FEATURES

- **–55°C to +85°C operation**
- **18 to 40 VDC input (19 to 40 VDC MTW2805S)**
- Fully Isolated
- Optocoupler feedback
- Fixed frequency
- Topology – Push-Pull Forward
- 50 V for up to 50 ms transient protection
- Inhibit function
- Indefinite short circuit protection
- Remote sense on MTW2805S model
- Up to 86% efficiency

DC/DC CONVERTERS 28 VOLT INPUT

MTW SERIES 30 WATT



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

Size (max.): 2.720 x 1.350 x 0.505 inches (69.09 x 34.29 x 12.83 mm)
See Section B8, case J5, for dimensions.
Weight: 60 grams max.
Screening: Standard or ES. See Section C2 for screening options, see Section A5 for ordering information.

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 x 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.

MTW SERIES
30 WATT

DC/DC CONVERTERS

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

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

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

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

		MTW2805S			MTW2812S			MTW2815S			
PARAMETER	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
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	–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[1]	MIN. TO MAX. V_{IN}	—	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	VDC
–55°C TO +85°C	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 CURRENT	BW ≤ 2 MHz	—	5	10	—	10	20	—	10	20	mA p-p
EFFICIENCY		80	82	—	82	84	—	84	86	—	%
START-UP	DELAY[2]	—	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

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.

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

PARAMETER	CONDITION	MTW2812D			MTW2815D			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	$+V_{OUT}$	11.88	12.0	12.12	14.85	15.0	15.15	VDC
	$-V_{OUT}$	11.88	12.0	12.12	14.85	15.0	15.15	
OUTPUT CURRENT		—	—	2.5	—	—	2.0	A
OUTPUT POWER[1]	–55°C to +85°C	—	—	30.0	—	—	30.0	W
OUTPUT RIPPLE VOLTAGE	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	CONTINUOUS	18	28	40	18	28	40	VDC
–55°C to +85°C	TRANSIENT 50 ms	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	35	50	—	45	60	mA
	FULL LOAD	—	—	1350	—	—	1400	
	INHIBITED	—	—	24	—	—	24	
INPUT RIPPLE CURRENT	BW ≤ 2 MHz	—	15	50	—	15	50	mA p-p
EFFICIENCY		81	84	—	82	85	—	%
START-UP	DELAY[3]	—	30	—	—	30	—	ms
	OVERSHOOT	—	500	—	—	500	—	mV

Notes
1. Up to 90% of full power is available from either output providing the total power does not exceed 30 watts.
2. The effect on the output voltage of either output (held at 3 watts) when the other output is varied from 3 to 27 watts.
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

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

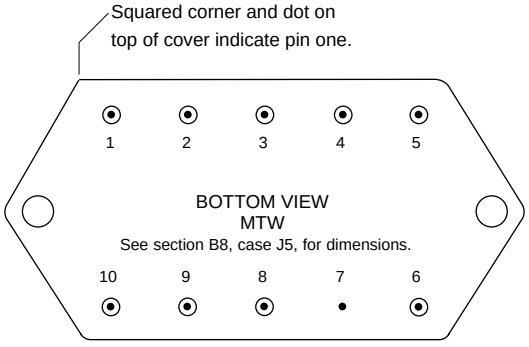
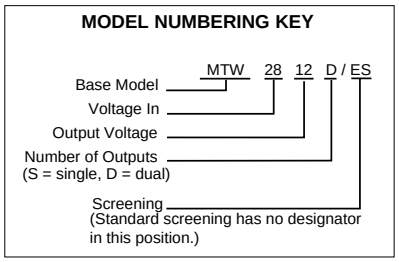


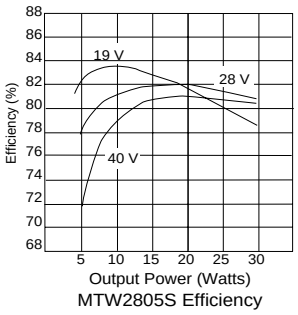
FIGURE 1: PIN OUT

DC/DC CONVERTERS

MODEL NUMBERING KEY

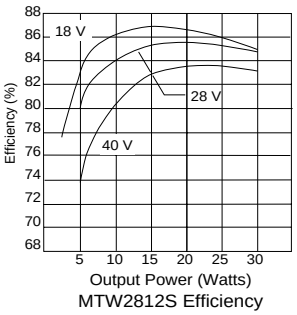


Typical Performance Curves: 25°C Tc



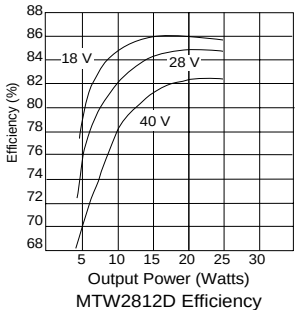
MTW2805S Efficiency

FIGURE 2



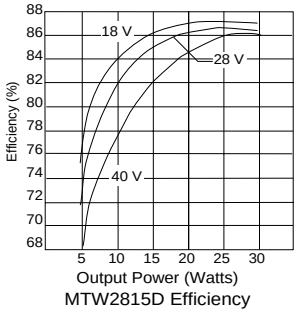
MTW2812S Efficiency

FIGURE 3



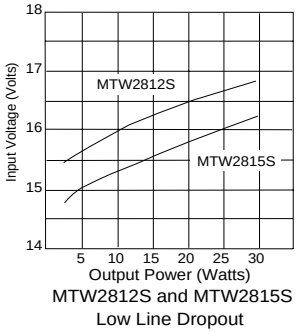
MTW2812D Efficiency

FIGURE 4



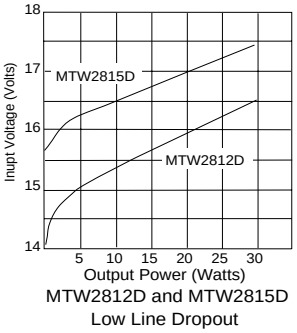
MTW2815D Efficiency

FIGURE 5



MTW2812S and MTW2815S
Low Line Dropout

FIGURE 6



MTW2812D and MTW2815D
Low Line Dropout

FIGURE 7

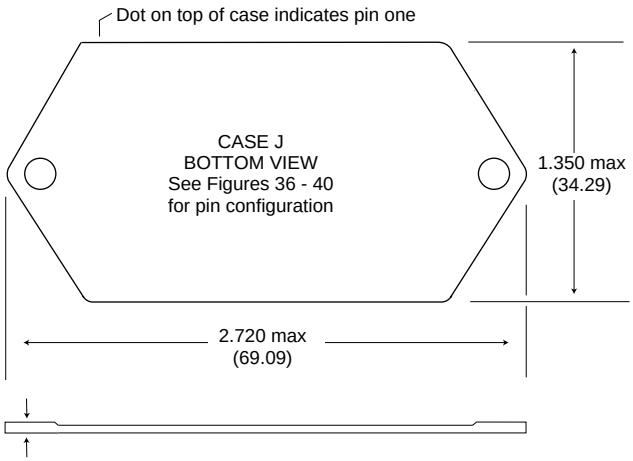
24421-001-DTS Rev A DQ# 1017

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CASES



Flange Thickness:

Cases J1 and J5	0.060 (1.52)
Case J2	0.073 (1.85) max
Cases J3 and J4	0.067 +0.005/-0.007 (1.70 +0.13/-0.8)

Materials

Header Case J1
Cold Rolled Steel/Nickel/Gold
Cases J2 - J5
Cold Rolled Steel/Nickel/Tin
Cover Case J1
Kovar/Nickel
Case J2 - J5
Cold Rolled Steel/Nickel/Tin
Pins #52 alloy (all cases)
Case J1
MHV Series Triple – compression glass seal
MTR Series Triple – ceramic seal
Cases J2 - J5
compression glass seal

Case dimensions in inches (mm)

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) 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.

FIGURE 35: CASE J MAXIMUM DIMENSIONS

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

BOTTOM VIEW CASE J4

Flanged cases: Designator required in Case Option position of model number.
FMD28-461 EMI Filter (down-leaded): Screening – Standard or ES

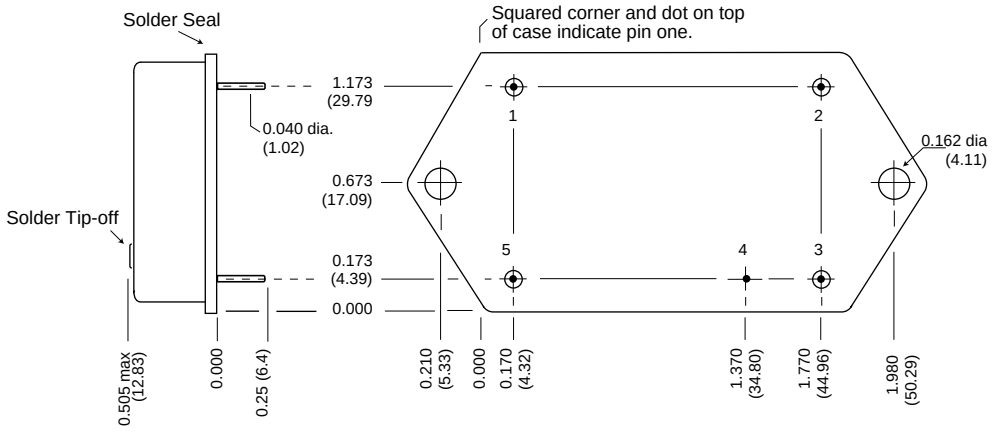


FIGURE 39: CASE J4

BOTTOM VIEW CASE J5

Flanged cases: Designator required in Case Option position of model number for MHL Series and MTO Series only.
MHL Series, MTO Series, MTW Series: Screening – Standard or ES
HR300 Series: no screening options

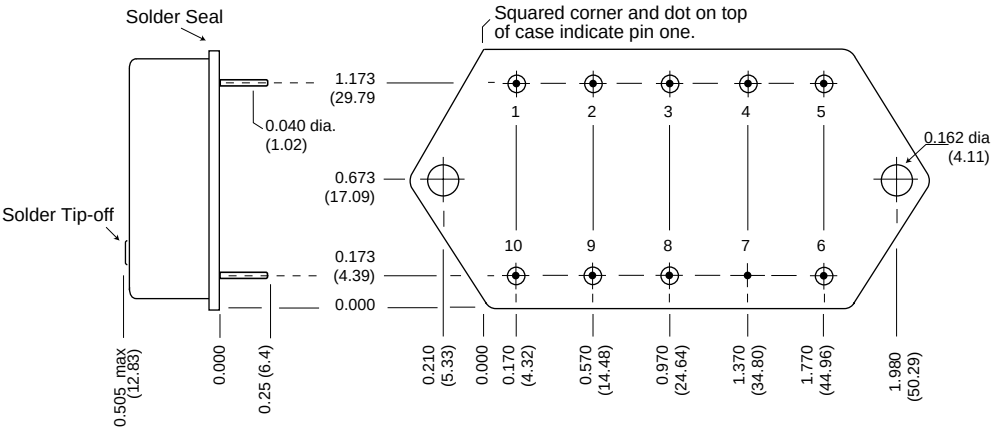


FIGURE 40: CASE J5

85°C PRODUCTS

TEST (85°C Products excluding HR products)	STANDARD	/ES
PRE-CAP INSPECTION		
Method 2017	yes	yes
TEMPERATURE CYCLE (10 times)		
Method 1010, Cond. B, -55°C to 125°C	no	yes
CONSTANT ACCELERATION		
Method 2001, 500 g	no	yes
BURN-IN		
96 hours at 70°C ambient (typical)	no	yes
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A		
Subgroups 1 and 4: +25°C case	yes	yes
HERMETICITY TESTING		
Fine Leak, Method 1014, Cond. A	no	yes
Gross Leak, Method 1014, Cond. C	no	yes
Gross Leak, Dip (1×10^{-3})	yes	no
FINAL VISUAL INSPECTION		
Method 2009	yes	yes

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

Applies to the following products:

MFW Series
MTW Series
MHE/MLP Series
MHL Series
MRH Series
MTO Series
MSR Series
DCH Series
FM/FMA/FMB EMI Filters
MSF EMI Filter