

# ML100SE Series

## Low Cost, Single Output Ultra-Miniature SMT DC/DC Converters



### Key Features:

- 1W Output Power
- Ultra-Miniature SMT Case
- EN 60950 Approved
- 1,500 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	3.3 VDC Output Models		±5.0		
	All Other Models		±3.0		%
Capacitive Load				220	µF
Line Regulation	3.3 VIN Models	For VIN 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	ML105S-24E & 24V Input Models			1	S
	Continuous (Autorecovery)				

#### General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 0.1V		20		pF
Switching Frequency				300	kHz

#### EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	EN 55022		Level B
Conducted Emissions	EN 55022		Level B
ESD, See Note 4	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
Safety Standards	EN 60950				

#### Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	3.3 VDC Input	-0.7		5.0	VDC
	5 VDC Input	-0.7		9.0	
	12 VDC Input	-0.7		18.0	
	15 VDC Input	-0.7		21.0	
	24 VDC Input	-0.7		30.0	
Peak Reflow Temperature	See Note 5			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.

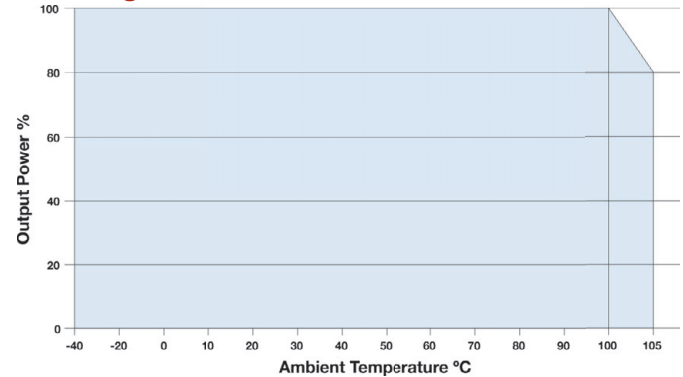
[www.micropowerdirect.com](http://www.micropowerdirect.com)

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-03E	3.3	2.97 - 3.63	433	25	3.3	303.0	30.0	18.0	69	No	1,000
ML103S-05E	3.3	2.97 - 3.63	409	25	5.0	200.0	20.0	12.0	74	Yes	1,000
ML103S-09E	3.3	2.97 - 3.63	388	25	9.0	111.0	12.0	8.0	78	No	1,000
ML103S-12E	3.3	2.97 - 3.63	378	25	12.0	84.0	9.0	7.0	80	No	1,000
ML103S-15E	3.3	2.97 - 3.63	378	25	15.0	67.0	7.0	6.0	80	No	1,000
ML103S-24E	3.3	2.97 - 3.63	378	25	24.0	42.0	4.0	5.0	80	No	1,000
ML105S-03E	5	4.50 - 5.50	277	20	3.3	303.0	30.0	18.0	72	Yes	500
ML105S-05E	5	4.50 - 5.50	250	20	5.0	200.0	20.0	12.0	80	Yes	500
ML105S-06E	5	4.50 - 5.50	250	20	9.0	167.0	17.0	10.0	80	Yes	500
ML105S-09E	5	4.50 - 5.50	250	20	9.0	111.0	12.0	8.0	80	Yes	500
ML105S-12E	5	4.50 - 5.50	250	20	12.0	84.0	9.0	7.0	80	Yes	500
ML105S-15E	5	4.50 - 5.50	250	20	15.0	67.0	7.0	6.0	80	Yes	500
ML105S-24E	5	4.50 - 5.50	250	20	24.0	42.0	4.0	5.0	80	Yes	500
ML112S-03E	12	10.8 - 13.2	116	15	3.3	303.0	30.0	18.0	72	Yes	200
ML112S-05E	12	10.8 - 13.2	104	15	5.0	200.0	20.0	12.0	80	Yes	200
ML112S-09E	12	10.8 - 13.2	104	15	9.0	111.0	12.0	8.0	80	Yes	200
ML112S-12E	12	10.8 - 13.2	104	15	12.0	84.0	9.0	7.0	80	Yes	200
ML112S-15E	12	10.8 - 13.2	104	15	15.0	67.0	7.0	6.0	80	Yes	200
ML112S-24E	12	10.8 - 13.2	104	15	24.0	42.0	4.0	5.0	80	Yes	200
ML115S-05E	15	13.5 - 16.5	83	10	5.0	200.0	20.0	12.0	80	No	200
ML115S-15E	15	13.5 - 16.5	83	10	15.0	67.0	7.0	6.0	80	No	200
ML124S-05E	24	21.6 - 26.4	52	7	5.0	200.0	20.0	12.0	80	Yes	100
ML124S-09E	24	21.6 - 26.4	52	7	9.0	110.0	11.0	8.0	80	Yes	100
ML124S-12E	24	21.6 - 26.4	52	7	12.0	84.0	9.0	7.0	80	No	100
ML124S-15E	24	21.6 - 26.4	52	7	15.0	67.0	7.0	6.0	80	Yes	100
ML124S-24E	24	21.6 - 26.4	52	7	24.0	42.0	4.0	5.0	80	Yes	100

Notes:

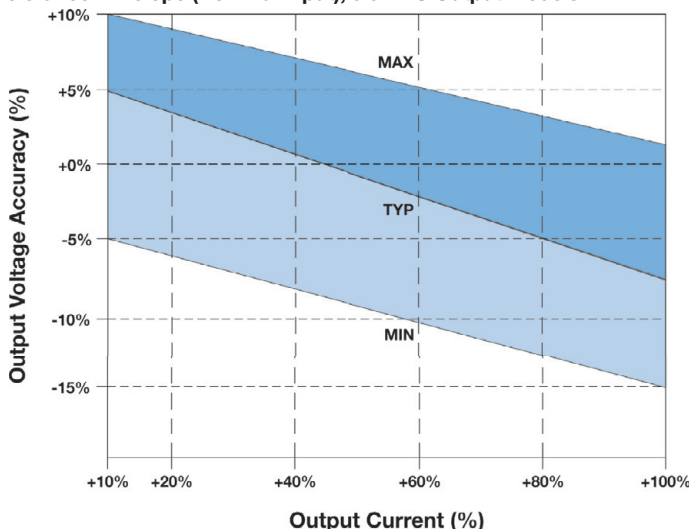
- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 0.33  $\mu$ F ceramic capacitor be placed from the +VOUT pin to the -VOUT pin.
- The **ML105S-24E** & **ML124-xxE** models have momentary (1S) protection against short circuit.
- 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.
- The recommended reflow settings are a peak temperature of 245 °C for a maximum period (TPK) of 10S and a time above liquidous (TL) 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

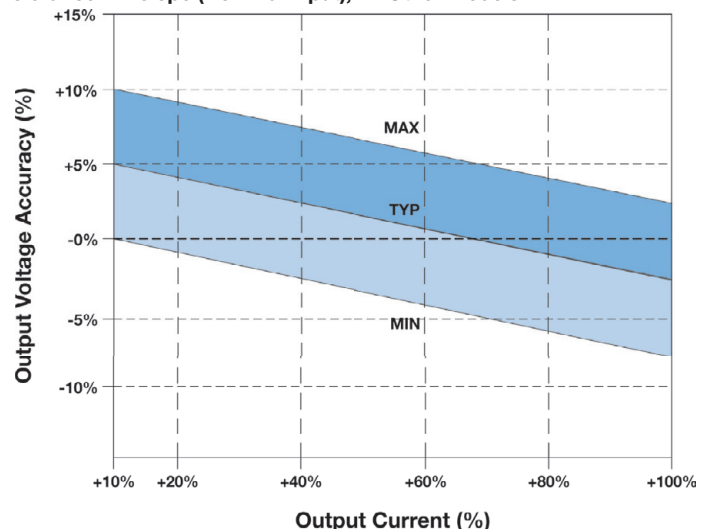


Characteristic Curves

Tolerance Envelope (Nominal Input), 3.3 VDC Output Models



Tolerance Envelope (Nominal Input), All Other Models



## Typical Connection



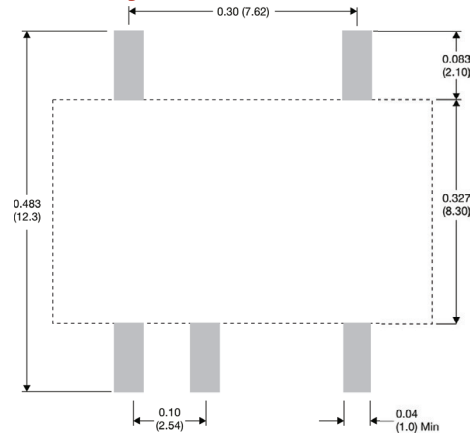
www.micropowerdirect.com

To meet the requirements of EN 55022 Class B, external components C<sub>1</sub> and L<sub>1</sub> are required. These components should be mounted as close to the unit as possible.

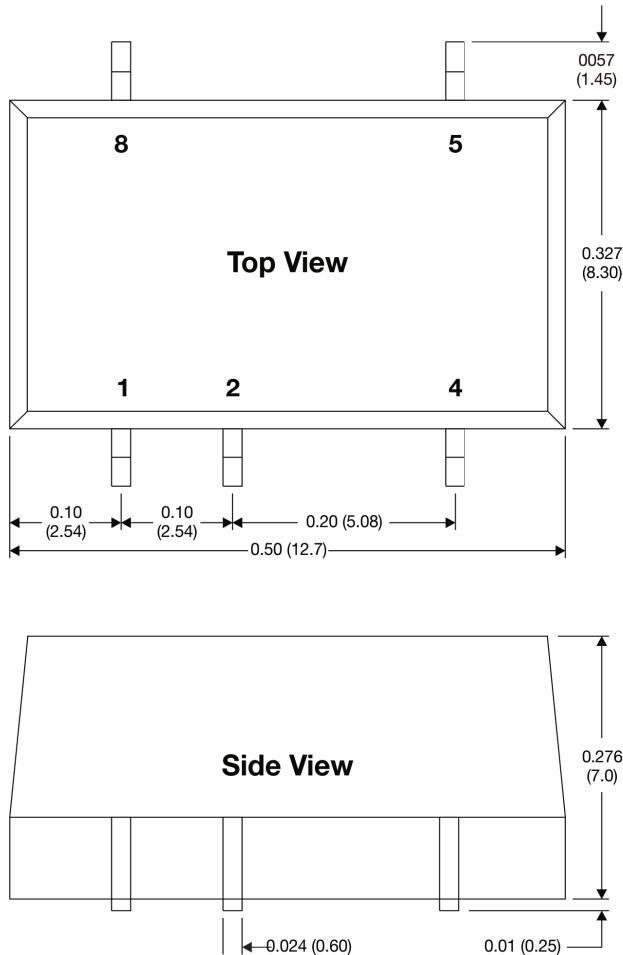
The output capacitor may be added if a further reduction in output ripple is required. The recommended value (C<sub>3</sub>) is given in the table below. Care must be taken in choosing the output capacitor not to exceed the maximum capacitive load capability of the unit.

V <sub>IN</sub>	C <sub>1</sub>	L <sub>1</sub>	V <sub>OUT</sub>	C <sub>3</sub>
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

## Board Layout



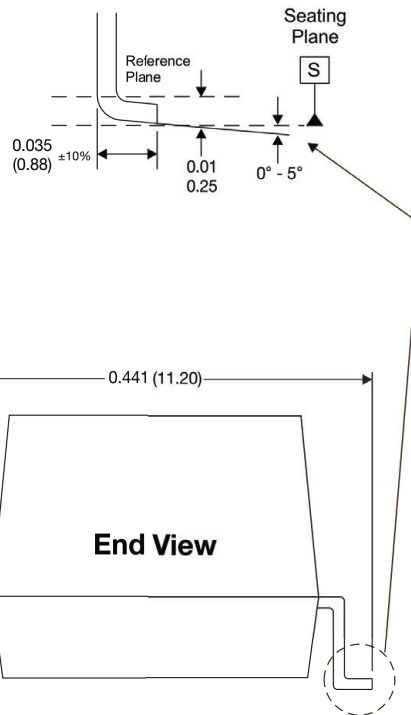
## Mechanical Dimensions



## Pin Connections

Pin	Description	Pin	Description
1	-V <sub>IN</sub>	4	-V <sub>OUT</sub>
2	+V <sub>IN</sub>	5	+V <sub>OUT</sub>
		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



**MicroPower Direct**  
We Power Your Success - For Less!

292 Page Street Ste D Stoughton, MA 02072 • TEL: (781) 344-8226 • FAX: (781) 344-8481 • E-Mail: sales@micropowerdirect.com