

# Solid-State Power Control Solutions

Smart Power Management



CARDS  
COMPONENTS  
SOFTWARE





## TAKE SMART POWER MANAGEMENT TO THE NEXT LEVEL

- Ground Vehicles
- Turrets
- Aircraft
- Watercraft
- Unmanned Vehicles
- Weapon Launchers

DDC's Solid-State Power Controller (SSPC) cards, power distribution units, and modules provide state of the art switching and circuit protection for secondary and primary power distribution.

SSPCs provide functional and performance advantages compared to relays and circuit breakers, including much higher reliability, accurate measurements, very low power dissipation, controlled rise and fall times for reduced EMI emissions, "soft starting" of loads, and controlled shutdown. Protective features include rapid short circuit protection, enabling circuit deactivation times on the order of 1 ms, along with I<sup>2</sup>t overload protection. I<sup>2</sup>t protection protects wiring, loads and the SSPCs themselves against overheating, while reliably avoiding "nuisance trips" when switching into motors, capacitive, or incandescent lamp loads.

DDC's SSPC boards and modules are processor-based, providing advantages in the areas of flexibility, measurement and

computational accuracy, and connectivity to an external power management computer by means of a data bus or network interface, such as CAN Bus, or RS-485. SSPC channels can be programmed for different rated currents to accommodate varying loads, and multiple SSPC channels can be paralleled, enabling higher current capacities.

A power management computer can poll the values of various SSPC parameters over the board's bus or network interface, including: basic on/off and built-in test status; input voltage, output voltage and current; board rail and/or load temperatures. This data can then be used to support system-level diagnostics and prognostics, enabling predictive, condition-based maintenance, to protect generators, batteries, wiring, connectors, loads and the SSPCs from failures and potential damage.

### FEATURES

### BENEFITS

|  |  |
|--|--|
| <b>I<sup>2</sup>t and Instant Trip Protection</b>                    | Protects loads and wiring harnesses like a thermal mechanical circuit breaker, but with solid-state reliability. I <sup>2</sup> t protection eliminates nuisance trips when switching into motor, capacitive, or lamp loads.   |
| <b>Rapid deactivation following short circuit detection (~ 1 mS)</b> | Fast clearing of short circuits prevents damage to wiring, equipment, and vehicles.  |
| <b>Programmable Current Rating</b>                                   | Selection of channel current rating from 10% to 100% of maximum rating provides precise load protection and power distribution system flexibility  |
| <b>Channel Paralleling</b>   | Provides system expandability with fewer SSPC components.  |
| <b>Solid State Switching</b>   | Relative to electromechanical switching: <ul style="list-style-type: none"> <li>• Higher reliability/system availability.</li> <li>• Reduced weight and volume.</li> <li>• Improved operation in high vibration environments.</li> </ul>   |
| <b>Network Control</b>   | Allows the system processor to control on/off status of SSPC channels, check conditions, and monitor power quality. Provide inputs to system computers for prognostics, diagnostics, and improved system maintenance.  |
| <b>Controlled Turn-On/Turn-Off Time &amp; High Inrush Capability</b> | <ul style="list-style-type: none"> <li>• Reduced EMI.</li> <li>• Eliminates nuisance and sympathetic tripping.</li> <li>• Reduced surge currents for switching into motor, solenoid, capacitive, or lamp loads.</li> <li>• Reduced inductive spikes for power turn-off.</li> <li>• For incandescent bulbs, increases lamp lifetimes</li> </ul> |
| <b>Low Power Dissipation</b>   | Highly efficient MOSFETs reduce losses and heat generation   |
| <b>Programmable Channel Defaults and Mission Override</b>            | Permits the power distribution system to respond to power loss and emergency conditions.   |
| <b>Multiple Board and Module Configurations</b>                      | Supports varying power distribution architectures, channel densities and space limitations.  |
| <b>Over Two Decades of Military Deployment</b>                       | DDC leads the industry in experience, reliability and product deployment   |



## SOLID STATE POWER CONTROLLERS



### Power Distribution Units

- Up to 32 Independent Load Channels, Rated From 5A to 600A
- Total Current Capability of 600A
- Remote Control of Channels and Channel Groups
- Channel Paralleling for Higher Current Loads
- Programmable Channel Trip Point with I<sup>2</sup>T Protection
- SAE J1939 CAN BUS Compatible Interface and RS-485 Interface Options
- Low Power Dissipation,  $\leq 26$  Watts at Maximum Load Current
- Conduction Cooled: -40°C to 85°C or Ambient Air Cooled: -40°C to 71°C Operating Temperature
- Nominal 28 VDC Operation, MIL-STD-1275D, MIL-STD-704, and DEF STAN 61-5 Compliant
- MIL-STD-810 and MIL-STD 461 Compliant



- DDC Innovations**
- Solid State Protection
  - Remote Control
  - Controlled Rise/Fall Times



- DDC Innovations**
- Programmable Trip
  - Channel Paralleling
  - Network Control



### SSPC Cards

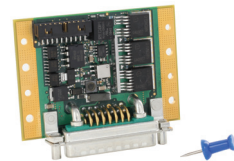
- Up to 20 Independent Load Channels, Rated From 8A to 300A
- Total Current Capability of 300A
- Remote Control of Channels and Channel Groups
- Channel Paralleling for Higher Current Loads
- Programmable Channel Trip Point with I<sup>2</sup>T Protection
- SAE J1939 CAN BUS Compatible Interface and RS-485 Interface Options
- Low Power Dissipation,  $\leq 26$  Watts at Maximum Load Current
- Conduction Cooled: -40°C to 105°C Operating Temperature
- Nominal 28 VDC Operation, MIL-STD-1275D, MIL-STD-704, and DEF STAN 61-5 Compliant



- DDC Innovations**
- Stand Alone Controller
  - High Power
  - Smart Point-of-Load Modules



- DDC Innovations**
- Ruggedized Enclosures with Standardized Connectors
  - Improved Mission Safety & Longevity
  - Reduced Weight and Space



### Smart Point-of-Load Modules

- 3.5 to 35A Programmable Trip Point with I<sup>2</sup>T Protection
- Remote Control via SAE J1939 CAN BUS Interface or Discrete Signal Interface
- Nominal 28 VDC Operation, MIL-STD-1275B Compliant
- Conduction Cooled, -40°C to +85°C Operating Temperature



- DDC Innovations**
- High Power PDU's

- DDC Innovations**
- Light Weight PDU's for Aerospace
  - Standard LRM's

1980's

1990's

2000's

2010

2011

2012

2013



**More than 500,000 DDC SSPC nodes installed on Military Vehicles since 1988**

# GENERAL SPECIFICATIONS

|   |   |
|---|---|
| <b>Input Power</b>                                    | 0 to 50 VDC   |
| <b>Current Rating</b>                                 | Up to 300 amps per channel on PDUs and 25 amps per channel on multi-channel cards. Channels may be paralleled for increased current ratings.  |
| <b>Programming Current Range</b>                      | 10% to 100% of channel maximum current rating   |
| <b>Interface Options</b>                              | Standard interfaces: CANbus, RS-485, RS-422 or Discrete<br>Factory options: Ethernet, MIL-STD-1553B   |
| <b>Instant Trip Level</b>                             | Up to 1400% of programmed current rating  |
| <b>Control Power Input</b>                            | 28 VDC Line or 5 VDC External   |
| <b>Isolation</b>                                      | Opto-isolated control circuitry   |
| <b>Power Out to Control Isolation</b>                 | 500 Volts   |
| <b>Load Monitoring/Reporting Accuracy</b>             | 5% voltage, current, temperature measurements.  |
| <b>Thermal Interface Temperature Range for Boards</b> | -40°C to 105°C  |
| <b>Temperature and Altitude</b>                       | MIL-STD-810F<br>Methods 501, 502, and 520:<br><ul style="list-style-type: none"> <li>-40° C (ambient) and altitude of 15,000 feet, minimum soak of 8 hours</li> <li>71° C (ambient) and altitude of 15,000 feet, minimum soak of 8 hours</li> </ul> |
| <b>Operational Vibration</b>                          | MIL-STD-810F, Method 514.5,<br>Category 24 - Minimal Integrity Test, Figure 514.5C-17 for a duration of 60 minutes in each of the three orthogonal axes.  |
| <b>Operational Shock</b>                              | MIL-STD-810F: functional shock response spectrum (SRS) per the "Functional Test for Ground Equipment" of Table 516.5-1 and Figure 516.5-8 in each of the three orthogonal axes.   |
| <b>Humidity</b>                                       | In accordance with MIL-STD-810F Method 507.4: 5 humidity cycles (240 hours)   |
| <b>EMI</b>  | Radiated emissions and susceptibility per MIL-STD-461, including CE102, CS101, CS114, CS115, CS116, RE102, and RE103.   |
| <b>Radiation</b>                                      | Tactical Nuclear Radiation Tolerant   |

Note: Certain specifications are model dependant. Contact factory for details

**Standard modules and multi-channel boards are ready to order. Contact DDC for model specifications.**

In addition to the standard 28 VDC products described, DDC capabilities include 270 VDC and AC SSPCs, as well as custom packaging and connectivity.

## INDUSTRY STANDARDS

|                      |                               |                      |                         |
|----------------------|-------------------------------|----------------------|-------------------------|
| <b>MIL-STD-704F</b>  | Electric Power, Aircraft      | <b>MIL-STD-810F</b>  | Environmental Standards |
| <b>MIL-STD-1275D</b> | Vehicle Power, 28VDC          | <b>MIL-STD-1686C</b> | ESD Program             |
| <b>MIL-STD-461E</b>  | Electro-magnetic Interference |                      |                         |



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