<tr>
<td>Boost FWD</td>
<td>$I_{R}$</td>
<td>650</td>
<td>1.23</td>
<td>1.67</td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>$R_{th(j-s)}$</td>
<td>Phase-Change Material $\lambda=3.4,\text{W/mK}$</td>
<td>2.44</td>
<td>K/W</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_{off}$</td>
<td>15</td>
<td>278</td>
<td>14</td>
</tr>
<tr>
<td>Peak reverse recovery current</td>
<td>$V_{F}$</td>
<td>12</td>
<td>14</td>
<td>A</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>$t_{re}$</td>
<td>15</td>
<td>0.68</td>
<td>ns</td>
</tr>
<tr>
<td>Reverse recovered charge</td>
<td>$Q_{re}$</td>
<td>153</td>
<td>0.122</td>
<td>μC</td>
</tr>
<tr>
<td>Peak rate of fall of recovery current</td>
<td>$I_{rec}(dV/dt)_\text{max}$</td>
<td>1738</td>
<td>153</td>
<td>A/μs</td>
</tr>
<tr>
<td>Reverse recovery energy</td>
<td>$E_{rec}$</td>
<td>0,0187</td>
<td>0,348</td>
<td>mWs</td>
</tr>
<tr>
<td>Thermal resistance chip to heatsink</td>
<td>$R_{th(j-s)}$</td>
<td>Phase-Change Material $\lambda=3.4,\text{W/mK}$</td>
<td>2.44</td>
<td>K/W</td>
</tr>
</tbody>
</table>

### Thermistor

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated resistance</td>
<td>$R$</td>
<td>$T_{j}=25,\text{°C}$</td>
<td>21511</td>
<td>Ω</td>
</tr>
<tr>
<td>Deviation of $R_{100}$</td>
<td>$\Delta R_{100}$</td>
<td>$T_{j}=100,\text{°C}$</td>
<td>-4,5</td>
<td>+4,5</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P$</td>
<td>$T_{j}=25,\text{°C}$</td>
<td>210</td>
<td>mW</td>
</tr>
<tr>
<td>Power dissipation constant</td>
<td>$R_{G}$</td>
<td>$T_{j}=25,\text{°C}$</td>
<td>3,5</td>
<td>mW/K</td>
</tr>
<tr>
<td>B-value</td>
<td>$B(25/50)$</td>
<td>$T_{j}=25,\text{°C}$</td>
<td>3884</td>
<td>K</td>
</tr>
<tr>
<td>B-value</td>
<td>$B(25/100)$</td>
<td>$T_{j}=25,\text{°C}$</td>
<td>3964</td>
<td>K</td>
</tr>
<tr>
<td>Vincotech NTC Reference</td>
<td>$F$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Typical output characteristics

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

At
- \( t_p = 250 \ \mu s \)
- \( T_j = 25 \ ^\circ C \)
- \( V_{CE} \) from 7 V to 17 V in steps of 1 V

Typical transfer characteristics

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

At
- \( t_p = 250 \ \mu s \)
- \( T_j = 25 \ ^\circ C \)
- \( V_{CE} = 5 \ V \)

Typical diode forward current as a function of forward voltage

\[ I_F = f(V_F) \]

At
- \( t_p = 250 \ \mu s \)
- \( T_j = 25 \ ^\circ C \)
- \( T_j = T_{j\max} - 25 \ ^\circ C \)
Figure 5
Typical switching energy losses as a function of collector current

\[ E = f(I_{c}) \]

With an inductive load at:
- \( T_j = 25/125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{CE} = \pm 15 \) V
- \( R_{gon} = 32 \) Ω
- \( R_{goff} = 32 \) Ω

Figure 6
Typical switching energy losses as a function of gate resistor

\[ E = f(R_{g}) \]

With an inductive load at:
- \( T_j = 25/125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{CE} = \pm 15 \) V
- \( I_c = 15 \) A

Figure 7
Typical reverse recovery energy loss as a function of collector current

\[ E_{rec} = f(I_{c}) \]

With an inductive load at:
- \( T_j = 25/125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{CE} = \pm 15 \) V
- \( R_{gon} = 32 \) Ω

Figure 8
Typical reverse recovery energy loss as a function of gate resistor

\[ E_{rec} = f(R_{g}) \]

With an inductive load at:
- \( T_j = 25/125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{CE} = \pm 15 \) V
- \( I_c = 15 \) A
Typical switching times as a function of collector current
\[ t = f(I_C) \]

With an inductive load at
- \( T_j = 125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{GS} = \pm 15 \) V
- \( R_{gon} = 32 \) Ω
- \( I_C = 15 \) A

Typical reverse recovery time as a function of collector current
\[ t_{rr} = f(I_C) \]

At
- \( T_j = 25/125 \) °C
- \( V_{CE} = 350 \) V
- \( V_{GS} = \pm 15 \) V
- \( R_{gon} = 32 \) Ω
Figure 13
Typical reverse recovery charge as a function of collector current

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

At
\[ T_j = 25/125 \quad ^\circ\text{C} \]
\[ V_C = 350 \quad \text{V} \]
\[ V_{GE} = \pm 15 \quad \text{V} \]
\[ R_{gon} = 32 \quad \Omega \]

Figure 14
Typical reverse recovery charge as a function of IGBT turn on gate resistor

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

At
\[ T_j = 25/125 \quad ^\circ\text{C} \]
\[ V_C = 350 \quad \text{V} \]
\[ I_F = 15 \quad \text{A} \]
\[ V_{GE} = \pm 15 \quad \text{V} \]

Figure 15
Typical reverse recovery current as a function of collector current

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

At
\[ T_j = 25/125 \quad ^\circ\text{C} \]
\[ V_C = 350 \quad \text{V} \]
\[ V_{GE} = \pm 15 \quad \text{V} \]
\[ R_{gon} = 32 \quad \Omega \]

Figure 16
Typical reverse recovery current as a function of IGBT turn on gate resistor

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

At
\[ T_j = 25/125 \quad ^\circ\text{C} \]
\[ V_C = 350 \quad \text{V} \]
\[ I_F = 15 \quad \text{A} \]
\[ V_{GE} = \pm 15 \quad \text{V} \]
**Figure 17**
Typical rate of fall of forward and reverse recovery current as a function of collector current
\[ \frac{dI}{dt}, \frac{dI_{rec}}{dt} = f(I_{c}) \]

**At**
- \( T_j = \frac{25}{125} \) °C
- \( V_{CE} = 350 \) V
- \( V_{GE} = \pm 15 \) V
- \( I_F = 15 \) A
- \( R_{gon} = 32 \) Ω

**Figure 18**
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
\[ \frac{dI}{dt}, \frac{dI_{rec}}{dt} = f(R_{gon}) \]

**At**
- \( T_j = \frac{25}{125} \) °C
- \( V_{CE} = 350 \) V
- \( V_{GE} = \pm 15 \) V
- \( I_F = 15 \) A
- \( V_{GE} = \pm 15 \) V

**Figure 19**
IGBT transient thermal impedance as a function of pulse width
\[ Z_{thJH} = f(t_p) \]

**At**
- \( D = \frac{t_p}{T} \)
- \( R_{th} = 2.20 \) K/W

**Figure 20**
FWD transient thermal impedance as a function of pulse width
\[ Z_{thJH} = f(t_p) \]

**At**
- \( D = \frac{t_p}{T} \)
- \( R_{th} = 1.65 \) K/W

**IGBT thermal model values**

\[ R \,(K/W) \quad \text{Tau (s)} \]

<table>
<thead>
<tr>
<th>( R ,(K/W) )</th>
<th>( \text{Tau (s)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,11</td>
<td>2,1E+00</td>
</tr>
<tr>
<td>0,17</td>
<td>4,5E-01</td>
</tr>
<tr>
<td>0,76</td>
<td>9,1E-02</td>
</tr>
<tr>
<td>0,59</td>
<td>2,4E-02</td>
</tr>
<tr>
<td>0,40</td>
<td>5,0E-03</td>
</tr>
<tr>
<td>0,17</td>
<td>9,0E-04</td>
</tr>
</tbody>
</table>

**FWD thermal model values**

\[ R \,(K/W) \quad \text{Tau (s)} \]

<table>
<thead>
<tr>
<th>( R ,(K/W) )</th>
<th>( \text{Tau (s)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,05</td>
<td>4,1E+00</td>
</tr>
<tr>
<td>0,10</td>
<td>5,7E-01</td>
</tr>
<tr>
<td>0,71</td>
<td>7,9E-02</td>
</tr>
<tr>
<td>0,40</td>
<td>2,0E-02</td>
</tr>
<tr>
<td>0,21</td>
<td>4,7E-03</td>
</tr>
<tr>
<td>0,17</td>
<td>9,2E-04</td>
</tr>
</tbody>
</table>
Buck

Figure 21
Power dissipation as a function of heatsink temperature

\[ P_{tot} = f(T_h) \]

At

\[ T_j = 175 \, ^\circ C \]

Figure 22
Collector current as a function of heatsink temperature

\[ I_C = f(T_h) \]

At

\[ T_j = 175 \, ^\circ C \]

\[ V_{GE} = 15 \, V \]

Figure 23
Power dissipation as a function of heatsink temperature

\[ P_{tot} = f(T_h) \]

At

\[ T_j = 150 \, ^\circ C \]

Figure 24
Forward current as a function of heatsink temperature

\[ I_F = f(T_h) \]

At

\[ T_j = 150 \, ^\circ C \]
Figure 25
Safe operating area as a function of collector-emitter voltage

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

At

- Single pulse
- \( T_J = 80 \, ^\circ C \)
- \( V_{CE} = \pm 15 \, V \)
- \( T_J = T_{jmax} \, ^\circ C \)

Figure 26
Gate voltage vs Gate charge

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

At

- \( I_C = 0 \, A \)

Figure 27
Reverse bias safe operating area

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

At

- \( T_J = 125 \, ^\circ C \)
- \( R_{gs} = 32 \, \Omega \)
- \( R_{gss} = 32 \, \Omega \)
**Figure 1**
Typical output characteristics
$I_C = f(V_{CE})$

At
- $t_p = 250 \, \mu s$
- $T_j = 25 \, ^\circ C$
- $V_{CE}$ from 7 V to 17 V in steps of 1 V

**Figure 2**
Typical output characteristics
$I_C = f(V_{CE})$

At
- $t_p = 250 \, \mu s$
- $T_j = 124 \, ^\circ C$
- $V_{CE}$ from 7 V to 17 V in steps of 1 V

**Figure 3**
Typical transfer characteristics
$I_C = f(V_{GE})$

At
- $t_p = 250 \, \mu s$
- $T_j = 25 ^\circ C$
- $T_j = T_{j\text{max}} - 25 ^\circ C$
- $V_{CE} = 10 \, V$

**Figure 4**
Typical diode forward current as a function of forward voltage
$I_F = f(V_F)$

At
- $t_p = 250 \, \mu s$
**Boost**

**Figure 5**
Typical switching energy losses as a function of collector current

\[ E = f(I_C) \]

With an inductive load at
- \( T_j = 25/124 \, ^\circ \text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( R_{gon} = 16 \, \Omega \)
- \( I_C = 15 \, \text{A} \)

**Figure 6**
Typical switching energy losses as a function of gate resistor

\[ E = f(R_g) \]

With an inductive load at
- \( T_j = 25/124 \, ^\circ \text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( I_C = 15 \, \text{A} \)

**Figure 7**
Typical reverse recovery energy loss as a function of collector current

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

With an inductive load at
- \( T_j = 25/124 \, ^\circ \text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( R_{gon} = 16 \, \Omega \)
- \( I_C = 15 \, \text{A} \)

**Figure 8**
Typical reverse recovery energy loss as a function of gate resistor

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

With an inductive load at
- \( T_j = 25/124 \, ^\circ \text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( I_C = 15 \, \text{A} \)
Figure 9  IGBT
Typical switching times as a function of collector current
\[ t = f(I_C) \]

With an inductive load at:
- \( T_J = 124 \) °C
- \( V_{CE} = 350 \) V
- \( V_G = \pm 15 \) V
- \( R_{gon} = 16 \) Ω
- \( I_C = 15 \) A

Figure 10  IGBT
Typical switching times as a function of gate resistor
\[ t = f(R_G) \]

With an inductive load at:
- \( T_J = 124 \) °C
- \( V_{CE} = 350 \) V
- \( V_G = \pm 15 \) V
- \( I_C = 15 \) A

Figure 11  FWD
Typical reverse recovery time as a function of collector current
\[ t_{rr} = f(I_C) \]

At:
- \( T_J = 25/124 \) °C
- \( V_{CE} = 350 \) V
- \( V_G = \pm 15 \) V
- \( R_{gon} = 16 \) Ω

Figure 12  FWD
Typical reverse recovery time as a function of IGBT turn on gate resistor
\[ t_{rr} = f(R_{gon}) \]

At:
- \( T_J = 25/124 \) °C
- \( V_{CE} = 350 \) V
- \( I_C = 15 \) A
- \( V_G = \pm 15 \) V
Figure 13 FWD
Typical reverse recovery charge as a function of collector current

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

At
- \( T_j = 25/124 \, ^\circ\text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( R_{gon} = 16 \, \Omega \)

Figure 14 FWD
Typical reverse recovery charge as a function of IGBT turn on gate resistor

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

At
- \( T_j = 25/124 \, ^\circ\text{C} \)
- \( V_R = 350 \, \text{V} \)
- \( I_F = 15 \, \text{A} \)
- \( V_{GE} = \pm 15 \, \text{V} \)

Figure 15 FWD
Typical reverse recovery current as a function of collector current

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

At
- \( T_j = 25/124 \, ^\circ\text{C} \)
- \( V_{CE} = 350 \, \text{V} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
- \( R_{gon} = 16 \, \Omega \)

Figure 16 FWD
Typical reverse recovery current as a function of IGBT turn on gate resistor

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

At
- \( T_j = 25/124 \, ^\circ\text{C} \)
- \( V_R = 350 \, \text{V} \)
- \( I_F = 15 \, \text{A} \)
- \( V_{GE} = \pm 15 \, \text{V} \)
**Boost**

**Figure 17**
Typical rate of fall of forward and reverse recovery current as a function of collector current

\[
\frac{dI_0}{dt}, \frac{dI_{rec}}{dt} = f(I_C)
\]

**At**
- \(T_J = 25/124 \, ^\circ\text{C}\)
- \(V_{CE} = 350 \, \text{V}\)
- \(V_{GE} = \pm 15 \, \text{V}\)
- \(I_F = 15 \, \text{A}\)
- \(R_{gon} = 16 \, \Omega\)

**Figure 18**
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

\[
\frac{dI_0}{dt}, \frac{dI_{rec}}{dt} = f(R_{gon})
\]

**At**
- \(T_J = 25/124 \, ^\circ\text{C}\)
- \(V_{CE} = 350 \, \text{V}\)
- \(I_F = 15 \, \text{A}\)
- \(V_{GE} = \pm 15 \, \text{V}\)

**Figure 19**
IGBT transient thermal impedance as a function of pulse width

\[Z_{thJH} = f(t_p)\]

**At**
- \(D = 0.5\)
- \(R_{thJH} = 1.60 \, \text{K/W}\)
- \(R_{thJH} = 2.44 \, \text{K/W}\)

**Figure 20**
FWD transient thermal impedance as a function of pulse width

\[Z_{thJH} = f(t_p)\]

**At**
- \(D = 0.5\)
- \(R_{thJH} = 1.60 \, \text{K/W}\)
- \(R_{thJH} = 2.44 \, \text{K/W}\)

---

IGBT thermal model values

<table>
<thead>
<tr>
<th>(R , (\text{K/W}))</th>
<th>(\text{Tau (s)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,07</td>
<td>3,986</td>
</tr>
<tr>
<td>0,30</td>
<td>0,314</td>
</tr>
<tr>
<td>0,70</td>
<td>0,055</td>
</tr>
<tr>
<td>0,38</td>
<td>0,007</td>
</tr>
<tr>
<td>0,15</td>
<td>0,0005</td>
</tr>
</tbody>
</table>

FWD thermal model values

<table>
<thead>
<tr>
<th>(R , (\text{K/W}))</th>
<th>(\text{Tau (s)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,06</td>
<td>5,6E+00</td>
</tr>
<tr>
<td>0,17</td>
<td>6,5E-01</td>
</tr>
<tr>
<td>0,60</td>
<td>1,5E-01</td>
</tr>
<tr>
<td>0,58</td>
<td>3,9E-02</td>
</tr>
<tr>
<td>0,61</td>
<td>8,9E-03</td>
</tr>
<tr>
<td>0,42</td>
<td>2,0E-03</td>
</tr>
</tbody>
</table>

---

copyright Vincotech 17

09 Oct. 2014 / Revision 2
Figure 21: Power dissipation as a function of heatsink temperature
\[ P_{\text{tot}} = f(T_h) \]

At
\[ T_j = 175 \, ^{\circ}\text{C} \]

Figure 22: Collector current as a function of heatsink temperature
\[ I_C = f(T_h) \]

At
\[ T_j = 175 \, ^{\circ}\text{C} \]

Figure 23: Power dissipation as a function of heatsink temperature
\[ P_{\text{tot}} = f(T_h) \]

At
\[ T_j = 175 \, ^{\circ}\text{C} \]

Figure 24: Forward current as a function of heatsink temperature
\[ I_F = f(T_h) \]

At
\[ T_j = 175 \, ^{\circ}\text{C} \]

\[ V_{\text{GS}} = 15 \, \text{V} \]
Boost Inverse Diode

**Figure 25**
Typical diode forward current as a function of forward voltage

\[ I_F = f(V_F) \]

![Graph showing typical diode forward current as a function of forward voltage.](image)

At
\[ t_p = 250 \, \mu s \]

**Figure 26**
Diode transient thermal impedance as a function of pulse width

\[ Z_{thJH} = f(t_p) \]

![Graph showing diode transient thermal impedance as a function of pulse width.](image)

At
\[ D = \frac{t_p}{T} \]
\[ R_{th} = 2.44 \, \text{K/W} \]

**Figure 27**
Power dissipation as a function of heatsink temperature

\[ P_{tot} = f(T_h) \]

![Graph showing power dissipation as a function of heatsink temperature.](image)

At
\[ T_j = 175 \, ^\circ C \]

**Figure 28**
Forward current as a function of heatsink temperature

\[ I_F = f(T_h) \]

![Graph showing forward current as a function of heatsink temperature.](image)

At
\[ T_j = 175 \, ^\circ C \]
Thermistor

**Figure 1**

**Thermistor**

Typical NTC characteristic

as a function of temperature

\[ R_T = f(T) \]
Switching Definitions BOOST

General conditions

\[
\begin{array}{l}
T_j = 125 \, ^\circ\text{C} \\
R_{on} = 16 \, \Omega \\
R_{off} = 16 \, \Omega \\
\end{array}
\]

Figure 1  Boost IGBT

Turn-off Switching Waveforms & definition of \( t_{doff}, t_{Eoff} \)

\( t_{Eoff} \) = integrating time for \( E_{off} \)

\( t_{doff} = 0,16 \, \mu\text{s} \)
\( t_{Eoff} = 0,41 \, \mu\text{s} \)

\[
\begin{array}{l}
V_{CE} (0\%) = -15 \, \text{V} \\
V_{CE} (100\%) = 15 \, \text{V} \\
I_{C} (100\%) = 15 \, \text{A} \\
t_{doff} = 0,16 \, \mu\text{s} \\
t_{Eoff} = 0,41 \, \mu\text{s} \\
\end{array}
\]

Figure 2  Boost IGBT

Turn-on Switching Waveforms & definition of \( t_{don}, t_{Eon} \)

\( t_{Eon} \) = integrating time for \( E_{on} \)

\( t_{don} = 0,066 \, \mu\text{s} \)
\( t_{Eon} = 0,17 \, \mu\text{s} \)

\[
\begin{array}{l}
V_{CE} (0\%) = -15 \, \text{V} \\
V_{CE} (100\%) = 15 \, \text{V} \\
I_{C} (100\%) = 15 \, \text{A} \\
t_{don} = 0,066 \, \mu\text{s} \\
t_{Eon} = 0,17 \, \mu\text{s} \\
\end{array}
\]

Figure 3  Boost IGBT

Turn-off Switching Waveforms & definition of \( t_f \)

\[
\begin{array}{l}
I_{C10\%} = 15 \, \text{A} \\
I_{C90\%} = 15 \, \text{A} \\
I_{C60\%} = 15 \, \text{A} \\
I_{C40\%} = 15 \, \text{A} \\
t_f = 0,073 \, \mu\text{s} \\
\end{array}
\]

Figure 4  Boost IGBT

Turn-on Switching Waveforms & definition of \( t_r \)

\[
\begin{array}{l}
I_{C10\%} = 15 \, \text{A} \\
I_{C90\%} = 15 \, \text{A} \\
I_{C60\%} = 15 \, \text{A} \\
I_{C40\%} = 15 \, \text{A} \\
t_r = 0,017 \, \mu\text{s} \\
\end{array}
\]
Switching Definitions BOOST

**Figure 5**  
Boost IGBT  
Turn-off Switching Waveforms & definition of \( t_{\text{Eoff}} \)

- \( P_{\text{Eoff}} \) (100%) = 5.26 kW
- \( E_{\text{Eoff}} \) (100%) = 0.54 mJ
- \( t_{\text{Eoff}} \) = 0.41 µs

**Figure 6**  
Boost IGBT  
Turn-on Switching Waveforms & definition of \( t_{\text{Eon}} \)

- \( P_{\text{Eon}} \) (100%) = 5.26 kW
- \( E_{\text{Eon}} \) (100%) = 0.27 mJ
- \( t_{\text{Eon}} \) = 0.17 µs

**Figure 7**  
Boost IGBT  
Turn-off Switching Waveforms & definition of \( t_{\text{rr}} \)

- \( V_{\text{d}} \) (100%) = 350 V
- \( I_{\text{d}} \) (100%) = 15 A
- \( I_{\text{RMS}} \) (100%) = -14 A
- \( t_{\text{rr}} \) = 0.28 µs
**Switching Definitions BOOST**

**Figure 8**

Turn-on Switching Waveforms & definition of $t_{Qrr}$

($t_{Qrr}$ = integrating time for $Q_{rr}$)

- $I_d (100\%) = 15$ A
- $Q_{rr} (100\%) = 1,22$ µC
- $t_{Qrr} = 0,55$ µs

**Figure 9**

Turn-on Switching Waveforms & definition of $t_{Erec}$

($t_{Erec}$ = integrating time for $E_{rec}$)

- $P_{rec} (100\%) = 5,26$ kW
- $E_{rec} (100\%) = 0,35$ mJ
- $t_{Erec} = 0,55$ µs

**Measurement circuit**

**Figure 10**

BOOST stage switching measurement circuit

- BUCK IGBT
- BOOST FRED
- BOOST IGBT
- BUCK FRED
- L2 115uH
- D13 15V
- D14 15V
- T3 BOOST FRED
- Vce
- Vcc
- T1 BOOST IGBT
- V15
- V-15
- T2
- V15
- V-15
- D15 0.00001
- D16 0.00003
- +15V
- -15V
- Rgon 16 Ohm
- Rgoff 16 Ohm

copyright Vincotech
Switching Definitions BUCK

General conditions

\[ T_j = 125 \, ^\circ\text{C} \]
\[ R_{\text{on}} = 32 \, \Omega \]
\[ R_{\text{off}} = 32 \, \Omega \]

**Figure 1**
BUCK IGBT
Turn-off Switching Waveforms & definition of \( t_{\text{doff}}, t_{\text{Eoff}} \)
(\( t_{\text{doff}} \) = integrating time for \( E_{\text{off}} \))

- \( V_{\text{GE}} (0\%) = -15 \, \text{V} \)
- \( V_{\text{CE}} (100\%) = 350 \, \text{V} \)
- \( I_{\text{C}} (100\%) = 15 \, \text{A} \)
- \( t_{\text{doff}} = 0,09 \, \mu\text{s} \)
- \( t_{\text{Eoff}} = 0,16 \, \mu\text{s} \)

**Figure 2**
BUCK IGBT
Turn-on Switching Waveforms & definition of \( t_{\text{don}}, t_{\text{Eon}} \)
(\( t_{\text{don}} \) = integrating time for \( E_{\text{on}} \))

- \( V_{\text{GE}} (0\%) = -15 \, \text{V} \)
- \( V_{\text{CE}} (100\%) = 350 \, \text{V} \)
- \( I_{\text{C}} (100\%) = 15 \, \text{A} \)
- \( t_{\text{don}} = 0,07 \, \mu\text{s} \)
- \( t_{\text{Eon}} = 0,17 \, \mu\text{s} \)

**Figure 3**
BUCK IGBT
Turn-off Switching Waveforms & definition of \( t_{f} \)

- \( V_{\text{C}} (100\%) = 350 \, \text{V} \)
- \( I_{\text{C}} (100\%) = 15 \, \text{A} \)
- \( t_{f} = 0,01 \, \mu\text{s} \)

**Figure 4**
BUCK IGBT
Turn-on Switching Waveforms & definition of \( t_{r} \)

- \( V_{\text{C}} (100\%) = 350 \, \text{V} \)
- \( I_{\text{C}} (100\%) = 15 \, \text{A} \)
- \( t_{r} = 0,01 \, \mu\text{s} \)
Switching Definitions BUCK

**Figure 5**
Turn-off Switching Waveforms & definition of $t_{\text{Eoff}}$

- $P_{\text{off}}$ (100%) = 5.23 kW
- $E_{\text{off}}$ (100%) = 0.13 mJ
- $t_{\text{Eoff}}$ = 0.16 µs

**Figure 6**
Turn-on Switching Waveforms & definition of $t_{\text{Eon}}$

- $P_{\text{on}}$ (100%) = 5.23 kW
- $E_{\text{on}}$ (100%) = 0.28 mJ
- $t_{\text{Eon}}$ = 0.17 µs

**Figure 7**
Turn-off Switching Waveforms & definition of $t_{\text{rr}}$

- $V_d$ (100%) = 350 V
- $I_d$ (100%) = 15 A
- $I_{\text{thr}}$ (100%) = -23 A
- $t_{\text{rr}}$ = 0.04 µs
Switching Definitions BUCK

**Figure 8**
Turn-on Switching Waveforms & definition of $t_{qrr}$
($t_{qrr} =$ integrating time for $Q_{rr}$)

**Figure 9**
Turn-on Switching Waveforms & definition of $t_{Erec}$
($t_{Erec} =$ integrating time for $E_{rec}$)

---

$I_d(100\%) = 15$ A
$Q_{rr}(100\%) = 0,52$ µC
$t_{qrr} = 0,07$ µs

$P_{rec}(100\%) = 5,23$ kW
$E_{rec}(100\%) = 0,06$ mJ
$t_{Erec} = 0,07$ µs

---

Measurement circuit

**Figure 10**
BUCK stage switching measurement circuit
Ordering Code and Marking - Outline - Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>28.2</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>28.2</td>
</tr>
<tr>
<td>3</td>
<td>9.7</td>
<td>28.2</td>
</tr>
<tr>
<td>4</td>
<td>15.7</td>
<td>28.2</td>
</tr>
<tr>
<td>5</td>
<td>18.7</td>
<td>28.2</td>
</tr>
<tr>
<td>6</td>
<td>24.7</td>
<td>28.2</td>
</tr>
<tr>
<td>7</td>
<td>27.7</td>
<td>28.2</td>
</tr>
<tr>
<td>8</td>
<td>33.8</td>
<td>28.2</td>
</tr>
<tr>
<td>9</td>
<td>36.8</td>
<td>28.2</td>
</tr>
<tr>
<td>10</td>
<td>42.8</td>
<td>28.2</td>
</tr>
<tr>
<td>11</td>
<td>46.2</td>
<td>28.2</td>
</tr>
<tr>
<td>12</td>
<td>52.2</td>
<td>28.2</td>
</tr>
<tr>
<td>13</td>
<td>52.2</td>
<td>23.7</td>
</tr>
<tr>
<td>14</td>
<td>52.2</td>
<td>20.7</td>
</tr>
<tr>
<td>15</td>
<td>41.25</td>
<td>20.6</td>
</tr>
<tr>
<td>16</td>
<td>38.25</td>
<td>20.6</td>
</tr>
<tr>
<td>17</td>
<td>32.55</td>
<td>20.6</td>
</tr>
<tr>
<td>18</td>
<td>29.55</td>
<td>20.6</td>
</tr>
<tr>
<td>19</td>
<td>18.7</td>
<td>20.7</td>
</tr>
<tr>
<td>20</td>
<td>18.7</td>
<td>23.7</td>
</tr>
<tr>
<td>21</td>
<td>15.7</td>
<td>23.7</td>
</tr>
<tr>
<td>22</td>
<td>15.7</td>
<td>20.7</td>
</tr>
<tr>
<td>23</td>
<td>4.75</td>
<td>20.6</td>
</tr>
<tr>
<td>24</td>
<td>1.75</td>
<td>20.6</td>
</tr>
<tr>
<td>25</td>
<td>8.35</td>
<td>12.2</td>
</tr>
<tr>
<td>26</td>
<td>11.35</td>
<td>12.2</td>
</tr>
<tr>
<td>27</td>
<td>19.95</td>
<td>12.2</td>
</tr>
<tr>
<td>28</td>
<td>22.95</td>
<td>12.2</td>
</tr>
<tr>
<td>29</td>
<td>44.35</td>
<td>12.2</td>
</tr>
<tr>
<td>30</td>
<td>47.35</td>
<td>12.2</td>
</tr>
<tr>
<td>31</td>
<td>52.2</td>
<td>8.9</td>
</tr>
<tr>
<td>32</td>
<td>52.2</td>
<td>5.9</td>
</tr>
<tr>
<td>33</td>
<td>46.75</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>43.95</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>40.95</td>
<td>0</td>
</tr>
</tbody>
</table>

DC+ 6.0
DC- 0.9
DC- 1

Ordering Code & Marking

<table>
<thead>
<tr>
<th>Version</th>
<th>Ordering Code</th>
<th>in DataMatrix as</th>
<th>in packaging barcode as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard in flow1 12mm housing</td>
<td>10-PY07N3A015SM-M892F08Y</td>
<td>M892F08Y</td>
<td>M892F08Y</td>
</tr>
</tbody>
</table>

Pin table

<table>
<thead>
<tr>
<th>Pin</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>28.2</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>28.2</td>
</tr>
<tr>
<td>3</td>
<td>9.7</td>
<td>28.2</td>
</tr>
<tr>
<td>4</td>
<td>15.7</td>
<td>28.2</td>
</tr>
<tr>
<td>5</td>
<td>18.7</td>
<td>28.2</td>
</tr>
<tr>
<td>6</td>
<td>24.7</td>
<td>28.2</td>
</tr>
<tr>
<td>7</td>
<td>27.7</td>
<td>28.2</td>
</tr>
<tr>
<td>8</td>
<td>33.8</td>
<td>28.2</td>
</tr>
<tr>
<td>9</td>
<td>36.8</td>
<td>28.2</td>
</tr>
<tr>
<td>10</td>
<td>42.8</td>
<td>28.2</td>
</tr>
<tr>
<td>11</td>
<td>46.2</td>
<td>28.2</td>
</tr>
<tr>
<td>12</td>
<td>52.2</td>
<td>28.2</td>
</tr>
<tr>
<td>13</td>
<td>52.2</td>
<td>23.7</td>
</tr>
<tr>
<td>14</td>
<td>52.2</td>
<td>20.7</td>
</tr>
<tr>
<td>15</td>
<td>41.25</td>
<td>20.6</td>
</tr>
<tr>
<td>16</td>
<td>38.25</td>
<td>20.6</td>
</tr>
<tr>
<td>17</td>
<td>32.55</td>
<td>20.6</td>
</tr>
<tr>
<td>18</td>
<td>29.55</td>
<td>20.6</td>
</tr>
<tr>
<td>19</td>
<td>18.7</td>
<td>20.7</td>
</tr>
<tr>
<td>20</td>
<td>18.7</td>
<td>23.7</td>
</tr>
<tr>
<td>21</td>
<td>15.7</td>
<td>23.7</td>
</tr>
<tr>
<td>22</td>
<td>15.7</td>
<td>20.7</td>
</tr>
<tr>
<td>23</td>
<td>4.75</td>
<td>20.6</td>
</tr>
<tr>
<td>24</td>
<td>1.75</td>
<td>20.6</td>
</tr>
<tr>
<td>25</td>
<td>8.35</td>
<td>12.2</td>
</tr>
<tr>
<td>26</td>
<td>11.35</td>
<td>12.2</td>
</tr>
<tr>
<td>27</td>
<td>19.95</td>
<td>12.2</td>
</tr>
<tr>
<td>28</td>
<td>22.95</td>
<td>12.2</td>
</tr>
<tr>
<td>29</td>
<td>44.35</td>
<td>12.2</td>
</tr>
<tr>
<td>30</td>
<td>47.35</td>
<td>12.2</td>
</tr>
<tr>
<td>31</td>
<td>52.2</td>
<td>8.9</td>
</tr>
<tr>
<td>32</td>
<td>52.2</td>
<td>5.9</td>
</tr>
<tr>
<td>33</td>
<td>46.75</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>43.95</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>40.95</td>
<td>0</td>
</tr>
</tbody>
</table>

Pin table

<table>
<thead>
<tr>
<th>Pin</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>11.35</td>
<td>12.2</td>
</tr>
<tr>
<td>27</td>
<td>19.95</td>
<td>12.2</td>
</tr>
<tr>
<td>28</td>
<td>22.95</td>
<td>12.2</td>
</tr>
<tr>
<td>29</td>
<td>44.35</td>
<td>12.2</td>
</tr>
<tr>
<td>30</td>
<td>47.35</td>
<td>12.2</td>
</tr>
<tr>
<td>31</td>
<td>52.2</td>
<td>8.9</td>
</tr>
<tr>
<td>32</td>
<td>52.2</td>
<td>5.9</td>
</tr>
<tr>
<td>33</td>
<td>46.75</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>43.95</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>40.95</td>
<td>0</td>
</tr>
</tbody>
</table>

Pinout

copyright Vincotech 27
09 Oct. 2014 / Revision 2
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.