ML100BI

1W, High 3kV Isolation, Ultra-Miniature SMT DC/DC Converters

Key Features:

- 1W Output Power
- Ultra-Miniature SMT Case
- -40°C to +105°C Operating Temperature Range
- 3000VDC Isolation Voltage
- Single and Dual Output
- Short Circuit Protected
- >3.5 MHour MTBF
- 25 Standard Models

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	VDC
	12 VDC Input	10.8	12	13.2	VDC
	15 VDC Input	13.5	15	16.5	VDC
	24 VDC Input	21.6	24	26.4	VDC
Reflected Ripple Current	--	--	15	--	mA
Input Filter	Capacitor				

Output

Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy	See Tolerance Graphs					
Line Regulation	3.3 VDC Output		--	--	±1.5	%
	Other Outputs		--	--	±1.2	
Load Regulation	10%-100% Of Load	3.3 VDC	--	15	--	%
		5 VDC	--	10	--	
		12 VDC	--	8	--	
		15 VDC	--	7	--	
		24 VDC	--	6	--	
Ripple & Noise, See Note 7	20 MHz Bandwidth		--	60	120	*mVp-p*
Temperature Coefficient	Full load		--	--	±0.03	% / °C
Output Short Circuit	Continuous, self-recovery					

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds	3000	--	--	VDC
Isolation Resistance	500 VDC	1000	--	--	MΩ
Isolation Capacitance	100 KHz / 0.1V	--	20	--	pF
Switching Frequency	Full load, nominal input voltage	--	220	--	kHz

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	3.5	--	--	MHours

EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR32/EN 55032	--	Class B
Conducted Emissions	CISPR32/EN 55032	--	Class B
ESD	EN 61000-4-2	B	±8 kV Air
			±4 kV Contact

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	3.3 VDC Input	-0.7	--	5	VDC
	5 VDC Input	-0.7	--	9	VDC
	12 VDC Input	-0.7	--	18	VDC
	15 VDC Input	-0.7	--	21	VDC
	24 VDC Input	-0.7	--	30	VDC
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 Selection Guide

UL	Model Number	Input				Output			Efficiency (%, Typ)	Reflected Ripple Current (mA Typ)	Capacitive Load (µF, Max) (See Note3)	Fuse Rating Slow-Blow (mA) (See Note7)
		Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
		Nominal	Range	Full-Load	No-Load							
	ML103S-03BI	3.3	2.97 – 3.63	370	3	3.3	303	30	80	15.0	2400	800
	ML103S-05BI	3.3	2.97 – 3.63	370	3	5.0	200	20	82	15.0	2400	800
	ML103S-09BI	3.3	2.97 – 3.63	370	3	9.0	111	11	83	15.0	1200	800
	ML103S-12BI	3.3	2.97 – 3.63	370	3	12.0	84	8	84	15.0	820	800
	ML105S-03BI	5	4.5 – 5.5	230	3	3.3	303	30	82	15.0	3000	500
▪	ML105S-05BI	5	4.5 – 5.5	230	3	5.0	200	20	85	15.0	3000	500
	ML105S-09BI	5	4.5 – 5.5	230	3	9.0	111	11	86	15.0	1200	500
▪	ML105S-12BI	5	4.5 – 5.5	230	3	12.0	84	8	86	15.0	820	500
	ML105S-15BI	5	4.5 – 5.5	230	3	15.0	67	7	86	15.0	680	500
	ML105S-24BI	5	4.5 – 5.5	230	3	24.0	42	4	87	15.0	330	500
	ML112S-03BI	12	10.8 – 13.2	99	3	3.3	303	30	82	15.0	3000	200
	ML112S-05BI	12	10.8 – 13.2	99	3	5.0	200	20	85	15.0	3000	200
	ML112S-09BI	12	10.8 – 13.2	99	3	9.0	111	11	86	15.0	1200	200
	ML112S-12BI	12	10.8 – 13.2	99	3	12.0	84	8	86	15.0	820	200
	ML112S-15BI	12	10.8 – 13.2	99	3	15.0	67	7	86	15.0	680	200
	ML112S-24BI	12	10.8 – 13.2	99	3	24.0	42	4	88	15.0	330	200
	ML115S-05BI	15	13.5 – 16.5	78	3	5.0	200	20	86	15.0	3000	200
	ML115S-12BI	15	13.5 – 16.5	78	3	12.0	84	8	87	15.0	820	200
	ML115S-15BI	15	13.5 – 16.5	78	3	15.0	67	7	88	15.0	680	200
	ML124S-03BI	24	21.6 – 26.4	51	3	3.3	303	30	82	15.0	3000	150
	ML124S-05BI	24	21.6 – 26.4	51	3	5.0	200	20	85	15.0	3000	150
	ML124S-09BI	24	21.6 – 26.4	51	3	9.0	111	11	86	15.0	1200	150
	ML124S-12BI	24	21.6 – 26.4	51	3	12.0	84	8	87	15.0	820	150
	ML124S-15BI	24	21.6 – 26.4	51	3	15.0	67	7	87	15.0	680	150
	ML124S-24BI	24	21.6 – 26.4	51	3	24.0	42	4	88	15.0	330	150
	* ML105S-05BI, -12BI have UL/cUL 62368 recognition (UL certificate). Contact factory for safety standard status of other models.											

Notes:

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product.
3. The maximum capacitive load is tested within the input voltage range and under full load conditions.
4. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity<75% RH, nominal input voltage, and output rated load.
5. 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.
6. These converters are designed to meet the IPC/JEDEC standard J-STD-020D.1 for reflow soldering. 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 <60 seconds at 217°C.
7. To further reduce input and output ripple, a capacitor filtering network can be connected at the input and output terminals.The application circuit is shown in Figure 8. However, care should be taken to select a suitable filter capacitor. If the capacitance is too large, it is likely to cause start-up problems. For each output, the recommended capacitive load values are shown in “Recommended Capacitive Load Value Table” for safe and reliable operation.
8. For EMC typical recommended circuit, See Figure 9.
9. In order to ensure that the module can work efficiently and reliably, the minimum output load should not be less than 10% of the rated load when used. If the power required is really small, connect a resistor in parallel to the output end (the sum of the power consumed by the resistance and the power actually used is greater than or equal to 10% of the rated power).
10. All indicator testing methods in this manual are based on our company’s corporate standards.
11. Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel.
12. Product specifications are subject to change without prior notice.

Typical Characteristic Curves

Temperature Derating Curve

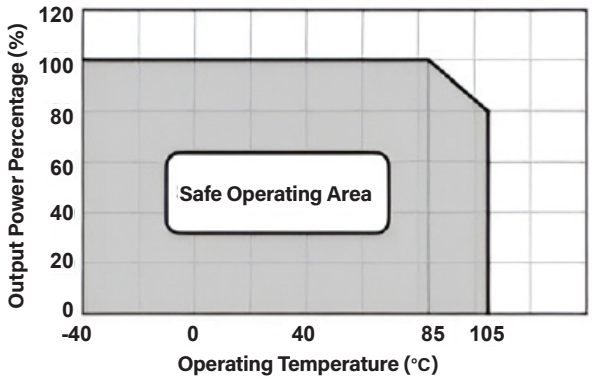


Fig. 1

Environmental					
Parameter	**Conditions**	**Min.**	**Typ**	**Max.**	**Units**
Operating Temperature Range	Ambient	-40	--	+105	°C
Storage Temperature Range	--	-55	--	+125	°C
Case Temperature Rise	--	--	25	--	°C
Cooling	Free air convection				
Humidity, See Note 4	Non condensing	--	--	95	%RH
Physical					
Case Size	0.531 in x 0.335 in x 0.285 in (See mechanical diagrams on page 5)				
Case Material	Black plastic; flame retardant and heat resistant (UL94V-0 rated)				
Weight	0.060 oz (1.7g) (Typ.)				

Output Regulation Curve(others)

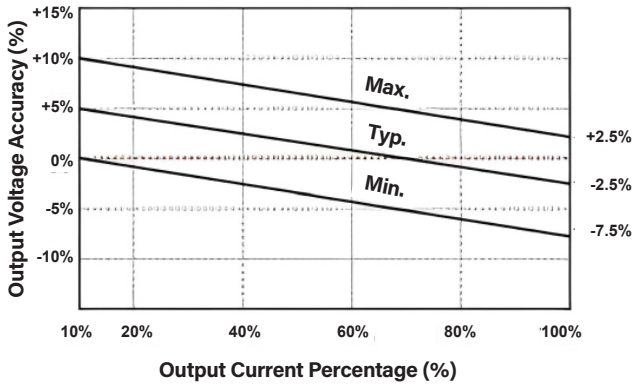


Fig. 2

Output Regulation Curve (3.3VDC Output)

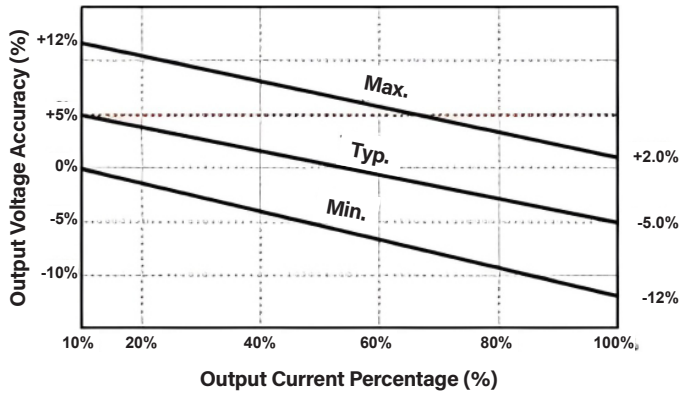


Fig. 3

Efficiency VS Input Voltage Curve (Full Load)

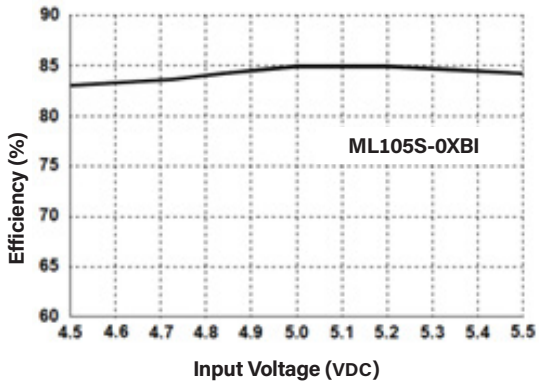


Fig. 4

Efficiency VS Output Load (Vin=5V)

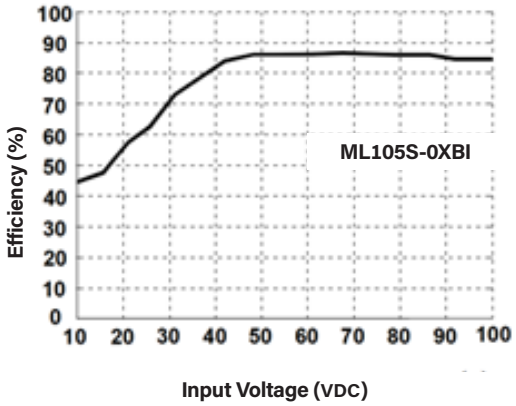


Fig. 5

Efficiency VS Input Voltage Curve (Full Load)

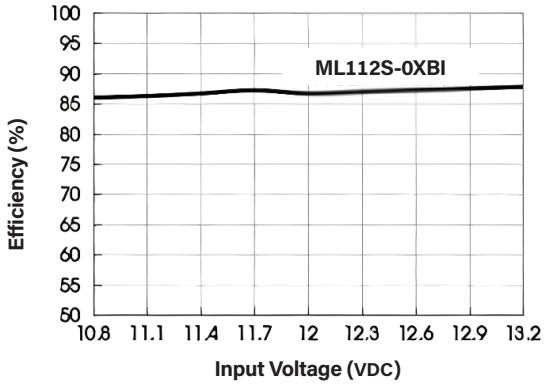


Fig. 6

Efficiency VS Output Load (Vin=12V)

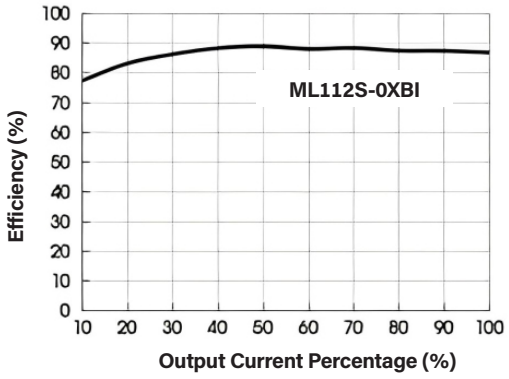


Fig. 7

Efficiency VS Input Voltage Curve (Full Load)

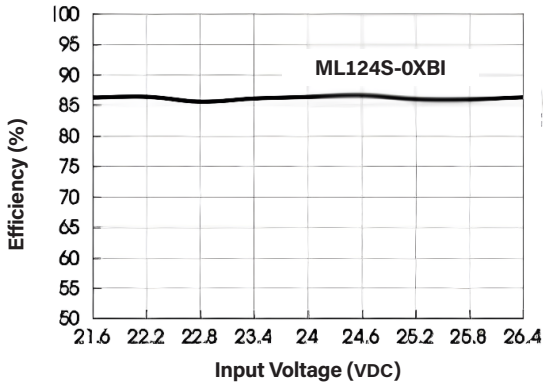


Fig. 8

Efficiency VS Output Load (Vin=24V)

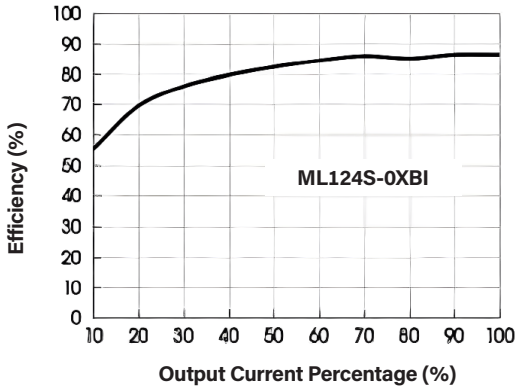


Fig. 9

Application Circuits

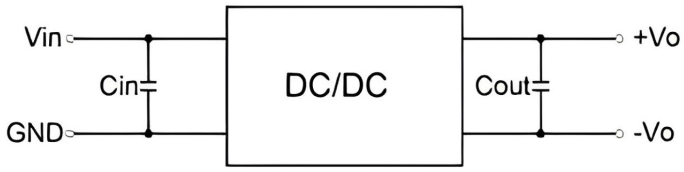


Fig. 10

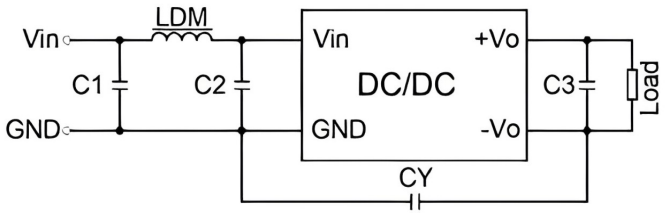
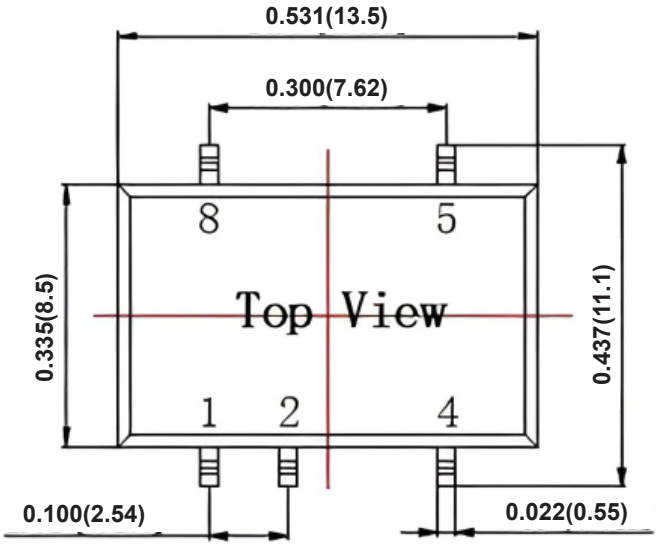


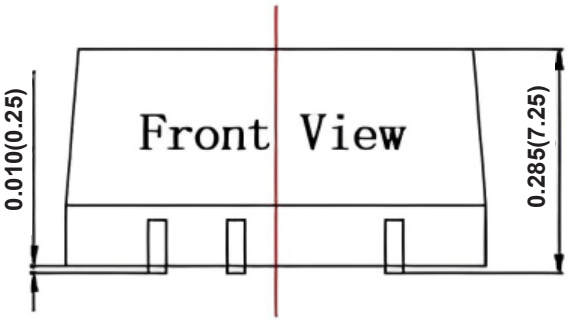
Fig. 11

Recommended Capacitive Load Value			
Vin(VDC)	Cin(μF)	Vo(VDC)	Cout(μF)
3.3/5	4.7	3.3/5	10
12	2.2	9	4.7
15	2.2	12	2.2
24	1	15	1
--	--	24	0.47

EMI Recommended Parameter	
C1,C2	4.7μF / 50μF
C2	Refer to the Cout parameter in Figure 10
CY	270pF / 3kV
LDM	6.8μH

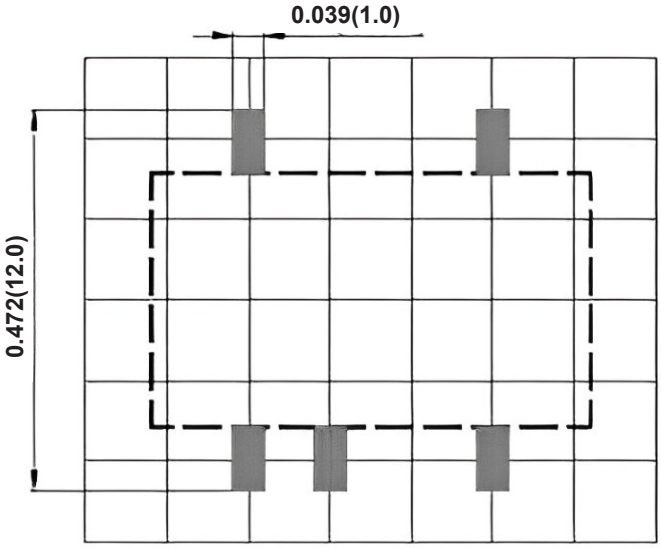
Mechanical Dimensions





Note:
Unit: inches(mm)
Pin section tolerances: ±0.004(±0.10)
General tolerances: ±0.020(±0.50)

PCB Layout



The grid distance is 2.54mm x 2.54mm

Pin Definition Table	
Pin	Function
1	GND
2	Vin
4	-Vo
5	+Vo
NC: cannot be connected to any external circuit	