

MHE Single and Dual DC-DC Converters

**17 TO 40 VOLTS INPUT – 15 TO 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
- Fully isolated
- Fixed frequency switching
- Output trim on single output models
- Inhibit function
- Up to 83% efficiency
- Indefinite short circuit protection



MODELS	
OUTPUT VOLTAGE (V)	
SINGLE	DUAL
5	±12
12	±15
15	

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. The MHE Series are manufactured in our fully certified and qualified MIL-PRF-38534 Class H production facility and packaged in hermetically sealed steel cases. They are ideal for use in programs requiring high reliability, small size, and high efficiency. MHE Series converters are built using thick-film hybrid technology. The series is solder sealed and guaranteed to pass a gross leak test (maximum leak rate of 1×10^{-3} atm-cc/sec). Environmentally screened (ES) models are hermetically sealed and are screened to “ES” standards. See Table 7 on page 8 for more information.

The MHE Series converters are pulse-width modulated switching regulators operating in the forward mode, with a nominal switching frequency of 125 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 volts. During inhibit, the input inhibit pin must sink approximately 1 mA. In the inhibit mode, converter output drops to less than 1 volt 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.

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

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

TABLE 1: PIN OUT

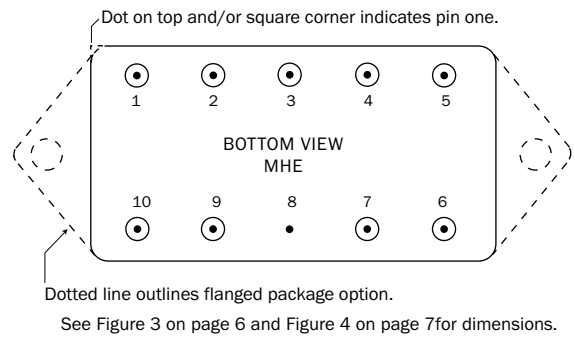


FIGURE 1: PIN OUT

OUTPUT ADJUSTMENT RESISTOR VALUES FOR MHE2805S ONLY	
Resistor Pin 3 to 4	Output Voltage: Voltage Increase
∞	0
390 k	+1%
145 k	+2%
63 k	+3%
22 k	+4%
0	+5%

CAUTION: Do not exceed maximum power rating when trimming up.

Output adjustment for 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.

TABLE 2: OUTPUT ADJUSTMENT RESISTORS

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

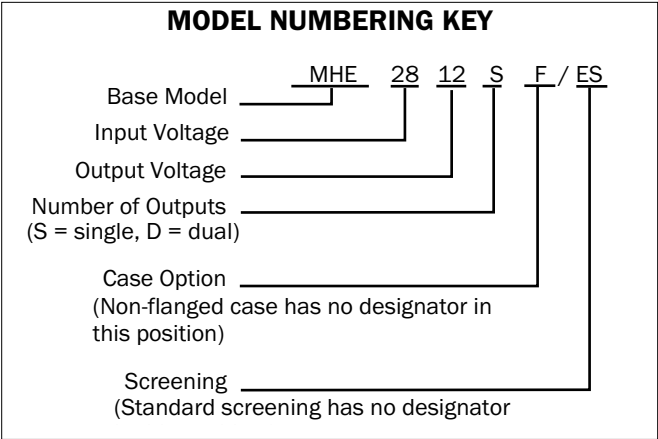


FIGURE 2: MODEL NUMBERING KEY

MODEL NUMBER OPTIONS					
To DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.					
CATEGORY	Base Model and Input Voltage	Output Voltage	Number of Outputs ¹	Case Options ²	Screening ³
OPTIONS	MHE28	05, 12, 15	S	(non-flanged, leave blank)	(standard, leave blank)
		12, 15	D	F (flanged)	ES
FILL IN FOR MODEL # ⁴	MHE28	_____	_____	_____	/ _____

Notes

1. Number of Outputs: S is a single output and D is a dual output.
2. Case Options: For the standard case, Figure 3 on page 6, leave the case option blank. For the flanged case option, Figure 4 on page 7, insert the letter F in the Case Option position.
3. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 7 on page 8.
4. If ordering by model number add a "Q" to request solder dipped leads (MHE2805S/ES-Q).

TABLE 3: MODEL NUMBER OPTIONS

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

TABLE 4: OPERATING CONDITIONS, ALL MODELS, 25 °C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MHE SERIES		ALL MODELS			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	
LEAD SOLDERING TEMPERATURE ¹	10 SECONDS MAX.	–	–	300	°C
STORAGE TEMPERATURE ¹		-55	–	+125	°C
CASE OPERATING TEMPERATURE	FULL POWER	-55	–	+85	°C
DERATING OUTPUT POWER/CURRENT LINEARLY ¹	CASE TEMPERATURE	From 100% at 85 °C to 0% at 115 °C			
	INPUT VOLTAGE	Derate by 33% at 16 volts input			
ISOLATION: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE ²	500 VDC AT 25 °C	100	–	–	Megohms
INPUT TO OUTPUT CAPACITANCE		–	60	–	pF
SWITCHING FREQUENCY		–	125	–	kHz
INHIBIT ACTIVE LOW (OUTPUT DISABLED)	INHIBIT PIN PULLED LOW ³	–	–	0.8	V
Do not apply a voltage to the inhibit pin ⁴	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED)	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
Do not apply a voltage to the inhibit pin ⁴	OPEN PIN VOLTAGE ¹	11	–	13	V

Notes

- Guaranteed by characterization test and/or analysis. Not a production test.
- When testing isolation, input pins are tied together and output pins are tied together. They are tested against each other and against case. Discharge the pins before and after testing.
- Tested with inhibit pin connected to input common.
- An external inhibit interface should be used to pull the inhibit low or leave it floating. The inhibit pin can be left unconnected if not used.

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

TABLE 5: ELECTRICAL CHARACTERISTIC 25 °C Tc, 28 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		–	–	3.0	–	–	1.6	–	–	1.33	A
OUTPUT POWER		–	–	15	–	–	20	–	–	20	W
OUTPUT RIPPLE	10 kHz TO 2 MHz	–	35	60	–	60	80	–	35	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 ¹	–	–	50	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	–	18	–	–	30	–	–	30	mA
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	–	20	50	–	25	50	–	25	50	mA p-p
EFFICIENCY		78	81	–	79	82	–	80	83	–	%

Notes

1. Guaranteed by characterization test and/or analysis. Not a production test.

TABLE 6: ELECTRICAL CHARACTERISTIC 25 °C Tc, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED

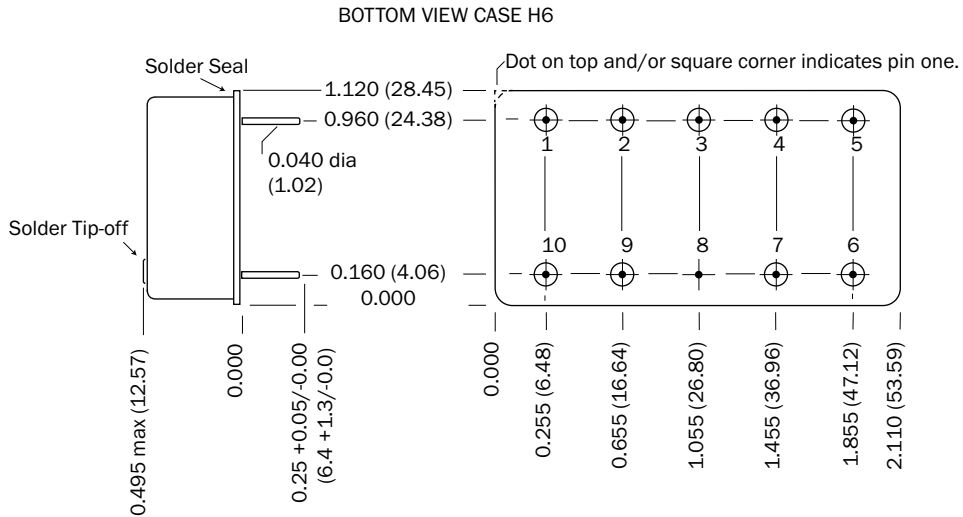
DUAL OUTPUT MODELS		MHE2812D			MHE2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		±11.88	±12.00	±12.12	±14.85	±15.00	±15.15	V
OUTPUT CURRENT ¹		–	–	±0.63	–	–	±0.5	A
OUTPUT POWER ¹		–	–	15	–	–	15	W
OUTPUT RIPPLE	10 kHz TO 2 MHz	–	30	50	–	30	50	mV p-p
LINE REGULATION	V _{IN} = 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 ²	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	–	35	–	–	35	mA
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	–	25	50	–	25	50	mA p-p
EFFICIENCY		76	79	–	76	79	–	%

Notes

1. On dual output models at least 25% of the load should be on the positive output.
 2. Guaranteed by characterization test and/or analysis. Not a production test.

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT



Weight: 50 grams typical

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

Please refer to the numerical dimensions for accuracy.

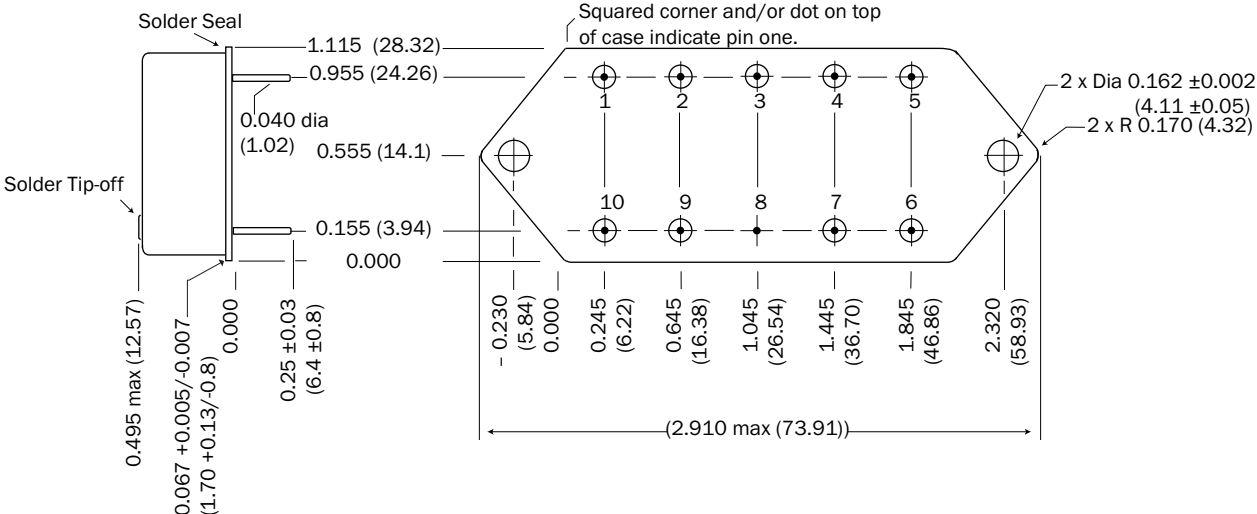
FIGURE 3: CASE H6 – MHE NON-FLANGED

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

BOTTOM VIEW CASE K7

*Flanged case: Designator ("F") required in Case Option position of model number.



Weight: 50 grams typical

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.

Please refer to the numerical dimensions for accuracy.

FIGURE 4: CASE K7 MHE FLANGED

MHE Single and Dual DC-DC Converters

17 TO 40 VOLTS INPUT – 15 TO 20 WATT

ENVIRONMENTAL SCREENING DC-DC CONVERTERS AND EMI FILTERS STANDARD AND /ES 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, Method 1014 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 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.

TABLE 7: ENVIRONMENTAL SCREENING

