**Features**
- Rad Hard: TID > 100kRad(Si)
- 2:1 margin: Operates beyond 200kRad TID
- No SEE: LET > 82MeV·cm²/mg
- Proton Resistant: No optocouplers used
- Specifically engineered for 70 VDC satellite bus
- Completely self contained Thick Film Hybrid DC-DC Converter
- No external EMI caps required
- Fully isolated design
- "Inhibit-not" function
- Power on soft start
- 200 kHz operation for low ripple and fast response time
- Built-in EMI input filter meets MIL-STD-461C requirements CE01, CE03, CS01, CS02 and CS06
- Short circuit and overvoltage protection
- Capability of external sync for switching frequencies
- Built-in test capability

**Specifications**

**INPUT:** 70 VDC nominal

**Range:** 55 to 90 VDC continuous

**ISOLATION:**
- Input to case: 500 VDC
- Input to output: 500 VDC
- Output to case: 100 VDC

**ENVIRONMENT:**
- Storage temperature: -55°C to +150°C
- Shock: 50 G's
- Acceleration: 500 G's
- Vibration: 30 G's
- Grades L, R & S:
  - Full Power Output at T_{case} = +85°C
  - Linearily derates to zero at T_{case} = +115°C
- Grades LE, RE & SE:
  - Full Power Output at T_{case} = +125°C
  - Linearily derates to zero at T_{case} = +135°C
- Grades L & LE:
  - TID up to 45kRad(Si)
  - No SEE up to 60MeV·cm²/mg
- WEIGHT: 90 grams typical

---

**Case Dimensions**

**Units:** inches | millimeters

<table>
<thead>
<tr>
<th>Case Style</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.205</td>
<td>56.007</td>
<td>1.755</td>
<td>44.577</td>
<td>0.495</td>
<td>12.573</td>
<td>1.400</td>
</tr>
<tr>
<td>3</td>
<td>2.205</td>
<td>56.007</td>
<td>1.755</td>
<td>44.577</td>
<td>0.495</td>
<td>12.573</td>
<td>1.400</td>
</tr>
<tr>
<td>5</td>
<td>2.205</td>
<td>56.007</td>
<td>1.755</td>
<td>44.577</td>
<td>0.495</td>
<td>12.573</td>
<td>1.400</td>
</tr>
<tr>
<td>6</td>
<td>2.220</td>
<td>56.388</td>
<td>1.760</td>
<td>44.704</td>
<td>0.495</td>
<td>12.573</td>
<td>1.400</td>
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<tr>
<td>8</td>
<td>2.220</td>
<td>56.388</td>
<td>2.110</td>
<td>53.594</td>
<td>0.495</td>
<td>12.573</td>
<td>—</td>
</tr>
<tr>
<td>10</td>
<td>2.220</td>
<td>56.388</td>
<td>1.760</td>
<td>44.704</td>
<td>0.495</td>
<td>12.573</td>
<td>1.400</td>
</tr>
</tbody>
</table>

**TOLERANCES:** ALL DIMENSIONS ±0.01 EXCEPT F = MAX, C = ±0.01/-0.02; DRAWINGS IN INCHES.
## DC-DC Converters

**Proton Rad Hard 100K+™ Series 8193**

### DUAL OUTPUT DEVICES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>8193-D05 (40W)</th>
<th>8193-D12 (40W)</th>
<th>8193-D15 (40W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>$V_{out} - V_{in}$</td>
<td>+4.9 ± 0.5 +5.1</td>
<td>+11.9 ± 12.0 +12.1</td>
<td>+14.9 ± 15.0 +15.1</td>
</tr>
<tr>
<td>Output current</td>
<td>$V_{out} - V_{in}$</td>
<td>+4.9 ± 5.0 +5.1</td>
<td>+11.9 ± 12.0 +12.1</td>
<td>+14.9 ± 15.0 +15.1</td>
</tr>
<tr>
<td>Efficiency</td>
<td>$P_{out}$</td>
<td>72% 76%</td>
<td>78% 82%</td>
<td>79% 83%</td>
</tr>
<tr>
<td>Line regulation</td>
<td>$V_{out} - V_{in}$</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
<td>±25mV ±125mV</td>
</tr>
<tr>
<td>Load regulation</td>
<td>$P_{load}$</td>
<td>10% to FL.</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
</tr>
<tr>
<td>Output ripple</td>
<td>FL, BW 2 MHz</td>
<td>mVpp</td>
<td>mVpp</td>
<td>mVpp</td>
</tr>
</tbody>
</table>

### Notes:
- Up to 90% full power available from either output if rated output power is not exceeded.
- Balanced load conditions.

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### TRIPLE OUTPUT DEVICES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>8193-T3.3/12 (24W)</th>
<th>8193-T3.3/15 (25.2W)</th>
<th>8193-T05 (19.5W)</th>
<th>8193-T12 (25.8W)</th>
<th>8193-T15 (27W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>$V_{out} - V_{in}$</td>
<td>+3.2 ± 3.3 +3.4</td>
<td>+3.2 ± 3.3 +3.4</td>
<td>+4.9 ± 5.0 +5.1</td>
<td>+4.9 ± 5.0 +5.1</td>
<td>+4.9 ± 5.0 +5.1</td>
</tr>
<tr>
<td>Output current</td>
<td>$V_{out} - V_{in}$</td>
<td>+4.9 ± 5.0 +5.1</td>
<td>+11.9 ± 12.0 +12.1</td>
<td>+14.9 ± 15.0 +15.1</td>
<td>+14.9 ± 15.0 +15.1</td>
<td>+14.9 ± 15.0 +15.1</td>
</tr>
<tr>
<td>Efficiency</td>
<td>$P_{out}$</td>
<td>66% 69%</td>
<td>66% 69%</td>
<td>66% 69%</td>
<td>71% 74%</td>
<td>71% 74%</td>
</tr>
<tr>
<td>Line regulation</td>
<td>$V_{out} - V_{in}$</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
<td>±25mV ±125mV</td>
<td>±25mV ±125mV</td>
<td>±25mV ±125mV</td>
</tr>
<tr>
<td>Load regulation</td>
<td>$P_{load}$</td>
<td>10% to FL.</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
<td>±25mV ±125mV</td>
<td>±25mV ±125mV</td>
</tr>
<tr>
<td>Output ripple</td>
<td>FL, BW 2 MHz</td>
<td>mVpp</td>
<td>mVpp</td>
<td>mVpp</td>
<td>mVpp</td>
<td>mVpp</td>
</tr>
</tbody>
</table>

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### MAGNETICALLY ISOLATED

- **70 VDC**

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Please specify GRADE LEVEL for your application. EU grade units will be shipped if no option is specified.

**EU Engineering Units**
- RE 100 K+™, +125°C military/aerospace
- SE 100 K+™, +125°C space

**R Engineering Units**
- 100 K+™, +85°C military/aerospace
- S 100 K+™, +85°C space

**L Engineering Units**
- 45 K, +85°C military/aerospace
- LE 45 K, 125°C military/aerospace

Revised 2015-09-17