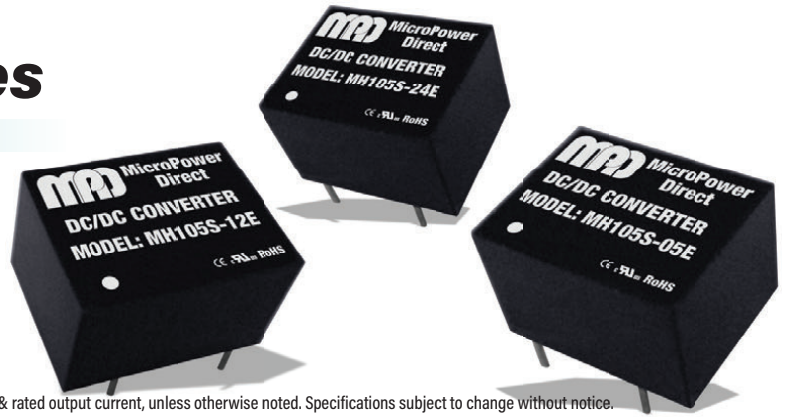


MH100E Series

Compact "MicroDIP" 1W Single Output DC/DC Converters



Key Features:

- 1W Output Power
- Compact "MicroDIP" Case
- UL Approved
- 1,500 VDC Isolation
- Short Circuit Protected
- Meets EN 55032 Class B
- -40°C to +105°C Operation
- >3.5 MHour MTBF
- 23 Standard Models
- Industry Standard Footprint
- LOW COST!



MicroPower Direct

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Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Range	3.3 VDC Input	2.97	3.3	3.63	VDC	
	5 VDC Input	4.50	5.0	5.50		
	12 VDC Input	10.8	12.0	13.2		
	15 VDC Input	13.5	15.0	16.5		
	24 VDC Input	21.6	24.0	26.4		
Reflected Ripple Current			15		mA	
Input Filter	Capacitor					
Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy	See Tolerance Graphs (Page 2)					
Line Regulation, See Note 2	For V _{IN} Change of 1%			±1.2	%	
Load Regulation, See Note 3	See Model Selection Guide					
Ripple & Noise (20 MHz)	See Note 4		60	150	mV P - P	
Temperature Coefficient				±0.03	%/°C	
Output Short Circuit, See Note 5	Continuous (Autorecovery)					
General						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation Voltage	See Note 6	1,500			VDC	
Isolation Resistance	500 VDC	1,000			MΩ	
Isolation Capacitance	100 kHz, 0.1V		20		pF	
Switching Frequency			100		kHz	
EMI Characteristics						
Parameter	Standard	Criteria	Level			
Radiated Emissions, See Page 4	CISPR32/EN 55032		Class B			
Radiated Emissions	CISPR32/EN 55032		Class B			
ESD	EN 61000-4-2	B	±8 kV Contact			
Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-40	+25	+105	°C	
Storage Temperature Range		-55		+125	°C	
Cooling	Free Air Convection					
Humidity	RH, Non-condensing			95	%	
Physical						
Case Size	See Mechanical Drawing (Page 4)					
Case Material	Flame Retardent, Non-Conductive, Black Plastic (UL94-V0)					
Weight	See Mechanical Drawing (Page 4)					
Reliability Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Units	
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours	
Safety Standards, See Note 1	UL/cUL 60950 recognition (UL certificate)					
Absolute Maximum Ratings						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Surge (1 Sec)	3.3 VDC Input			5.0	VDC	
	5 VDC Input			9.0		
	12 VDC Input			18.0		
	15 VDC Input			21.0		
	24 VDC Input			30.0		
Lead Temperature	1.5 mm From Case For 10 Sec			300	°C	

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

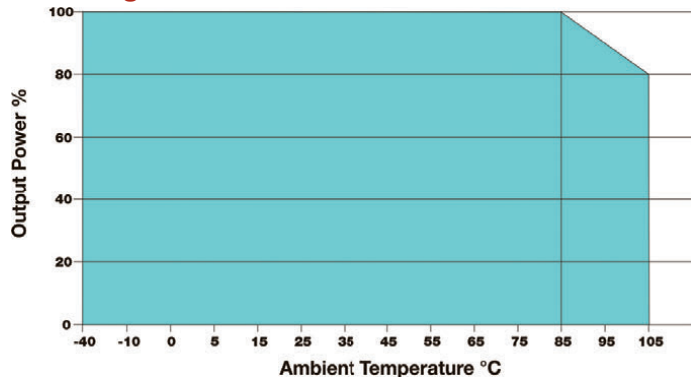
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	Model Number	Input				Output			Load Regulation (% Typ)	Efficiency (% Typ)	Capacitive Load (μF, Max)	Fuse Rating Slow-Blow (mA)
		Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA)					
		Nominal	Range	Full-Load	No-Load		Max.	Min.				
UL	MH103S-03E	3.3	2.97 - 3.63	404	30	3.3	303	30	±18	72	220	800
UL	MH103S-05E	3.3	2.97 - 3.63	404	30	5.0	200	20	±12	76	220	800
UL	MH105S-03E	5.0	4.5 - 5.5	277	20	3.3	303	30	±15	72	220	550
UL	MH105S-05E	5.0	4.5 - 5.5	277	20	5.0	200	20	±10	80	220	550
UL	MH105S-09E	5.0	4.5 - 5.5	277	20	9.0	111	12	±8	80	220	550
UL	MH105S-12E	5.0	4.5 - 5.5	277	20	12.0	84	9	±7	80	220	550
UL	MH105S-15E	5.0	4.5 - 5.5	277	20	15.0	67	7	±6	80	220	550
UL	MH105S-24E	5.0	4.5 - 5.5	277	20	24.0	42	4	±5	80	220	550
UL	MH112S-03E	12	10.8 - 13.2	115	15	3.3	303	30	±18	72	220	240
UL	MH112S-05E	12	10.8 - 13.2	115	15	5.0	200	20	±12	80	220	240
UL	MH112S-09E	12	10.8 - 13.2	115	15	9.0	111	12	±8	80	220	240
UL	MH112S-12E	12	10.8 - 13.2	115	15	12.0	84	9	±7	80	220	240
UL	MH112S-15E	12	10.8 - 13.2	115	15	15.0	67	7	±6	80	220	240
UL	MH112S-24E	12	10.8 - 13.2	115	15	24.0	42	4	±5	80	220	240
	MH115S-05E	15	13.5 - 16.5	83	10	5.0	200	20	±12	80	220	175
	MH115S-12E	15	13.5 - 16.5	83	10	12.0	84	9	±7	80	220	175
	MH115S-15E	15	13.5 - 16.5	83	10	15.0	67	7	±6	80	220	175
UL	MH124S-03E	24	21.6 - 26.4	57	17	3.3	303	30	±18	72	220	125
UL	MH124S-05E	24	21.6 - 26.4	57	17	5.0	200	20	±12	80	220	125
UL	MH124S-09E	24	21.6 - 26.4	57	17	9.0	111	12	±8	80	220	125
UL	MH124S-12E	24	21.6 - 26.4	57	17	12.0	84	9	±7	80	220	125
UL	MH124S-15E	24	21.6 - 26.4	57	17	15.0	67	7	±6	80	220	125
UL	MH124S-24E	24	21.6 - 26.4	57	17	24.0	42	4	±5	80	220	125

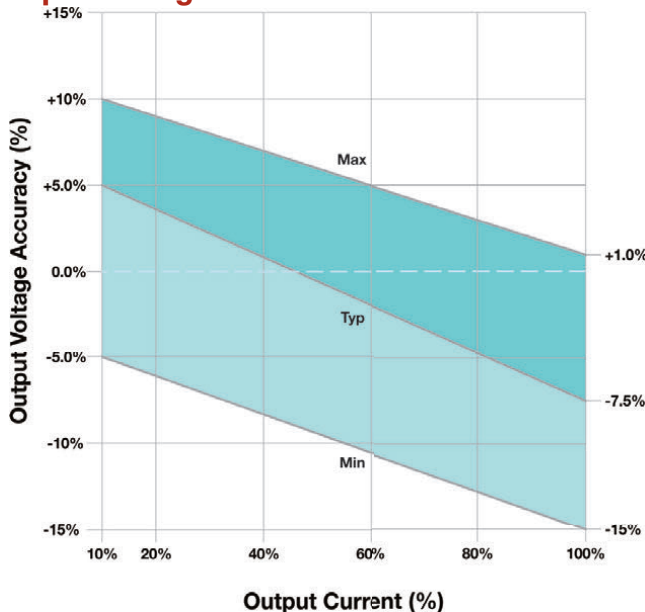
Notes:

- Units that are marked "UL" in the model selection table above are approved to EN 60950.
- All 3.3 Vout models have a specified line regulation of 1.5 %/°C.
- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 1 μF ceramic capacitor & a 10 μF electrolytic capacitor be placed in parallel from the +Vout pin to the -Vout pin.
- The MH124S-xxE & MH103S-xxE models have momentary (1S) protection against short circuit faults.
- Isolation voltage is specified for a period of 60S with a leakage current lower than 1 mA.
- Operation at no load will not damage these units, however, they may not meet all specifications.
- It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

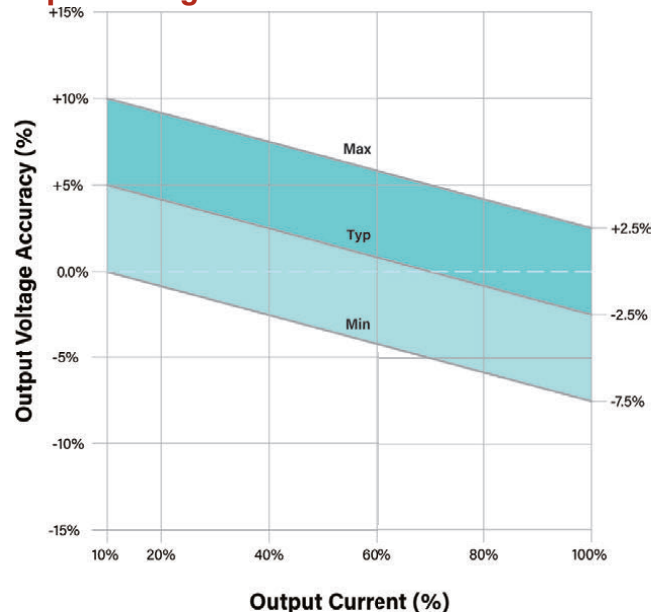
Derating Curve



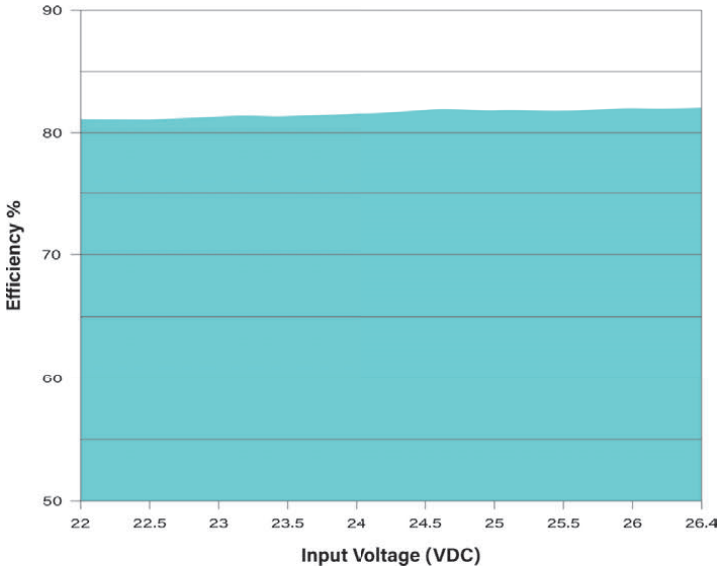
Output Voltage Tolerance: MH1xxS-03E



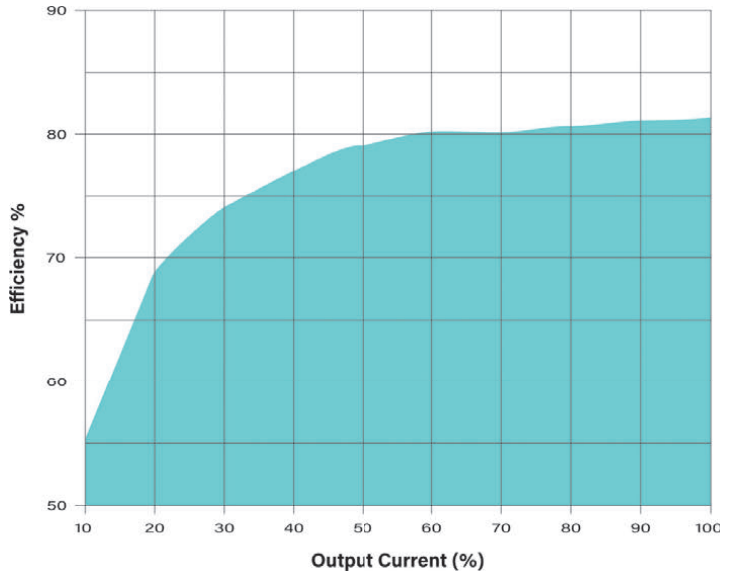
Output Voltage Tolerance: All Other Models



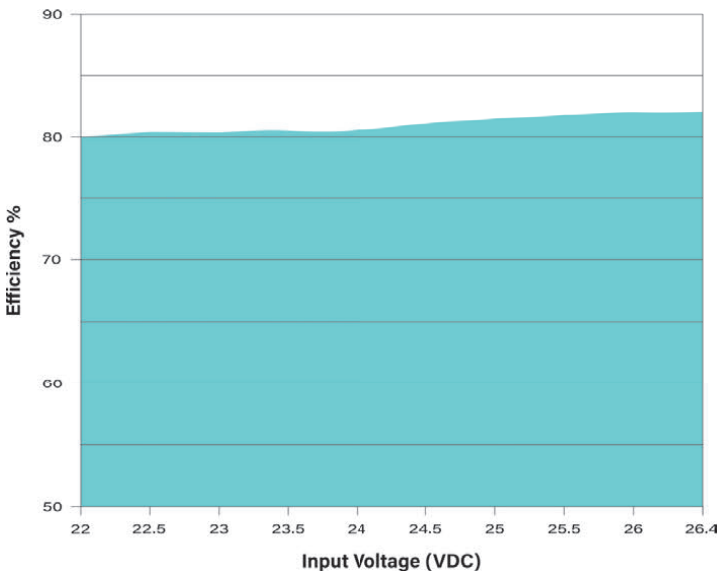
Efficiency vs Input: MH105S-05E



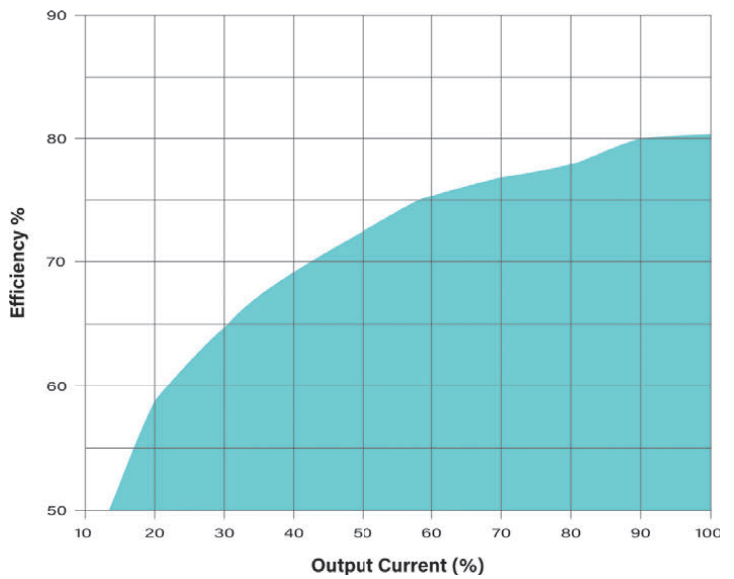
Efficiency vs Output Load: MH105S-05E



Efficiency vs Input: MH124S-15E



Efficiency vs Output Load: MH124S-15E



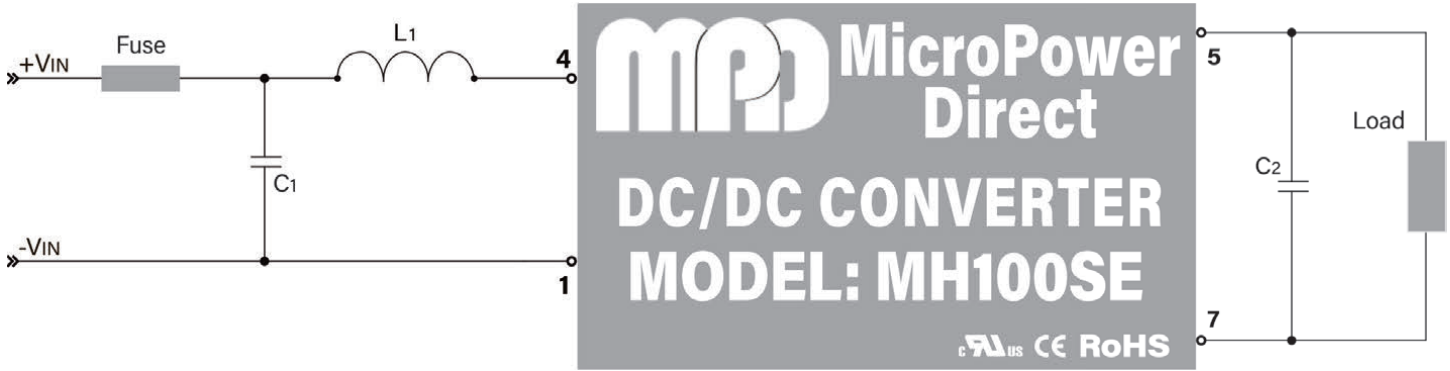
Simple Connection



V _{IN}	C ₁	V _{OUT}	C ₃
3.3 VDC	4.7 μF/25V	3.3 VDC	10 μF
5 VDC	4.7 μF/25V	5 VDC	10 μF
12 VDC	2.2 μF/50V	9 VDC	4.7 μF
15 VDC	2.2 μF/50V	12 VDC	2.2 μF
24 VDC	1.0 μF/50V	15 VDC	1.0 μF
		24 VDC	0.47 μF

The diagram above illustrates a simple connection of the MH100SE. For applications that do not require the circuit to meet EMI/EMC specifications, the capacitors C1 and C2 will reduce input/output ripple and improve the converter stability over time and temperature. The recommended component values are given in the table at right.

Typical Connection



The diagram above illustrates a typical connection of the MH100SE for an application that requires compliance to EMI/EMC standards EN 55032 and EN 61000-4 (as specified on page 1). Some notes on these components are:

1. An external fuse is recommended to protect the unit in the event a fault occurs on the input line. A recommended value is given in model selection table on page 2.
3. The output filtering capacitor (C2) is a high frequency, low resistance electrolytic capacitor. Care must be

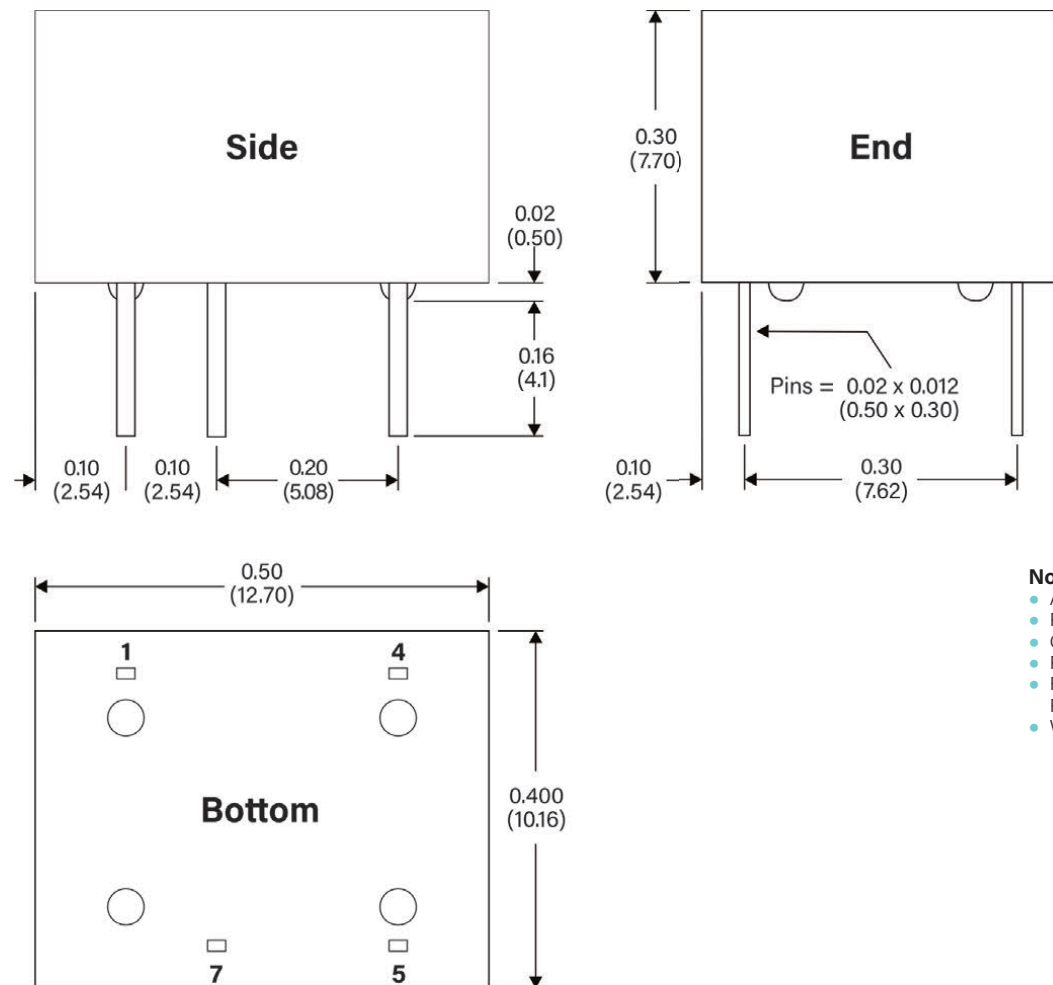
taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above.

4. Suggested component values are:

Component	VIN: 3.3V, 5V, 12V	VIN: 15V, 24V
C1	4.7 μ F/25V	4.7 μ F/50V
L1	6.8 μ H	6.8 μ H
C2	See C2 in Table On Page 3	

5. In many applications, simply adding input/output capacitors will enhance the input surge protection & and reduce output ripple sufficiently. In this case, capacitors C1 and C2 could be connected as shown in the simple connection on page 3, without the other filter components.

Mechanical Dimensions



Pin Connections

Pin	Description
1	-VIN
4	+VIN
5	+VOUT
7	-VOUT

Notes:

- All dimensions are typical in inches (mm)
- Pin 1 is marked by a "dot" or indentation on the unit
- General Tolerance = ± 0.02 (± 0.50)
- Pin Tolerance = ± 0.004 (± 0.10)
- Recommended pin hole size (on the application PC Board) is $\varnothing 0.039$ ($\varnothing 1.00$)
- Weight (Typ) = 0.059 Oz (1.8g)