

19.5-40 Watt Hybrid

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 filter 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 EU, L, R & S:

Full Power Output at T_{case} = +85°C

Linearly derates to zero at T_{case} = +115°C

Grades LE, RE & SE:

Full Power Output at T_{case} = +125°C

Linearly derates to zero at T_{case} = +135°C

Grades L & LE:

TID up to 45kRad(Si)

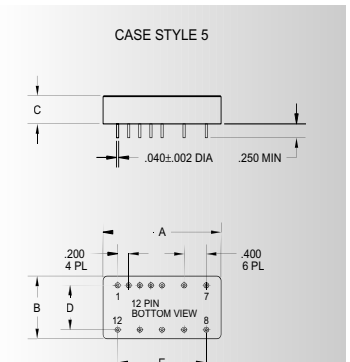
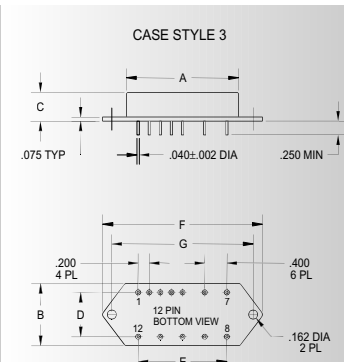
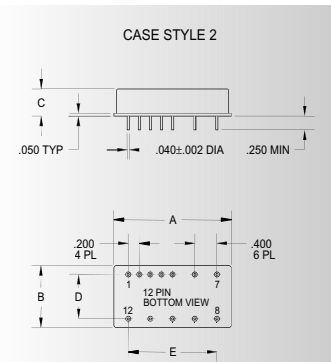
No SEE up to 60MeV*cm²/mg

WEIGHT: 90 grams typical

| SINGLE OUTPUT DEVICES | | 8193-S03.3 (26.4W) | | | 8193-S05 (40W) | | | 8193-S05.2 (40W) | | | 8193-S12 (40W) | | |
|-----------------------|--|--------------------|------|------|----------------|------|------|------------------|------|-------|----------------|-------|-------|
| PARAMETER | CONDITION | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX |
| Output voltage | — | +3.2 | +3.3 | +3.4 | +4.9 | +5.0 | +5.1 | +5.1 | +5.2 | +5.3 | +11.9 | +12.0 | +12.1 |
| Output current | V _{in min} — V _{in max} | — | — | 8A | — | — | 8A | — | — | 7.69A | — | — | 3.33A |
| Efficiency | P _{out} = max rated load | 66% | 69% | — | 71% | 74% | — | 71% | 74% | — | 78% | 82% | — |
| Line regulation | P _{out} = max rated load V _{in min} — V _{in max} | — | 10mV | 30mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 20mV | 100mV |
| Load regulation | P _{out} = 10% to F.L. | — | 10mV | 30mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 20mV | 100mV |
| Output ripple | F.L. BW 2 MHz mV _{pp} | — | 30 | 65 | — | 40 | 85 | — | 40 | 85 | — | 60 | 150 |

| SINGLE OUTPUT DEVICES | | 8193-S15 (40W) | | | 8193-S28 (40W) | | | | | | | | |
|-----------------------|--|----------------|-------|-------|----------------|-------|-------|--|--|--|--|--|--|
| PARAMETER | CONDITION | MIN | TYP | MAX | MIN | TYP | MAX | | | | | | |
| Output voltage | — | +14.9 | +15.0 | +15.1 | +27.8 | +28.0 | +28.2 | | | | | | |
| Output current | V _{in min} — V _{in max} | — | — | 2.67A | — | — | 1.43A | | | | | | |
| Efficiency | P _{out} = max rated load | 79% | 83% | — | 78% | 82% | — | | | | | | |
| Line regulation | P _{out} = max rated load V _{in min} — V _{in max} | — | 25mV | 125mV | — | 50mV | 250mV | | | | | | |
| Load regulation | P _{out} = 10% to F.L. | — | 25mV | 125mV | — | 50mV | 250mV | | | | | | |
| Output ripple | F.L. BW 2 MHz mV _{pp} | — | 75 | 180 | — | 150 | 350 | | | | | | |

| Model No. | Case Style | Pin Count | Mounting |
|-----------|------------|-----------|---|
| 8193 | 2 | 12 | Solder Sealed Flangeless PCB Mount |
| 8193 | F | 12 | Solder Sealed PCB Mount with Flange |
| 8193 | J | 12 | Seam Weld Flangeless PCB Mount |
| 8193 | JF | 12 | Seam Weld PCB Mount with Flange |
| 8193 | XF | 8 | Seam Weld Chassis Mount with Flange |
| 8193 | PC | 10 | Solder Sealed Flangeless PCB Stud Mount |



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

Case Dimensions

Units: inches | millimeters

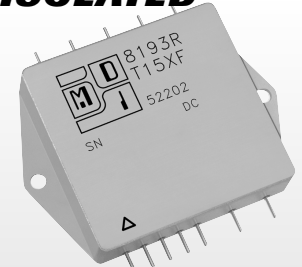
| Case Style | A | B | C | D | E | F | G |
|------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 2 | 2.205 56.007 | 1.755 44.577 | 0.495 12.573 | 1.400 35.560 | 1.600 40.640 | — — | — — |
| 3 F | 2.205 56.007 | 1.755 44.577 | 0.495 12.573 | 1.400 35.560 | 1.600 40.640 | 2.960 75.184 | 2.610 66.294 |
| 5 J | 2.205 56.007 | 1.755 44.577 | 0.495 12.573 | 1.400 35.560 | 1.600 40.640 | — — | — — |
| 6 JF | 2.220 56.388 | 1.760 44.704 | 0.495 12.573 | 1.400 35.560 | 1.600 40.640 | 2.960 75.184 | 2.610 66.294 |
| 8 XF | 2.220 56.388 | 2.110 53.594 | 0.495 12.573 | — — | 1.600 40.640 | 2.960 75.184 | 2.610 66.294 |
| 10 PC | 2.220 56.388 | 1.760 44.704 | 0.495 12.573 | 1.400 35.560 | 1.600 40.640 | — — | — — |

DC-DC CONVERTERS

PROTON RAD HARD 100K+™ SERIES

8193

MAGNETICALLY ISOLATED



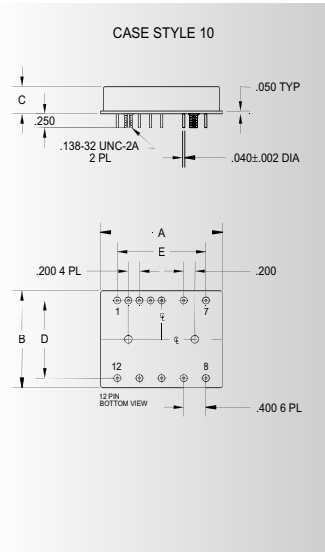
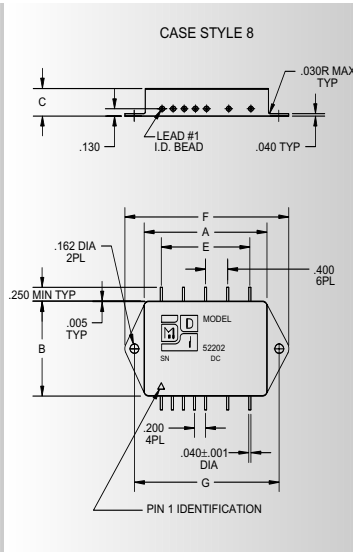
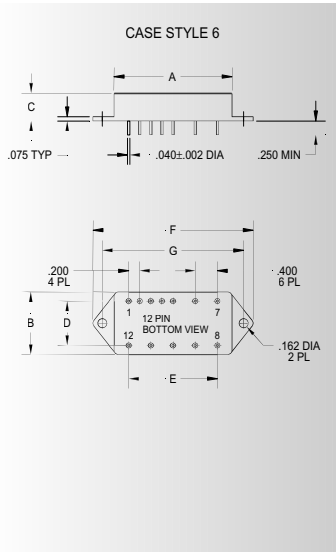
70 VDC

0006

| DUAL OUTPUT DEVICES | | 8193-D05 (40W) | | | 8193-D12 (40W) | | | 8193-D15 (40W) | | |
|---------------------|--|----------------|-------|-------|----------------|-------|--------|----------------|-------|--------|
| PARAMETER | CONDITION | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX |
| Output voltage | $+I_{out} = -I_{out}$ | +4.9 | +5.0 | +5.1 | +11.9 | +12.0 | +12.1 | +14.9 | +15.0 | +15.1 |
| | | -4.9 | -5.0 | -5.1 | -11.9 | -12.0 | -12.1 | -14.9 | -15.0 | -15.1 |
| Output current* | $V_{in min} - V_{in max}$ | ±150mA | — | ±4A | ±95mA | — | ±1.67A | ±76mA | — | ±1.33A |
| Efficiency | $P_{out} = \text{max rated load}$ | 73% | 76% | — | 78% | 82% | — | 79% | 83% | — |
| Line regulation | $P_{out} = \text{max rated load}$ $V_{in min} - V_{in max}$ | — | ±10mV | ±50mV | — | ±20mV | ±100mV | — | ±25mV | ±125mV |
| Load regulation† | $P_{out} = 10\%$ to F.L. | — | ±10mV | ±50mV | — | ±20mV | ±100mV | — | ±25mV | ±125mV |
| Output ripple | F.L. BW 2 MHz mV _{pp} | — | 40 | 85 | — | 60 | 150 | — | 75 | 180 |

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

| TRIPLE OUTPUT DEVICES | | 8193-T3.3/5 (17.5W) | | | 8193-T3.3/12 (24W) | | | 8193-T3.3/15 (25.2W) | | | 8193-T05 (19.5W) | | | 8193-T12 (25.8W) | | | 8193-T15 (27W) | | | | | |
|-----------------------|--|---------------------|------|--------|--------------------|-------|--------|----------------------|-------|--------|------------------|------|--------|------------------|-------|--------|----------------|-------|--------|-------|-------|--------|
| PARAMETER | CONDITION | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | | | |
| Output voltage | $+I_{out} = -I_{out}$ | +3.2 | +3.3 | +3.4 | +3.2 | +3.3 | +3.4 | +3.2 | +3.3 | +3.4 | +4.9 | +5.0 | +5.1 | +4.9 | +5.0 | +5.1 | +11.9 | +12.0 | +12.1 | +14.9 | +15.0 | +15.1 |
| | | -4.9 | -5.0 | -5.1 | -11.9 | -12.0 | -12.1 | -14.9 | -15.0 | -15.1 | -4.9 | -5.0 | -5.1 | -11.9 | -12.0 | -12.1 | -14.9 | -15.0 | -15.1 | -14.9 | -15.0 | -15.1 |
| Output current | $V_{in min} - V_{in max}$ | 400mA | — | 4A | 400mA | — | 4A | 400mA | — | 4A | 300mA | — | 3A | 300mA | — | 3A | 300mA | — | 3A | 300mA | — | 3A |
| | | ±40mA | — | ±450mA | ±40mA | — | ±450mA | ±32mA | — | ±400mA | ±40mA | — | ±450mA | ±40mA | — | ±450mA | ±32mA | — | ±400mA | ±32mA | — | ±400mA |
| Efficiency | $P_{out} = \text{max rated load}$ | 66% | 69% | — | 66% | 69% | — | 66% | 69% | — | 66% | 69% | — | 71% | 74% | — | 71% | 74% | — | 71% | 74% | — |
| Line regulation | $P_{out} = \text{max rated load}$ $V_{in min} - V_{in max}$ | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV |
| | | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV |
| Load regulation | $P_{out} = 10\%$ to F.L. | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV | — | 10mV | 50mV |
| | | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV | — | 25mV | 50mV |
| Output ripple | F.L. BW 2 MHz mV _{pp} | — | 30 | 65 | — | 30 | 65 | — | 30 | 65 | — | 40 | 85 | — | 40 | 85 | — | 40 | 85 | — | 40 | 85 |
| | | — | — | 50 | — | — | 50 | — | — | 50 | — | — | 50 | — | — | 50 | — | — | 50 | — | — | 50 |



8193-SXX output <24 VDC

| | | | |
|-------|-------------|--------|-----------------|
| Pin 1 | bit | Pin 7 | + input |
| Pin 2 | inhibit not | Pin 8 | main output |
| Pin 3 | soft start | Pin 9 | main output ret |
| Pin 4 | sync | Pin 10 | + remote sense |
| Pin 5 | N/C | Pin 11 | adjust |
| Pin 6 | input ret | Pin 12 | - remote sense |

8193-SXX output ≥24 VDC

| | | | |
|-------|-------------|--------|-----------------|
| Pin 1 | bit | Pin 7 | + input |
| Pin 2 | inhibit not | Pin 8 | + remote sense |
| Pin 3 | soft start | Pin 9 | - remote sense |
| Pin 4 | sync | Pin 10 | main output |
| Pin 5 | adjust | Pin 11 | N/C |
| Pin 6 | input ret | Pin 12 | main output ret |

8193-DXX

| | | | |
|-------|-------------|--------|-----------------|
| Pin 1 | bit | Pin 7 | + input |
| Pin 2 | inhibit not | Pin 8 | + remote sense |
| Pin 3 | soft start | Pin 9 | - remote sense |
| Pin 4 | sync | Pin 10 | + dual output |
| Pin 5 | adjust | Pin 11 | dual output ret |
| Pin 6 | input ret | Pin 12 | - dual output |

8193-TXX

| | | | |
|-------|-------------|--------|-----------------|
| Pin 1 | bit | Pin 7 | + input |
| Pin 2 | inhibit not | Pin 8 | main output |
| Pin 3 | soft start | Pin 9 | main output ret |
| Pin 4 | sync | Pin 10 | + dual output |
| Pin 5 | N/C | Pin 11 | dual output ret |
| Pin 6 | input ret | Pin 12 | - dual output |

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

EU Engineering Units
R 100 K+™, +85°C military/aerospace
L 45 K, +85°C military/aerospace

RE 100 K+™, +125°C military/aerospace
S 100 K+™, +85°C space
LE 45 K, 125°C military/aerospace

SE 100 K+™, +125°C space

Revised 2019-09-17