

# ML200SEI Series

## 2W, High Isolation Ultra-Miniature SMT DC/DC Converters



### Key Features:

- 2W Output Power
- Ultra-Miniature SMT Case
- 3,000 VDC Isolation
- Single Output
- -40°C to +105°C Operation
- >3.5 MHour MTBF
- 13 Standard Models
- **LOW COST!**

**RoHS**



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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	5 VDC Input	4.5	5.0	5.5	VDC
	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			±3.0		%
Capacitive Load				220	µF
Line Regulation	For Vin Change of 1%			±1.2	%
Load Regulation, See Note 1	See Model Selection Guide				
Ripple & Noise (20 MHz)	See Note 2		100	200	mV P - P
Temperature Coefficient				±0.03	%/°C
Output Short Circuit	Momentary (1S Max)				

#### 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	EN 55022		B
Conducted Emissions	EN 55022		B
ESD	EN 61000-4-2	B	±8kV

#### 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 2)				
Case Material	Non-Conductive Black Plastic (UL94-V0)				
Weight	0.05 Oz (1.52g)				

#### Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours

#### Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	5 VDC Input	-0.7		9.0	VDC
	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

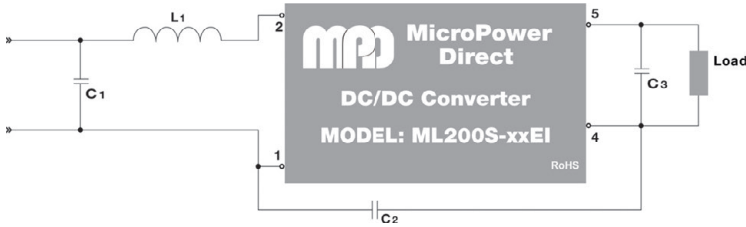
**Caution:** Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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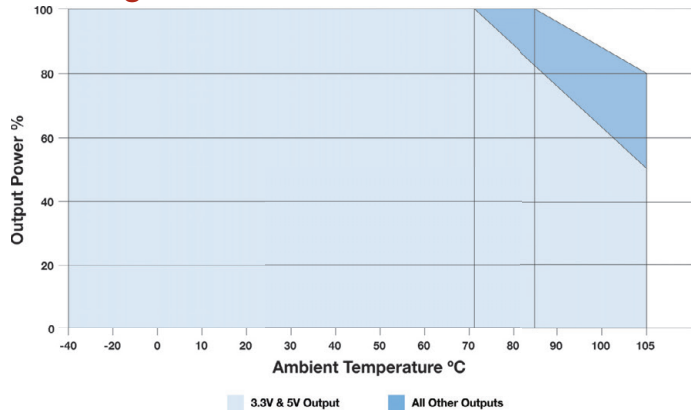
Model Number	Input				Output			Load Regulation % Typ.	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
ML205S-05EI	5	4.50 - 5.50	506	30	5.0	400.0	40.0	12.0	79	1,000
ML205S-09EI	5	4.50 - 5.50	489	30	9.0	222.0	22.0	9.0	82	1,000
ML205S-12EI	5	4.50 - 5.50	489	30	12.0	167.0	17.0	8.0	82	1,000
ML205S-15EI	5	4.50 - 5.50	482	30	15.0	133.0	13.0	7.0	83	1,000
ML212S-05EI	12	10.8 - 13.2	211	25	5.0	400.0	40.0	12.0	79	500
ML212S-12EI	12	10.8 - 13.2	203	25	12.0	167.0	17.0	8.0	82	500
ML212S-15EI	12	10.8 - 13.2	201	25	15.0	133.0	13.0	7.0	83	500
ML212S-24EI	12	10.8 - 13.2	198	25	24.0	83.0	8.0	6.0	84	500
ML215S-15EI	15	13.5 - 16.5	169	18	15.0	133.0	13.0	7.0	83	400
ML224S-05EI	24	21.6 - 26.4	105	15	5.0	400.0	40.0	12.0	79	250
ML224S-12EI	24	21.6 - 26.4	102	15	12.0	167.0	17.0	8.0	82	250
ML224S-15EI	24	21.6 - 26.4	100	15	15.0	133.0	13.0	7.0	83	250
ML224S-24EI	24	21.6 - 26.4	97	15	24.0	83.0	8.0	6.0	86	250

Notes:

- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that a 1  $\mu$ F capacitor and a 10  $\mu$ F capacitor be placed in parallel from the +Vout pin to the -Vout pin.
- It is recommended that the minimum output load should be at least 10%. Continuous operation below this level could damage the unit.
- 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 below will typically meet EN 55022 Class B.



Derating Curve

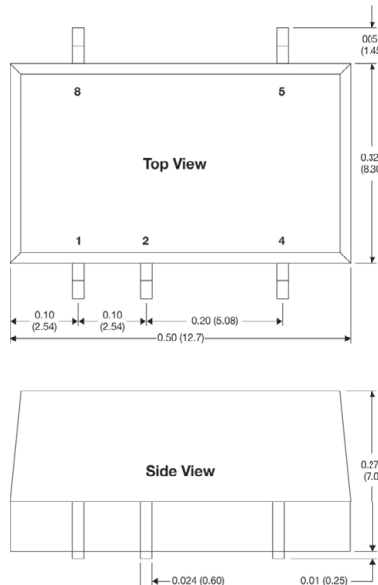
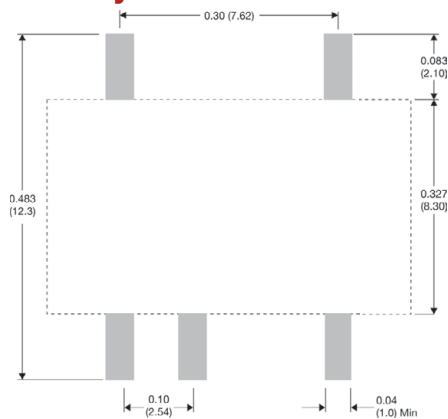


V <sub>IN</sub>	C <sub>1</sub>	C <sub>2</sub>	L <sub>1</sub>	V <sub>OUT</sub>	C <sub>3</sub>
5 VDC	4.7 $\mu$ F/50V		6.8 $\mu$ H	5 VDC	10 $\mu$ F
12 VDC	4.7 $\mu$ F/50V		6.8 $\mu$ H	9 VDC	4.7 $\mu$ F
15 VDC	4.7 $\mu$ F/50V		6.8 $\mu$ H	12 VDC	2.2 $\mu$ F
24 VDC	4.7 $\mu$ F/50V	1 nF/3 kV	6.8 $\mu$ H	15 VDC	1.0 $\mu$ F
				24 VDC	0.47 $\mu$ F

Mechanical Dimensions

- The recommended reflow settings are a peak temperature of 245 °C for a maximum period (T<sub>pk</sub>) of 10S and a time above liquidous (T<sub>l</sub>) of  $\leq$ 60 seconds at 217 °C. For more information, please contact the factory.
- 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.

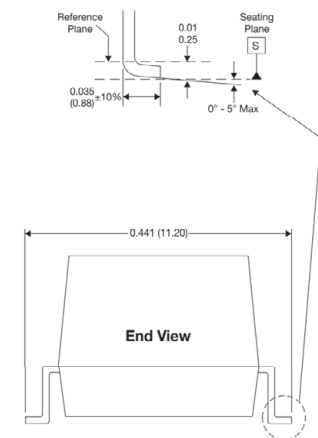
Board Layout



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 =  $\pm$ 0.01 ( $\pm$ 0.25)
- Pin 1 is marked by a "dot" or indentation on the unit



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