

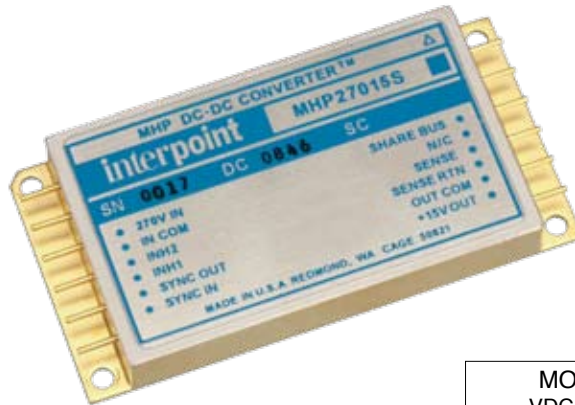
MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

FEATURES

Parallel operation with current share, up to 5 units (up to 276 watts)

- Operating range -55° to +100°C
- Input voltage 160 to 400 VDC
- Transient protection 450 V for 50 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Remote sense on single models
- Inhibit primary side and secondary side
- Sync In and Sync Out
- Indefinite short circuit protection
- High power density, up to 85% efficiency



MODELS VDC OUTPUT

| SINGLE | DUAL |
|--------|------|
| 5 | ±5 |
| 12 | ±12 |
| 15 | ±15 |
| 28 | |

DESCRIPTION

The MHP270 Series™ DC/DC converters provide up to 65 watts of output power over -55°C to +100°C temperature range. MHP270 models operate from a MIL-STD-704 nominal 270-volt DC power bus with 160 to 400 VDC continuous operation with surges to 450 volts. Isolated outputs include 5, 12, 15, and 28 VDC singles and ±5, ±12 and ±15 VDC duals. Parallel operation for all loading conditions is supported without any requirement for external components. The converters are available with standard screening or “ES” screening

MHP270 DC/DC converters are constant frequency, pulse width modulated switching power supplies which use a quasi-square wave, two-switch single-ended forward converter design. Tight load regulation is achieved through a wide-bandwidth magnetic feedback circuit.

Up to five single output MHP270 converters may be used in parallel to power a single load by simply connecting the share pins of all units. Units in this configuration have an 85% current sharing accuracy over 35% load to full load conditions.

MHP270 Series of converters feature a flexible synchronization scheme in which units may be synchronized to an external clock or to one another by using Sync In and Sync Out pins provided on each unit. MHP270 converters have a nominal switching frequency of 525 kHz, but may be synchronized at any frequency from 475 to 575 kHz.

MHP270 converters meet a wide variety of military/aerospace performance and environmental specifications. Their continuous operation input voltage (160 to 400) meets the normal operating

limits of MIL-STD-704. The unit shuts down above approximately 425 volts, but it is rated to withstand a surge of up to 450 volts for 50 milliseconds. The units are built as fully hermetic thick film hybrids in our MIL-PRF-38534 certified facilities.

FEATURES

Undervoltage lock-out – shuts down when the input line voltage falls below approximately 120 VDC to provide smooth initialization.

Continuous short circuit protection – current limit set at approximately 125%.

Soft-start – controlled start-up at turn-on, release from inhibit and recovery from load fault conditions.

Remote sense – Sense lines increase the output voltage to compensate for IR drops in traces and wires. The voltage compensation can be up to a maximum of 10% of nominal output voltage to maintain tightly regulated voltage at the load.

OUTPUT VOLTAGE OPTIONS

The MHP270 Series converters are capable of providing other output voltage options in addition to those characterized on this datasheet. Contact your sales representative to discuss other output voltage options, www.cranee.com/interpoint/contacts.

US PATENTS

Interpoint converters may use one or more of the following US patents 5,521,807, 5,694,303, and 5,631,822.

MHP270 Single and Dual DC/DC Converters

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OPERATING CONDITIONS AND CHARACTERISTICS

Input Voltage Range

- 160 to 400 VDC continuous
- 450 VDC for 50 msec transient

Output Power

- 50 to 65 watts depending on model

Lead Soldering Temperature (10 sec)

- 300°C

Storage Temperature Range (Tc)

- -65°C to +150°C

Case Operating Temperature (Tc)

- -55 to +100°C full power

Output Voltage Temperature Coefficient

- 100 ppm/°C typical

Current Limit

- 125% of full load typical

Isolation

- 100 megohm minimum at 500 V

Conversion Frequency

- Free run mode 525 kHz typical
 - 475 kHz. min., 575 kHz max
- External sync range: 475 to 575 kHz

Low Line Drop Out

- Vout drops 1% of nominal
- Input voltage 155 VDC max

Undervoltage Lockout

- Input voltage 110 VDC min

SYNC AND INHIBIT

Sync

- Sync In
 - Input frequency 475 to 575 kHz.
 - Duty cycle 40% min, 60% max
 - Active low 0.8 V max
 - Active high 4.5 V min, 10 V max
 - Referenced to input common

Sync Out

- Referenced to input common

Inhibit (INH1, INH2)

- In Share (parallel mode) use a common inhibit signal for all converters
- Active low (output disabled)
 - INH1 referenced to input common
 - Active low 0.8 V max
 - Inhibit pin will source 15 mA max
 - INH2 referenced to output common
 - Active low 0.2 V max
 - Inhibit pin will source 15 mA max
- Active high (output enabled)
 - Open collector
 - Open pin voltage: INH1 = 12V typ, INH2 = 5 V typ

MECHANICAL AND ENVIRONMENTAL

Size (maximum)

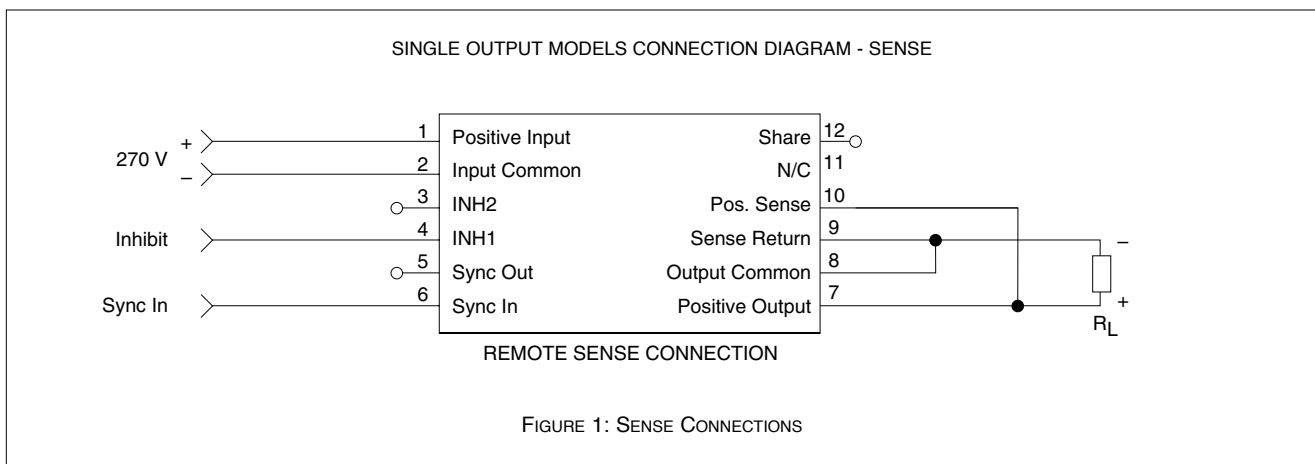
- 3.005 x 1.505 x 0.400 inches (76.33 x 38.23 x 10.16 mm)
- See case U for dimensions.

Weight (maximum)

- 86 grams max

Screening

- Standard or ES. See Screening Table 1 for more information.



MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

| PIN OUT | | |
|---------|------------------|------------------|
| Pin | Single Output | Dual Output |
| 1 | Positive Input | Positive Input |
| 2 | Input Common | Input Common |
| 3 | Inhibit 2 (INH2) | Inhibit 2 (INH2) |
| 4 | Inhibit 1 (INH1) | Inhibit 1 (INH1) |
| 5 | Sync Out | Sync Out |
| 6 | Sync In | Sync In |
| 7 | Positive Output | Positive Output |
| 8 | Output Common | Output Common |
| 9 | Sense Return | Negative Output |
| 10 | Positive Sense | No connection |
| 11 | No connection | No connection |
| 12 | Share | Share |

| PINS NOT IN USE | |
|-----------------------------|--|
| Inhibit (INH1, INH2) | Leave unconnected |
| Sync Out | Leave unconnected |
| Sync In | Connect to input common |
| Share | Leave unconnected |
| Sense Lines | Must be connected to appropriate outputs |

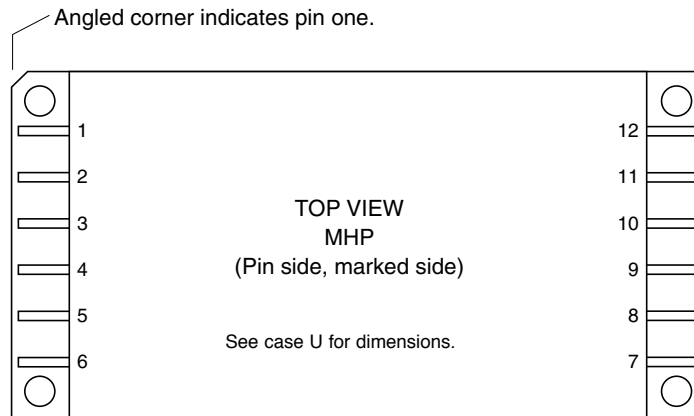
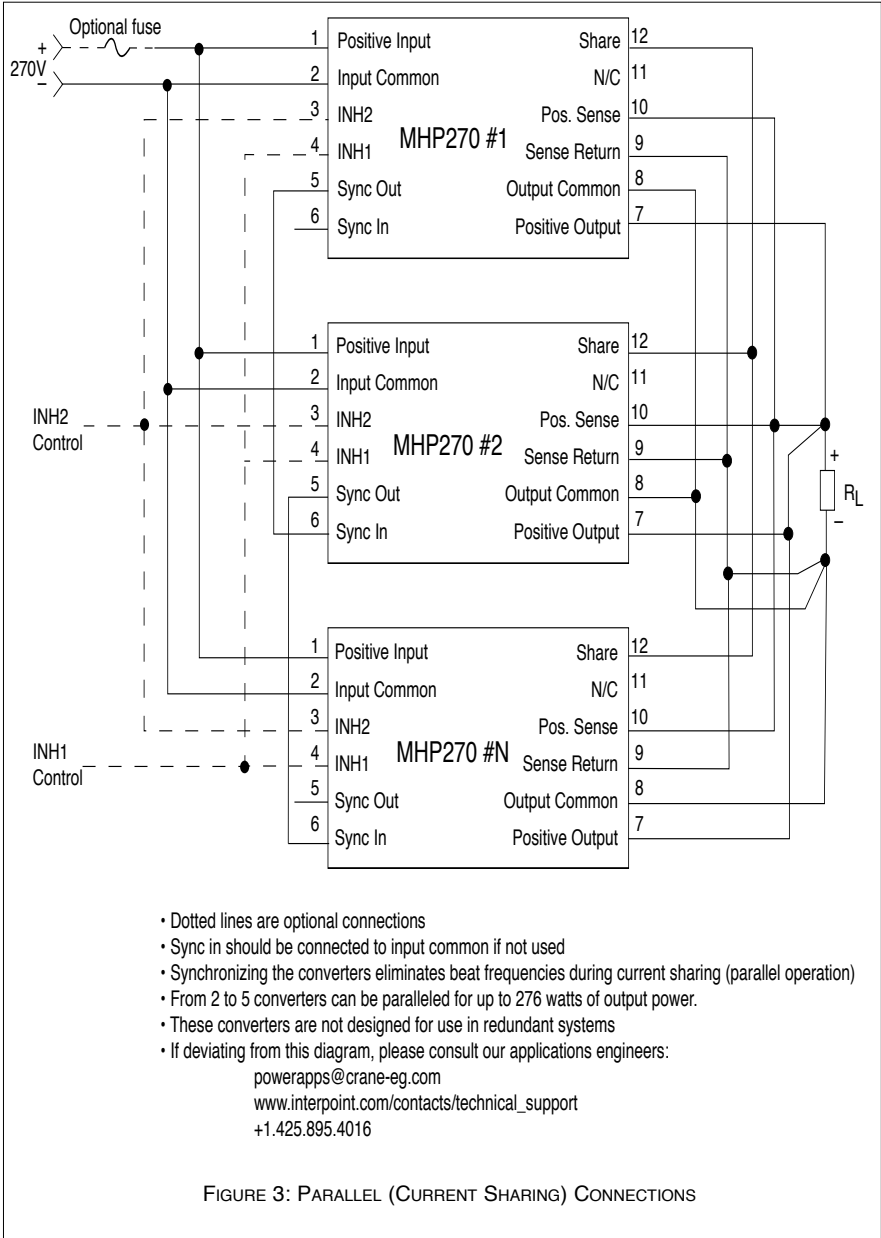


FIGURE 2: PIN OUT

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

SINGLE OUTPUT MODELS CONNECTION DIAGRAM - PARALLEL



MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

| SINGLE OUTPUT MODELS | | MHP27005S | | | MHP27012S | | | UNITS |
|------------------------------|------------------------------------|-----------|------|------|-----------|-------|-------|--------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | VDC |
| OUTPUT CURRENT | V _{IN} = 160 TO 400 VDC | 0 | — | 10 | 0 | — | 5 | A |
| OUTPUT POWER | V _{IN} = 160 TO 400 VDC | 0 | — | 50 | 0 | — | 60 | W |
| OUTPUT RIPPLE | 10 kHz - 2 MHz | — | — | 50 | — | — | 80 | mV p-p |
| LINE REGULATION ² | V _{IN} = 160 TO 400 VDC | — | — | 50 | — | — | 120 | mV |
| LOAD REGULATION ² | NO LOAD TO FULL | — | — | 50 | — | — | 120 | mV |
| INPUT VOLTAGE | CONTINUOUS | 160 | 270 | 400 | 160 | 270 | 400 | VDC |
| | TRANSIENT 50 msec. ^{1, 3} | — | — | 450 | — | — | 450 | V |
| INPUT CURRENT | NO LOAD | — | — | 20 | — | — | 20 | mA |
| | INHIBITED–INH1 | — | — | 8 | — | — | 8 | |
| | INHIBITED–INH2 | — | — | 15 | — | — | 15 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | — | 60 | — | — | 60 | mA p-p |
| EFFICIENCY | | 76 | — | — | 81 | — | — | % |
| LOAD FAULT | POWER DISSIPATION SHORT CIRCUIT | — | — | 30 | — | — | 35 | W |
| STEP LOAD RESPONSE | 50% - 100% - 50% TRANSIENT | — | — | 300 | — | — | 700 | mV pk |
| | RECOVERY ⁴ | — | — | 300 | — | — | 500 | μs |
| CAPACITIVE LOAD ¹ | NO EFFECT ON DC PERFORMANCE | — | — | 1000 | — | — | 500 | μF |

Notes

1. **Guaranteed by design, not tested.**

2. Load and line transition time > 10 μs

3. Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.

4. Recovery time is measured from application of the transient to point the point at which Vout is within 1% of final value.

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

| SINGLE OUTPUT MODELS | | MHP27015S | | | MHP27028S | | | UNITS |
|------------------------------|------------------------------------|-----------|-------|-------|-----------|-------|-------|--------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | | 14.85 | 15.00 | 15.15 | 27.72 | 28.00 | 28.28 | VDC |
| OUTPUT CURRENT | V _{IN} = 160 TO 400 VDC | 0 | — | 4.33 | 0 | — | 2.32 | A |
| OUTPUT POWER | V _{IN} = 160 TO 400 VDC | 0 | — | 65 | 0 | — | 65 | W |
| OUTPUT RIPPLE | 10 kHz - 2 MHz | — | — | 90 | — | — | 280 | mV p-p |
| LINE REGULATION ² | V _{IN} = 160 TO 400 VDC | — | — | 150 | — | — | 280 | mV |
| LOAD REGULATION ² | NO LOAD TO FULL | — | — | 150 | — | — | 280 | mV |
| INPUT VOLTAGE | CONTINUOUS | 160 | 270 | 400 | 160 | 270 | 400 | VDC |
| | TRANSIENT 50 msec. ^{1, 3} | — | — | 450 | — | — | 450 | V |
| INPUT CURRENT | NO LOAD | — | — | 20 | — | — | 20 | mA |
| | INHIBITED–INH1 | — | — | 7 | — | — | 8 | |
| | INHIBITED–INH2 | — | — | 15 | — | — | 15 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | — | 65 | — | — | 70 | mA p-p |
| EFFICIENCY | | 80 | — | — | 80 | — | — | % |
| LOAD FAULT | POWER DISSIPATION SHORT CIRCUIT | — | — | 45 | — | — | 45 | W |
| STEP LOAD RESPONSE | 50% - 100% - 50% TRANSIENT | — | — | 700 | — | — | 1800 | mV pk |
| | RECOVERY ⁴ | — | — | 300 | — | — | 1000 | μs |
| CAPACITIVE LOAD ¹ | NO EFFECT ON DC PERFORMANCE | — | — | 500 | — | — | 500 | μF |

Notes

1. **Guaranteed by design, not tested.**

2. Load and line transition time > 10 μs

3. Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.

4. Recovery time is measured from application of the transient to point the point at which Vout is within 1% of final value.

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

| DUAL OUTPUT MODELS ² | | MHP27005D | | | MHP27012D | | | MHP27015D | | | UNITS |
|---|---|-----------|------|------------------|-----------|-------|------------------|-----------|-------|-------------------|--------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | +V _{OUT} | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | VDC |
| | -V _{OUT} | 4.92 | 5.00 | 5.08 | 11.82 | 12.00 | 12.18 | 14.77 | 15.00 | 15.23 | |
| OUTPUT CURRENT ³ V _{IN} = 160 TO 400 VDC | EACH OUTPUT | — | ±5 | 8.0 ¹ | — | ±2.5 | 4.0 ¹ | — | ±2.17 | 3.46 ¹ | A |
| | TOTAL | — | — | 10 | — | — | 5 | — | — | 4.33 | |
| OUTPUT POWER ³ V _{IN} = 160 TO 400 VDC | EACH OUTPUT | — | — | 40 ¹ | — | — | 48 ¹ | — | — | 52 ¹ | W |
| | TOTAL | — | — | 50 | — | — | 60 | — | — | 65 | |
| OUTPUT RIPPLE ±V _{OUT} | 10 kHz - 2 MHz | — | 50 | 100 | — | 50 | 125 | — | 50 | 125 | mV p-p |
| LINE REGULATION ⁴ ±V _{OUT} | V _{IN} = 160 TO 400 VDC | — | — | 100 | — | — | 120 | — | — | 150 | mV |
| LOAD REGULATION ^{4, 5} ±V _{OUT} | NO LOAD TO FULL | — | — | 100 | — | — | 120 | — | — | 150 | mV |
| CROSS REGULATION ⁶ | EFFECT ON -V _{OUT} | — | — | 1000 | — | — | 800 | — | — | 750 | mV |
| INPUT VOLTAGE | CONTINUOUS | 160 | 270 | 400 | 160 | 270 | 400 | 160 | 270 | 400 | VDC |
| | TRANSIENT 50 msec. ^{1, 7} | 0 | — | 450 | 0 | — | 450 | 0 | — | 450 | V |
| INPUT CURRENT | NO LOAD | — | — | 20 | — | — | 20 | — | — | 20 | mA |
| | INHIBITED-INH1 | — | — | 8 | — | — | 8 | — | — | 8 | |
| | INHIBITED-INH2 | — | — | 15 | — | — | 15 | — | — | 15 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | — | 60 | — | — | 60 | — | — | 65 | mA p-p |
| EFFICIENCY | BALANCED LOAD | 74 | — | — | 81 | — | — | 82 | — | — | % |
| LOAD FAULT | POWER DISSIPATION SHORT CIRCUIT | — | — | 30 | — | — | 35 | — | — | 45 | W |
| STEP LOAD RESPONSE ±V _{OUT} | 50% - 100% - 50% ⁸ TRANSIENT | — | — | 300 | — | — | 900 | — | — | 900 | mV pk |
| | RECOVERY ⁹ | — | — | 300 | — | — | 300 | — | — | 300 | μs |
| CAPACITIVE LOAD ¹ | NO EFFECT ON DC PERFORMANCE | — | — | — | — | — | 500 | — | — | 500 | μF |

Notes

1. **Guaranteed by design, not tested.**

2. Share operation not characterized for dual outputs.

3. Up to 80% of the total output power is available from either output provided that the opposite output is simultaneously carrying 20% of the total output power.

4. Load and line transition time > 10 μs

5. Assumes balanced loads on the outputs.

6. Effect on the negative output from 50%/50% loads to 70%/30% or 30%/70% loads.

7. Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.

8. Second output at 50%

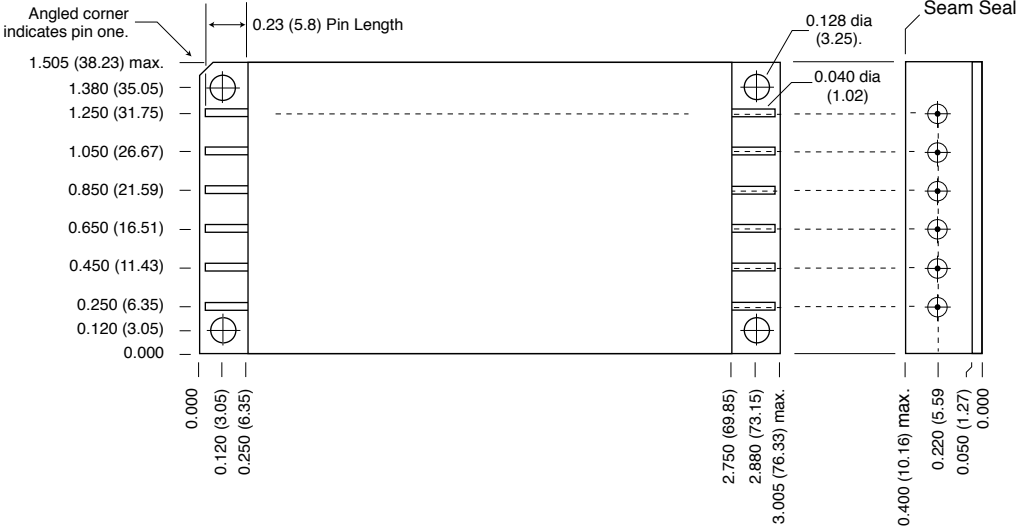
9. Recovery time is measured from application of the transient to point at which V_{out} is within 1% of final value.

MHP270 Single and Dual DC/DC Converter Cases

270 VOLT INPUT – 65 WATT

TOP VIEW CASE U* Flanged case, short-leaded

*Does not require designator in Case Option position of model number.



Case dimensions in inches (mm)
Tolerance ± 0.005 (0.13) for three decimal places
 ± 0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials
Header Cold Rolled Steel/Nickel/Gold
Cover Kovar/Nickel
Pins #52 alloy/Gold, compression glass seal
Seal Hole: 0.100 \pm 0.002 (2.54 \pm 0.05)

Case U, Rev F, 20100503

FIGURE 4: CASE U

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

STANDARD AND /ES (NON-QML) ENVIRONMENTAL SCREENING ^{1, 2}

| TEST PERFORMED | NON-QML | |
|--|----------|-----|
| | STANDARD | /ES |
| Pre-cap Inspection Method 2017, 2032 | ■ | ■ |
| Temperature Cycle (10 times) Method 1010, Cond. B, -55°C to +125°C, ambient | | ■ |
| Constant Acceleration Method 2001, 500 g | | ■ |
| Burn-in Method 1015 ³ 96 hours | | ■ |
| Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case | ■ | ■ |
| Hermeticity Test Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip (1 x 10 ⁻³) | ■ | ■ |
| Final visual inspection Method 2009 | ■ | ■ |

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes:

1. "Non-QML" Refers to products that do not offer QML screening.
2. Standard and /ES, non-QML products, may not meet all of the requirements of MIL-PRF-38534.
3. Burn-in designed to bring the case temperature to the maximum case temperature of the product. Refer to the specific product information for the maximum case temperature.

SCREENING TABLE 1: ENVIRONMENTAL SCREENING