MHV Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 15 WATT

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 81% efficiency
- Low output noise



MODELS

VDC OUTPUT		
SINGLE	DUAL	TRIPLE
3.3	±5	+5 & ±12
5	±12	+5 & ±15
12	±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°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 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.

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CRANE AEROSPACE & ELECTRONICS

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.

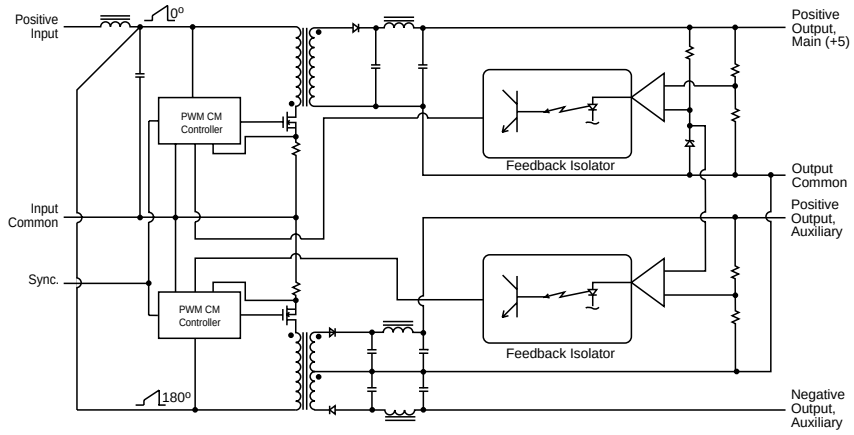

FIGURE 1: MHV TRIPLE BLOCK DIAGRAM

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 ≤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

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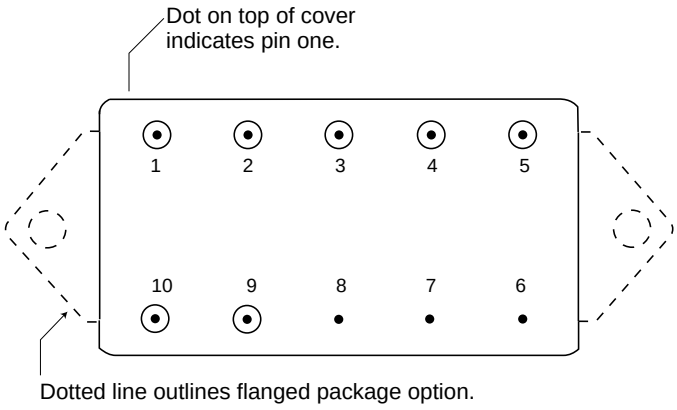
PIN OUT

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.

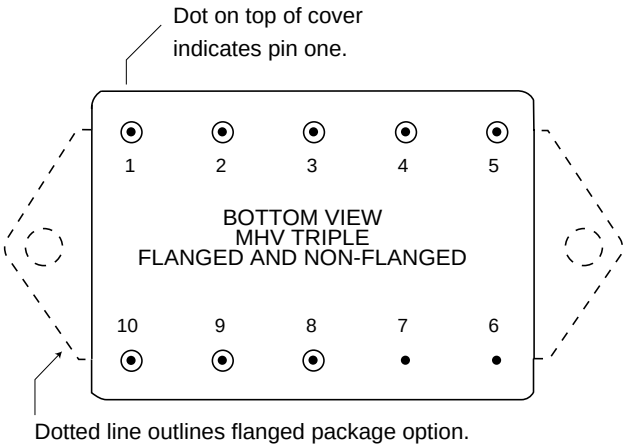
PINS NOT IN USE

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



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

28 VOLT INPUT – 15 WATT

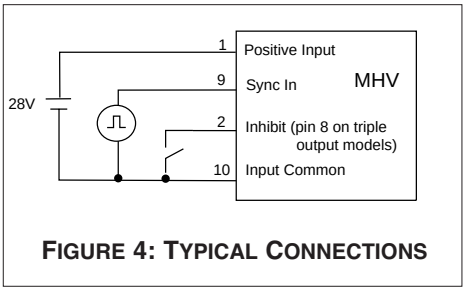
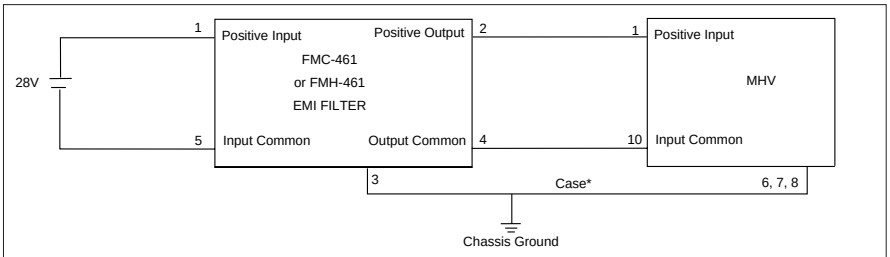


FIGURE 4: TYPICAL CONNECTIONS



*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 5: 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

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.

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

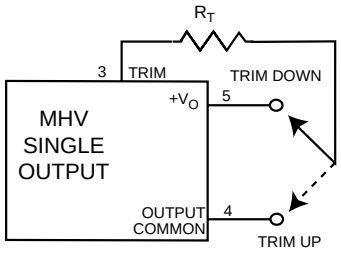


FIGURE 6: MHV SINGLE OUTPUTTRIM

MHV Single, Dual and Triple DC/DC Converters

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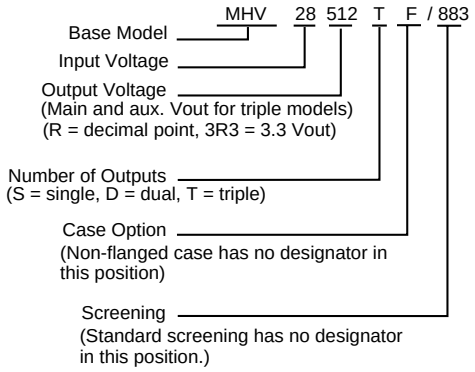
MODEL NUMBERING KEY



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.dscc.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
	“R” = decimal point, 3R3 = 3.3VDC	
Number of outputs	S (single), D (dual) or T (triple)	
Case option	non-flanged case option, leave blank	F (flanged case option),
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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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	10 kHz - 2 MHz													
VOLTAGE	Tc = –55°C to +125°C	—	5	25	—	5	25	—	5	25	—	5	25	mV p-p
LINE REGULATION	V_{IN} = 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[1]	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	10 kHz - 20 MHz													
CURRENT	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[2]	POWER DISSIPATION													
	SHORT CIRCUIT[2]	—	—	7	—	—	8	—	—	7	—	—	7	W
	RECOVERY[1]	—	—	20	—	—	20	—	—	20	—	—	20	ms
STEP LOAD	50% – 100% – 50%													
RESPONSE[3]	TRANSIENT	—	—	300	—	—	300	—	—	350	—	—	450	mV pk
	RECOVERY	—	—	1	—	—	1.5	—	—	1.3	—	—	1.3	mS
START-UP	DELAY	—	14	18	—	14	18	—	14	18	—	14	18	ms
0 TO 28 V_{IN}	OVERSHOOT	—	0	100	—	0	100	—	0	120	—	0	150	mV pk
STEP LINE	16-50-16 VDC[4]													
RESPONSE[1]	TRANSIENT			175			550			550			650	mVpk
	RECOVERY[4]			0.9			2			2.5			2.5	mS
CAPACITIVE LOAD[1]				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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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[2]	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 $+V_{OUT}$ / $-V_{OUT}$	—	5	35	—	5	25	—	10	50	mVp-p
LINE REGULATION	V_{IN} = 16 TO 50 VDC ±V_{OUT}	—	0	10	—	0	10	—	0	10	mV
LOAD REGULATION	NO LOAD TO FULL ±V_{OUT}	—	5	15	—	2	15	—	2	15	mV
INPUT VOLTAGE	CONTINUOUS	16	28	50	16	28	50	16	28	50	VDC
NO LOAD TO FULL[1]	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[1,3]	POWER DISSIPATION SHORT CIRCUIT	—	—	7.5	—	—	9	—	—	9	W
	RECOVERY	—	—	20	—	—	25	—	—	30	ms
STEP LOAD RESPONSE[4] ± V_{OUT}	50% – 100% — 50% TRANSIENT	—	—	180	—	—	200	—	—	250	mV pk
	RECOVERY	—	—	1500	—	—	800	—	—	80	
START UP[1]	+V_{OUT} DELAY	---	10	16	---	10	18	---	12	20	ms
	±V_{OUT} OVERSHOOT	---	0	50	---	0	100	---	0	100	mV pk
	-V_{OUT} DELAY	---	10	18	---	10	23	---	12	28	mS
STEP LINE[1] RESPONSE[1,5]	16-50-16 VDC TRANSIENT	---	---	400	---	---	500	---	---	500	mV pk
	RECOVERY	---	---	4	---	---	3	---	---	3	mS
CAPACITIVE LOAD[1]		---	---	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.

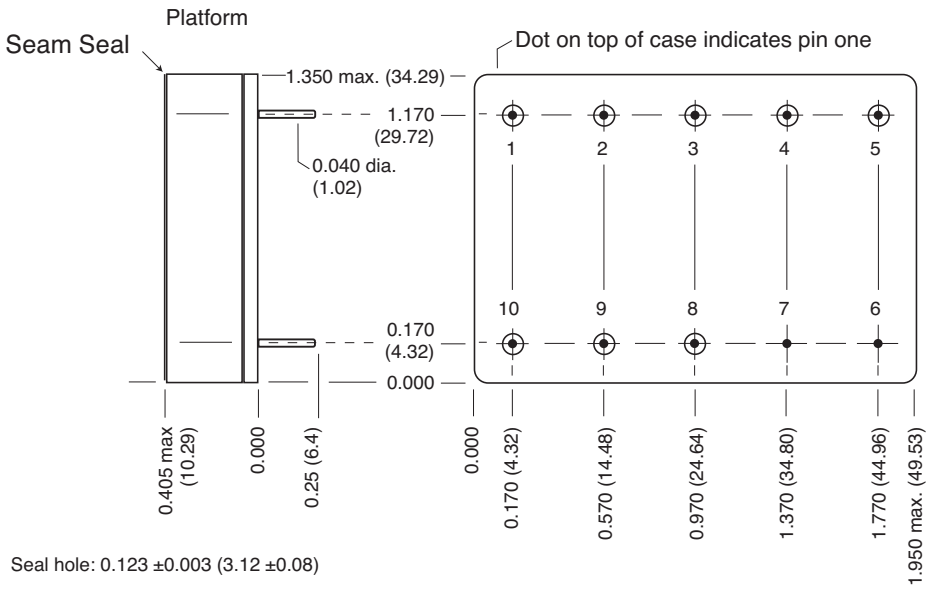
TRIPLE OUTPUT MODELS		MHV28512T			MHV28515T			
PARAMETER	**CONDITION**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
OUTPUT VOLTAGE	MAIN	4.95	5.0	5.05	4.95	5.0	5.05	VDC
	+ AUXILIARY	11.88	12.0	12.12	14.85	15.0	15.15	
	– AUXILIARY	11.82	12.0	12.18	14.77	15.0	15.23	
OUTPUT CURRENT[2]	MAIN	0	—	2.0	0	—	2.0	A
V_{IN} = 16 TO 50	+ 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[3]	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	—	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	MAIN	—	0	5	—	0	5	mV
V_{IN} = MIN. TO MAX.	+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[4]	- AUXILIARY CONDITION A & B	—	400	800	—	400	800	mV
INPUT VOLTAGE[1]	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 /	POWER DISSIPATION MAIN	—	—	9	—	—	9	W
SHORT CIRCUIT[4]	± AUXILIARY	—	—	9	—	—	9	
	RECOVERY - EACH OPUTPUT	---	---	25	---	---	25	mS
STEP LOAD RESPONSE[6, 7]	TRANSIENT MAIN	—	—	250	—	—	250	mV
	± AUXILIARY	—	—	550	—	—	550	
	RECOVERY MAIN	—	—	2.5	—	—	2.5	ms
	± AUXILIARY	—	—	3.5	—	—	3.5	
START-UP[7]	DELAY EACH OUTPUT	—	7	15	—	7	15	ms
	OVERSHOT MAIN	---	---	100	---	---	100	mV pk
	± AUXILIARY	---	---	240	---	---	300	
CAPACITIVE LOAD[1]	MAIN	---	---	200	---	---	200	µF
	± AUXILIARY	---	---	100	---	---	100	
STEPLINE RESPONSE[7]	TRANSIENT[1] MAIN	—	—	400	—	—	400	mV pk
	± AUXILIARY	—	—	500	—	—	500	
	RECOVERY[1] MAIN	—	—	3	—	—	3	mS
	± AUXILIARY	—	—	4	—	—	4	

Notes
1. Guaranteed by design, not tested.
2. 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.
3. The sum of the auxiliary output power may not exceed 5 watts.
4. 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; -(50%) negative aux. = 2.5 W to 0.5 W (50% to 10%).
   B. From +Po = 70% and -Po = 30% to + Po = 30% and -Po =70%.
   Above conditions are referenced to 50%/50% balanced loads.
5. Load fault is a short circuit (<50 mΩ). Recovery is into a resistive load.
6. Load step transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
7. 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 ±0.003 (3.12 ±0.08)

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 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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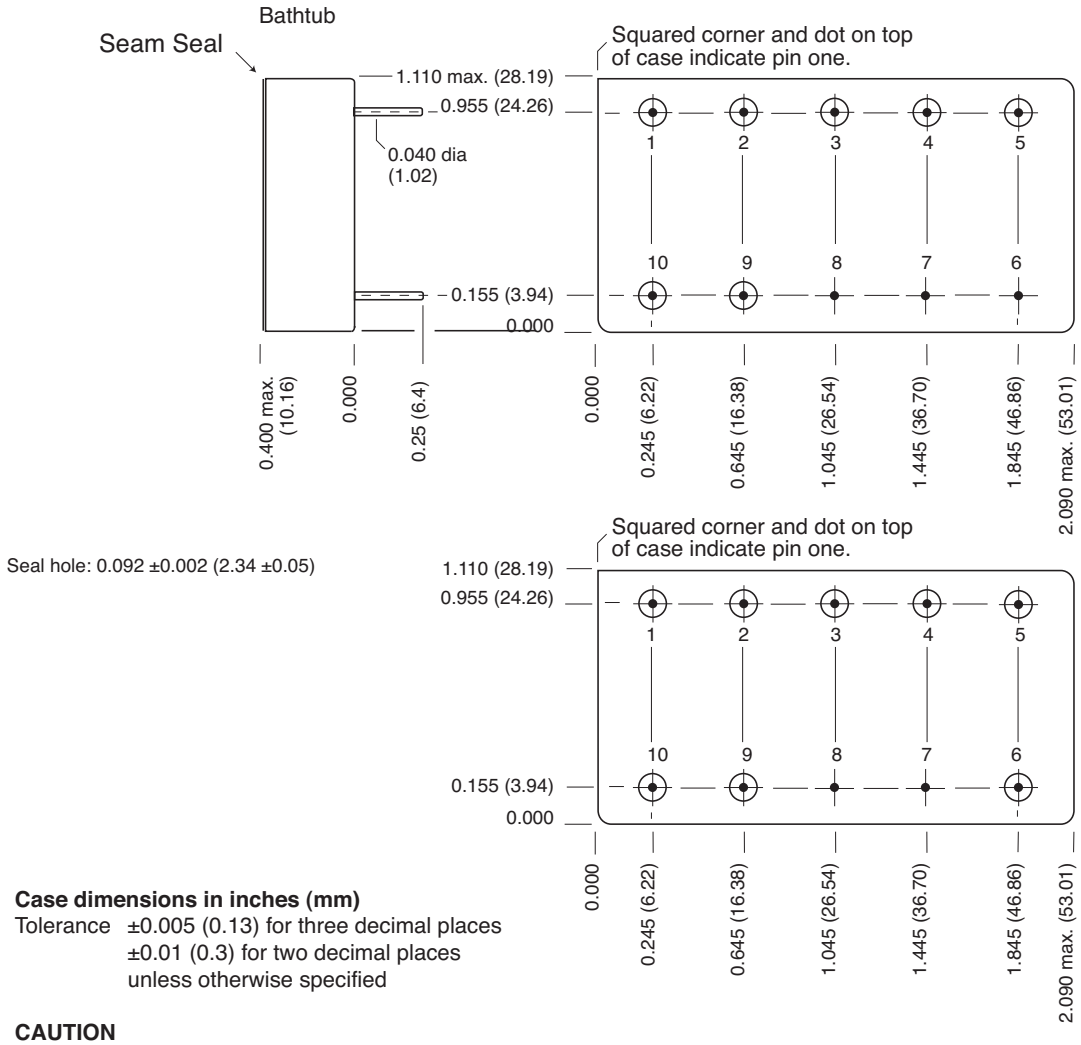
FIGURE 7: CASE F1- MHV SINGLE AND DUAL

MHV Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 15 WATT

CASE H2
BOTTOM VIEW



Seal hole: 0.092 ±0.002 (2.34 ±0.05)

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 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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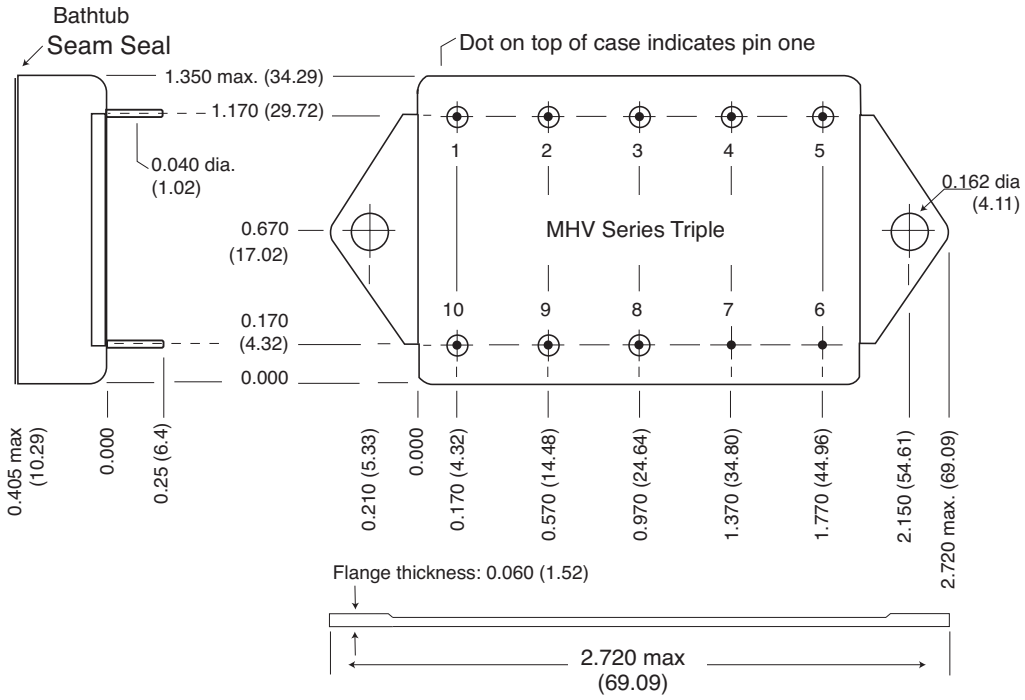
FIGURE 8: CASE H2 - MHV TRIPLE

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 ±0.002

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 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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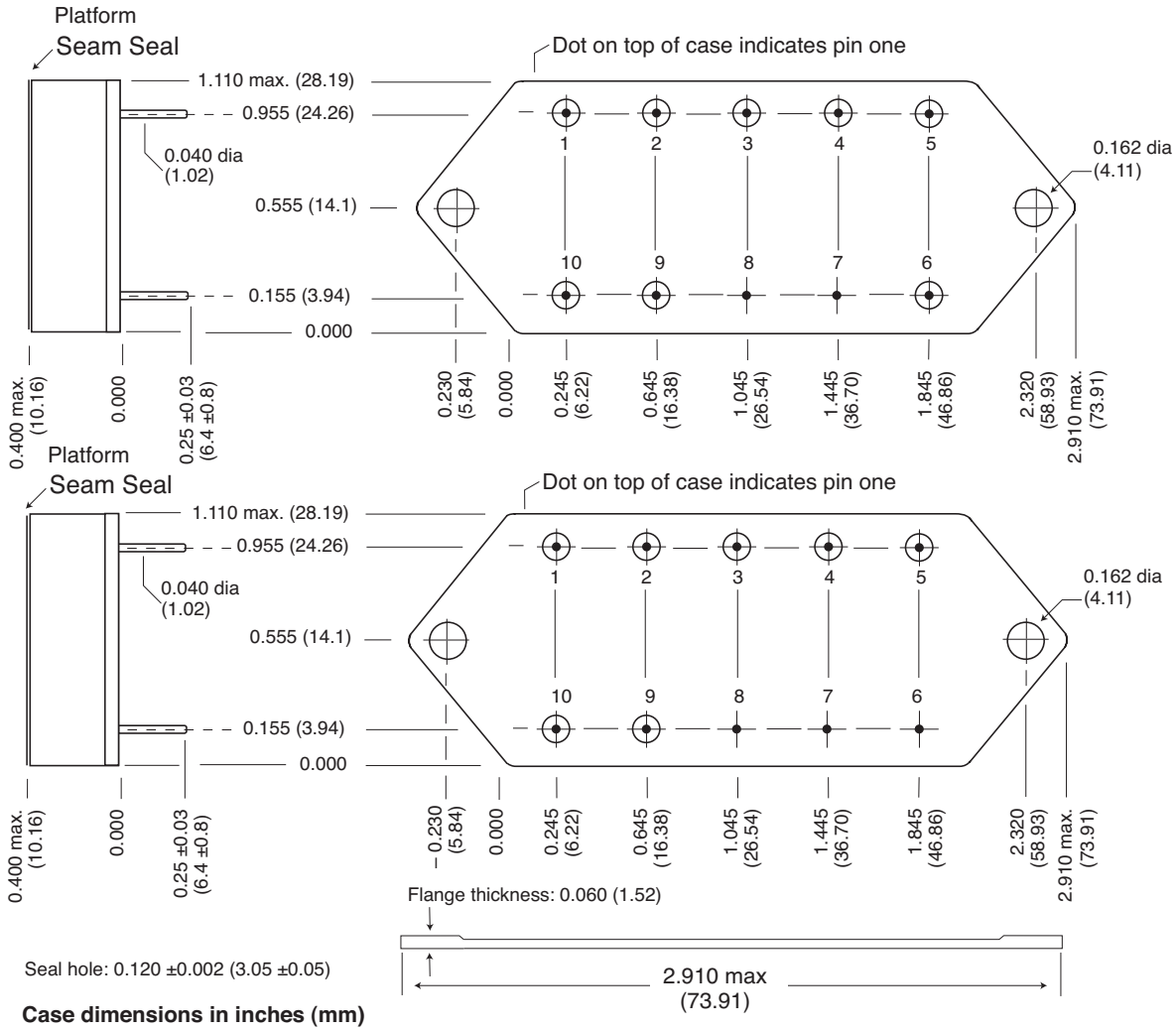
FIGURE 9: CASE J1 - MHV TRIPLE

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)[1]		Class H, QML	
	M/S[2]	P[3]	M/S[2]	P[3]
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[4]	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 no 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	no	no	yes
Method 1010, Cond. B, -55°C to 125°C, ambient	no	yes	no
Constant Acceleration			
Method 2001, 3000 g	no	no	yes
Method 2001, 500g	no	yes	no
Burn-In			
Method 1015, 160 hours at 125°C case, typical	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 case	no	no	yes
Subgroups 1 and 4: +25°C case	yes	yes	no
Hermeticity Test			
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.

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