

ML100SEI Series

Low Cost, Single Output 1W High Isolation SMT DC/DC Converters



Key Features:

- 1W Output Power
- Ultra-Miniature SMT Case
- EN 60950 Approved
- 3,000 VDC Isolation
- Short Circuit Protected
- Single Output
- -40°C to +105°C Operation
- >3.5 MHour MTBF
- **LOW COST!**



MicroPower Direct

292 Page Street
Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerdirect.com
W: www.micropowerdirect.com



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	4.5	5.0	5.5	
	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	
Input Filter	Capacitor				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	See Tolerance Envelope Graphs (Page 2)				
Capacitive Load				220	μF
Line Regulation	3.3 V _{IN} Models	For V _{IN} Change of 1%		±1.5	%
	All Other Models			±1.2	
Load Regulation, See Note 1	See Model Selection Guide				
Ripple & Noise (20 MHz), See Note 2			60	150	mV P - P
Temperature Coefficient				±0.03	%/°C
Output Short Circuit	See Note 3 for Models			1	S
	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	3,000			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 Note 4	EN 55022		Level B
Conducted Emissions, See Note 4	EN 55022		Level 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	Non-Conductive Black Plastic (UL94-V0)
Weight	0.053 Oz (1.60g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1			Level 1 (See Note 5)	
Safety Standards	EN 60950				

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	
Peak Reflow Temperature	See Note 6			245	°C
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.

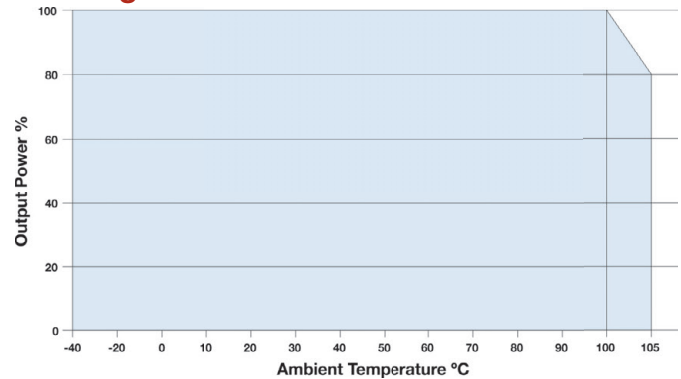
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Model Number	Input				Output			Load Regulation	Efficiency (% Typ)	Safety (EN 6950)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load				% Typ.			
ML103S-03EI	3.3	2.97 - 3.63	439	25	3.3	303.0	30.0	18.0	69	No	1,000
ML103S-05EI	3.3	2.97 - 3.63	409	25	5.0	200.0	20.0	12.0	74	Yes	1,000
ML103S-12EI	3.3	2.97 - 3.63	398	25	12.0	84.0	9.0	7.0	76	No	1,000
ML105S-03EI	5	4.50 - 5.50	277	20	3.3	303.0	30.0	18.0	72	Yes	500
ML105S-05EI	5	4.50 - 5.50	250	20	5.0	200.0	20.0	12.0	80	Yes	500
ML105S-06EI	5	4.50 - 5.50	250	20	6.0	167.0	17.0	10.0	80	Yes	500
ML105S-09EI	5	4.50 - 5.50	250	20	9.0	111.0	12.0	8.0	80	Yes	500
ML105S-12EI	5	4.50 - 5.50	250	20	12.0	84.0	9.0	7.0	80	Yes	500
ML105S-15EI	5	4.50 - 5.50	250	20	15.0	67.0	7.0	6.0	80	Yes	500
ML105S-24EI	5	4.50 - 5.50	250	20	24.0	42.0	4.0	5.0	80	Yes	500
ML112S-03EI	12	10.8 - 13.2	116	15	3.3	303.0	30.0	18.0	72	Yes	200
ML112S-05EI	12	10.8 - 13.2	104	15	5.0	200.0	20.0	12.0	80	Yes	200
ML112S-09EI	12	10.8 - 13.2	104	15	9.0	111.0	12.0	8.0	80	Yes	200
ML112S-12EI	12	10.8 - 13.2	104	15	12.0	84.0	9.0	7.0	80	Yes	200
ML112S-15EI	12	10.8 - 13.2	104	15	15.0	67.0	7.0	6.0	80	Yes	200
ML112S-24EI	12	10.8 - 13.2	104	15	24.0	42.0	4.0	6.0	80	No	200
ML115S-15EI	15	13.5 - 16.5	84	10	15.0	67.0	7.0	5.0	80	No	200
ML124S-05EI	24	21.6 - 26.4	52	7	5.0	200.0	20.0	12.0	80	Yes	100
ML124S-09EI	24	21.6 - 26.4	52	7	9.0	110.0	12.0	8.0	80	Yes	100
ML124S-15EI	24	21.6 - 26.4	52	7	15.0	67.0	7.0	6.0	80	Yes	100
ML124S-24EI	24	21.6 - 26.4	52	7	24.0	42.0	4.0	5.0	80	Yes	100

Notes:

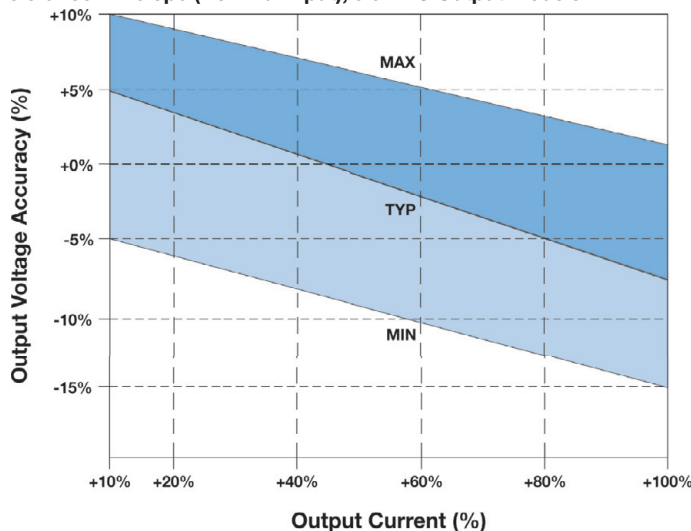
- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 1.0 μ F ceramic capacitor and a 10 μ F electrolytic be connected in parallel from the +Vout pin to the -Vout pin.
- The **ML105S-24EI**, **ML103S-xxEI** & **ML124S-xxEI** models have momentary (1S) protection against short circuit faults.
- These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors will enhance stability and reduce output ripple. The simple connection shown on page 3 will typically meet EN 55022 Class B.
- Any units that are not packaged in a vacuum sealed container should be stored in a controlled environment. Contact the factory for more information.
- The recommended reflow settings are a peak temperature of 245 °C for a maximum period (T_{PK}) of 10S and a time above liquidous (T_L) of \leq 60 seconds at 217 °C. For more information, please contact the factory.
- Operation at no load will not damage these units, however, they may not meet all specifications. Operation below 10% load will cause the output voltage to rise.
- 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

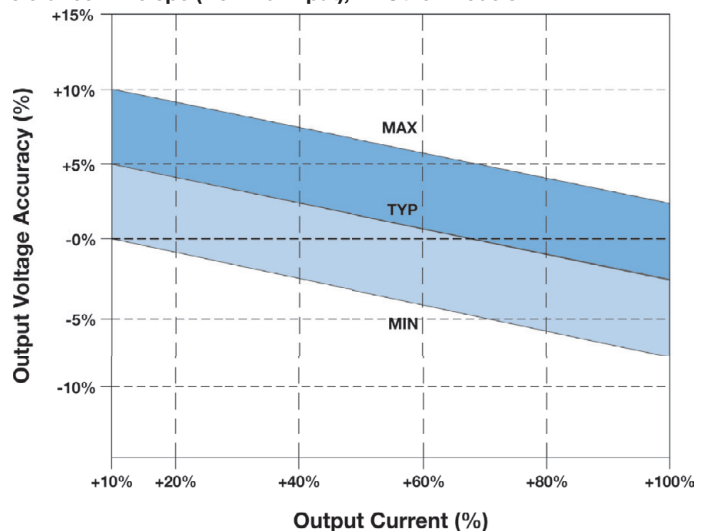


Characteristic Curves

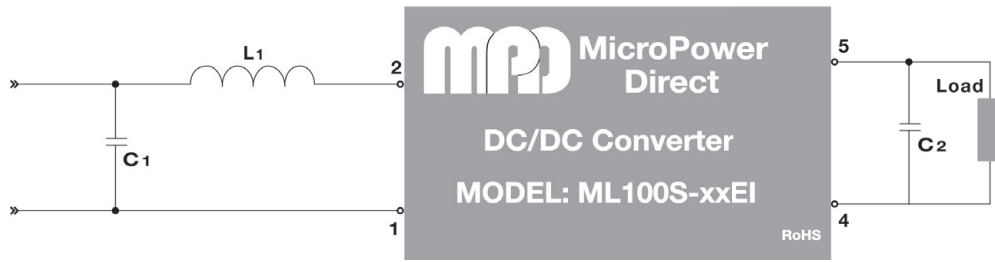
Tolerance Envelope (Nominal Input), 3.3 VDC Output Models



Tolerance Envelope (Nominal Input), All Other Models



Typical Connection

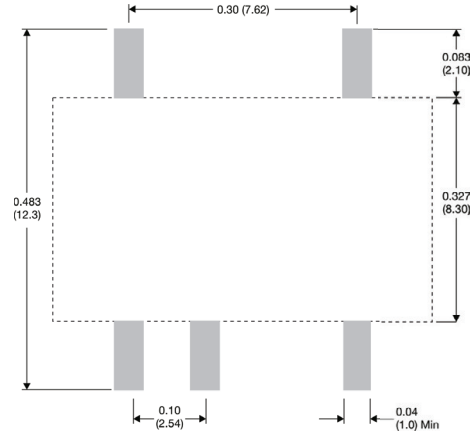


To meet the requirements of EN 55022 Class B, external components C₁ and L₁ are required. These components should be mounted as close to the unit as possible.

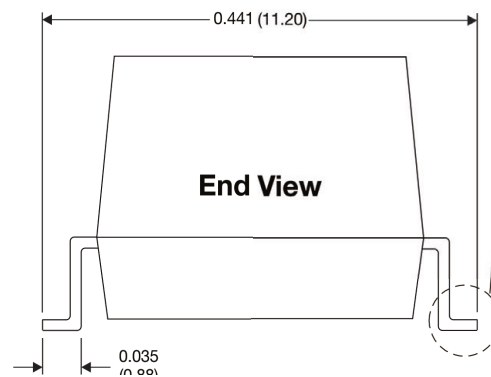
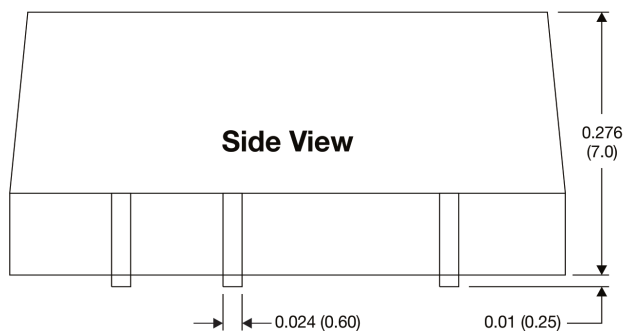
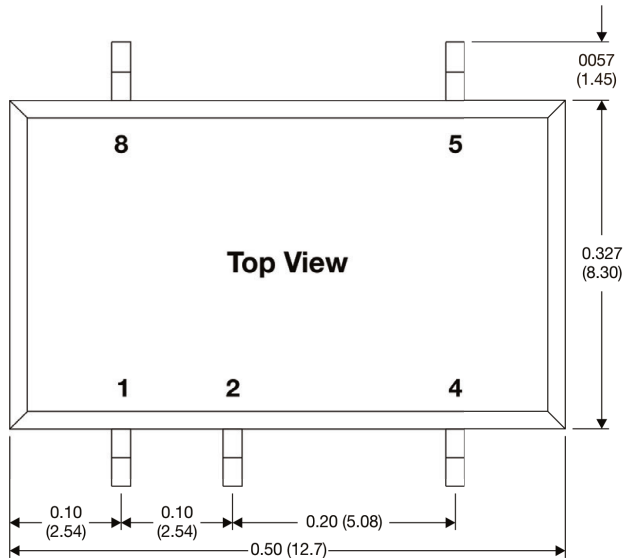
The output capacitor may be added if a further reduction in output ripple is required. The recommended value (C₂) is given in the table below. Care must be taken in choosing the output capacitor not to exceed the maximum capacitive load capability of the unit.

V _{IN}	C ₁	L ₁	V _{OUT}	C ₂
3.3 VDC	4.7 μF/50V	6.8 μH	3.3 VDC	10 μF
5 VDC	4.7 μF/50V	6.8 μH	5 VDC	10 μF
12 VDC	4.7 μF/50V	6.8 μH	6 VDC	10 μF
15 VDC	4.7 μF/50V	6.8 μH	9 VDC	4.7 μF
24 VDC	4.7 μF/50V	6.8 μH	12 VDC	2.2 μF
			15 VDC	1.0 μF
			24 VDC	0.47 μF

Board Layout



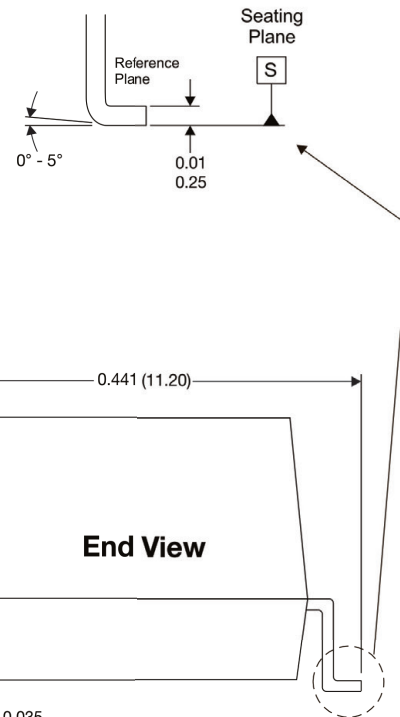
Mechanical Dimensions



Pin Connections

Pin	Description	Pin	Description
1	-VIN	4	-VOUT
2	+VIN	5	+VOUT
		8	NC

NC = No Connection



Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Pin 1 is marked by a "dot" or indentation on the unit



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