50kW SiC boost converter evaluation unit for PV applications:
- 4-phase interleaved
- \( V_{in} = 400V-600V, V_{out} = 800V \)
- Reference design includes schematic, detailed presentation, efficiency calculations, thermal images and sample waveforms
- Sample unit available for purchase

Ultracapacitors for solar applications:
- Provide temporary “ride-through” power to help guard against variable and intermittent PV input power.
- Control the rate at which power ramps up and down in order to eliminate rapid power swings.
- Standard small cells available: Voltage range: 2.2VDC-5.5VDC Capacitance range: 0.3F-3400F
- Standard modules available: Voltage range: 8.1VDC-160VDC Capacitance range: 3F-500F Passive and active balancing
- Custom solutions also available

Transformerless and transformer-based inverter modules with single- and three-phase outputs:
- Special topologies include asymmetric H-bridge, neutral point clamped (NPC) inverters, and parallel and symmetric boosts for high efficiency
- For systems with overall power up to 200kW
- SiC and SiC/Si hybrid technologies

Power Resistors:
- Axial, lead power controls, current sense, surface mount, heat sinkable, surge rated, high current/breaking, tubular, high voltage
- Manufacturers: Ohmite

Power Semiconductor:
- SCR/Thyristor: 200V-8500V, 240A-6400A
- MOSFET/Module: 600V-1700V, 5A-1200A
- Diode/Rectifier/Module: 300V-9000V, <1A-8800A
- SiC Hybrids: 500V-1700V, 15A-1200A
- HV Diode/Assembly: 1000V-2000V, <1A-25A
- Manufacturers: CREE / Dynex / EDI / Microsemi / Powerex / Semikron / Vincotech

Power Factor Correction (PFC) Film Capacitors:
- Terminal type: Screw, quick connect blades, double-quick-connect spade
- Oil Filled: 240VAC-4000VAC, 0.5µF-600µF
- Output Type: Single-phase, three-phase
- Case: Aluminum cylindrical case
- Manufacturers: CDE / KEMET / Genteq

DC-DC Converters:
- Film: 250VDC – 3000VDC, 0.01µF-330µF
- Terminal Type: Box, axial, direct-mount
- Manufacturers: CDE / Genteq / Illinois Capacitor / KEMET / GE

Gate Drive/Control:
- Integrated drivers, plug-and-play drivers
- Manufacturers: CREE / Powerex / Power Integrations (CT Concept)

Snubber Capacitors:
- Terminal type: Screw, quick connect blades, double-quick-connect spade
- Oil-Filled: 240VAC-4000VAC, 0.5µF-600µF
- Output Type: Single-phase, three-phase
- Case: Aluminum cylindrical case
- Manufacturers: CDE / KEMET / Genteq

EMI/RFI Filters:
- X1/X2 & Y1/Y2 Capacitors:
  - Filter Cap: Up to 760VAC, 0.001µF-8.3µF
  - Terminal Type: Box
  - Manufacturer: CDE / KEMET
- Modules:
  - DC Filter: 75V-1200V, 3A-2500A @ 150 kHz
  - AC Filter: 250VAC-600VAC, 1A-2000A @ 150 kHz
  - Type: Single-phase, three-phase (Delta/Wye), IEC INLET/PEM, medical, military, temppest, custom
  - Manufacturer: Astrodyne TDI (Radius Power)

DC Link Capacitors (Power Film & Aluminum Electrolytic):
- Film: 100VDC-3000VDC, 0.001µF-2700µF
- Terminal Type: Screw, box, axial, board mount
- Manufacturer: CDE / KEMET / Kendell
- Electrolytic: 33VDC-550VDC, 1µF-2.7F
- Terminal Type: Screw, snap, flatpack, radial, axial
- Manufacturer: Illinois Capacitor, Kemet, Maxwell, VinaTech

Transformers and Reactors:
- Industrial High Power: Custom X-formers, Reactors, X-formers/Reactors up to 10000VA
- Linear Power Transformers: Laminated and low-profile board-mount, 1.1VA-56VA
- Switch Mode Power Transformers: Custom low- to high-power board-mount, 1VA-360VA
- Manufacturer: Tamura

Ohmite

RichardsonRFPD
An Arrow Company

Your Global Source for RF, Wireless, Energy & Power Technologies
www.richardsonrfpd.com  |  800.737.6937  |  630.262.6800

Solar Panel

PV

Inverter

Snubber

DC Link

AC EMI/RFI Filter

Transformers and Reactors

DC EMI/RFI Filter

Gate Drive / Control

Snubber DC Link

Gate Drive / Control

AC EMI/RFI Filter

Transformers and Reactors

Ultracapacitors (Optional Energy Storage)
- Small Cells: 2.2VDC-5.5VDC, 0.3F-3400F
- Modules: 8.1VDC-160VDC, 3F-500F
- Manufacturers: Axidan / DAU / Priatherm / Illinois Capacitor / KEMET / GE

Thermal Management:
- Board level, extrusion, bonded fin, liquid cold plate, custom
- Manufacturers: Axidan / DAU / Priatherm / Illinois Capacitor / KEMET / GE

Wakefield-Vette

DAU / Priatherm

Ohmite

RichardsonRFPD
An Arrow Company

Your Global Source for RF, Wireless, Energy & Power Technologies
www.richardsonrfpd.com  |  800.737.6937  |  630.262.6800

Solar Panel

PV

Inverter

Snubber

DC Link

AC EMI/RFI Filter

Transformers and Reactors

Ultracapacitors (Optional Energy Storage)
- Small Cells: 2.2VDC-5.5VDC, 0.3F-3400F
- Modules: 8.1VDC-160VDC, 3F-500F
- Manufacturers: Axidan / DAU / Priatherm / Illinois Capacitor / KEMET / GE

Thermal Management:
- Board level, extrusion, bonded fin, liquid cold plate, custom
- Manufacturers: Axidan / DAU / Priatherm / Illinois Capacitor / KEMET / GE

Wakefield-Vette

DAU / Priatherm

Ohmite

RichardsonRFPD
An Arrow Company

Your Global Source for RF, Wireless, Energy & Power Technologies
www.richardsonrfpd.com  |  800.737.6937  |  630.262.6800
### FROM COMPONENTS TO INTEGRATED POWER SOLUTIONS

Providing

- Global distribution with local presence
- Design support from prototype to production
- Latest products from market-leading suppliers

---

<table>
<thead>
<tr>
<th>POWER SEMICONDUCTORS</th>
<th>Silicon Carbide</th>
<th>Rectifiers/Thyristors</th>
<th>IGBTs</th>
<th>MOSFETs</th>
<th>Silicon Carbide</th>
<th>Silicon Carbide/Silicon Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREE</td>
<td>D &amp; M</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>D &amp; M</td>
<td>—</td>
</tr>
<tr>
<td>Dynex</td>
<td>—</td>
<td>M</td>
<td>M</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Electronic Devices, Inc.</td>
<td>—</td>
<td>D &amp; M</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Microsemi</td>
<td>D &amp; M</td>
<td>D &amp; M</td>
<td>D &amp; M</td>
<td>D &amp; M</td>
<td>D &amp; M</td>
<td>D &amp; M</td>
</tr>
<tr>
<td>Powerex*</td>
<td>—</td>
<td>D &amp; M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Semikron</td>
<td>—</td>
<td>D &amp; M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Vincotech</td>
<td>—</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

* D = Discrete, M = Module

---

<table>
<thead>
<tr>
<th>THERMAL MANAGEMENT</th>
<th>Board Level</th>
<th>Bonded Fin</th>
<th>Extruded</th>
<th>Liquid Cold Plate</th>
<th>Custom</th>
<th>Thermal Accessories*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aavid</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>DAU</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Priatherm</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Wakefield-Vette</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Thermal Accessories include precision clamps, thermal interface material and wedgelocks

---

<table>
<thead>
<tr>
<th>POWER CAPACITORS</th>
<th>Power Film</th>
<th>Aluminum Electrolytic</th>
<th>AC &amp; DC Oil-Filled</th>
<th>Mica</th>
<th>Ultracapacitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornell Dubilier (CDE)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>General Electric</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Gaintaq</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Illinois Capacitor</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Kemet</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Kendell</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Maxwell**</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>United Chemi-Con</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>VinaTech</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>POWER RESISTORS AND CURRENT SENSORS</th>
<th>Axial Lead</th>
<th>Heat Sinkable</th>
<th>Surface Mount</th>
<th>Tubular</th>
<th>Open Loop Current Sensors</th>
<th>Closed Loop Current Sensors</th>
<th>Flux-Gate Current Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohmite</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tamura</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>POWER SOLUTIONS FOR VARIABLE FREQUENCY DRIVES (VFDS)</th>
<th>Industrial Power Filter</th>
<th>Industrial Power Supply</th>
<th>Overvoltage Products</th>
<th>Regulator for VFDS</th>
<th>Switching Regulator Module</th>
<th>Undervoltage Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonitron</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>EMI/RFI FILTER PRODUCTS</th>
<th>AC Filter Modules</th>
<th>DC Filter Modules</th>
<th>Discretes (X &amp; Y Capacitors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrodynne TDI (Radius Power)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Kemet</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cornell Dubilier (CDE)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>GATED DRIVERS, CONVERTERS AND CONTROL DEVICES</th>
<th>AC-DC Modules</th>
<th>DC-DC Modules</th>
<th>Switching Regulators</th>
<th>LED Driver Modules</th>
<th>SiC MOSFET Gate Drivers</th>
<th>IGBT Gate Drivers</th>
<th>Custom Gate Drivers</th>
<th>Medical &amp; Military Power Supplies/Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Devices, Inc. (ADI)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>CREE</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Power Integrations (CT-CONCEPT)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Powerex*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>RECOM Power</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Semikron</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

M = Modules only, IC = Integrated Circuit only

---

©2015 Richardson RFPD, Inc. All other product names and logos are trademarks of their respective manufacturers. Rev 7/15 DOC-013

**NOTE:** All of our supplier agreements are global except:

- Powerex: North/South America: IGBTs, MOSFET Modules, Diode/Rectifier Modules. NASA/IPL Spain/Israel: Discrete SCR, Thyristors and Diode/Rectifier components.
- Maxwell: Americas, Asia-Pac (excluding Japan, Korea, Australia, New Zealand)