DC-DC CONVERTERS
28 VOLT INPUT

MHE SERIES
20 WATT

NOT RECOMMENDED FOR NEW DESIGNS

FEATURES

- -55°C to +85°C operation
- 17 to 40 volts input
- 50 volts for 50 ms transient protection in 28 Vin models
- Fully isolated
- Fixed frequency switching
- Output trim on single output models
- Inhibit function
- Up to 83% efficiency
- Indefinite short circuit protection

MODELS OUTPUT VOLTAGE	
SINGLE	DUAL
5	±12
12	±15
15	

Size (max.): Non-flanged
2.110 x 1.120 x 0.495 inches MHE (case H6) (53.59 x 28.45 x 12.57) mm
Flanged
2.910 x 1.115 x 0.495 inches MHE (case K7) (73.91 x 28.45 x 12.57) mm
See cases H6 and K7 for dimensions.
Weight: 50 grams typical
Screening: Standard or ES. See screening table for more information.

DESCRIPTION

The Interpoint® MHE Series™ dc-dc converters offer the high efficiencies associated with switching regulators, yet have full isolation and the excellent regulation typical of linear regulators. No external components are required for operation. MHE Series converters are built using thick-film hybrid technology, and are sealed in metal packages for military, aerospace, and other high-reliability applications. Unscreened models are solder sealed and are guaranteed to pass a gross leak test (maximum leak rate of 1 x 10^{-3} atm.-cc/sec). Environmentally screened models are hermetically sealed and are screened to "ES" standards.

The MHE Series converters are pulse-width modulated switching regulators operating in the forward mode, with a nominal switching frequency of 125 to 140 kHz. Isolation is achieved through the use of a transformer in the forward power circuit, and an optocoupler is used in the feedback/control loop. The full load output power is available over the full input voltage range. Short-term transients of 50 volts will not impair normal operation.

The efficiency is typically greater than 80% over the entire input voltage range and from approximately 25% of full load to full load. This feature makes the MHE Series converters ideal for either battery or aircraft power applications.

An inhibit function is provided on MHE Series converters to allow power shutdown and startup from a logic input. The unit is inhibited when the inhibit input pin (pin 2) is connected to the input common (pin 10). The open circuit voltage of the inhibit pin is 11 to 13 VDC. During inhibit, the input inhibit pin must sink approximately 1 mA. In the inhibit mode, converter output drops to less than 1 V and the input current is typically 8 mA.

Automatic current limiting circuitry protects the converter from short circuits.

MHE Series converters are rated to operate at full load up to a case temperature of 85°C, with the output power derated linearly to zero at 115°C. Because of the unit's high efficiency, heat sinking requirements are minimized, but due consideration should be given to removing self-generated heat when operating the device at maximum ratings. To increase dissipation, heat conducting material (PCB, copper sheet, heat sink, etc.) should be brought into contact with the converter's baseplate.

When the MHE Series converters are used in applications requiring full power operation for extended periods of time, or in shock and vibration environments, it is highly recommended that the flange-mount option be used. This option provides improved thermal transfer capabilities as well as a mechanically secure mounting configuration.

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ABSOLUTE MAXIMUM RATINGS

Output Power
- 15 to 20 watts depending on model

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

Storage Temperature Range (Case)
- -55°C to +125°C

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range
Continuous
- 17 to 40 volts

Transient
- 50 volts for 50 msec

Case Operating Temperature (Tc)
- -55°C to +85°C full power

Derating Output Power/Current
- Linearly from 100% at 85°C to 0% at 115° C
- Derate by 33% at 16 volts input

TYPICAL CHARACTERISTICS

Output Voltage Temperature Coefficient
- 150 ppm/°C, typical

Input to Output Capacitance
- 60 pF, typical

Isolation
- 100 megohm minimum at 500 V

Conversion Frequency
- 125 kHz, typical

Inhibit Pin Voltage (unit enabled)
- 11 to 13 volts

INHIBIT

Inhibit TTL Open Collector
- Logic low (output disabled)
  Logic low voltage ≤0.8 volts
- Referenced to input common
- Logic high (output enabled)
  Open collector

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

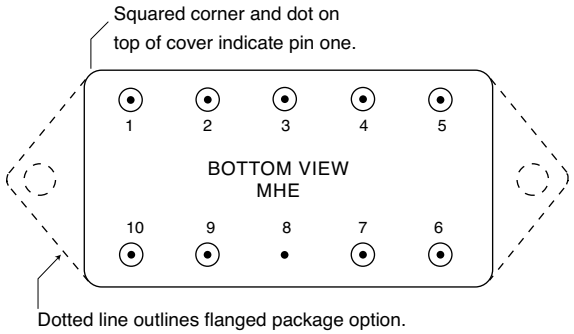
SINGLE OUTPUT MODELS		MHE2805S			MHE2812S			MHE2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	V
OUTPUT CURRENT [1]	TC = -55°C TO +85°C	—	—	3.0	—	—	1.67	—	—	1.33	A
OUTPUT POWER [1]	TC = -55°C TO +85°C	—	—	15	—	—	20	—	—	20	W
OUTPUT RIPPLE	0 TO 1 MHz	—	35	60	—	60	80	—	30	60	mV p-p
LINE REGULATION	V_{IN} MIN TO MAX	—	2	10	—	3	10	—	3	10	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	20	—	5	15	—	5	15	mV
INPUT VOLTAGE	CONTINUOUS	17	28	40	17	28	40	17	28	40	V
	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	—	18	—	—	30	—	—	30	mA
INPUT RIPPLE	10 KHZ TO 2 MHz	—	20	50	—	25	50	—	25	50	mA p-p
EFFICIENCY		78	81	—	79	82	—	80	83	—	%

DUAL OUTPUT MODELS		MHE2812D			MHE2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		±11.88	±12.00	±12.12	±14.85	±15.00	±15.15	V
OUTPUT CURRENT [1]	TC = -55°C TO +85°C	—	—	±0.63	—	—	±0.5	A
OUTPUT POWER [1]	TC = -55°C TO +85°C	—	—	15	—	—	15	W
OUTPUT RIPPLE	0 TO 1 MHz	—	30	50	—	30	50	mV p-p
LINE REGULATION	V_{IN} MIN TO MAX	—	3	10	—	3	15	mV
LOAD REGULATION	NO LOAD TO FULL	—	5	15	—	5	15	mV
INPUT VOLTAGE	CONTINUOUS	17	28	40	17	28	40	V
	TRANSIENT 50 ms	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	—	35	—	—	35	mA
INPUT RIPPLE	10 KHZ TO 2 MHz	—	25	50	—	25	50	mA p-p
EFFICIENCY		76	79	—	76	79	—	%

Note
1.On dual output models at least 25% of the load should be on the positive output.

PIN OUT

Pin	Single Output	Dual Output
1	Positive Input	Positive Input
2	Inhibit	Inhibit
3	Output Adjust	Positive Output
4	Output Common	Output Common
5	Positive Output	Negative Output
6	No connection	No connection
7	No connection	No connection
8	Case Ground	Case Ground
9	No connection	No connection
10	Input Common	Input Common



See cases H6 and K7 for dimensions.

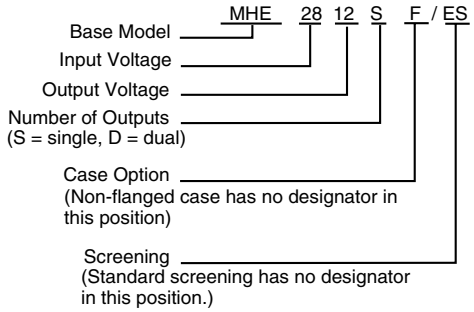
FIGURE 1: PIN OUT

OUTPUT ADJUSTMENT RESISTOR VALUES FOR MHE2805S

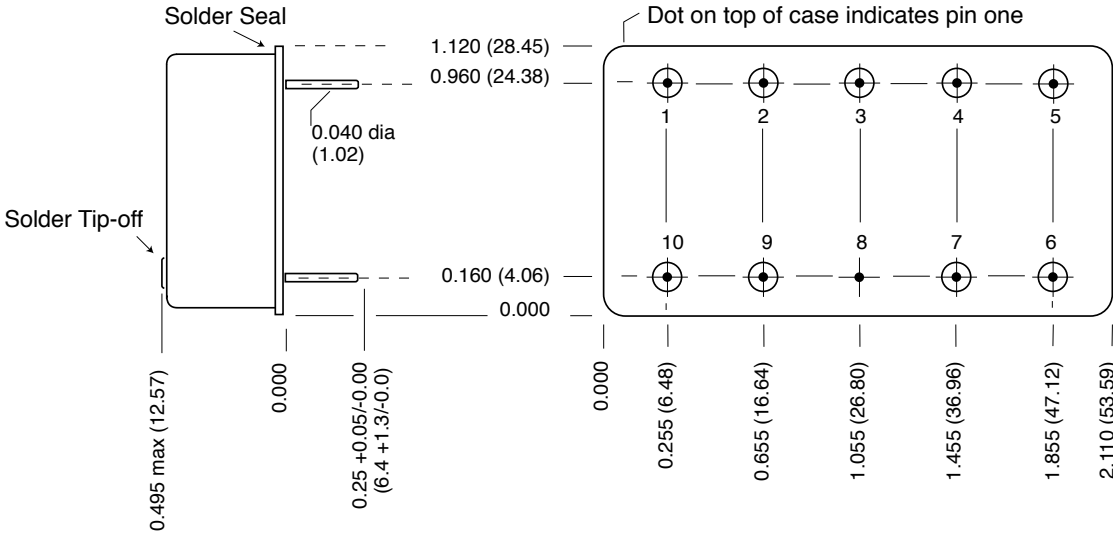
Resistance Pin 3 to 4	Output Voltage Increase (%)
∞	0
390K	+1%
145K	+2%
63K	+3%
22K	+4%
0	+5%

Output Adjustment all single output models:
The output can be adjusted upward by using the output adjust (pin 3) The resistance between output adjust (pin 3) and output common (pin 4) will determine the magnitude of the increase in the output. The table above is applicable only to MHE2805S.

MODEL NUMBERING KEY



BOTTOM VIEW CASE H6



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

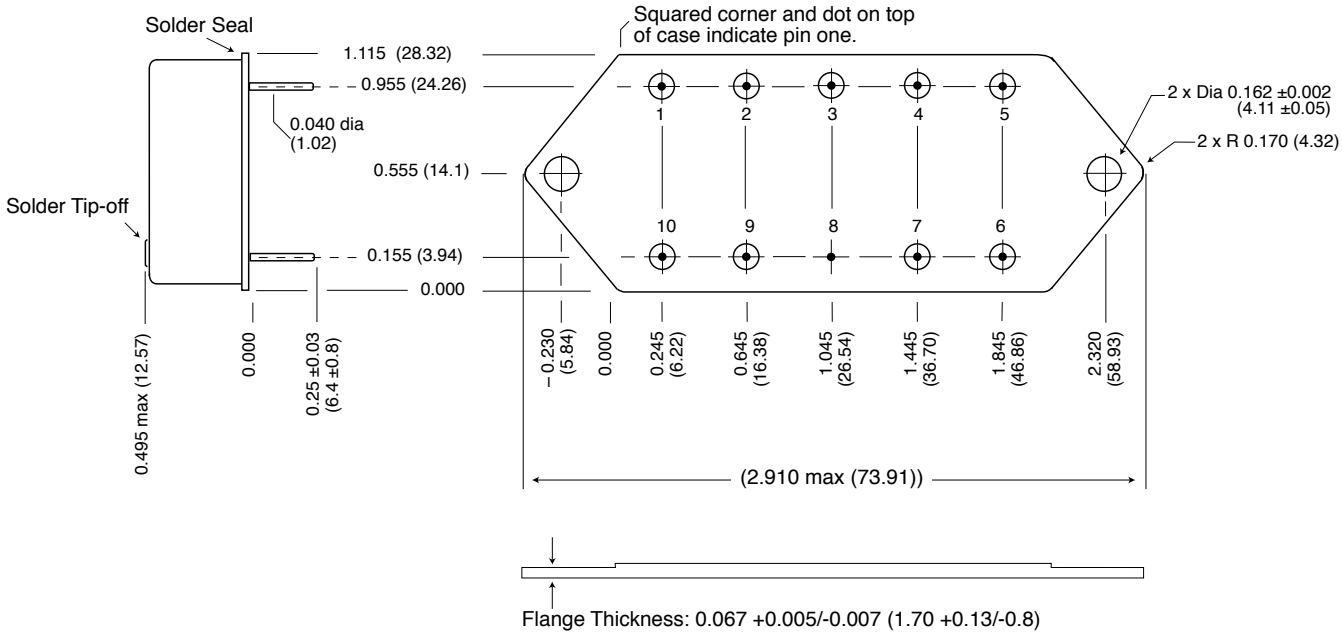
Header	Cold Rolled Steel/Nickel/Tin
Cover	Cold Rolled Steel/Nickel/Tin
Pins	#52 alloy, compression glass seal or ceramic seal

Case H6, Rev D, 20100211
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.

FIGURE 4: CASE H6 – MHE NON-FLANGED

BOTTOM VIEW CASE K7

*Flanged case: 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.

Case K7, Rev F, 20100419
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.

FIGURE 6: CASE K7 – MHE FLANGED

ENVIRONMENTAL SCREENING STANDARD AND /ES, NON-QML[1]

TEST PERFORMED	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 [2] 96 hours		■
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	■	■
Hermeticity Test		
Gross Leak, Cond. C_1, fluorocarbon		■
Fine Leak, Cond. A_2, helium		■
Gross Leak, Dip	■	
Final visual inspection Method 2009	■	■

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

Notes
1. Standard and /ES, non-QML products, may not meet all of the requirements of MIL-PRF-38534.
2. Burn-in temperature 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. Burn-in is a powered test.