FEATURES

- Low Cost
- RoHS Compliant
- Efficiency up to 75%
- Low Leakage Current
- 4000VAC I/O Isolation
- Single and Dual Outputs
- MTBF > 2,000,000 Hours
- Internal SMT Construction
- Operating Temperature: -25°C to +60°C
- Medical & Industrial Safety: UL60601-1 and UL60950-1

DESCRIPTION

The MDHU100 series power modules are 2W DC/DC converters that are specially designed to provide ultra-high levels of isolation (4000VAC) in a miniature DIP package. These converters operate over input voltage ranges of 4.5~5.5VDC, 10.8~13.2VDC, and 21.6~26.4VDC. This series also has single and dual output voltages of 5, 12, 15, ±12, and ±15VDC. These converters have both medical (UL60601-1) and industrial (UL60950-1) safety approvals and are useful for a variety of applications including distributed power systems, mixed analog/digital subsystems, portable test equipment, local power networks, and battery-backed systems.

SPECIFICATIONS: *MDHU100Series*

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS	Min	Nom	Max	Unit
INPUT (V_{in})					
Input Voltage Range	5V nominal input models	4.5	5	5.5	VDC
	12V nominal input models	10.8	12	13.2	
	24V nominal input models	21.6	24	26.4	
Reverse Polarity Input Current	All models			0.3	A
Input Surge Voltage (1000ms)	5V nominal input models	-0.7		9	VDC
	12V nominal input models	-0.7		18	
	24V nominal input models	-0.7		30	
Input Filter	All models	Internal Capacitor			
Leakage Current	240VAC, 60Hz			2	µA
OUTPUT (V_o)					
Output Voltage		See Rating Chart			
Output Voltage Accuracy			±2.0	±4.0	%
Output Voltage Balance	Dual Output, Balanced Loads		±0.1	±1.0	%
Load Regulation	Io = 20% to 100%	See Rating Chart			
Line Regulation	Vin = min. to max.		±1.2	±1.5	%
Output Power				2	W
Output Current Range		See Rating Chart			
Ripple & Noise (20MHz)			100	150	mV_{pk-pk}
Ripple & Noise (20MHz)	Over Line, Over Load, and Over Temperature			200	mV_{pk-pk}
Ripple & Noise (20MHz)				15	mVrms
PROTECTION					
Short Circuit Protection		0.5 seconds max.			
Input Fuse Recommendation	5V nominal input models	1000mA slow-blow type			
	12V nominal input models	500mA slow-blow type			
	24V nominal input models	200mA slow-blow type			
GENERAL					
Efficiency		See Rating Chart			
Switching Frequency		50	80	100	KHz
Isolation Voltage Rated	60 seconds	4000			VAC
Isolation Voltage Test	Flash Test for 1 second	6000			VDC
Isolation Resistance	500VDC	10			GΩ
Isolation Capacitance	100KHz, 1V		15	20	pF
Internal Power Dissipation				650	mW
Max. Capacitive Load		See Rating Chart			
ENVIRONMENTAL					
Operating Temperature (Ambient)	Ambient	-25		+60	°C
Operating Temperature (Case)	Case	-25		+90	°C
Storage Temperature		-40		+125	°C
Lead Temperature	1.5mm from case for 10 seconds			260	°C
Humidity				95	%
Cooling		Free air convection			
Temperature Coefficient			±0.01	±0.02	%/°C
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	2000			Khours
PHYSICAL					
Weight		0.18oz (5.1g)			
Dimensions (L x W x H)		0.94 x 0.54 x 0.34 inches 23.8 x 13.7 x 8.62 mm			
Case Material		Non-conductive black plastic			
Flammability		UL94V-0			
SAFETY					
Industrial Approvals		UL60950-1			
Medical Approvals		UL60601-1			

MODEL SELECTION GUIDE

SINGLE OUTPUT MODELS									
Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Max. Load Regulation	Efficiency (Typ)	Maximum Capacitive Load
			Min	Max	No Load	Max Load			
MDHU505N2	5 VDC (4.5 ~ 5.5 VDC)	5 VDC	8mA	400mA	60mA	606mA	12%	66%	330 µF
MDHU512N2		12 VDC	3mA	165mA		600mA	10%	66%	330 µF
MDHU515N2		15 VDC	2.5mA	133mA		605mA	10%	66%	330 µF
MDHU1205N2	12 VDC (10.8 ~ 13.2 VDC)	5 VDC	8mA	400mA	30mA	253mA	12%	66%	330 µF
MDHU1212N2		12 VDC	3mA	165mA		250mA	10%	66%	330 µF
MDHU1215N2		15 VDC	2.5mA	133mA		252mA	10%	66%	330 µF
MDHU2405N2	24 VDC (21.6 ~ 26.4 VDC)	5 VDC	8mA	400mA	15mA	126mA	12%	66%	330 µF
MDHU2412N2		12 VDC	3mA	165mA		125mA	10%	66%	330 µF
MDHU2415N2		15 VDC	2.5mA	133mA		126mA	10%	66%	330 µF

DUAL OUTPUT MODELS									
Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Max. Load Regulation	Efficiency (Typ)	Maximum Capacitive Load
			Min	Max	No Load	Max Load			
MDHU512ND2	5 VDC (4.5 ~ 5.5 VDC)	±12 VDC	±1.5mA	±83mA	60mA	553mA	10%	72%	100 µF
MDHU515ND2		±15 VDC	±1mA	±66mA		542mA	10%	73%	100 µF
MDHU1212ND2	12 VDC (10.8 ~ 13.2 VDC)	±12 VDC	±1.5mA	±83mA	30mA	224mA	10%	74%	100 µF
MDHU1215ND2		±15 VDC	±1mA	±66mA		220mA	10%	75%	100 µF
MDHU2412ND2	24 VDC (21.6 ~ 26.4 VDC)	±12 VDC	±1.5mA	±83mA	15mA	112mA	10%	74%	100 µF
MDHU2415ND2		±15 VDC	±1mA	±66mA		110mA	10%	75%	100 µF

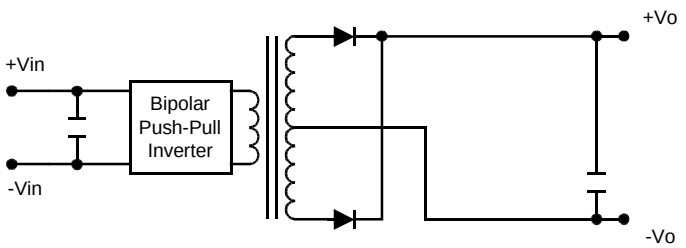
NOTES

1. The MDHU100 series requires a minimum output loading to maintain specified regulations. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.
2. All DC/DC converters should be externally fused at the front end for protection.
3. Other input and output voltages may be available, please contact factory.

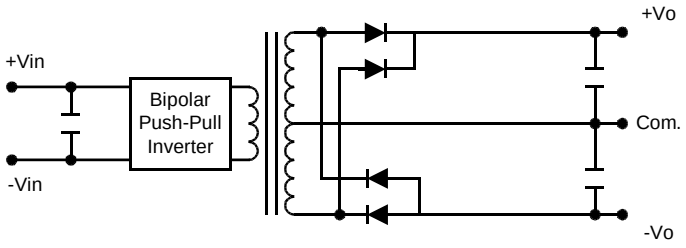
**Due to advances in technology, specifications are subject to change without notice.*

BLOCK DIAGRAMS

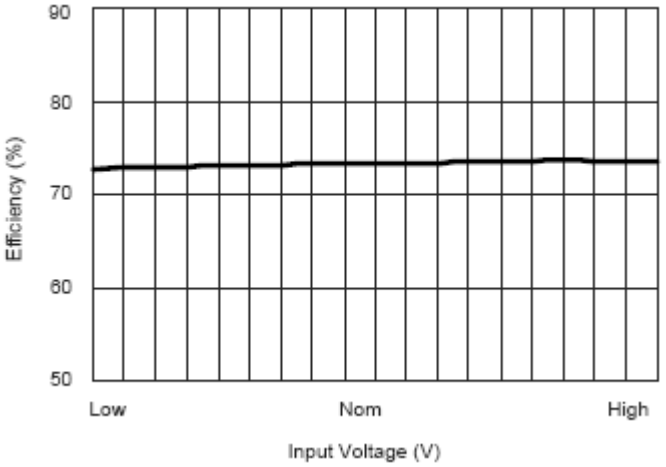
Single Output



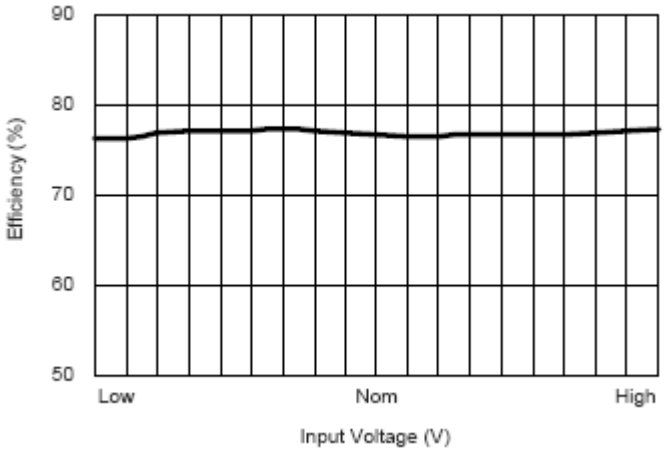
Dual Output



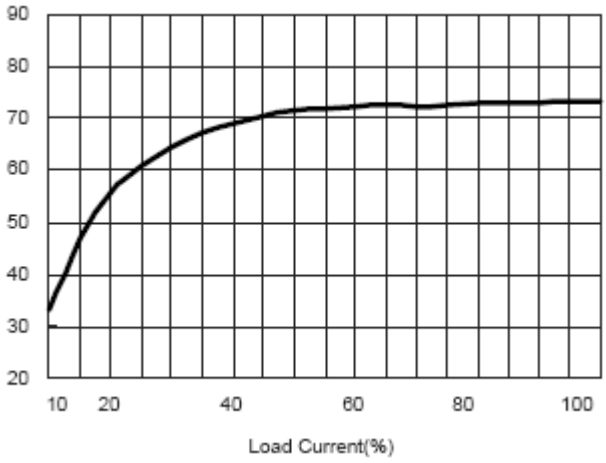
Efficiency vs Input Voltage (Single Output)



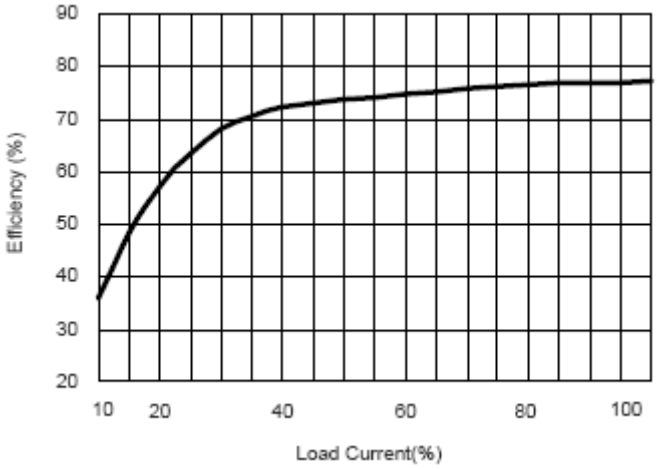
Efficiency vs Input Voltage (Dual Output)



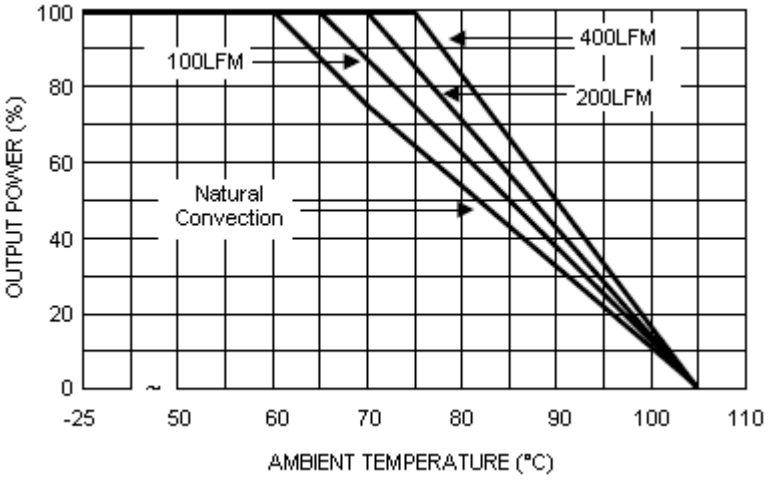
Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)

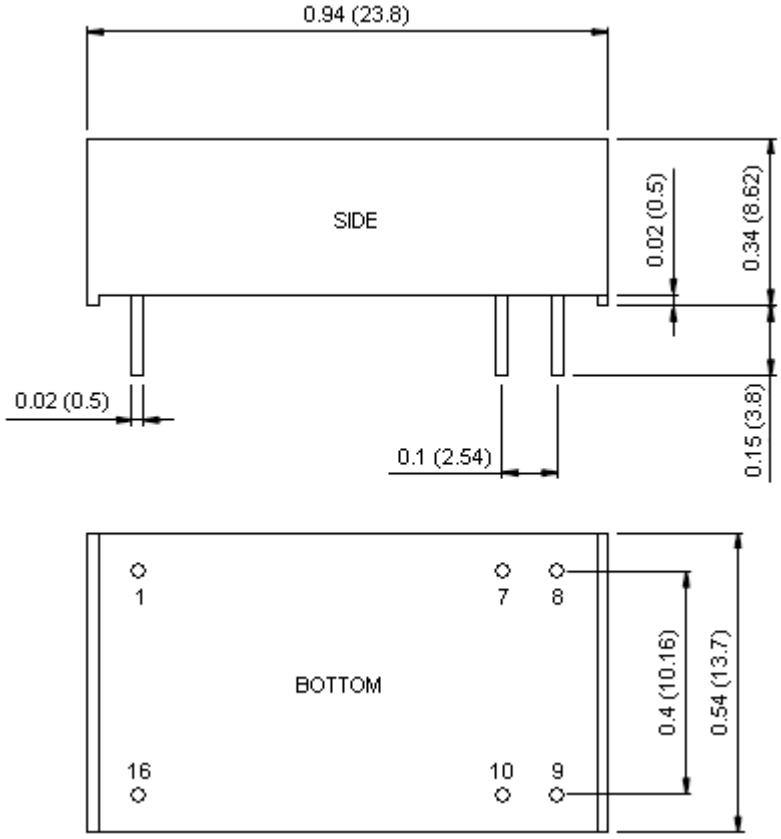


Derating Curve



MECHANICAL DRAWING

Unit: inches (mm)



PIN CONNECTIONS		
PIN	**Single Output**	**Dual Output**
1	-Vin	-Vin
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

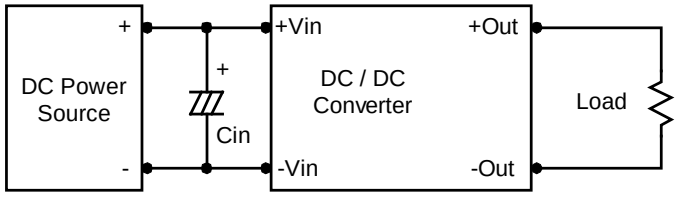
NC: No Connection

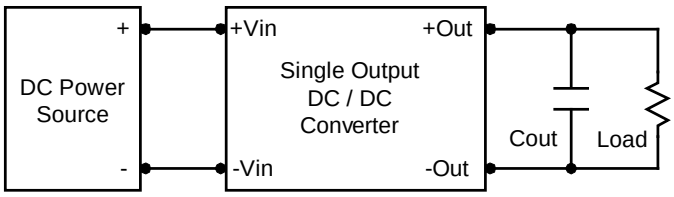
1. Tolerance: X.X±0.25 [X.XX±0.01]
   X.XX±0.13 [X.XXX±0.005]
2. Pin: ±0.05 [±0.002]

DESIGN & FEATURE CONSIDERATONS

Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. A capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100KHz) capacitor of 2.2µF for the 5V input models, a 1.0µF for the 12V input models, and a 0.47µF for the 24V input models.





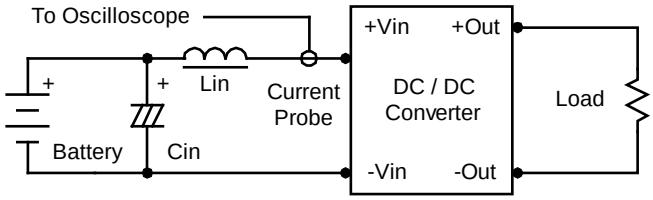
Maximum Capacitive Load

The MDHU100 series has a limit of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimal performance we recommend 100µF maximum capacitive load for dual outputs and 330µF capacitive load for single outputs. The maximum capacitance can be found in the Model Selection Guide.

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor Lin (4.7µH) and Cin (220µF, ESR < 1.0Ω at 100KHz) to simulate source impedance.



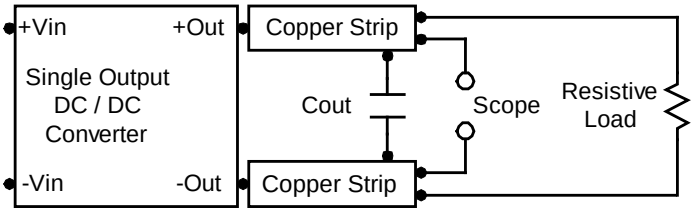
Capacitor Cin offsets possible battery impedance.

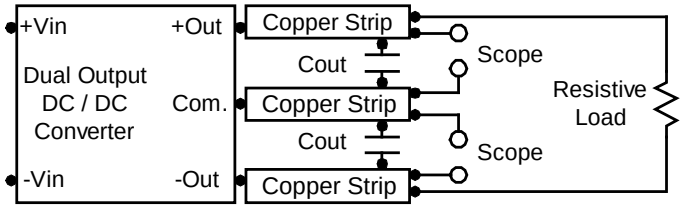
Current ripple is measured at the input terminals of the module. Measurement bandwidth is 0 ~ 500KHz.

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47µF ceramic capacitor.

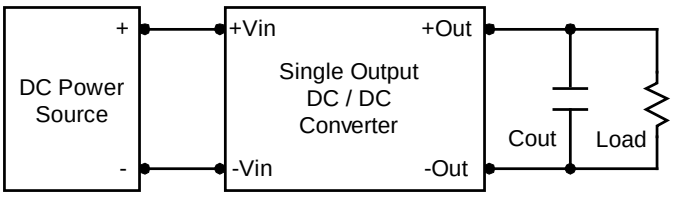
Scope measurement should be made by using a BNC socket; measurement bandwidth is 0 ~ 20MHz. Position the load between 50mm and 75mm from the DC/DC Converter.

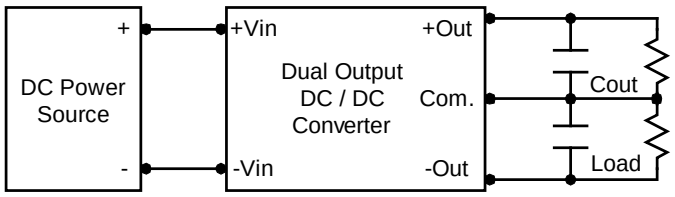




Output Ripple Reduction

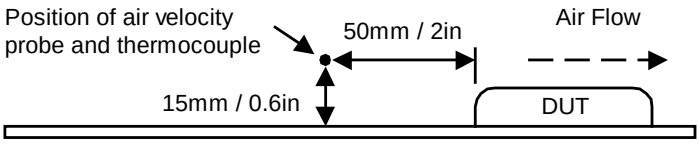
A good quality low ESR capacitor placed as close as possible across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 3.3µF capacitors at the output.





Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module, and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 90°C. The derating curves are determined from measurements obtained in an experimental apparatus.



COMPANY INFORMATION:

Wall Industries, Inc. has created custom and modified units for over 40 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on time and on budget. Our ISO9001-2000 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

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