**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 50 VDC satellite bus
- Completely self contained Thick Film Hybrid DC-DC Converter
- No external filter caps required
- Fully isolated design
- "Inhibit-not" function
- Power on soft start
- Built-in test capability
- Short circuit and overvoltage protection
- Built-in EMI input filter meets MIL-STD-461C requirements CE01, CE03, CS01, CS02 and CS06
- 200 kHz operation for low ripple and fast response time
- ENVIRONMENT:

  - Storage temperature: -55°C to +150°C
  - Shock: 50 G’s
  - Acceleration: 500 G’s
  - Vibration: 30 G’s

  Grades L & LE:
  - Full Power Output at Tcase = +85°C
  - Linearity derates to zero at Tcase = +115°C

  Grades LE, RE & SE:
  - Full Power Output at Tcase = +125°C
  - Linearity derates to zero at Tcase = +135°C

  Grades L & LE:
  - TID up to 45kRad(Si)
  - No SEE up to 60MeV·cm²/mg

  **WEIGHT**: 90 grams typical

**Specifications**

**INPUT**:
- 50 VDC nominal
- Range: 30 to 75 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

**19.5-40 Watt Hybrid**

**Table 1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>—</td>
<td>+3.2</td>
<td>+3.3</td>
<td>+3.4</td>
</tr>
<tr>
<td>Output current</td>
<td>Vout — Vin</td>
<td>+4.9</td>
<td>+5.0</td>
<td>+5.1</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Pout/Pl</td>
<td>66%</td>
<td>69%</td>
<td>71%</td>
</tr>
<tr>
<td>Line regulation</td>
<td>Vout — Vin</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Load regulation</td>
<td>Pout/Pl</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Output ripple</td>
<td>FL BW 2 MHz mVpp</td>
<td>—</td>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

**Model No.**
- Solder Sealed Flangeless PCB Mount
- Solder Sealed PCB Mount with Flange
- Seam Weld Flangeless PCB Mount
- Seam Weld PCB Mount with Flange
- Seam Weld Chassis Mount with Flange
- Solder Sealed Flangeless PCB Stud Mount

**Case Dimensions**

<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>
</tr>
<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>

**Grades**

- L & LE:
  - Full Power Output at Tcase = +125°C
  - Linearity derates to zero at Tcase = +135°C

- LE, RE & SE:
  - Full Power Output at Tcase = +125°C
  - Linearity derates to zero at Tcase = +135°C

- Grades L & LE:
  - TID up to 45kRad(Si)
  - No SEE up to 60MeV·cm²/mg

- Grades EU, L, R & S:
  - Full Power Output at Tcase = +85°C
  - Linearity derates to zero at Tcase = +115°C

**Modular Devices, Inc.**

- Fax 631.345.3106
- Tel 631.345.3100

- Revision: 2015-09-17
### DC-DC CONVERTERS

#### MAGNETICALLY ISOLATED

**50 VDC**

#### PROTON RAD HARD 100K+™ SERIES 7193

### DUAL OUTPUT DEVICES

<table>
<thead>
<tr>
<th>Parameter Condition</th>
<th>7193-D05 (40W)</th>
<th>7193-D12 (40W)</th>
<th>7193-D15 (40W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage ( V_{o_{\text{min}}} - V_{o_{\text{max}}} )</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 ( I_{o_{\text{max}}} )</td>
<td>±150mA — ±4A</td>
<td>±150mA — ±4A</td>
<td>±150mA — ±4A</td>
</tr>
<tr>
<td>Efficiency ( P_{\text{out}} )</td>
<td>73% 76% —</td>
<td>78% 82% —</td>
<td>79% 83% —</td>
</tr>
<tr>
<td>Line regulation ( V_{o_{\text{min}}} - V_{o_{\text{max}}} )</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
<td>±25mV ±125mV</td>
</tr>
<tr>
<td>Load regulation ( P_{\text{out}} = 10% ) to FL.</td>
<td>±10mV ±50mV</td>
<td>±20mV ±100mV</td>
<td>±25mV ±125mV</td>
</tr>
<tr>
<td>Output ripple F.L. BW 2 MHz ( mV_{pp} )</td>
<td>40 85 —</td>
<td>60 150 —</td>
<td>75 180 —</td>
</tr>
</tbody>
</table>

**Notes:** *Up to 90% full power available from either output if rated output power is not exceeded; †balanced load conditions.

### TRIPLE OUTPUT DEVICES

<table>
<thead>
<tr>
<th>Parameter Condition</th>
<th>7193-T3.5 (17.5W)</th>
<th>7193-T3.12 (24W)</th>
<th>7193-T3.15 (25.2W)</th>
<th>7193-T05 (19.5W)</th>
<th>7193-T12 (25.8W)</th>
<th>7193-T15 (27W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage ( V_{o_{\text{min}}} - V_{o_{\text{max}}} )</td>
<td>+3.2 +3.3 +3.4</td>
<td>+3.2 +3.3 +3.4</td>
<td>+3.2 +3.3 +3.4</td>
<td>+3.2 +3.3 +3.4</td>
<td>+3.2 +3.3 +3.4</td>
<td>+3.2 +3.3 +3.4</td>
</tr>
<tr>
<td>Output current ( I_{o_{\text{max}}} )</td>
<td>±80mA — ±2A</td>
<td>±80mA — ±2A</td>
<td>±80mA — ±2A</td>
<td>±80mA — ±2A</td>
<td>±80mA — ±2A</td>
<td>±80mA — ±2A</td>
</tr>
<tr>
<td>Efficiency ( P_{\text{out}} )</td>
<td>66% 69% —</td>
<td>66% 69% —</td>
<td>66% 69% —</td>
<td>66% 69% —</td>
<td>66% 69% —</td>
<td>66% 69% —</td>
</tr>
<tr>
<td>Line regulation ( V_{o_{\text{min}}} - V_{o_{\text{max}}} )</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
</tr>
<tr>
<td>Load regulation ( P_{\text{out}} = 10% ) to FL.</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
<td>±3mV ±15mV</td>
</tr>
<tr>
<td>Output ripple F.L. BW 2 MHz ( mV_{pp} )</td>
<td>30 65 —</td>
<td>30 65 —</td>
<td>30 65 —</td>
<td>30 65 —</td>
<td>30 65 —</td>
<td>30 65 —</td>
</tr>
</tbody>
</table>

**Notes:**

- **100 K+™, +85°C military/aerospace**
- **100 K+™, +125°C military/aerospace**
- **RE** 100 K+™, +125°C military/aerospace
- **SE** 100 K+™, +125°C space
- **R** 100 K+™, +85°C military/aerospace
- **S** 100 K+™, +85°C space
- **LE** 45 K, +85°C military/aerospace
- **L** 45 K, +85°C military/aerospace

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