

# MHV Single, Dual and Triple DC/DC Converters

## 28 VOLT INPUT – 15 WATT

### FEATURES

- $-55^{\circ}$  to  $+125^{\circ}\text{C}$  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 81% efficiency
- Low output noise



### MODELS

#### VDC OUTPUT

SINGLE	DUAL	TRIPLE
3.3	$\pm 5$	+5 & $\pm 12$
5	$\pm 12$	+5 & $\pm 15$
12	$\pm 15$	
15		

### DESCRIPTION

Interpoint's MHV Series™ of DC/DC converters offers 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  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  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  $180^{\circ}$  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 6 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 Single, Dual and Triple DC/DC Converters

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### OPERATING CONDITIONS AND CHARACTERISTICS

#### Input Voltage Range

- 16 to 50 VDC continuous
- Transient: see Electrical Characteristics tables

#### 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

#### 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

#### Output Voltage Temperature Coefficient

- 100 ppm/°C 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
- @ Tc = -55° to +125°C

#### Inhibit Pin Voltage (unit enabled)

- 11 V typical

#### Undervoltage Lockout

- 7 V input typical

#### Clock Frequency

- External sync range 490 to 710 kHz.

### MECHANICAL AND ENVIRONMENTAL

#### Size (maximum)

Non-flanged Single and dual output models

2.125 x 1.125 x 0.400 inches (53.98 x 28.58 x 10.16 mm)

See case H2 for dimensions.

Triple output models

1.950 x 1.350 x 0.405 inches (49.53 x 34.29 x 10.29 mm)

See case F1 for dimensions.

Flanged Single and dual output models

2.910 x 1.125 x 0.400 inches (73.91 x 28.58 x 10.16 mm)

See case K3 for dimensions.

Triple output models

2.720 x 1.350 x 0.405 inches (69.09 x 34.29 x 10.29 mm)

See case J1 for dimensions.

#### Weight (maximum)

60 grams typical

#### Screening

Standard, ES, or 883 (Class H). See "883, Class H, QML Products – Element Evaluation" and "883, Class H, QML Products – Environmental Screening" for more information.

### SYNC AND INHIBIT

#### Sync In (490 to 710 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

#### Sync Out - Referenced to input common

#### Inhibit (INH1, INH2) : TTL Open Collector

- Logic low (output disabled)
- Logic low voltage  $\leq 0.8$  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

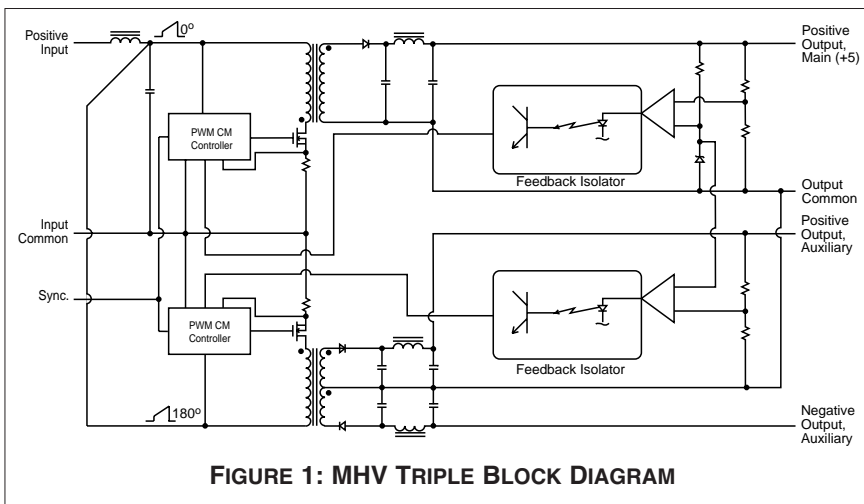


FIGURE 1: MHV TRIPLE BLOCK DIAGRAM

# MHV Single, Dual and Triple DC/DC Converters

## 28 VOLT INPUT – 15 WATT

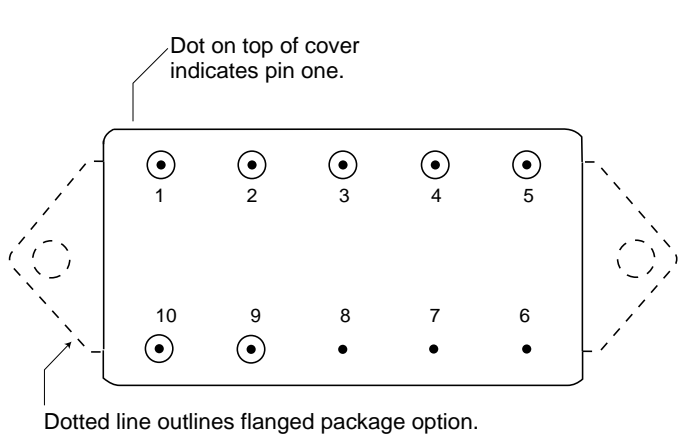
**PIN OUT**

**PINS NOT IN USE**

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

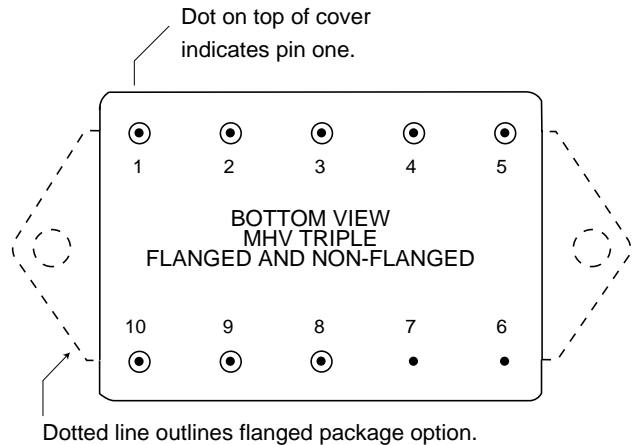
Case	User's discretion
Inhibit (INH1, INH2)	Leave unconnected
Sync In	Leave unconnected

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



See cases H2 and K3 for dimensions.

**FIGURE 2: PIN OUT SINGLES AND DUALS**

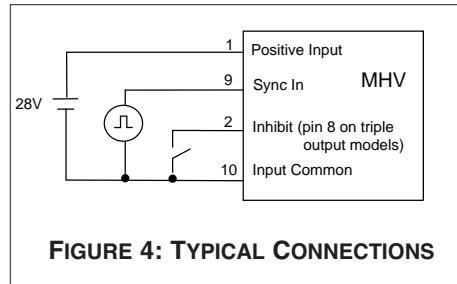


See cases F1 and J1 for dimensions.

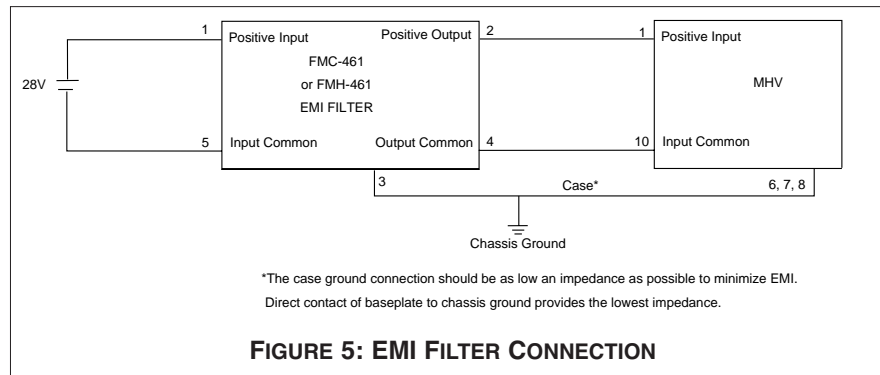
**FIGURE 3: PIN OUT TRIPLE**

# MHV Single, Dual and Triple DC/DC Converters

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**FIGURE 4: TYPICAL CONNECTIONS**



**FIGURE 5: EMI FILTER CONNECTION**

### TRIM – SINGLE OUTPUT MODELS ONLY

#### Calculated Trim

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

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

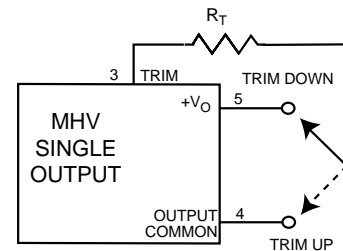
$V_o$  = desired output voltage

#### Formula Values by Model

	3.3V	5V	12V	15V
<b>A</b>	3.7	3.7	14	18.2
<b>B</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					
<b>MHV283R3S</b>	18	36	128	4	n/a	n/a
<b>MHV2805S</b>	8	20	81	23	5	n/a
<b>MHV2812S</b>	n/a	19	116	177	67	11
<b>MHV2815S</b>	0.3	21	122	255	104	28



**FIGURE 6: MHV SINGLE OUTPUT TRIM**

#### Notes

If calculated result is a negative value, the desired output voltage is outside the allowed trim range.

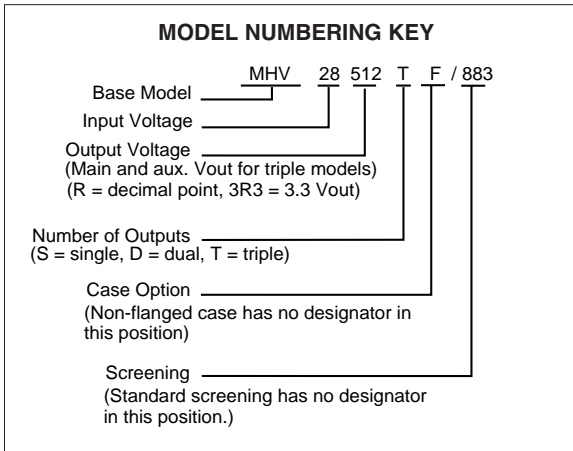
Calculated values of  $R_T$  are  $\pm 15\%$ .

When trimming up, do not exceed the maximum output power.

When trimming down, do not exceed the maximum output current.

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**SMD NUMBERS**

STANDARD MICROCIRCUIT DRAWING (SMD)	MHV SERIES SIMILAR PART
5962-9852801HXC	MHV283R3S/883
5962-9852201HXC	MHV2805S/883
5962-9852301HXC	MHV2812S/883
5962-9852401HXC	MHV2815S/883
5962-9852501HXC	MHV2805D/883
5962-9852601HXC	MHV2812D/883
5962-9852701HXC	MHV2815D/883
5962-9673001HXC	MHV28512T/883
5962-9673101HXC	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 available at [www.dscs.dla.mil/programs/smcr](http://www.dscs.dla.mil/programs/smcr).

### Model Selection

**MHV28**                                                        

*Base model*      *Vout value*      *number of outputs*      *case option*      *screening*

Choose one from each of the following rows

**Vout value**      for singles or duals: 3R3, 5, 12, or 15      for triples\*: 512 or 515

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*"R" = decimal point, 3R3 = 3.3VDC*

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**Number of outputs**      S (single), D (dual) or T (triple)

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**Case option**      non-flanged case option, leave blank      F (flanged case option),

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**Screening**      standard screening, leave blank      /ES (ES screening), /883 (Class H, QML)

\* for triple models "5" indicates the main voltage, "12" or "15" indicate the ± auxiliary voltages.

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SINGLE OUTPUT MODELS		MHV283R3S			MHV2805S			MHV2812S			MHV2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
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 <sub>IN</sub> = 16 to 50 VDC	0	—	3.03	0	—	3.0	0	—	1.25	0	—	1.0	A
OUTPUT POWER	V <sub>IN</sub> = 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	25	—	5	25	—	5	25	—	5	25	mV p-p
LINE REGULATION	V <sub>IN</sub> = 16 to 50 VDC	—	0	8	—	0	8	—	1	10	—	4	13	mV
LOAD REGULATION	NO LOAD TO FULL	—	15	30	—	15	40	—	8	30	—	10	35	mV
INPUT VOLTAGE	CONTINUOUS	16	28	50	16	28	50	16	28	50	16	28	50	VDC
NO LOAD TO FULL <sup>1</sup>	TRANSIENT 120 ms	—	—	80	—	—	80	—	—	75	—	—	60	V
INPUT CURRENT	NO LOAD	—	34	42	—	44	52	—	43	55	—	45	62	mA
	INHIBITED	—	8.4	10	—	8.4	10	—	8.4	10	—	8.4	10	mA
INPUT RIPPLE CURRENT	10 kHz - 20 MHz Tc = -55°C to +125°C	—	10	45	—	10	40	—	10	40	—	10	40	mA pp
EFFICIENCY		69	72	—	74	77	—	79	81	—	78	81	—	%
LOAD FAULT <sup>2</sup>	POWER DISSIPATION													
	SHORT CIRCUIT <sup>2</sup>	—	—	7	—	—	8	—	—	7	—	—	7	W
	RECOVERY <sup>1</sup>	—	—	20	—	—	20	—	—	20	—	—	20	ms
STEP LOAD RESPONSE <sup>3</sup>	50% – 100% – 50%													
	TRANSIENT	—	—	300	—	—	300	—	—	350	—	—	450	mV pk
	RECOVERY	—	—	1	—	—	1.5	—	—	1.3	—	—	1.3	mS
START-UP 0 TO 28 V <sub>IN</sub>	DELAY	—	14	18	—	14	18	—	14	18	—	14	18	ms
	OVERSHOOT	—	0	100	—	0	100	—	0	120	—	0	150	mV pk
STEP LINE RESPONSE <sup>1</sup>	16-50-16 VDC <sup>4</sup>													
	TRANSIENT			175			550			550			650	mVpk
	RECOVERY <sup>4</sup>			0.9			2			2.5			2.5	mS
CAPACITIVE LOAD <sup>1</sup>			200			200			200			200	μF	

### Notes

1. Guaranteed by design, not tested.

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.

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

DUAL OUTPUT MODELS		MHV2805D			MHV2812D			MHV2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	+V <sub>OUT</sub>	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	VDC
	-V <sub>OUT</sub>	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	
OUTPUT CURRENT	V <sub>IN</sub> = 16 TO 50 VDC	—	—	±1.50	—	—	±0.625	—	—	±0.500	A
OUTPUT POWER <sup>2</sup>	V <sub>IN</sub> = 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 <sub>OUT</sub> / -V <sub>OUT</sub>	—	5	35	—	5	25	—	10	50	mVp-p
LINE REGULATION	V <sub>IN</sub> = 16 TO 50 VDC ±V <sub>OUT</sub>	—	0	10	—	0	10	—	0	10	mV
LOAD REGULATION	NO LOAD TO FULL ±V <sub>OUT</sub>	—	5	15	—	2	15	—	2	15	mV
INPUT VOLTAGE	CONTINUOUS	16	28	50	16	28	50	16	28	50	VDC
NO LOAD TO FULL <sup>1</sup>	TRANSIENT 120 msec	—	—	80	—	—	75	—	—	60	V
INPUT CURRENT	NO LOAD	—	22	30	—	32	43	—	37	50	mA
	INHIBITED	—	8.4	10	—	8.4	10	—	8.4	10	
INPUT RIPPLE CURRENT	10 kHz - 20 MHz Tc = -55°C to +125°C	—	5	40	—	5	40	—	10	45	mA p-p
EFFICIENCY		77	79	—	81	83	—	80	83	—	%
LOAD FAULT <sup>1,3</sup>	POWER DISSIPATION	—	—	—	—	—	—	—	—	—	—
	SHORT CIRCUIT	—	—	7.5	—	—	9	—	—	9	W
	RECOVERY	—	—	20	—	—	25	—	—	30	ms
STEP LOAD RESPONSE <sup>4</sup> ± V <sub>OUT</sub>	50% – 100% – 50%	—	—	—	—	—	—	—	—	—	—
	TRANSIENT	—	—	180	—	—	200	—	—	250	mV pk
	RECOVERY	—	—	1500	—	—	800	—	—	80	
START UP <sup>1</sup>	+V <sub>OUT</sub> DELAY	---	10	16	---	10	18	---	12	20	ms
	±V <sub>OUT</sub> OVERSHOOT	---	0	50	---	0	100	---	0	100	mV pk
	-V <sub>OUT</sub> DELAY	---	10	18	---	10	23	---	12	28	mS
STEP LINE <sup>1</sup> RESPONSE <sup>1,5</sup>	16-50-16 VDC	---	---	---	---	---	---	---	---	---	---
	TRANSIENT	---	---	400	---	---	500	---	---	500	mV pk
	RECOVERY	---	---	4	---	---	3	---	---	3	mS
CAPACITIVE LOAD <sup>1</sup>		---	---	100	---	---	100	---	---	100	μF

### Notes

1. Guaranteed by design, not tested.
2. Up to 7.5 watts is available from either output.
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.

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

TRIPLE OUTPUT MODELS		MHV28512T			MHV28515T			UNITS
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	
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 <sup>2</sup> VIN = 16 TO 50	MAIN	0	—	2.0	0	—	2.0	A
	+ AUXILIARY	—	0.208	0.333	—	0.167	0.267	
	- AUXILIARY	—	0.208	0.333	—	0.167	0.267	
	TOTAL	—	—	2.416	—	—	2.333	
OUTPUT POWER <sup>3</sup> VIN = 16 TO 50	MAIN	—	—	10	—	—	10	W
	+ AUXILIARY	—	—	4	—	—	4	
	- AUXILIARY	—	—	4	—	—	4	
	TOTAL	—	—	15	—	—	15	
OUTPUT RIPPLE	10 kHz to 2 MHz MAIN	—	8	22	—	8	22	mV p-p
VOLTAGE Tc= -55° to +125°C	10 kHz to 2 MHz ± AUXILIARY	—	9	22	—	9	22	
LINE REGULATION VIN = MIN. TO MAX.	MAIN	—	0	5	—	0	5	mV
	+AUXILIARY	—	5	35	—	7	35	
	- AUXILIARY	—	7	40	—	7	40	
LOAD REGULATION	MAIN	—	10	20	—	10	20	mV
	+AUXILIARY	—	10	30	—	10	30	
	- AUXILIARY	—	40	70	—	40	80	
CROSS REGULATION <sup>4</sup>	- AUXILIARY CONDITION A & B	—	400	800	—	400	800	mV
INPUT VOLTAGE <sup>1</sup>	CONTINUOUS	16	28	50	16	28	50	VDC
	TRANSIENT 120 ms	—	—	80	—	—	80	
INPUT CURRENT	NO LOAD	—	30	37	—	34	41	mA
	INHIBITED	—	8.4	10	—	8.4	10	
INPUT RIPPLE CURRENT Tc= -55° to +125°C	10 kHz to 10 MHz	—	10	30	—	10	30	mA p-p
EFFICIENCY		76	78	—	75	78	—	%
LOAD FAULT / SHORT CIRCUIT <sup>4</sup>	POWER DISSIPATION MAIN ± AUXILIARY	—	—	9	—	—	9	W
	RECOVERY - EACH OPUTPUT	---	---	25	---	---	25	
STEP LOAD RESPONSE <sup>6, 7</sup>	TRANSIENT MAIN	—	—	250	—	—	250	mV
	± AUXILIARY	—	—	550	—	—	550	
	RECOVERY MAIN	—	—	2.5	—	—	2.5	ms
	± AUXILIARY	—	—	3.5	—	—	3.5	
START-UP <sup>7</sup>	DELAY EACH OUTPUT	—	7	15	—	7	15	ms
	OVERSHOT MAIN ± AUXILIARY	---	---	100	---	---	100	
CAPACITIVE LOAD <sup>1</sup>	MAIN	---	---	200	---	---	200	μF
	± AUXILIARY	---	---	100	---	---	100	
STEPLINE RESPONSE <sup>7</sup>	TRANSIENT <sup>1</sup> MAIN	—	—	400	—	—	400	mV pk
	± AUXILIARY	—	—	500	—	—	500	
	RECOVERY <sup>1</sup> MAIN	—	—	3	—	—	3	mS
	± AUXILIARY	—	—	4	—	—	4	

### Notes

- Guaranteed by design, not tested.
- 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.
- The sum of the auxiliary output power may not exceed 5 watts.
- 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:

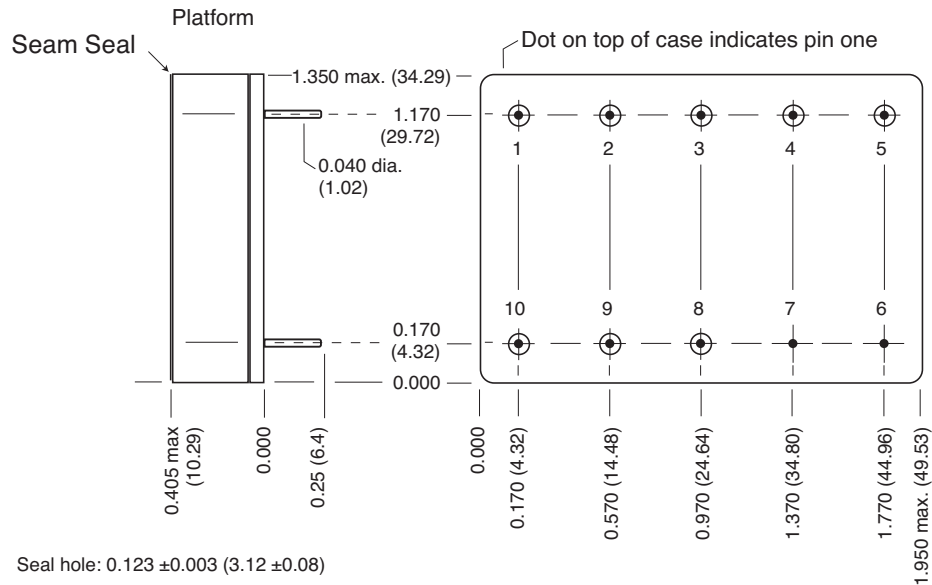
- Positive aux. = 2.5 W; -(50%) negative aux. = 2.5 W to 0.5 W (50% to 10%).
  - From +Po = 70% and -Po = 30% to + Po = 30% and -Po = 70%.  
Above conditions are referenced to 50%/50% balanced loads.
- Load fault is a short circuit (<50 mΩ). Recovery is into a resistive load.
  - Load step transition ≥ 10 μs. Recovery = time to settle to within 1% of Vout final value.
  - Input step transition ≥ 10 μs. Recovery = time to settle to within 1% of Vout final value.



# MHV Single, Dual and Triple DC/DC Converter Cases

## 28 VOLT INPUT – 15 WATT

### BOTTOM VIEW CASE F1



Seal hole:  $0.123 \pm 0.003$  (3.12  $\pm$  0.08)

#### Case dimensions in inches (mm)

Tolerance  $\pm 0.005$  (0.13) for three decimal places  
 $\pm 0.01$  (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 ceramic seal

Case F1, Rev C, 20051216

Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.

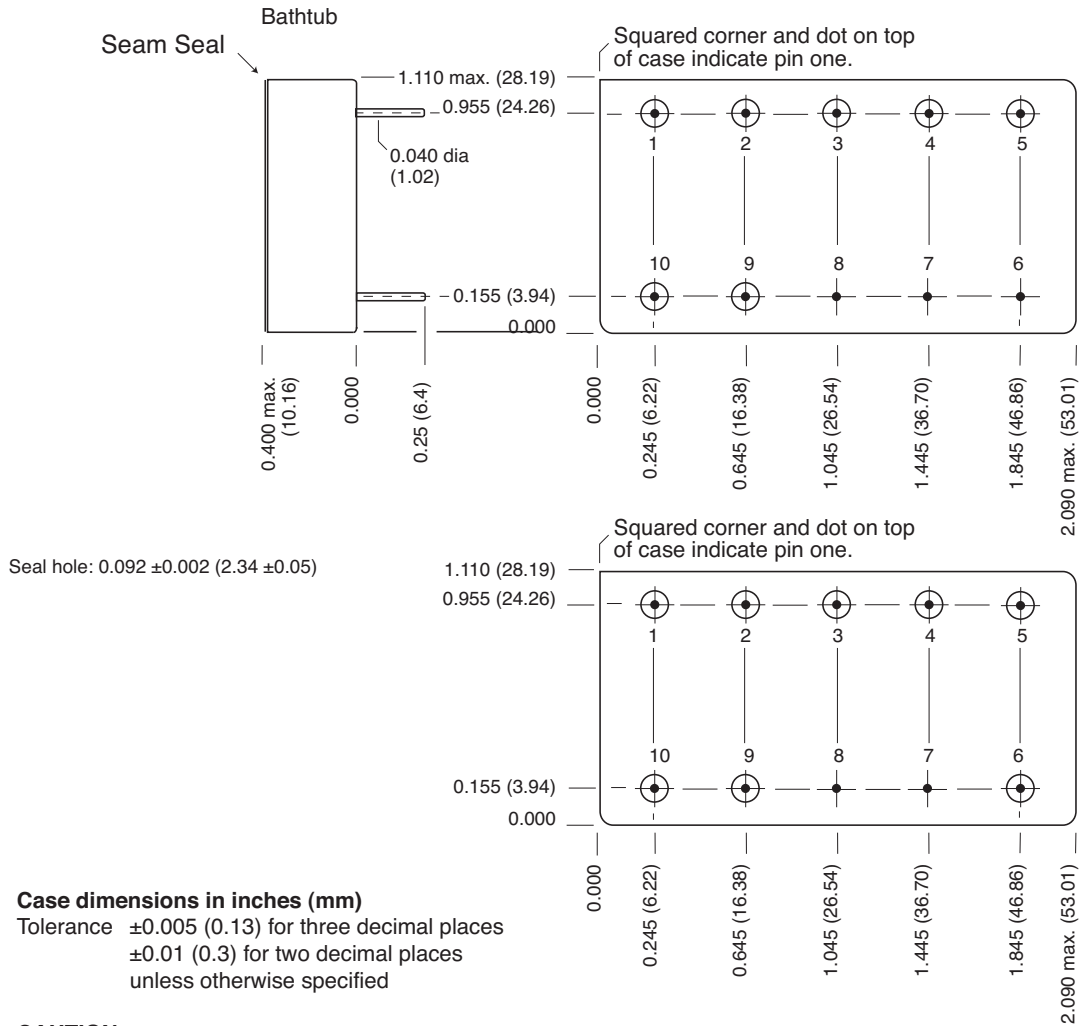
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FIGURE 7: CASE F1- MHV SINGLE AND DUAL

# MHV Single, Dual and Triple DC/DC Converter Cases

## 28 VOLT INPUT – 15 WATT

### CASE H2 BOTTOM VIEW



**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

Case H2, Rev C - 20060109

Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.

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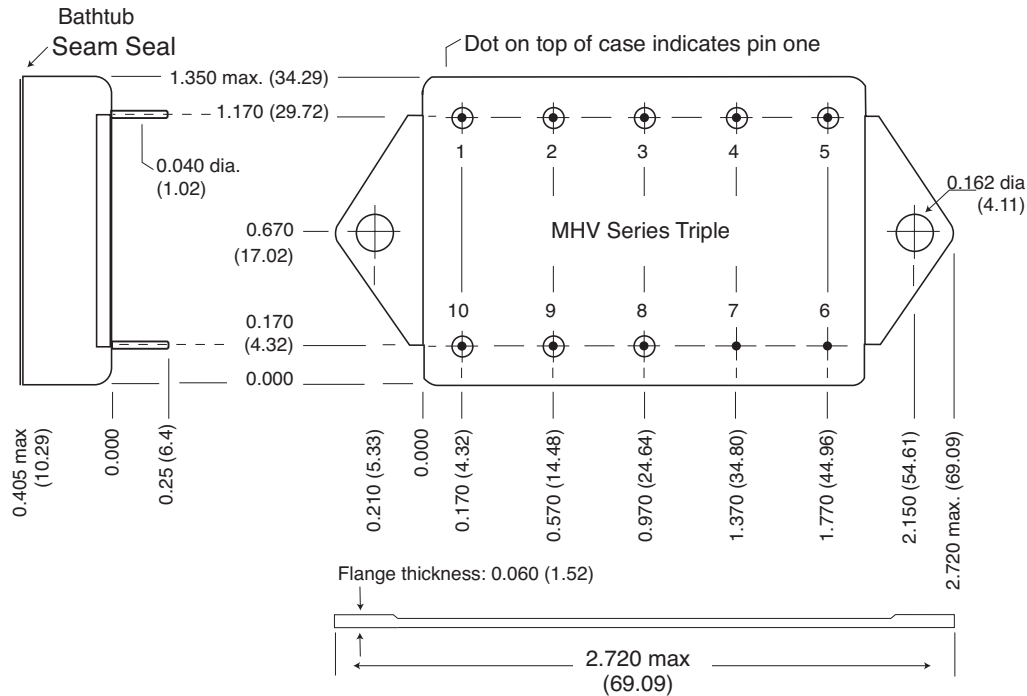
**FIGURE 8: CASE H2 - MHV TRIPLE**

# MHV Single, Dual and Triple DC/DC Converter Cases

## 28 VOLT INPUT – 15 WATT

### BOTTOM VIEW CASE J1

Flanged cases: Designator "F" required in Case Option position of model number.



Seal hole:  $0.920 \pm 0.002$

#### Case dimensions in inches (mm)

Tolerance  $\pm 0.005$  (0.13) for three decimal places  
 $\pm 0.01$  (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

Case J1, Rev D - 20060710

Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.

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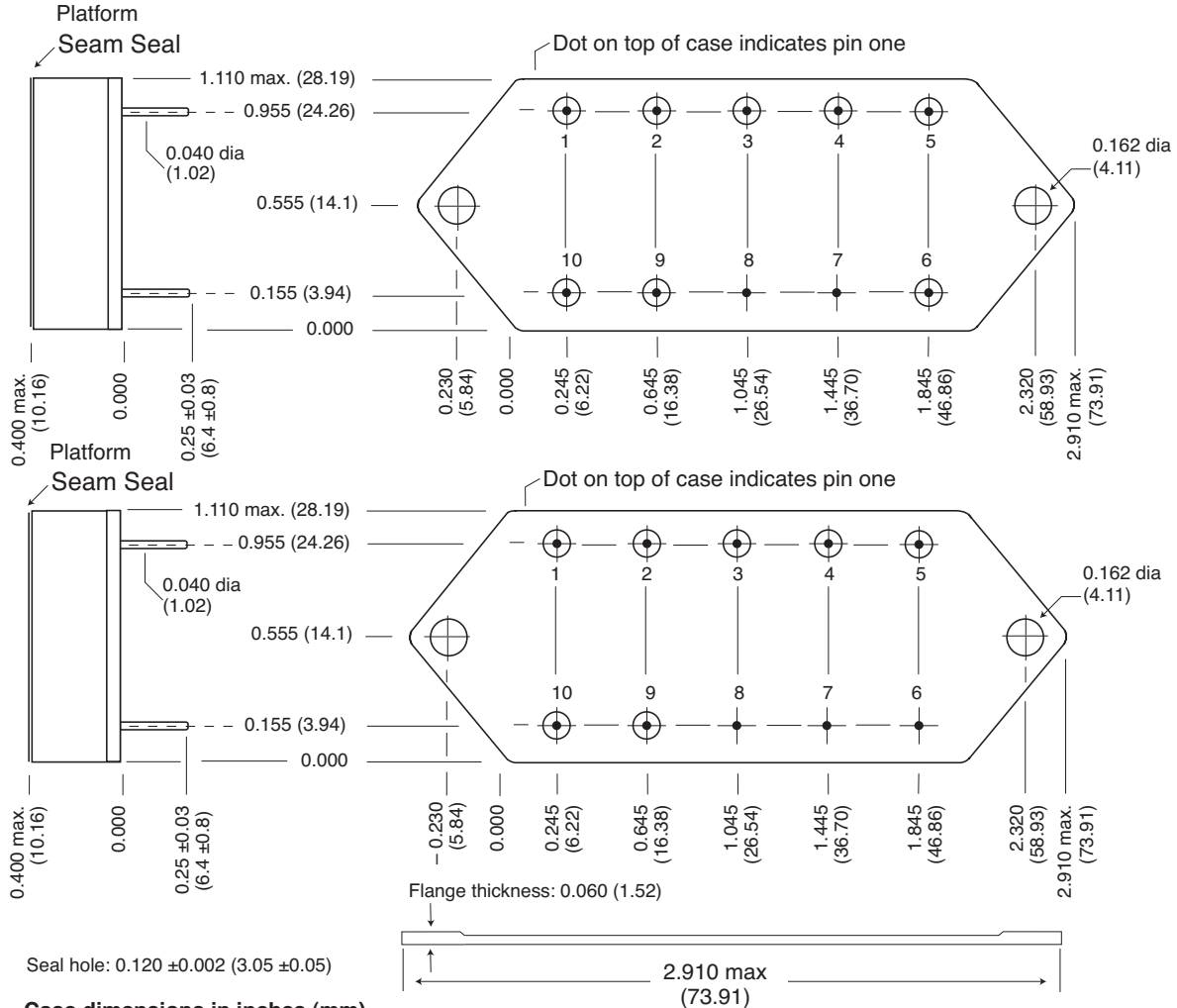
FIGURE 9: CASE J1 - MHV TRIPLE

# MHV Single, Dual and Triple DC/DC Converter Cases

## 28 VOLT INPUT – 15 WATT

### BOTTOM VIEW CASE K3

Flanged cases: Designator "F" required 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

Case K3, Rev C, 20060110

**FIGURE 11: CASE K3 - MHV SINGLE AND DUAL**

## MHV Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 15 WATT

### 883, CLASS H, QML PRODUCTS – ELEMENT EVALUATION

ELEMENT EVALUATION  TEST PERFORMED (COMPONENT LEVEL)	STANDARD (NON-QML) <sup>1</sup>		CLASS H, QML	
	M/S <sup>2</sup>	P <sup>3</sup>	M/S <sup>2</sup>	P <sup>3</sup>
Element Electrical (probe)	yes	no	yes	yes
Element Visual	no	no	yes	yes
Internal Visual	no	no	yes	no
Final Electrical	no	no	yes	yes
Wire Bond Evaluation <sup>4</sup>	no	no	yes	yes
SLAM™/C-SAM: Input Capacitors only (Add'l test, not req. by H or K)	no	no	no	yes

**Definitions:**

Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534

SLAM™: Scanning Laser Acoustic Microscopy

C-SAM: C - Mode Scanning Acoustic Microscopy

**Notes:**

1. Non-QML products do not meet all of the requirements of MIL-PRF-38534
2. M/S = Active components (Microcircuit and Semiconductor Die)
3. P = Passive components
4. Not applicable to EMI filters that have no wire bonds

# MHV Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 15 WATT

## 883, CLASS H, QML PRODUCTS – ENVIRONMENTAL SCREENING

TEST	125°C STANDARD non-QML	125°C /ES non-QML	Class H /883 QML
Pre-cap Inspection Method 2017, 2032	yes	yes	yes
Temperature Cycle (10 times) Method 1010, Cond. C, -65°C to 150°C, ambient Method 1010, Cond. B, -55°C to 125°C, ambient	no no	no yes	yes no
Constant Acceleration Method 2001, 3000 g Method 2001, 500g	no no	no yes	yes no
Burn-In Method 1015, 160 hours at 125°C case, typical 96 hours at 125°C case, typical	no no	no yes	yes no
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 through 6: -55°C, +25°C, +125°C case Subgroups 1 and 4: +25°C case	no yes	no yes	yes no
Hermeticity Test Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip (1 x 10 <sup>-3</sup> )	no no yes	yes yes no	yes yes no
Final Visual Inspection Method 2009	yes	yes	yes

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