Features & Benefits

- DC input range: 43 – 110V (continuous)
- Isolated output
- Encapsulated circuitry for shock and vibration resistance
- Extended temperature range (–55 to +100°C)
- Input surge withstand: 150V for 100ms
- DC output: 3.3 – 48V
- Programmable output: 10 – 110%
- Regulation: ±0.2% no load to full load
- Efficiency: Up to 87%
- Maximum operating temp: 100°C, full load
- Power density: up to 90W per cubic inch
- Height above board: 0.43in [10.9mm]
- Parallelable, with N+M fault tolerance
- Low-noise ZCS/ZVS architecture
- RoHS Compliant (with F or G pin option)

Product Overview

These DC-DC converter modules use advanced power processing, control and packaging technologies to provide the performance, flexibility, reliability and cost effectiveness of a mature power component.

High-frequency ZCS/ZVS switching provides high power density with low noise and high efficiency.

Applications

Railway/Transportation system applications including communications systems, information display, lighting, control systems, ticket machines, passenger entertainment, public address systems, door control, industrial power systems and power generation systems.

For details on proper operation please refer to the: Design Guide & Applications Manual for Maxi, Mini, Micro Family.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>+IN to –IN voltage</td>
<td>-0.5 to +155</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>PC to –IN voltage</td>
<td>-0.5 to +7.0</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>PR to –IN voltage</td>
<td>-0.5 to +7.0</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>SC to –OUT voltage</td>
<td>-0.5 to +1.5</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>Sense to –OUT voltage</td>
<td>1.0</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>Isolation voltage</td>
<td>3000</td>
<td>V_RMS</td>
<td>Test voltage</td>
</tr>
<tr>
<td>IN to base</td>
<td>1500</td>
<td>V_RMS</td>
<td>Test voltage</td>
</tr>
<tr>
<td>OUT to base</td>
<td>500</td>
<td>V_RMS</td>
<td>Test voltage</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>–55 to +100</td>
<td>°C</td>
<td>M-Grade</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>–65 to +125</td>
<td>°C</td>
<td>M-Grade</td>
</tr>
<tr>
<td>Pin soldering temperature</td>
<td>500 (260)</td>
<td>°F</td>
<td>&lt;5 sec, wave solder</td>
</tr>
<tr>
<td></td>
<td>750 (390)</td>
<td>°F</td>
<td>&lt;7 sec, hand solder</td>
</tr>
<tr>
<td>Mounting torque</td>
<td>5 [0.57] in-lbs [N·m]</td>
<td>6 each</td>
<td></td>
</tr>
</tbody>
</table>

Part Numbering

e.g. V72C15C1508L

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Output Voltage</th>
<th>Product Grade Temperatures (°C)</th>
<th>Output Power</th>
<th>Pin Style</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>V = Standard</td>
<td>3V = 3.3V</td>
<td>Grade Operating Storage</td>
<td>3.3V 75W</td>
<td>Blank: Short TinLead</td>
<td></td>
</tr>
<tr>
<td>S = Enhanced efficiency (avail s12)</td>
<td>5V = 5V</td>
<td></td>
<td>5V 100W</td>
<td>TinLead</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8V = 8V</td>
<td></td>
<td>8V 100W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12V = 12V</td>
<td></td>
<td>12V 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15V = 15V</td>
<td></td>
<td>15V 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24V = 24V</td>
<td></td>
<td>24V 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28V = 28V</td>
<td></td>
<td>28V 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36V = 36V</td>
<td></td>
<td>36V 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48V = 48V</td>
<td></td>
<td>48V 150W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Product images may not highlight current product markings.
Module Family Electrical Characteristics

Electrical characteristics apply over the full operating range of input voltage, output load (resistive) and baseplate temperature, unless otherwise specified. All temperatures refer to the operating temperature at the center of the baseplate.

## Module Input Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating input voltage</td>
<td>43</td>
<td>72</td>
<td>110</td>
<td>V(_{\text{DC}})</td>
<td>Per EN50155 and GBT-25119</td>
</tr>
<tr>
<td>Input surge withstand</td>
<td></td>
<td></td>
<td>150</td>
<td>V(_{\text{DC}})</td>
<td>&lt;100ms</td>
</tr>
<tr>
<td>Undervoltage turn-on</td>
<td></td>
<td></td>
<td>41.7</td>
<td>V(_{\text{DC}})</td>
<td></td>
</tr>
<tr>
<td>Undervoltage turn-off</td>
<td></td>
<td></td>
<td>35.2</td>
<td>V(_{\text{DC}})</td>
<td></td>
</tr>
<tr>
<td>Overvoltage turn-off/on</td>
<td>111</td>
<td>115.5</td>
<td>121</td>
<td>V(_{\text{DC}})</td>
<td></td>
</tr>
<tr>
<td>Disabled input current</td>
<td></td>
<td>1.5</td>
<td></td>
<td>mA</td>
<td>PC pin low</td>
</tr>
</tbody>
</table>

## Module Output Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage set point</td>
<td>±1</td>
<td></td>
<td></td>
<td>%</td>
<td>Of nominal output voltage. Nominal input; full load; 25°C</td>
</tr>
<tr>
<td>Line regulation</td>
<td>±0.02</td>
<td>±0.20</td>
<td></td>
<td>%</td>
<td>Low line to high line; full load</td>
</tr>
<tr>
<td>Temperature regulation</td>
<td>±0.002</td>
<td>±0.005</td>
<td></td>
<td>% / °C</td>
<td>Over operating temperature range</td>
</tr>
<tr>
<td>Power sharing accuracy</td>
<td>±2</td>
<td>±5</td>
<td></td>
<td>%</td>
<td>10 – 100% of full load</td>
</tr>
<tr>
<td>Programming range</td>
<td>10</td>
<td>110</td>
<td></td>
<td>%</td>
<td>Of nominal output voltage. For trimming below 90% of nominal, a minimum load of 10% of maximum rated power may be required.</td>
</tr>
</tbody>
</table>

### +OUT to –OUT — Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3V</td>
<td>−0.5 to 4.7</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5V</td>
<td>−0.5 to 7.0</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8V</td>
<td>−0.5 to 10.9</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12V</td>
<td>−0.5 to 16.1</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15V</td>
<td>−0.5 to 20.0</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24V</td>
<td>−0.5 to 31.7</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28V</td>
<td>−0.5 to 36.9</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36V</td>
<td>−0.5 to 47.1</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48V</td>
<td>−0.5 to 62.9</td>
<td>V(_{\text{DC}})</td>
<td>Externally applied</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The permissible load current must never be exceeded during normal, abnormal or test conditions. For additional output related application information, please refer to output connections on page 7.

## Thermal Resistance and Capacity

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseplate to sink; flat, greased surface</td>
<td>0.24</td>
<td></td>
<td></td>
<td>°C/Watt</td>
</tr>
<tr>
<td>Baseplate to sink; thermal pad (P/N 20265)</td>
<td>0.21</td>
<td></td>
<td></td>
<td>°C/Watt</td>
</tr>
<tr>
<td>Baseplate to ambient</td>
<td>10.9</td>
<td></td>
<td></td>
<td>°C/Watt</td>
</tr>
<tr>
<td>Baseplate to ambient; 1000LFM</td>
<td>2.8</td>
<td></td>
<td></td>
<td>°C/Watt</td>
</tr>
<tr>
<td>Thermal capacity</td>
<td>48</td>
<td></td>
<td></td>
<td>Watt-sec/°C</td>
</tr>
</tbody>
</table>
## Module Family Electrical Characteristics (Cont.)

Electrical characteristics apply over the full operating range of input voltage, output load (resistive) and baseplate temperature, unless otherwise specified. All temperatures refer to the operating temperature at the center of the baseplate.

### Module Control Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Side (PC = Primary Control; PR = Parallel)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC bias voltage</td>
<td>5.50</td>
<td>5.75</td>
<td>6.00</td>
<td>V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>PC current = 1.0mA</td>
</tr>
<tr>
<td>current limit</td>
<td>1.5</td>
<td>2.1</td>
<td>3.0</td>
<td>mA</td>
<td>PC voltage = 5.5V</td>
</tr>
<tr>
<td>PC module disable</td>
<td>2.3</td>
<td>2.6</td>
<td>2.9</td>
<td>V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>Switch must be able to sink ≥4mA. See Figure 2</td>
</tr>
<tr>
<td>PC module enable delay</td>
<td>4</td>
<td>7</td>
<td>ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC module alarm</td>
<td></td>
<td>0.5</td>
<td>V&lt;sub&gt;AVG&lt;/sub&gt;</td>
<td></td>
<td>UV, OV, OT, module fault. See Figures 3 and 5</td>
</tr>
<tr>
<td>PC resistance</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
<td>MΩ</td>
<td>See Figure 3, converter off or fault mode</td>
</tr>
<tr>
<td>PR emitter amplitude</td>
<td>5.7</td>
<td>5.9</td>
<td>6.1</td>
<td>Volts</td>
<td>PR load &gt;30Ω, &lt;30pF</td>
</tr>
<tr>
<td>PR emitter current</td>
<td>150</td>
<td>mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR receiver impedance</td>
<td>375</td>
<td>500</td>
<td>625</td>
<td>Ω</td>
<td>25°C</td>
</tr>
<tr>
<td>PR receiver threshold</td>
<td>2.4</td>
<td>2.5</td>
<td>2.6</td>
<td>Volts</td>
<td>Minimum pulse width: 20ns</td>
</tr>
<tr>
<td>PR drive capability</td>
<td>12</td>
<td>modules</td>
<td></td>
<td></td>
<td>Without PR buffer amplifier</td>
</tr>
<tr>
<td><strong>Secondary Side (SC = Secondary Control)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC bandgap voltage</td>
<td>1.21</td>
<td>1.23</td>
<td>1.25</td>
<td>V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>Referenced to –Sense</td>
</tr>
<tr>
<td>SC resistance</td>
<td>990</td>
<td>1000</td>
<td>1010</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>SC capacitance</td>
<td>0.033</td>
<td>µF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC module alarm</td>
<td>0</td>
<td>V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td></td>
<td></td>
<td>With open trim; referenced to –Sense. See Figure 7</td>
</tr>
</tbody>
</table>

### Module General Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation test voltage (IN to OUT)*</td>
<td>3000</td>
<td>V&lt;sub&gt;IN&lt;/sub&gt;</td>
<td></td>
<td>Complies with reinforced insulation requirements</td>
<td></td>
</tr>
<tr>
<td>Isolation test voltage (IN to base)*</td>
<td>1500</td>
<td>V&lt;sub&gt;IN&lt;/sub&gt;</td>
<td></td>
<td>Complies with basic insulation requirements</td>
<td></td>
</tr>
<tr>
<td>Isolation test voltage (OUT to base)*</td>
<td>500</td>
<td>V&lt;sub&gt;IN&lt;/sub&gt;</td>
<td></td>
<td>Complies with operational insulation requirements</td>
<td></td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>10</td>
<td>MΩ</td>
<td></td>
<td>IN to OUT, IN to baseplate, OUT to baseplate</td>
<td></td>
</tr>
<tr>
<td>Weight (E, C, T grade)</td>
<td>1.9 [52.8]</td>
<td>2.1 [59.3]</td>
<td>2.3 [65.8]</td>
<td>ounces [grams]</td>
<td></td>
</tr>
<tr>
<td>Weight (H, M grade)</td>
<td>2.1 [58.7]</td>
<td>2.3 [65.2]</td>
<td>2.5 [71.7]</td>
<td>ounces [grams]</td>
<td></td>
</tr>
<tr>
<td>Temperature limiting</td>
<td>100</td>
<td>115</td>
<td>°C</td>
<td>See Figures 3 and 5. Do not operate converter &gt;100°C.</td>
<td></td>
</tr>
<tr>
<td>Agency approvals</td>
<td>cURus, cTÜVus, CE</td>
<td></td>
<td></td>
<td>UI60950-1, EN60950-1, CSA60950-1, IEC60950-1.</td>
<td>With appropriate fuse in series with the +Input</td>
</tr>
</tbody>
</table>

* Isolation test voltage, 1 minute or less.

**Note:** Specifications are subject to change without notice.
## Module-Specific Operating Specifications

### 3.3V<sub>OUT</sub>, 75W (e.g. S72C3V3C75BL, V72C3V3C75BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S72C3V3C75BL (enhanced efficiency)</td>
<td>82.5</td>
<td>85.3</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>V72C3V3C75BL (standard efficiency)</td>
<td>78.8</td>
<td>82.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>105</td>
<td>132</td>
<td></td>
<td>mV</td>
<td>P-P: Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>4.14</td>
<td>4.3</td>
<td>4.46</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>3.2</td>
<td>3.7</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>22.73</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>23.1</td>
<td>26.1</td>
<td>30.7</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>15.8</td>
<td>26.1</td>
<td>30.7</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

### 5V<sub>OUT</sub>, 100W (e.g. S72C5C100BL, V72C5C100BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S72C5C100BL (enhanced efficiency)</td>
<td>84.4</td>
<td>86.1</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>V72C5C100BL (standard efficiency)</td>
<td>81.3</td>
<td>82.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>120</td>
<td>150</td>
<td></td>
<td>mV</td>
<td>P-P: Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>6.03</td>
<td>6.25</td>
<td>6.47</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>4.2</td>
<td>5</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>20</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>20.4</td>
<td>23</td>
<td>27</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>14</td>
<td>23</td>
<td>27</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

### 8V<sub>OUT</sub>, 100W (e.g. V72C8C100BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>180</td>
<td>225</td>
<td></td>
<td>mV</td>
<td>P-P: Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>9.36</td>
<td>9.7</td>
<td>10.1</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>6.3</td>
<td>7.5</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>12.5</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>12.7</td>
<td>14.4</td>
<td>16.9</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>8.75</td>
<td>14.4</td>
<td>16.9</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>
## Module-Specific Operating Specifications (Cont.)

### 12V<sub>OUT</sub>, 150W (e.g. S72C12C150BL, V72C12C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S72C12C150BL (enhanced efficiency)</td>
<td>86.8</td>
<td>88.3</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>V24C12C50BL (standard efficiency)</td>
<td>86.5</td>
<td>87.5</td>
<td></td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>220</td>
<td>275</td>
<td></td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>13.7</td>
<td>14.3</td>
<td>14.9</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>4.3</td>
<td>5.3</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>12.5</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>12.7</td>
<td>14.4</td>
<td>17.5</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>8.75</td>
<td>14.4</td>
<td>17.5</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

### 15V<sub>OUT</sub>, 150W (e.g. V72C15C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84.2</td>
<td>85.9</td>
<td></td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>150</td>
<td>188</td>
<td></td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>17.1</td>
<td>17.8</td>
<td>18.5</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>3.6</td>
<td>4.3</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>10</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>10.2</td>
<td>11.5</td>
<td>13.5</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>7</td>
<td>11.5</td>
<td>13.5</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

### 24V<sub>OUT</sub>, 150W (e.g. V72C24C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83.5</td>
<td>84.9</td>
<td></td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>Ripple and noise</td>
<td>116</td>
<td>145</td>
<td></td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>27.1</td>
<td>28.1</td>
<td>29.1</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>6</td>
<td>7</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>6.25</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>6.37</td>
<td>7.19</td>
<td>8.44</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>4.37</td>
<td>7.19</td>
<td>8.98</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>
### Module-Specific Operating Specifications (Cont.)

#### 28\text{V}_\text{OUT}, 150W (e.g. V72C28C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>85.3</td>
<td>86.2</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>Ripple and noise</td>
<td></td>
<td></td>
<td></td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>31.5</td>
<td>32.7</td>
<td>33.9</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>5.3</td>
<td>6.2</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>5.36</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>5.46</td>
<td>6.16</td>
<td>7.24</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>3.75</td>
<td>6.16</td>
<td>7.24</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

#### 36\text{V}_\text{OUT}, 150W (e.g. V72C36C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>85.2</td>
<td>87.9</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>Ripple and noise</td>
<td></td>
<td>72</td>
<td>90</td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>40.4</td>
<td>41.9</td>
<td>42.4</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>5</td>
<td>5.6</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>4.17</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>4.25</td>
<td>4.8</td>
<td>5.63</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>2.91</td>
<td>4.8</td>
<td>5.63</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>

#### 48\text{V}_\text{OUT}, 150W (e.g. V72C48C150BL)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>85.0</td>
<td>86.4</td>
<td></td>
<td>%</td>
<td>Nominal input; 75% load; 25°C</td>
</tr>
<tr>
<td>Ripple and noise</td>
<td></td>
<td>70</td>
<td>88</td>
<td>mV</td>
<td>P-P; Nominal input; full load; 20MHz bandwidth</td>
</tr>
<tr>
<td>Output OVP set point</td>
<td>53.7</td>
<td>55.7</td>
<td>57.7</td>
<td>Volts</td>
<td>25°C; recycle input voltage or PC to restart (&gt;100ms off)</td>
</tr>
<tr>
<td>Dissipation, standby</td>
<td>6.0</td>
<td>6.8</td>
<td></td>
<td>Watts</td>
<td>No load</td>
</tr>
<tr>
<td>Load regulation</td>
<td>±0.02</td>
<td>±0.2</td>
<td></td>
<td>%</td>
<td>No load to full load; nominal input</td>
</tr>
<tr>
<td>Output Current</td>
<td>0</td>
<td>3.13</td>
<td></td>
<td>Amps</td>
<td></td>
</tr>
<tr>
<td>Current limit</td>
<td>3.19</td>
<td>3.6</td>
<td>4.23</td>
<td>Amps</td>
<td>Output voltage 95% of nominal</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>2.19</td>
<td>3.6</td>
<td>4.23</td>
<td>Amps</td>
<td>Output voltage &lt;250mV</td>
</tr>
</tbody>
</table>
Output Connections and Considerations

The permissible load current must never be exceeded during normal, abnormal or test conditions. Converters subject to dynamic loading exceeding 25% of rated current must be reviewed by Vicor Applications Engineering to ensure that the converter will operate properly.

Under dynamic-load, light-load or no-load conditions, the converter may emit audible noise. Converters that utilize remote sense may require compensation circuitry to offset the phase lag caused by the external output leads and load impedance. If an external remote-sense circuit is used, the remote-sense leads must be protected for conditions such as lead reversal, noise pickup, open circuit or excessive output lead resistance between the sense point and the converters output terminals. For applications that may draw more than the rated current, a fast-acting electronic circuit breaker must be utilized to protect the converter. Under no circumstance should the rated current be exceeded. Utilizing or testing of current limit or short circuit current will damage the converter. Ensure that the total output capacitance connected to the converter does not exceed the limits on Page 16, “Maximum Output Capacitance”, of the design guide.

Comprehensive Online Application Information

The Design Guide and Applications Manual includes:

- Application circuits
- Design requirements
- EMC considerations
- Current sharing in power arrays
- Thermal performance information
- Recommended soldering methods
- Accessory modules – filtering, rectification, front-ends
- Mounting options
- ...and more.

Also at vicorpower.com

- PowerBench online configurators
- Over 20 Application Notes
- Online calculators – thermal, trimming, hold-up
- PDF data sheets for ALL Vicor products
Primary Control – PC Pin

Module Enable/Disable

The module may be disabled by pulling PC to 0V (2.3V max) with respect to the –Input. This may be done with an open collector transistor, relay, or optocoupler. Converters may be disabled with a single transistor or relay either directly or via “OR’ing” diodes for two or more converters. See Figure 2.

Primary Auxiliary Supply

During normal operation only, the PC Pin can source 5.7V @ 1.5mA. In the example shown in Figure 4, PC powers a module enabled LED.

Module Alarm

The module contains “watchdog” circuitry which monitors input voltage, operating temperature and internal operating parameters. In the event that any of these parameters are outside of their allowable operating range, the module will shut down and PC will go low. PC will periodically go high and the module will check to see if the fault (as an example, Input Undervoltage) has cleared. If the fault has not been cleared, PC will go low again and the cycle will restart. The SC pin will go low in the event of a fault and return to its normal state after the fault has been cleared. See Figures 3 and 5.
**Secondary Control – SC Pin**

**Output Voltage Programming**
The output voltage of the converter can be adjusted or programmed via fixed resistors, potentiometers or voltage DACs. See Figure 8.

![Figure 8 — Output voltage trim-down and trim-up circuit](image)

**Trim Down**
1. This converter is not a constant-power device – it has a constant current limit. Hence, available output power is reduced by the same percentage that output voltage is trimmed down. Do not exceed maximum rated output current.
2. The trim-down resistor must be connected between the SC and –S pins. Do not bypass the SC pin directly with a capacitor.

**Trim Up**
1. The converter is rated for a maximum delivered power. To ensure that maximum rated power is not exceeded, reduce maximum output current by the same percentage increase in output voltage.
2. The trim-up resistor must be connected between the SC and +S pins. Do not bypass the SC pin directly with a capacitor.
3. Do not trim the converter above maximum trim range (typically +10%) or the output over voltage protection circuitry may be activated.

**Trim resistor values calculated automatically:**
On-line calculators for trim resistor values are available on the vicor website at: asp.vicorpower.com/calculators/calculators.asp?calc=1
Resistor values can be calculated for fixed trim up, fixed trim down and for variable trim up or down.

**Parallel Bus – PR Pin**

**Parallel Operation**
The PR pin supports paralleling for increased power with N+1 (N+M) redundancy. Modules of the same input voltage, output voltage, and power level will current share if all PR pins are suitably interfaced.

Compatible interface architectures include the following:

- **AC-coupled single-wire interface.** All PR pins are connected to a single communication bus through 0.001µF (500V) capacitors. This interface supports current sharing and is fault tolerant except for the communication bus. Up to three converters may be paralleled by this method. See Figure 9.

- **Transformer-coupled interface.** For paralleling four or more converters a transformer-coupled interface is required, and under certain conditions a PR buffer circuit.

Parallel Bus / Voltage-Drop Compensation

- The +OUT and –OUT power buses should be designed to minimize and balance parasitic impedance from each module output to the load.
- At the discretion of the power system designer, a subset of all modules within an array may be configured as children by connecting SC to –OUT.
- Do not use output OR’ing diodes with MicroMods.

Figure 11 — N+1 module array output connections

Figure 12 — Voltage-drop compensation

Pin Styles*

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Finish</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(None)</td>
<td>Short</td>
<td>Tin/Lead</td>
<td>Requires inboard mounting</td>
</tr>
<tr>
<td>L</td>
<td>Long</td>
<td>Tin/Lead</td>
<td>Onboard mounting for 0.065in boards</td>
</tr>
<tr>
<td>S</td>
<td>Short ModuMate</td>
<td>Gold</td>
<td>SurfMate or inboard socket mounting</td>
</tr>
<tr>
<td>N</td>
<td>Long ModuMate</td>
<td>Gold</td>
<td>Onboard socket mounting</td>
</tr>
<tr>
<td>F</td>
<td>Short RoHS</td>
<td>Gold</td>
<td>Select for RoHS-compliant inboard solder, socket or SurfMate mounting</td>
</tr>
<tr>
<td>G</td>
<td>Long RoHS</td>
<td>Gold</td>
<td>Select for RoHS-compliant onboard solder or socket mounting</td>
</tr>
<tr>
<td>K</td>
<td>Extra Long RoHS</td>
<td>Gold</td>
<td>Select for RoHS compliance onboard mounting for thicker PCBs (not intended for socket or Surfmate mounting)</td>
</tr>
</tbody>
</table>

* Pin style designator follows the “B” after the output power and precedes the baseplate designator.
Ex. V72C151T150BN2 — Long ModuMate Pins

Storage

Vicor products, when not installed in customer units, should be stored in ESD safe packaging in accordance with ANSI/ESD S20.20, “Protection of Electrical and Electronic Parts, Assemblies and Equipment” and should be maintained in a temperature controlled factory/warehouse environment not exposed to outside elements controlled between the temperature ranges of 15°C and 38°C. Humidity shall not be condensing, no minimum humidity when stored in an ESD compliant package.
### Converter Pins

<table>
<thead>
<tr>
<th>No.</th>
<th>Function Label</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+IN</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Primary Control</td>
<td>PC</td>
</tr>
<tr>
<td>3</td>
<td>Parallel</td>
<td>PR</td>
</tr>
<tr>
<td>4</td>
<td>–IN</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>Secondary Control</td>
<td>SC</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+OUT</td>
<td>+</td>
</tr>
</tbody>
</table>

**Mechanical Drawings**

- **SLOTTED BASEPLATE**
  - Ref Dwg. 37207 rev 5

**Converter Pins**

<table>
<thead>
<tr>
<th>No.</th>
<th>Function Label</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+IN</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Primary Control</td>
<td>PC</td>
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<td>3</td>
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<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+OUT</td>
<td>+</td>
</tr>
</tbody>
</table>

**Notes:**
1. **MATERIAL:**
   - Base: Aluminum
   - Pin Plating: Nickel Barrier followed by Gold Plating, Nickel Barrier followed by Palladium 25 (Si-Ni), followed by 3 to 5 Micron Gold.
   - Converter Pins: RoHS Gold Plated Copper

2. **DIMENSIONS AND VALUES IN BRACKETS ARE METRIC**
3. **MANUFACTURING CONTROL IS IN PLACE TO ENSURE THAT THE SPACING BETWEEN THE MODULES LABEL SURFACE TO THE PRINTED CIRCUIT BOARD OF THE APPLICATION RANGES FROM DIRECT CONTACT (ZERO), TO THE MAXIMUM GAP AS CALCULATED FROM THE TOLERANCE STACK-UP AND IS NOT SUBJECTED TO NEGATIVE TOLERANCE ACCUMULATION**

**Figure 13 — Module outline**

- **PCB THICKNESS**
  - 0.062 ±0.010
  - 1.57 ±0.25

- **PLATED THRU HOLE DIA**
  - 0.080" ±0.010
  - 2.032 ±0.510
  - 1.000 ±0.250
  - 6.35 ±1.600

- **SHORT PIN STYLE**
  - 0.094 ±0.003
  - 2.39 ±0.08

- **LONG PIN STYLE**
  - 0.094 ±0.003
  - 2.39 ±0.08

**For Soldering Methods and Procedures**

Please refer to:
- [The Maxi, Mini Micro Design Guide](#)

**Figure 14 — PCB mounting specifications**

- **PCB Window**
  - **PCB WINDOW**

- **Soldering**
  - **SOLDER: TIN/LEAD PLATED**
  - **MODUMATE: GOLD PLATED COPPER**
  - **RoHS: GOLD PLATED COPPER**

**Unless otherwise specified, dimensions are in inches**

<table>
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<th>Decimals</th>
<th>Tol.</th>
<th>Angles</th>
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<td>0.XX</td>
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<tr>
<td>0.XX</td>
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<td>0.XXXX</td>
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