**FEATURES**

- **–55° to +125°C operation**
- **16 to 50 VDC input**
- Fully Isolated
- Optocoupler feedback
- Fixed switching frequency 600 kHz typical,
- Topology – Dual Single Ended Flybacks
- 80 V / 120 ms transient protection (12 Vout single and dual to 75 V, 15 Vout single and dual to 60V)
- Inhibit and sync functions
- Trim on single output models
- Up to 84% efficiency
- Low output noise

# DC/DC CONVERTERS 28 VOLT INPUT

# MHV SERIES 15 WATT


| MODELS | | |
|---|---|---|
| VDC OUTPUT | | |
| SINGLE | DUAL | TRIPLE |
| 3.3 | ±5 | +5 & ±12 |
| 5 | ±12 | +5 & ±15 |
| 12 | ±15 | |
| 15 | | |

Size (max.): Non flanged Single and dual output models, case H2, 2.125 x 1.125 x 0.400 inches (53.98 x 28.58 x 10.16 mm)
Triple output models, case F1, 1.950 x 1.350 x 0.405 inches (49.53 x 34.29 x 10.29 mm)
Flanged Single and dual output models, case K3, 2.910 x 1.125 x 0.400 inches (73.91 x 28.58 x 10.16 mm)
Triple output models, case J1, 2.720 x 1.350 x 0.405 inches (69.09 x 34.29 x 10.29 mm)
See Section B8, cases H2, F1, K3, and J1 for dimensions.
Weight: 60 grams maximum.
Screening: Standard, ES, or 883 (Class H). See Section C2 for screening options, see Section A5 for ordering information.

## DESCRIPTION

Interpoint's MHV Series™ of DC/DC converters offer a wide input voltage range of 16 to 50 VDC and a choice of nine different output voltage configurations comprised of single, dual or triple outputs. The converters will withstand transients of up to 80 V for up to 120 milliseconds while maintaining output voltages (with the exception of the 12 volt single and dual outputs which will withstand transients up to 75 volts and the 15 volt single and dual outputs which will withstand up to 60 volts). The MHV Series operates at a full 15 watts of output power (10 watts for the 3.3 volt single output) over the military temperature range of –55°C to +125°C while maintaining low input and output noise.

### CONVERTER DESIGN

MHV Series DC/DC converters are switching regulators that use continuous flyback conversion topology with a clock frequency of approximately 600 kHz. MHV Series converters incorporate two internal converters with one converter phase shifted 180° from the other to create a dual phase/phase-shifted operation. Each of the internal converters operates at approximately one-half of the clock frequency. This proprietary technology eliminates cross regulation, minimizes input ripple, greatly reduces output ripple and improves efficiency. On the triple output models, this design provides completely independent regulation with no cross regulation effect between the main and auxiliary outputs and no minimum loading required on the main output.

### INHIBIT FUNCTION

Open collector TTL levels control the inhibit circuit. The converter is enabled when the inhibit terminal is left unconnected or when the inhibit terminal is connected to a voltage between 11.5 and 50 V.

When a low (0.8 V) is applied to the inhibit terminal the converter shuts down, typically drawing 8.4 mA of input current. Inhibit terminal resistance is 3.3 k ohms and draws 8.4 mA, typical.

### SYNCHRONIZATION FUNCTION

Applying an external signal of 40% to 60% duty cycle and 500 to 700 kHz will synchronize the converter to your system requirements. Free run clock frequency is approximately 600 kHz. If not used, the sync terminal must be left unconnected.

### TRIM

Single output converters feature a trim range of as low as 80% to as high as 110% of Vout nominal, depending on the model. To trim up, connect a resistor from output common (pin 4) to the trim terminal (pin 3). To trim down, connect a resistor from the positive output (pin 5) to the trim terminal (pin 3). See Figure 4 and trim tables for more information.

### UNDERVOLTAGE LOCKOUT

An undervoltage lockout of approximately 7 VDC keeps system current levels low during startup.

### SHORT CIRCUIT PROTECTION

Under short circuit conditions of 130% or more of full load current, the converter will protect itself by shutting down. Short circuit duration should be brief because power dissipation may cause internal temperatures to rise rapidly. Restart is automatic upon removal of the short circuit.

# MHV SERIES
# 15 WATT

# DC/DC CONVERTERS

### ABSOLUTE MAXIMUM RATINGS

**Input Voltage**
- 16 to 50 VDC

**Output Power**
- 15 watts (10 watts MHV283R3S)

**Lead Soldering Temperature (10 sec per lead)**
- 300°C

**Storage Temperature Range (Case)**
- –65°C to +150°C

### RECOMMENDED OPERATING CONDITIONS

**Input Voltage Range**
- 16 to 50 VDC continuous
- Transient: see Electrical Characteristics tables

**Case Operating Temperature (Tc)**
- –55°C to +125°C full power
- –55°C to +130°C absolute

**Derating Output Power/Current**
- Linearly from 100% at 125°C to 0% at 130°C

### SYNC AND INHIBIT

**Sync In (500 to 700 kHz)**
- Duty cycle 40% min, 60% max
- Logic low 0.8 V max
- Logic high 4.5 V min, 10 V max
- Referenced to input common
- If not used, leave unconnected

**Inhibit TTL Open Collector**
- Logic low (output disabled)
  Logic low voltage ≤0.8 V
  Inhibit pin current
  8.4 mA typical, 10 mA maximum
- Referenced to input common
- Logic high (output enabled)
  Open collector
  Unconnected or 11.5 to 50 V

### TYPICAL CHARACTERISTICS

**Output Voltage Temperature Coefficient**
- 100 ppm/°C typical

**Undervoltage Lockout**
- 7 V input typical

**Current Limit**
- 130% of full load typical at 25°C

**Isolation**
- 100 megohm minimum at 500 V

**Audio Rejection**
- 30 dB typical

**Conversion (Switching) Frequency**
- Free run mode 300 kHz
  typical 245 kHz. min, 355 kHz. max

**Clock Frequency**
- External sync range 500 to 700 kHz.

**Inhibit Pin Voltage (unit enabled)**
- 11 V typical

**Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.**

| SINGLE OUTPUT MODELS | | MHV283R3S | | | MHV2805S | | | MHV2812S | | | MHV2815S | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | UNITS |
| OUTPUT VOLTAGE | | 3.27 | 3.30 | 3.33 | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | VDC |
| OUTPUT CURRENT | $V_{IN}$ = 16 to 50 VDC | 0 | — | 3.03 | 0 | — | 3.0 | 0 | — | 1.25 | 0 | — | 1.0 | A |
| OUTPUT POWER | $V_{IN}$ = 16 to 50 VDC | 0 | — | 10 | 0 | — | 15 | 0 | — | 15 | 0 | — | 15 | W |
| OUTPUT RIPPLE VOLTAGE | 10 kHz - 2 MHz Tc = –55°C to +125°C | — | 5 | 60 | — | 10 | 60 | — | 7 | 60 | — | 5 | 60 | mV p-p |
| LINE REGULATION | $V_{IN}$ = 16 to 50 VDC | — | 0 | 20 | — | 0 | 20 | — | 0 | 20 | — | 0 | 20 | mV |
| LOAD REGULATION | NO LOAD TO FULL | — | 15 | 45 | — | 15 | 40 | — | 5 | 35 | — | 5 | 40 | mV |
| INPUT VOLTAGE | CONTINUOUS | 16 | 28 | 50 | 16 | 28 | 50 | 16 | 28 | 50 | 16 | 28 | 50 | VDC |
| NO LOAD TO FULL | TRANSIENT 120 ms | — | — | 80 | — | — | 80 | — | — | 75 | — | — | 60 | V |
| INPUT CURRENT | NO LOAD | — | 23 | 45 | — | 29 | 52 | — | 26 | 51 | — | 28 | 57 | mA |
| | FULL LOAD | — | 489 | 518 | — | 687 | 724 | — | 638 | 678 | — | 638 | 687 | mA |
| | INHIBITED | — | 8.4 | 10 | — | 8.4 | 10 | — | 8.4 | 10 | — | 8.4 | 10 | mA |
| INPUT RIPPLE CURRENT[1] | 10 kHz - 20 MHz Tc = –55°C to +125°C | — | 10 | 50 | — | 10 | 50 | — | 10 | 50 | — | 10 | 50 | mA pp |
| EFFICIENCY | | 69 | 73 | — | 74 | 78 | — | 79 | 84 | — | 78 | 84 | — | % |
| LOAD FAULT[2] | POWER DISSIPATION SHORT CIRCUIT[2] | — | — | 9.5 | — | — | 11 | — | — | 11 | — | — | 10.5 | W |
| | RECOVERY | — | — | 20 | — | — | 20 | — | — | 20 | — | — | 20 | ms |
| | OUTPUT CURRENT TRIP POINT | 3.97 | — | — | 3.93 | — | — | 1.64 | — | — | 1.31 | — | — | A |
| STEP LOAD RESPONSE[3] | 50% – 100% – 50% TRANSIENT | — | — | 250 | — | — | 300 | — | — | 300 | — | — | 350 | mV pk |
| | RECOVERY | — | — | 700 | — | — | 1500 | — | — | 900 | — | — | 700 | µs |
| START-UP 0 TO 28 $V_{IN}$ | DELAY | — | 5 | 20 | — | 5 | 20 | — | 5 | 20 | — | 5 | 20 | ms |
| | OVERSHOOT | — | 50 | 100 | — | 0 | 50 | — | 0 | 120 | — | 0 | 150 | mV pk |

Notes
1. Lin = 5.5 µH.
2. Load fault is a short circuit (<50 mΩ). Recovery is into a resistive load.
3. Load step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
4. Input step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.

**Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.**

| DUAL OUTPUT MODELS | | MHV2805D | | | MHV2812D | | | MHV2815D | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITIONS** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **UNITS** |
| OUTPUT VOLTAGE | $+V_{OUT}$ | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | VDC |
| | $-V_{OUT}$ | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | |
| OUTPUT CURRENT | $V_{IN}$ = 16 TO 50 VDC | — | — | ±1.50 | — | — | ±0.625 | — | — | ±0.500 | A |
| OUTPUT POWER[1] | $V_{IN}$ = 16 TO 50 VDC | — | ±7.5 | 15 | — | ±7.5 | 15 | — | ±7.5 | 15 | W |
| OUTPUT RIPPLE VOLTAGE | 10 kHz- 2 MHz Tc = –55°C to +125°C $+V_{OUT}$ / $-V_{OUT}$ | — | 15 | 120 | — | 10 | 60 | — | 20 | 80 | mVp-p |
| LINE REGULATION | $V_{IN}$ = 16 TO 50 VDC ±$V_{OUT}$ | — | 0 | 20 | — | 0 | 20 | — | 0 | 20 | mV |
| LOAD REGULATION | NO LOAD TO FULL ±$V_{OUT}$ | — | 5 | 40 | — | 5 | 40 | — | 5 | 40 | mV |
| INPUT VOLTAGE | CONTINUOUS | 16 | 28 | 50 | 16 | 28 | 50 | 16 | 28 | 50 | VDC |
| NO LOAD TO FULL | TRANSIENT 120 msec | — | — | 80 | — | — | 75 | — | — | 60 | V |
| INPUT CURRENT | NO LOAD | — | 18 | 25 | — | 30 | 40 | — | 35 | 45 | mA |
| | FULL LOAD | — | 670 | 705 | — | 634 | 670 | — | 635 | 670 | |
| | INHIBITED | — | 8.4 | 10 | — | 8.4 | 10 | — | 8.4 | 10 | |
| INPUT RIPPLE CURRENT[2] | 10 kHz - 20 MHz Tc = –55°C to +125°C | — | 10 | 200 | — | 10 | 200 | — | 10 | 200 | mA p-p |
| EFFICIENCY | | 76 | 80 | — | 80 | 85 | — | 80 | 84 | — | % |
| LOAD FAULT[3] | POWER DISSIPATION SHORT CIRCUIT | — | — | 9 | — | — | 10 | — | — | 10 | W |
| | RECOVERY | — | — | 15 | — | — | 25 | — | — | 25 | ms |
| | OUTPUT CURRENT TRIP POINT | 1.97 | — | — | 0.819 | — | — | 0.655 | — | — | A |
| STEP LOAD RESPONSE[4] ± $V_{OUT}$ | 50% – 100% — 50% TRANSIENT | — | — | 200 | — | — | 300 | — | — | 400 | mV pk |
| | RECOVERY | — | — | 500 | — | — | 700 | — | — | 900 | µs |
| START-UP 0 TO 28 $V_{IN}$ | DELAY | — | 5 | 12 | — | 10 | 18 | — | 12 | 20 | ms |
| | OVERSHOOT | — | 0 | 50 | — | 0 | 120 | — | 0 | 150 | mV pk |

Notes
1. Up to 7.5 watts is available from either output.
2. Lin = 2 µH.
3. Load fault is a short circuit (<50 mΩ). Recovery is into a resistive load.
4. Load step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
5. Input step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.

# DC/DC CONVERTERS

**Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.**

| TRIPLE OUTPUT MODELS | | MHV28512T | | | MHV28515T | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITION** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **UNITS** |
| OUTPUT VOLTAGE | MAIN | 4.95 | 5.0 | 5.05 | 4.95 | 5.0 | 5.05 | VDC |
| | + AUXILIARY | 11.88 | 12.0 | 12.12 | 14.85 | 15.0 | 15.15 | |
| | – AUXILIARY | 11.82 | 12.0 | 12.18 | 14.77 | 15.0 | 15.23 | |
| OUTPUT CURRENT[1] | MAIN | 0 | — | 2.0 | 0 | — | 2.0 | A |
| $V_{IN}$ = 16 TO 50 | + AUXILIARY | — | — | 0.333 | — | — | 0.267 | |
| | – AUXILIARY | — | — | 0.333 | — | — | 0.267 | |
| | TOTAL | — | — | 2.416 | — | — | 2.333 | |
| OUTPUT POWER[2] | MAIN | — | — | 10 | — | — | 10 | W |
| $V_{IN}$ = 16 TO 50 | + AUXILIARY | — | — | 4 | — | — | 4 | |
| | – AUXILIARY | — | — | 4 | — | _ | 4 | |
| | TOTAL | — | — | 15 | — | — | 15 | |
| OUTPUT RIPPLE | 10 kHz to 2 MHz MAIN | — | 5 | 30 | — | 10 | 35 | mV p-p |
| VOLTAGE | 10 kHz to 2 MHz ± AUXILIARY | — | 5 | 30 | — | 10 | 35 | |
| LINE REGULATION | MAIN | — | 0 | 20 | — | 0 | 20 | mV |
| $V_{IN}$ = MIN. TO MAX. | +AUXILIARY | — | 1 | 35 | — | 5 | 35 | |
| | – AUXILIARY | — | 1 | 35 | — | 5 | 35 | |
| LOAD REGULATION | MAIN | — | 10 | 25 | — | 10 | 25 | mV |
| | +AUXILIARY | — | 10 | 45 | — | 15 | 55 | |
| | – AUXILIARY | — | 10 | 65 | — | 15 | 80 | |
| CROSS REGULATION[3] | CONDITION A | — | 300 | 500 | — | 300 | 500 | mV |
| – AUXILIARY | CONDITION B | — | 400 | 700 | — | 400 | 700 | |
| INPUT VOLTAGE | CONTINUOUS | 16 | 28 | 50 | 16 | 28 | 50 | VDC |
| | TRANSIENT 120 ms | — | — | 80 | — | — | 80 | |
| INPUT CURRENT | NO LOAD | — | 23 | 32 | — | 28 | 37 | mA |
| | FULL LOAD | — | 670 | 705 | — | 670 | 705 | |
| | INHIBITED | — | 8.4 | 10 | — | 8.4 | 10 | |
| INPUT RIPPLE CURRENT | 10 kHz to 10 MHz | — | 10 | 40 | — | 15 | 40 | mA p-p |
| EFFICIENCY | | 76 | 80 | — | 76 | 80 | — | % |
| LOAD FAULT[4] | SHORT CIRCUIT POWER DISSIPATION | | | | | | | |
| | MAIN | — | — | 9 | — | — | 9 | W |
| | ± AUXILIARY | — | — | 8 | — | — | 8 | |
| STEP LOAD RESPONSE[5, 6] | TRANSIENT | | | | | | | |
| | MAIN | — | — | 250 | — | — | 250 | mV |
| | ± AUXILIARY | — | — | 500 | — | — | 500 | |
| | RECOVERY | | | | | | | |
| | MAIN | — | — | 2.5 | — | — | 2.5 | ms |
| | ± AUXILIARY | — | — | 4 | — | — | 3.5 | |
| START-UP[6] 0 TO 28 $V_{IN}$ | DELAY EACH OUTPUT | — | 5 | 12 | — | 5 | 12 | ms |

Notes
1. The sum of the 12 volt auxiliary output currents may not exceed 416 mA. The sum of the 15 volt auxiliary output currents may not exceed 333 mA.
2. The sum of the auxiliary output power may not exceed 5 watts.
3. Cross regulation occurs between the two auxiliaries and is measured on –aux. +5 is held constant at 2.0 A. Cross regulation is specified for two conditions:
   A. Positive aux. = 2.5 W; negative aux. = 2.5 W to 0.5 W.
   B. Negative aux. = 4 W to 1 W; positive aux. = 1 W to 4 W, simultaneous.
4. Load fault is a short circuit (<50 mΩ). Recovery is into a resistive load.
5. Load step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
6. Input step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
7. Lin = 5.5 µH.

**DIAGRAMS**

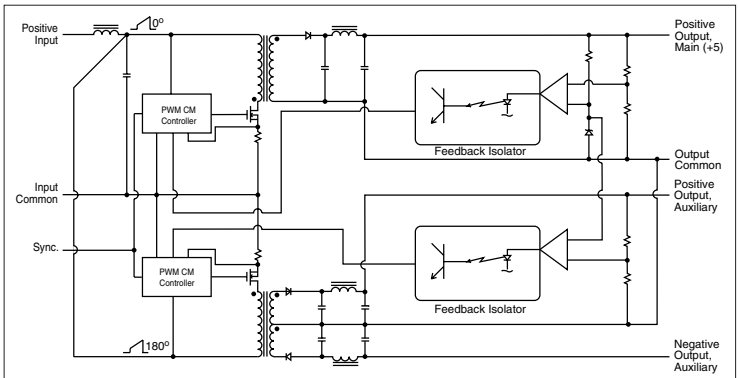



**FIGURE 1: MHV TRIPLE BLOCK DIAGRAM**

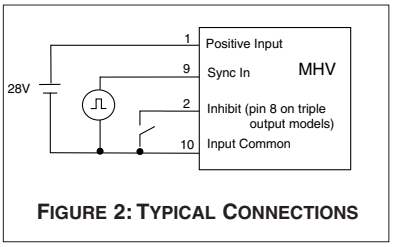
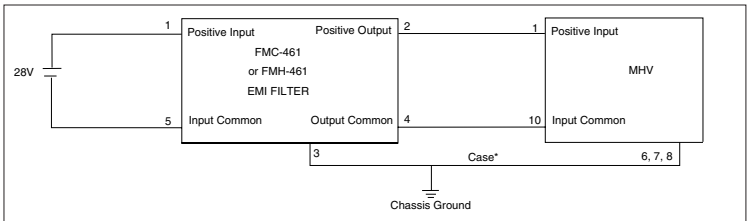



**FIGURE 2: TYPICAL CONNECTIONS**




*The case ground connection should be as low an impedance as possible to minimize EMI.
Direct contact of baseplate to chassis ground provides the lowest impedance.

**FIGURE 3: EMI FILTER CONNECTION**

**TRIM – SINGLE OUTPUT MODELS ONLY**

**Calculated Trim**

Trim down: $R_T\ (k\Omega) = \left(\frac{(V_o - 2.5)}{V_{o\ nominal} - V_0}\right) A - B$

Trim up: $R_T\ (k\Omega) = \left(\frac{2.5A}{V_{o\ -} V_{o\ nominal}}\right) - B$

$V_o$ = desired output voltage

**Formula Values by Model**

| | 3.3V | 5V | 12V | 15V |
|---|---|---|---|---|
| **A** | 3.7 | 3.7 | 14 | 18.2 |
| **B** | 10 | 10 | 30 | 30 |

**Quick Reference Trim Table**

| MODEL | % $V_{OUT}$ NOMINAL | | | | | |
|---|---|---|---|---|---|---|
| | 110 | 106 | 102 | 95 | 90 | 80 |
| | $R_{TRIM}$ ( ($R_T$) k ohms | | | | | |
| **MHV283R3S** | 18 | 36 | 128 | 4 | n/a | n/a |
| **MHV2805S** | 8 | 20 | 81 | 23 | 5 | n/a |
| **MHV2812S** | n/a | 19 | 116 | 177 | 67 | 11 |
| **MHV2815S** | 0.3 | 21 | 122 | 255 | 104 | 28 |

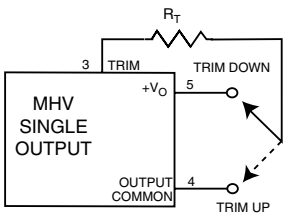



**FIGURE 4: MHV SINGLE OUTPUT TRIM**

Notes
If calculated result is a negative value, the desired output voltage is outside the allowed trim range.
Calculated values of $R_T$ are ±15%.
When trimming up, do not exceed the maximum output power.
When trimming down, do not exceed the maximum output current.

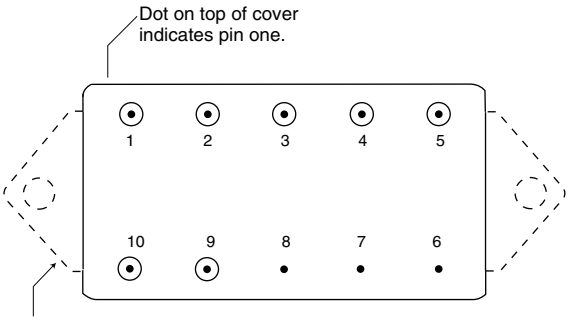
# MHV SERIES
# 15 WATT

# DC/DC CONVERTERS

**PIN OUT**

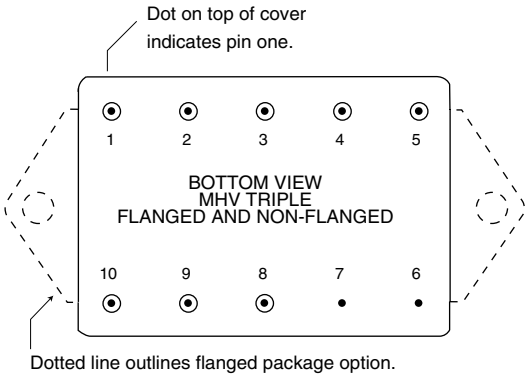
| Pin | Single Output | Dual Output | Triple Output |
|---|---|---|---|
| 1 | Positive Input | Positive Input | Positive Input |
| 2 | Inhibit | Inhibit | Main (+5) Output |
| 3 | Trim | Positive Output | Output Common |
| 4 | Output Common | Output Common | Neg. Aux. Output |
| 5 | Positive Output | Negative Output | Pos. Aux. Output |
| 6,7 | Case Ground | Case Ground | Case Ground |
| 8 | Case Ground | Case Ground | Inhibit |
| 9 | Sync In | Sync In | Sync In |
| 10 | Input Common | Input Common | Input Common |

Leave sync pin (pin 9) unconnected if not used.




See Section B8, cases H2 and K3 for dimensions.

**FIGURE 5: PIN OUT SINGLES AND DUALS**




See Section B8, cases F1, J1, and J2 for dimensions.

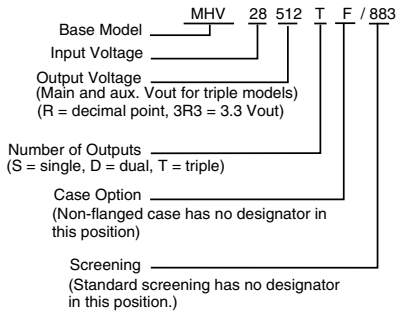
**FIGURE 6: PIN OUT TRIPLE**

**SMD NUMBERS**

| STANDARD MICROCIRCUIT DRAWING (SMD) | MHV SERIES SIMILAR PART |
|---|---|
| IN PROCESS | MHV283R3S/883 |
| | MHV2805S/883 |
| | MHV2812S/883 |
| | MHV2815S/883 |
| | MHV2805D/883 |
| | MHV2812D/883 |
| | MHV2815D/883 |
| | MHV28512T/883 |
| | MHV28515T/883 |

Flanged SMD numbers for the MHV Series of converters have the suffix HZC instead of HXC. For exact specifications for an SMD product, refer to the SMD drawing. Call your Interpoint representative for status on MHV SMD releases. See Section A3, SMDs, for more information.

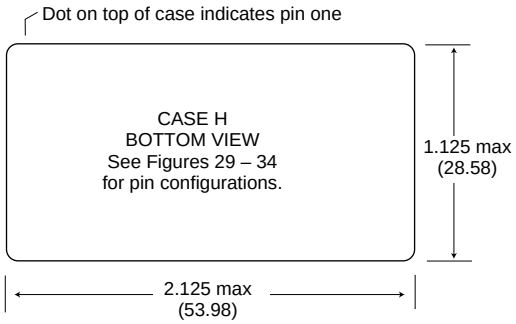
**MODEL NUMBERING KEY**






MHV 21421-001-DTS Rev B


CRANE AEROSPACE interpoint A CRANE CO. COMPANY




**Materials**

Header Cold Rolled Steel/Nickel/Gold
cases H1 and H2
Cold Rolled Steel/Nickel/Tin
cases H3, H4, and H5

Cover Kovar/Nickel
cases H1 and H2
Cold Rolled Steel/Nickel/Tin
cases H3, H4, and H5

Pins #52 alloy
ceramic seal
case H1
case H2 (except MHV Series Single and Dual)
compression glass seal
MHV Series Single and Dual
case H3, H4, H5

**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.

**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

**FIGURE 28: CASE H MAXIMUM DIMENSIONS**

BOTTOM VIEW CASE H1
FMC EMI Filter: Screening – Standard, ES, or 883
SFMC EMI Filter: Screening – Space Standard, H, or K

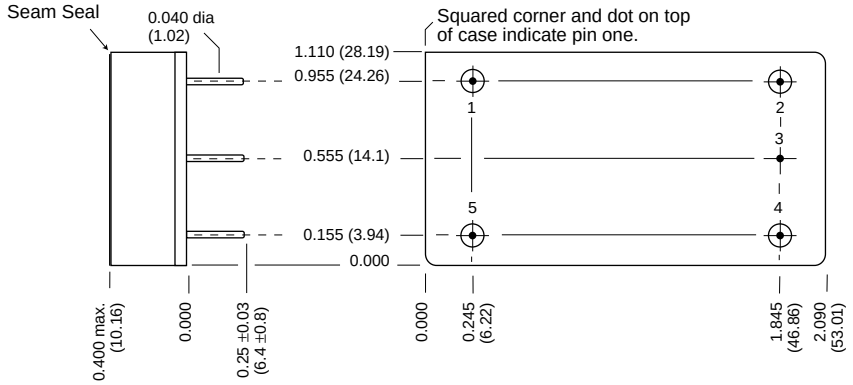



**FIGURE 29: CASE H1**

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

BOTTOM VIEW CASE H2

MTR Series Single, MHV Series Single and Dual, and MHD Series:
Screening – Standard, ES, or 883
MTR Series Dual: Screening – 883
SMTR Series Single and Dual: Screening – Space Standard, H, or K

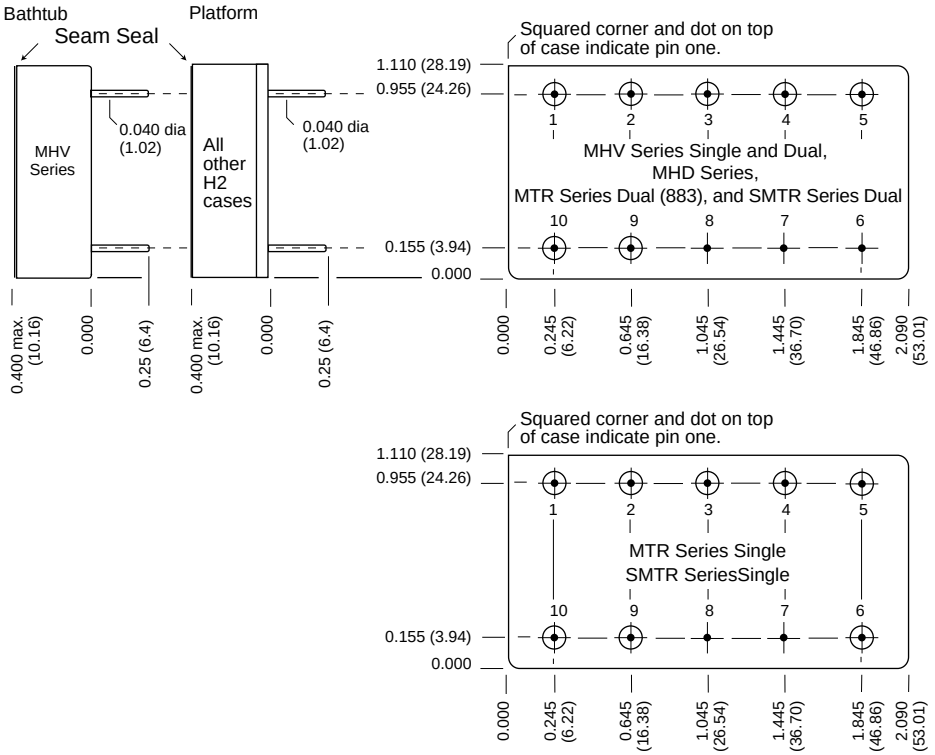
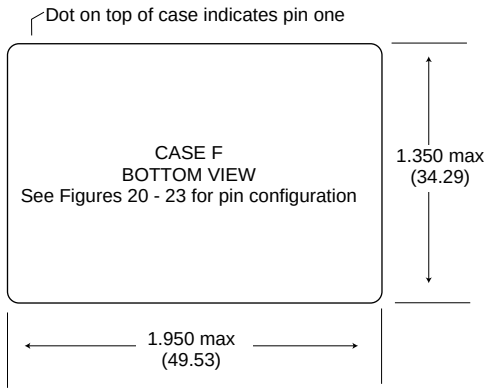



**FIGURE 30: CASE H2**




**Materials**

Header Case F1
Cold Rolled Steel/Nickel/Gold
Cases F2 - F4
Cold Rolled Steel/Nickel/Tin

Cover Case F1
Kovar/Nickel
Cases F2 - F4
Cold Rolled Steel/Nickel/Tin

Pins #52 alloy (all cases)
MHV Series Triple – compression glass seal
MTR Series Triple, case F1 – ceramic seal
MTR Series Triple, case F2 – compression glass seal
HUM40 – compression glass seal or ceramic seal
Case F3 – compression glass seal
Case F4 – compression glass seal or ceramic seal

**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.

**Case dimensions in inches (mm)**

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) for two decimal places
unless otherwise specified

**FIGURE 19: CASE F MAXIMUM DIMENSIONS**

BOTTOM VIEW CASE F1

MTR Series Triple and MHV Series Triple: Screening – Standard, ES, or 883

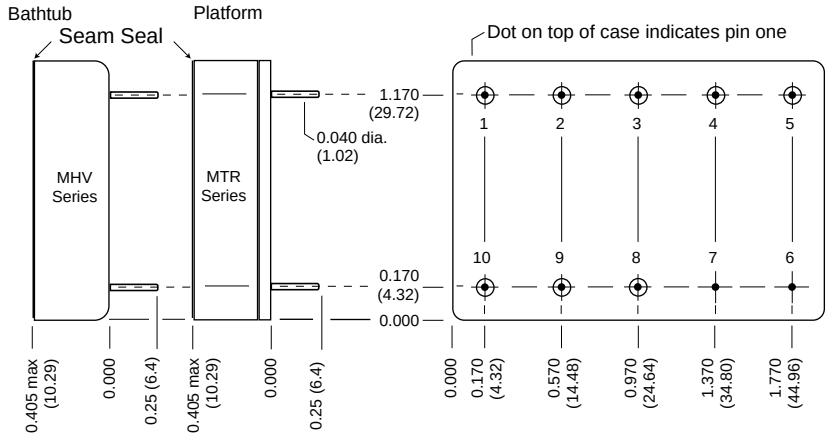
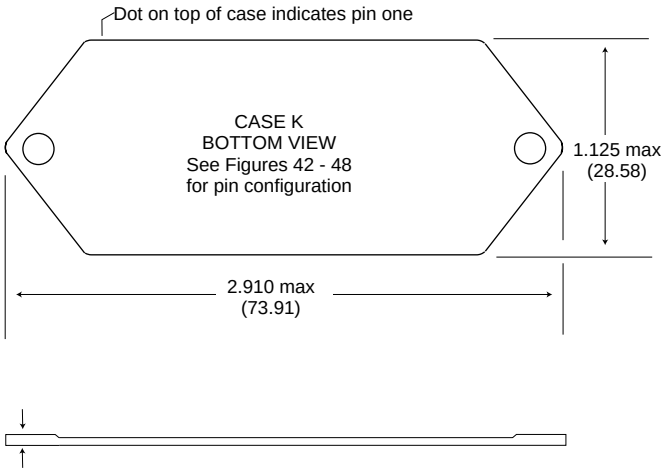



**FIGURE 20: CASE F1**

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

# CASES




**Flange Thickness:**
Cases K1, K2, K3 and MLP Series (K5)
0.060 (1.52)
Cases K4, K5 (except MLP Series), K6, K7, and K8
0.067 +0.005/-0.007 (1.70 +0.13/-0.8)

**Materials**

Header Case K1 - K3
Cold Rolled Steel/Nickel/Gold
Cases K4 - K8
Cold Rolled Steel/Nickel/Tin

Cover Case K1 - K3
Kovar/Nickel
Case K4 - K8
Cold Rolled Steel/Nickel/Tin

Pins #52 alloy (all cases)
Case K1, K2, and K3 (except MHV Series Single and Dual)
ceramic seal
Cases K4 - K8 and MHV Series Single and Dual (K3)
compression glass seal

**Case dimensions in inches (mm)**

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) 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.

**FIGURE 41: CASE K MAXIMUM DIMENSIONS**

BOTTOM VIEW CASE K3

Flanged cases: Designator required in Case Option position of model number.
MTR Series Single, MHV Series Single and Dual, MHD Series:
Screening – Standard, ES, or 883
MTR Series Dual: Screening – 883
SMTR Series: Screening – Space Standard, H, or K

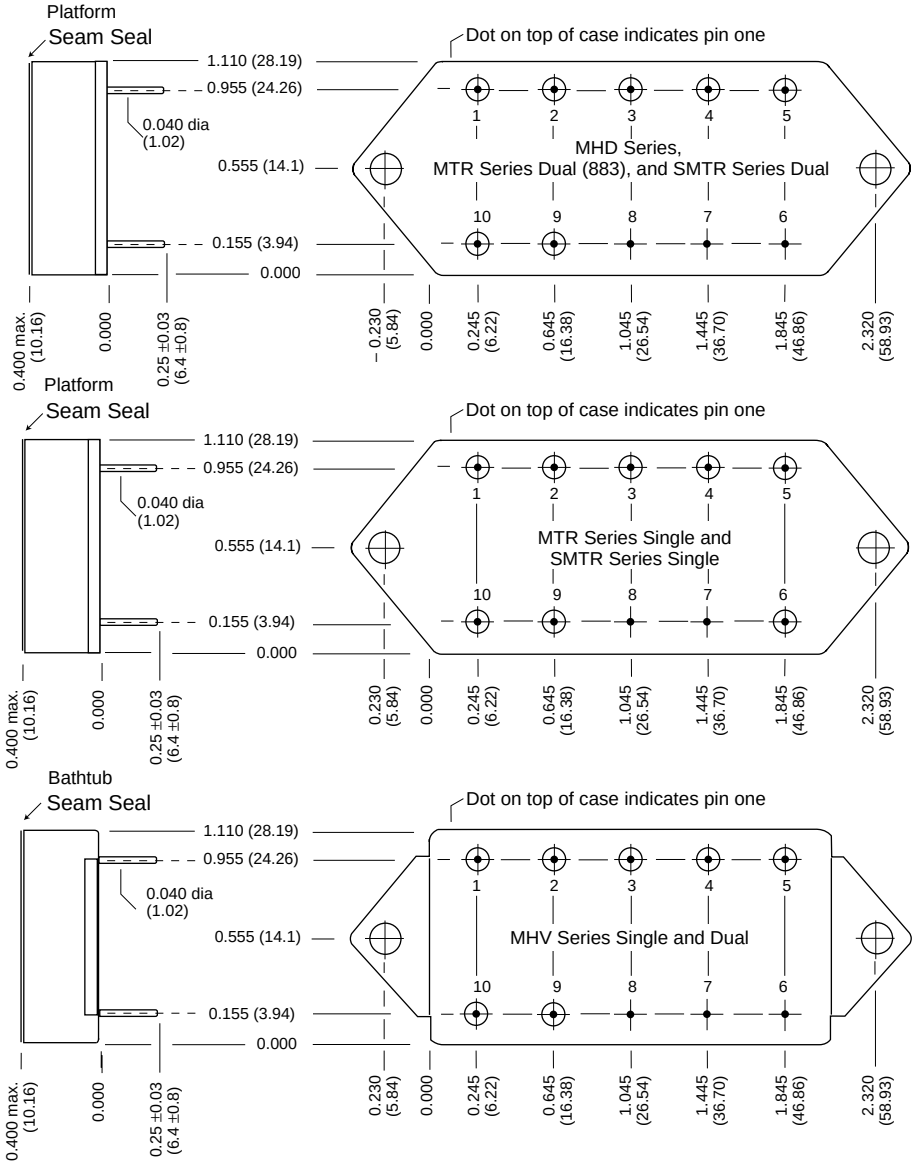
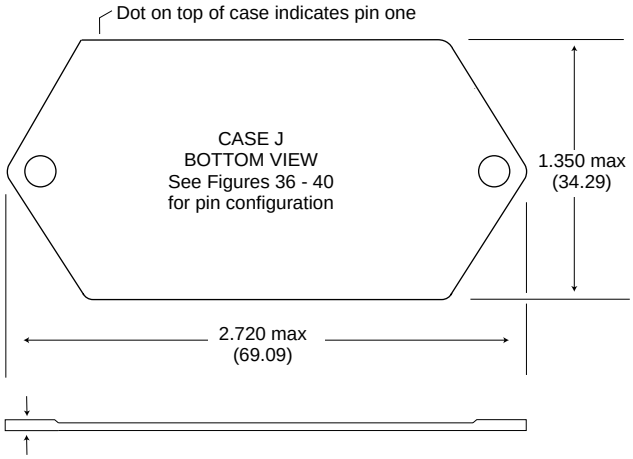



**FIGURE 44: CASE K3**

# CASES




**Flange Thickness:**

| | |
|---|---|
| Cases J1 and J5 | 0.060 (1.52) |
| Case J2 | 0.073 (1.85) max |
| Cases J3 and J4 | 0.067 +0.005/-0.007 (1.70 +0.13/-0.8) |

**Materials**

Header Case J1
Cold Rolled Steel/Nickel/Gold
Cases J2 - J5
Cold Rolled Steel/Nickel/Tin

Cover Case J1
Kovar/Nickel
Case J2 - J5
Cold Rolled Steel/Nickel/Tin

Pins #52 alloy (all cases)
Case J1
MHV Series Triple – compression glass seal
MTR Series Triple – ceramic seal
Cases J2 - J5
compression glass seal

**Case dimensions in inches (mm)**

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) 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.

**FIGURE 35: CASE J MAXIMUM DIMENSIONS**

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

BOTTOM VIEW CASE J1

Flanged cases: Designator required in Case Option position of model number.
MHV Series Triple and MTR Series Triple: Screening – Standard, ES, or 883

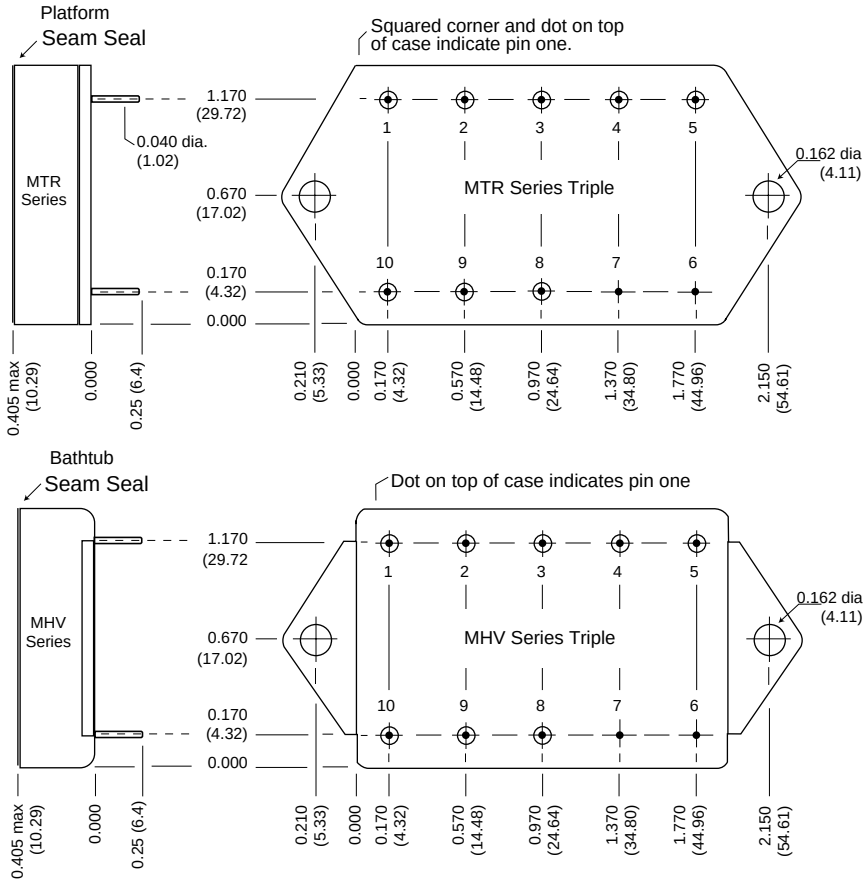



**FIGURE 36: CASE J1**

# 125°C PRODUCTS

| TEST (125°C Products) | STANDARD | /ES | /883 (Class H)* |
|---|---|---|---|
| PRE-CAP INSPECTION | | | |
| Method 2017, 2032 | yes | yes | yes |
| TEMPERATURE CYCLE (10 times) | | | |
| Method 1010, Cond. C, -65°C to 150°C | no | no | yes |
| Method 1010, Cond. B, -55°C to 125°C | no | yes | no |
| CONSTANT ACCELERATION | | | |
| Method 2001, 3000 g | no | no | yes |
| Method 2001, 500 g | no | yes | no |
| BURN-IN | | | |
| Method 1015, 160 hours at 125°C | no | no | yes |
| 96 hours at 125°C case (typical) | no | yes | no |
| FINAL ELECTRICAL TEST MIL-PRF-38534, Group A | | | |
| Subgroups 1 through 6: -55°C, +25°C, +125°C | no | no | yes |
| Subgroups 1 and 4: +25°C case | yes | yes | no |
| HERMETICITY TESTING | | | |
| Fine Leak, Method 1014, Cond. A | no | yes | yes |
| Gross Leak, Method 1014, Cond. C | no | yes | yes |
| Gross Leak, Dip (1 x $10^{-3}$) | yes | no | no |
| FINAL VISUAL INSPECTION | | | |
| Method 2009 | yes | yes | yes |

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

*883 products are built with element evaluated components and are 100% tested and guaranteed over the full military temperature range of –55°C to +125°C.

Applies to the following products

| | | | |
|---|---|---|---|
| MOR Series | MHD Series | MGH Series | FMGA EMI Filter |
| MFLHP Series | MHV Series | MCH Series | FMSA EMI Filter |
| MFL Series | MHF+ Series | FM-704A EMI Filter | HUM Modules** |
| MHP Series | MHF Series** | FMD**/FME EMI Filter | LCM Modules** |
| MTR Series | MGA Series | FMC EMI Filter | LIM Modules |
| MQO Series** | MSA Series | FMH EMI Filter | |

**MFLHP Series, MQO Series, MHF Series, FMD EMI Filters, Hum Modules, and LCM Modules do not offer '883" screening.