

MTW Single and Dual DC-DC Converters

28 VOLT INPUT – 30 WATT

NOT RECOMMENDED FOR NEW DESIGNS

FEATURES

- -55 °C to +85 °C operation
- 18 to 40 volt input
(19 to 40 volt input 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, typical



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

DESCRIPTION

The Interpoint® 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 1×10^{-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 Table 6 on page 8.

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 volts (19 to 40 volts 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 volts for 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 volt 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.

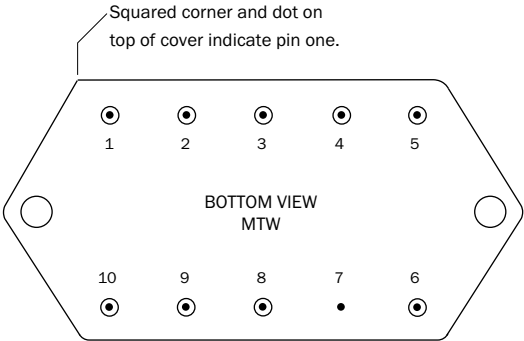
The MTW Series offers low noise on both the input and output lines. In the single output converters, two-section L-C filters at both the input and output limit output ripple voltage and minimize reflected ripple on the input line. A small value (1000 pF, 500 V) ceramic capacitor connected between the 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 FMCE-0528, FMCE-0828 EMI filters or FM-704A transient suppressor is recommended.

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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

TABLE 1: PIN OUT



See Figure 9 on page 7 for dimensions

FIGURE 1: PIN OUT

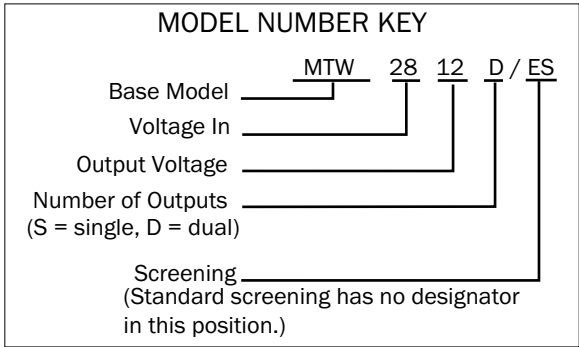


FIGURE 2: MODEL NUMBERING KEY

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	Screening ²
OPTIONS	MTW28	05, 12, 15	S	(standard, leave blank)
		12, 15	D	ES
FILL IN FOR MODEL # ³	MTW28	_____	_____	/ _____
Notes 1. Number of Outputs: S is a single output and D is a dual output. 2. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 6 on page 8. 3. If ordering by model number add a “-Q” to request solder dipped leads (MTW2805S/ES-Q).				

TABLE 2: : MODEL NUMBERING OPTIONS

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TABLE 3: OPERATING CONDITIONS, ALL MODELS, 25 °C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MTW 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
	ABSOLUTE	-55	–	+115	
DERATING OUTPUT POWER/CURRENT LINEARLY ¹		From 100% at 85 °C to 0% at 115 °C			
ISOLATION: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE ²	500 VDC AT 25 °C	100	–	–	Megohms
INPUT TO OUTPUT CAPACITANCE ¹	SINGLE OUTPUT MODELS	–	80	–	pF
	MTW2812D	–	70	–	
	MTW2815D	–	80	–	
CURRENT LIMIT	% OF FULL LOAD		125		%
SWITCHING FREQUENCY		240	–	300	kHz
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin ⁴	INHIBIT PIN PULLED LOW ³	–	–	0.8	V
	INHIBIT PIN SOURCE CURRENT ¹	–	1	–	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin ⁴	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE ¹				V
	SINGLE OUTPUT MODELS	11	–	15	
	MTW2812D	8	–	12	
MTW2815D	10	–	14		

Notes

1. Guaranteed by characterization test and/or analysis. Not a production test.
2. 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.

3. Tested with inhibit pin connected to input common.
4. 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.

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TABLE 4: ELECTRICAL CHARACTERISTIC 25 °C CASE, 28 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	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	V
OUTPUT CURRENT		–	–	6.0	–	–	2.5	–	–	2.0	A
OUTPUT POWER	-55 °C TO +85 °C	–	–	30	–	–	30	–	–	30	W
OUTPUT RIPPLE	BW ≤ 2 MHz	–	30	50	–	30	65	–	30	65	mV p-p
LINE REGULATION ¹	V _{IN} = MIN TO MAX	–	7	20	–	10	25	–	10	25	mV
LOAD REGULATION ¹	NO LOAD TO FULL	–	5	20	–	10	20	–	10	20	mV
INPUT VOLTAGE	NO LOAD TO FULL	19	28	40	18	28	40	18	28	40	V
-55 °C TO +85 °C	TRANSIENT, 50 ms ²	–	–	50	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	15	20	–	20	35	–	20	35	mA
	INHIBITED	–	–	15	–	–	22	–	–	22	
INPUT RIPPLE CURRENT	BW ≤ 2 MHz	–	5	10	–	10	20	–	10	20	mA p-p
EFFICIENCY		80	82	–	82	84	–	82	86	–	%
START-UP ²	DELAY ³	–	15	–	–	30	–	–	40	–	ms
	OVERSHOOT	–	300	–	–	400	–	–	400	–	V

Notes

1. For MTW2805S, with the remote sense pins connected to the load and no resistance between the output pins and load.
 2. Guaranteed by characterization test and/or analysis. Not a production test.

3. 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.

CAUTION

Permanent damage to the MTW2805S will result if pin 6 (Positive Sense) is shorted to ground. Damage may also result if pin 4 (Output Common) or pin 5 (Positive Output) 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 volts measured across pins 4 and 5.

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TABLE 5: ELECTRICAL CHARACTERISTIC 25 °C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED

DUAL OUTPUT MODELS		MTW2812D			MTW2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	+V _{OUT}	11.88	12.00	12.12	14.85	15.00	15.15	V
	-V _{OUT}	11.88	12.00	12.12	14.85	15.00	15.15	
OUTPUT CURRENT ¹		–	–	2.5	–	–	2.0	A
OUTPUT POWER ¹	-55 °C TO +85 °C	–	–	30	–	–	30	W
OUTPUT RIPPLE	BW _≤ 2 MHz	–	50	85	–	50	85	mV p-p
LINE REGULATION	V _{IN} = 18 to 40	–	10	25	–	10	25	mV
LOAD REGULATION	NO LOAD TO FULL	–	20	50	–	20	50	mV
CROSS REGULATION ²	+V _{OUT}	–	2.5	3.5	–	2.2	3.2	%
	-V _{OUT}	–	2.5	3.5	–	2.2	3.2	
INPUT VOLTAGE -55 °C TO +85 °C	NO LOAD TO FULL	18	28	40	18	28	40	V
	TRANSIENT 50 ms ³	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	35	50	–	45	60	mA
	INHIBITED	–	–	24	–	–	24	
INPUT RIPPLE CURRENT	BW _≤ 2 MHz	–	15	50	–	15	50	mA p-p
EFFICIENCY		81	84	–	82	85	–	%
START-UP ³	DELAY ⁴	–	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.
- Guaranteed by characterization test and/or analysis. Not a production test.
- 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.

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Typical Performance Curves: 25°C case, 28 Vin, 100% load, unless otherwise specified.
These are examples for reference only and are not guaranteed specifications.

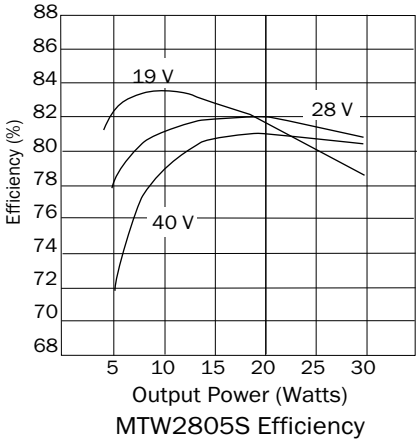


FIGURE 3

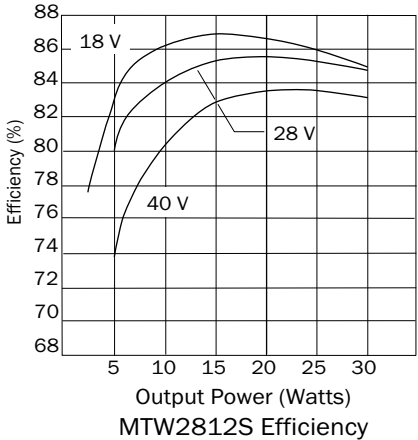


FIGURE 4

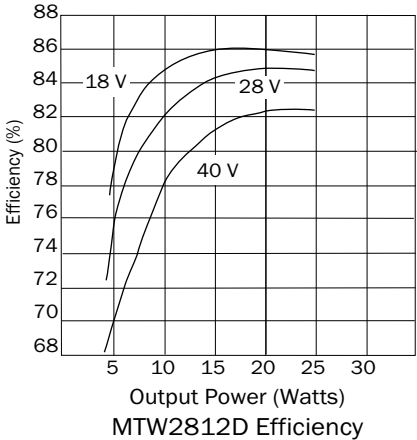


FIGURE 5

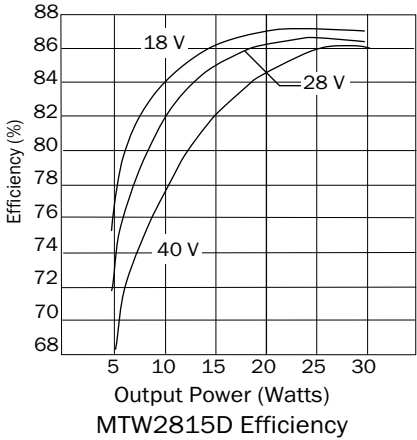


FIGURE 6

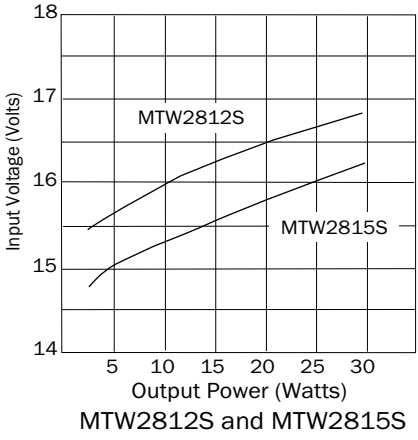


FIGURE 7

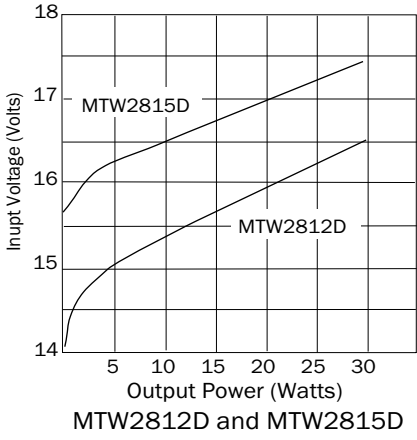
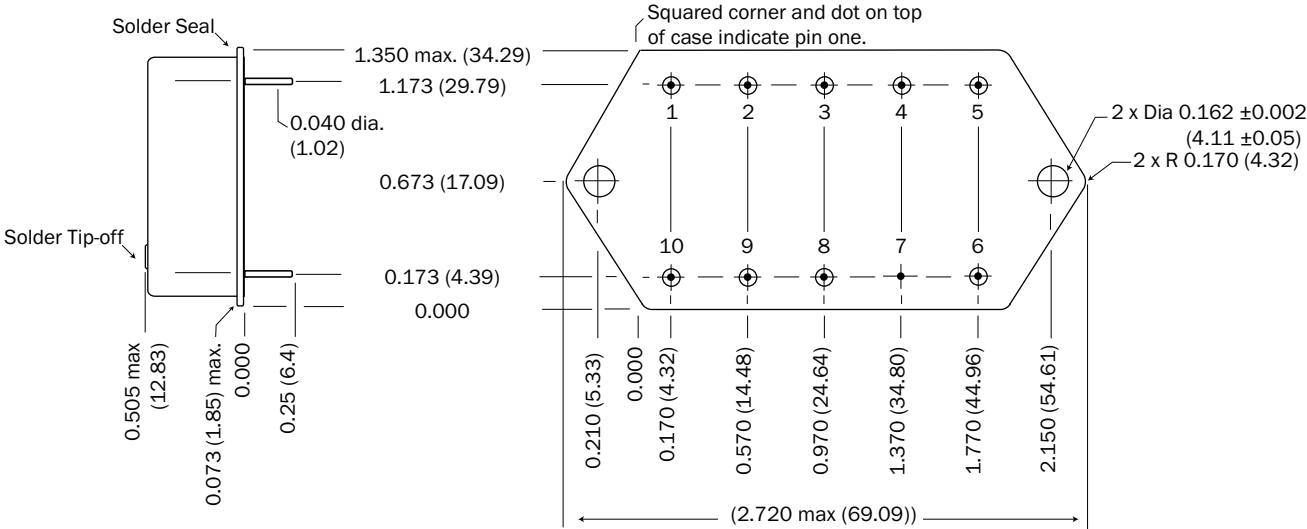


FIGURE 8

MTW Single and Dual DC-DC Converters

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BOTTOM VIEW CASE J5



Weight: 60 grams max.

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 9: CASE J5

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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 6: ENVIRONMENTAL SCREENING

