

# DC/DC CONVERTERS 28 VOLT INPUT

MTW SERIES  
30 WATT

**NOT RECOMMENDED FOR NEW DESIGNS**

## FEATURES

- -55°C to +85°C operation
- 18 to 40 VDC input  
(19 to 40 VDC MTW2805S)
- 50 V for 50 ms transient protection
- Fully isolated
- Fixed frequency
- Remote sense on MTW2805S model
- Inhibit function
- Indefinite short circuit protection
- Up to 86% efficiency



Size (max.): 2.720 x 1.350 x 0.505 inches (69.09 x 34.29 x 12.83 mm)  
See case J5 for dimensions.

Weight: 60 grams max.

Screening: Standard or ES. See screening table for more information.

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

## DESCRIPTION

The MTW Series™ of DC/DC converters offer the high efficiency and wide input voltage range of switching regulators with the isolation, excellent output regulation, and low output noise typical of linear regulators without requiring the use of external components. MTW 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 sealed with solder and are guaranteed to pass a gross leak test (maximum leak rate of  $1 \times 10^{-3}$  atm.-cc/sec). Environmentally screened models (/ES) are hermetically sealed with solder and will pass a fine leak and gross leak test as described in Section C2.

MTW converters use a constant frequency pulse-width modulated switching regulator design operating in the forward mode with a clock switching frequency of 240 to 300 kHz. Isolation is achieved through the use of a transformer in the forward power circuit and an optocoupler in the feedback control loop. The full load output power of 30 watts is available over the entire 18 to 40 VDC (19 to 40 VDC for MTW2805S) input range. On dual output models, up to 90% of full power is available from either output up to a combined total of 30 watts. Input transients of 50 V to up to 50 ms. duration will not impair normal operation.

Efficiency is high over the entire input voltage range and from approximately 25% of full load to full load (see typical efficiency curves).

MTW converters are provided with indefinite short circuit protection through the use of current limiting techniques. When the output current reaches approximately 125% of the full rated load, the output voltage begins to reduce to protect the converter. The converter can sustain a true short circuit condition indefinitely.

With temperatures measured at the baseplate, the MTW Series is rated for full power operation from -55°C to +85°C with the power derated linearly to 0 at 115°C. The MTW's flanged case facilitates

removal of heat and provides for mechanically secure mounting. In applications requiring full power operation, an efficient heat sink attached to the baseplate is required.

An inhibit is provided to allow power shut-down and start-up from a logic input. An open circuit on the inhibit pin allows normal operation, while a connection between the inhibit pin and input common disables the internal oscillator and shuts down the output. In the inhibit mode, approximately 1 mA must be sunk from pin the inhibit pin. An open collector, active low, is required to activate the inhibit function.

All MTW converters are characterized by close output regulation over the entire operating range with no minimum power requirement. On 12 and 15 VDC output models, typical line regulation is 10 to 20 mv. The MTW2805S model uses external remote sense pins which monitor the voltage at the load to provide typical regulation in the 5 to 7 mV range. The voltage sensing circuitry operates in a true four terminal voltage mode, eliminating the adverse effects of line resistance voltage drops. The remote sense pins may be left unconnected, but see cautions in on the following pages. For normal operation, remote sense pins should be connected to their respective output pins.

The MTW Series offers low noise on both the input and output line. In the single output converters, two-section L-C filters at both the input and output limit output ripple voltage and minimize reflected ripple on the input line. A small value (1000 pF, 500 V) ceramic capacitor connected between the case and input common pin of the single volt output models will reduce EMI on the input lines to levels near those required by MIL-STD-461C's CE03 standard. In the dual output converters, single-section L-C filters are used at the input and outputs. If compliance with MIL-STD-461 is necessary, use of Interpoint's FMA-416 EMI filter or FM-704A transient suppressor is recommended.

## ABSOLUTE MAXIMUM RATINGS

### Input Voltage

- 18 to 40 VDC (19 to 40 VDC MTW2805S)

### Output Power

- 30 watts

### Lead Soldering Temperature (10 sec per lead)

- 300°C

### Storage Temperature Range (Case)

- -55°C to +125°C

## RECOMMENDED OPERATING CONDITIONS

### Input Voltage Range

- 18 to 40 VDC continuous (19 to 40 MTW2805S)
- 50 V for 50 msec transient

### Case Operating Temperature (Tc)

- -55°C to +85°C full power
- -55°C to +115°C absolute

### Derating Output Power/Current

- Linearly from 100% at 85°C to 0% at 115°C

## CAUTION

Permanent damage to the MTW2805S will result if pin 6 is shorted to ground. Damage may also result if pin 4 or pin 5 is disconnected from the load during operation with the remote sense leads connected to the load. If remote sense pins are not connected to the load, the output voltage of the MTW2805S will rise to approximately 6.2 VDC measured across pins 4 and 5.

## TYPICAL CHARACTERISTICS

### Output Voltage Temperature Coefficient

- 100 ppm/°C, typical

### Input to Output Capacitance

- 80 pF typical single output models
- 70 pF typical MTW2812D
- 60 pF typical MTW2815D

### Current Limit

- 125% of full load typical

### Isolation

- 100 megohm minimum at 500 V

### Conversion Frequency

- 240 to 300 kHz

### Inhibit Pin Voltage (unit enabled)

- 11 to 15 V single output models
- 8 to 12 V MTW2812D
- 10 to 14 V MTW2815D

## INHIBIT

### Inhibit TTL Open Collector

- Logic low (output disabled)  
Inhibit pin current 1 mA typical
- 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		MTW2805S			MTW2812S			MTW2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.95	5.0	5.05	11.88	12.0	12.12	14.85	15.0	15.15	VDC
OUTPUT CURRENT		—	—	6.0	—	—	2.5	—	—	2.0	A
OUTPUT POWER	TC = -55°C TO +85°C	—	—	30.0	—	—	30.0	—	—	30.0	W
OUTPUT RIPPLE	BW ≤ 2 MHz	—	30	50	—	30	65	—	30	65	mV p-p
LINE REGULATION <sup>1</sup>	MIN TO MAX V <sub>IN</sub>	—	7	20	—	10	25	—	10	25	mV
LOAD REGULATION <sup>1</sup>	NO LOAD TO FULL	—	5	20	—	10	20	—	10	20	mV
INPUT VOLTAGE TC = -55°C TO +85°C	NO LOAD TO FULL	19	28	40	18	28	40	18	28	40	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	15	20	—	20	35	—	20	35	mA
	FULL LOAD	—	—	1370	—	—	1400	—	—	1400	
	INHIBITED	—	—	15	—	—	22	—	—	22	
INPUT RIPPLE	BW ≤ 2 MHz	—	5	10	—	10	20	—	10	20	mA p-p
EFFICIENCY		80	82	—	82	84	—	84	86	—	%
START-UP	DELAY <sup>2</sup>	—	15	—	—	30	—	—	40	—	ms
	OVERSHOOT	—	300	—	—	400	—	—	400	—	mV

## Notes

1. For MTW2805S, with the remote sense pins connected to the load and no resistance between the output pins and load.

2. A low output impedance power source is required on the input to realize this start-up time. If less than full surge current is available, start-up time will be longer.

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

DUAL OUTPUT MODELS		MTW2812D			MTW2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	+ V <sub>OUT</sub>	11.88	12.0	12.12	14.85	15.0	15.15	VDC
	- V <sub>OUT</sub>	11.88	12.0	12.12	14.85	15.0	15.15	
OUTPUT CURRENT		—	—	2.5	—	—	2.0	A
OUTPUT POWER <sup>1</sup>	TC = -55°C TO +85°C	—	—	30.0	—	—	30.0	W
OUTPUT RIPPLE	BW ≤ 2 MHz	—	50	85	—	50	85	mV p-p
LINE REGULATION	V <sub>IN</sub> = 18 TO 40	—	10	25	—	10	25	mV
LOAD REGULATION	NO LOAD TO FULL	—	20	50	—	20	50	mV
CROSS REGULATION <sup>2</sup>	+ V <sub>OUT</sub>	—	2.5	3.5	—	2.2	3.2	%
	- V <sub>OUT</sub>	—	2.5	3.5	—	2.2	3.2	
INPUT VOLTAGE TC = -55°C TO +85°C	CONTINUOUS	18	28	40	18	28	40	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	35	50	—	45	60	mA
	FULL LOAD	—	—	1350	—	—	1400	
	INHIBITED	—	—	24	—	—	24	
INPUT RIPPLE	BW ≤ 2 MHz	—	15	50	—	15	50	mA p-p
EFFICIENCY		81	84	—	82	85	—	%
START-UP	DELAY <sup>3</sup>	—	30	—	—	30	—	ms
	OVERSHOOT	—	500	—	—	500	—	mV

#### Notes

- Up to 90% of full power is available from either output providing the total power does not exceed 30 watts.
- The effect on the output voltage of either output (held at 3 watts) when the other output is varied from 3 to 27 watts.
- A low output impedance power source is required on the input to realize this start-up time. If less than full surge current is available, start-up time will be longer.

### PIN OUT

Pin	MTW2805S	Single Output	Dual Output
1	Positive Input	Positive Input	Positive Input
2	Inhibit	Inhibit	No connection
3	Sense Return	No connection	Positive Output
4	Output Common	Output Common	Output Common
5	Positive Output	Positive Output	Negative Output
6	Positive Sense	No connection	No connection
7	Case Ground	Case Ground	Case Ground
8	No connection	No connection	Inhibit
9	No connection	No connection	Input Common
10	Input Common	Input Common	Input Common

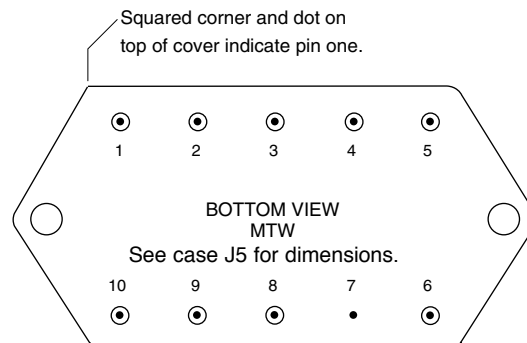
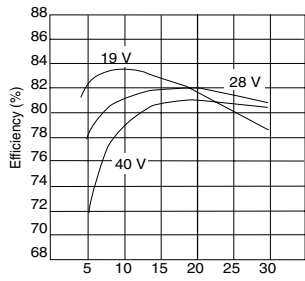
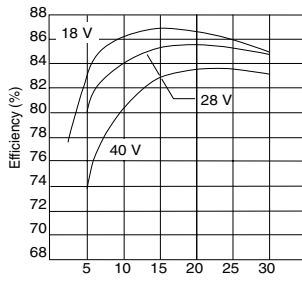


FIGURE 1: PIN OUT

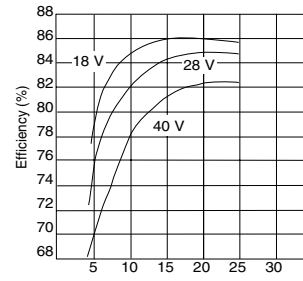
Typical Performance Curves: 25°C Tc



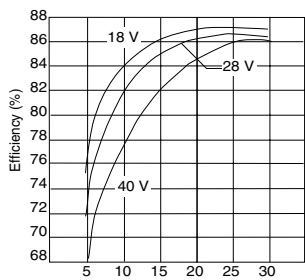
MTW2805S Efficiency  
FIGURE 2



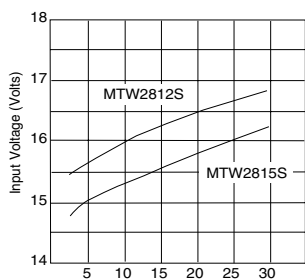
MTW2812S Efficiency  
FIGURE 3



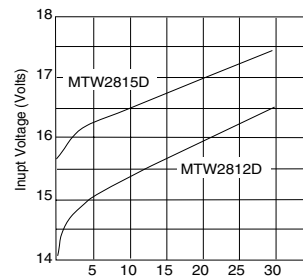
MTW2812D Efficiency  
FIGURE 4



MTW2815D Efficiency  
FIGURE 5

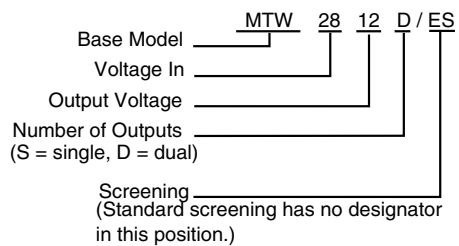


MTW2812S and MTW2815S  
Low Line Dropout  
FIGURE 6

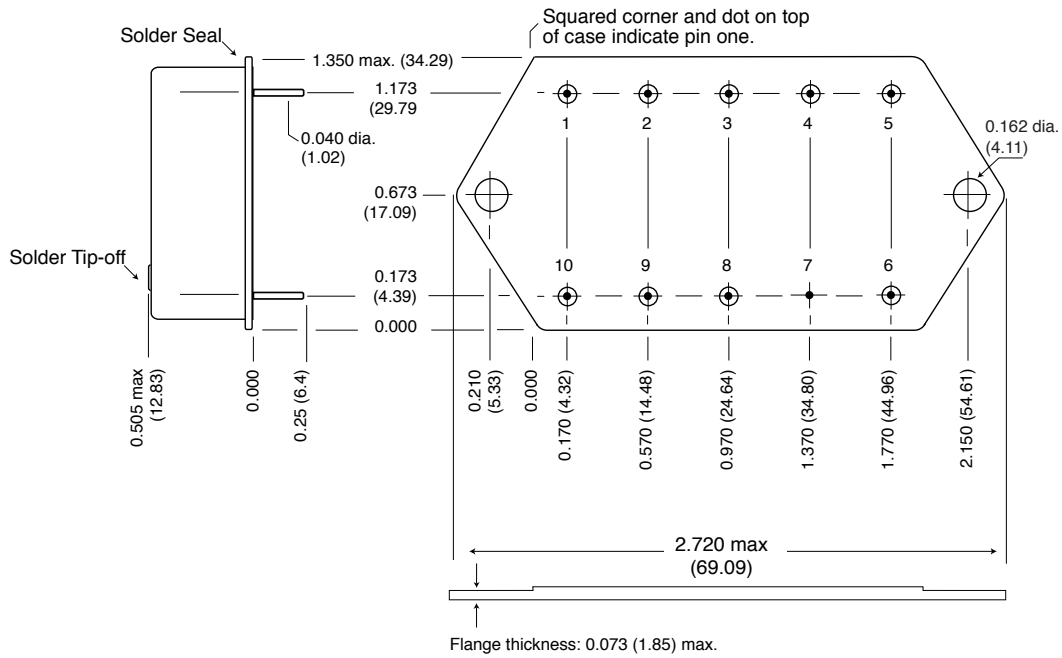


MTW2812D and MTW2815D  
Low Line Dropout  
FIGURE 7

## MODEL NUMBERING KEY



## BOTTOM VIEW CASE J5



### 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.

Case J5, Rev E, 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.  
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FIGURE 8: CASE J5

## STANDARD AND /ES (NON-QML) PRODUCTS ENVIRONMENTAL SCREENING <sup>1</sup>

TEST PERFORMED	STANDARD NON-QML <sup>2</sup>	/ES NON-QML <sup>2</sup>
Pre-cap Inspection Method 2017, 2032	yes	yes
Temperature Cycle (10 times) Method 1010, Cond. B, -55°C to +125°C, ambient	no	yes
Constant Acceleration Method 2001, 500 g	no	yes
Burn-in Method 1015 <sup>3</sup> 96 hours	no	yes
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	yes	yes
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
Final visual inspection Method 2009	yes	yes

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

Notes:

**1. Refers to products that do not offer QML screening.**

2. Standard and /ES, non-QML products, do not meet all of the requirements of MIL-PRF-38534.

3. Burn-in designed to bring the case temperature to the maximum case temperature of 85°C.