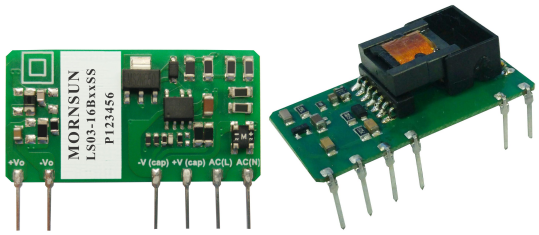
3W, AC/DC converter



CE Report EN62368-1 | CB IEC60950-1 | UK CA BS EN 62368-1 | RoHS

FEATURES

- Ultra-wide 90 - 528VAC and 100 - 745VDC input voltage range
- Accepts AC and/or DC input (dual-use of same terminal)
- Operating ambient temperature range -40℃ to +85℃
- High I/O isolation test voltage of up to 4000VAC
- Compact size and high power density
- Used in such as electrical, instrumentation industries
- Output short circuit, over-current protection
- Design to meets IEC60950, EN62368 and FCC part 15 standards

LS03-16BxxSS(-F) series is a compact size Mornsun power converter. It features ultra-wide input voltage, accepting both DC and AC input voltage, low power consumption, high efficiency, high reliability and Class II reinforced insulation. The products meet UL60950, EN62368, FCC part 15 safety standards and are widely used in industrial control instrumentation and such as electric power for demanding volume applications with the requirement for wide input voltage ranges, the need to meet UL/CE safety certifications and lower demand for EMC compliance levels. We recommend using external components as shown in design reference for enhanced EMC performance in harsh environmental conditions.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN/IEC	LS03-16B03SS(-F)	1.65W	3.3V/500mA	63	2200
	LS03-16B05SS(-F)	2.5W	5V/500mA	67	1100
	LS03-16B09SS(-F)	3W	9V/333mA	70	680
	LS03-16B12SS(-F)		12V/250mA	76	680
	LS03-16B15SS(-F)		15V/200mA	76	560
	LS03-16B24SS(-F)		24V/125mA	76	470

Note: 1. *An "-F" suffix designates horizontal package vs. standard vertical mounting.
2. The product picture is for reference only. For details, please refer to the actual product.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	90	--	528	VAC
	DC input	100	--	745	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.12	A
	230VAC	--	--	0.06	
	480 VAC	--	--	0.04	
Inrush Current	115VAC	--	9	--	
	230VAC	--	15	--	
	480 VAC		27	--	
Leakage Current		0.25mA RMS typ. 230VAC/50Hz			
Recommended External Input Fuse		2.0A, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	LS03-16B03SS(-F)		--	±6	--	%
	Others		--	±5	--	
Line Regulation	Full load	LS03-16B03SS(-F)	--	±2.5	--	
		Others	--	±1.5	--	

Load Regulation	10% - 100% load	--	±2.5	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	--	180	mV
Temperature Coefficient		--	±0.15	--	%/℃
Stand-by Power Consumption	230VAC Input	--	--	0.3	W
	528VAC Input	--	--	0.5	
Short Circuit Protection		Hiccup, continuous, self-recover			
Over-current Protection		150 - 300%Io, self-recover			
Minimum Load		10	--	--	%
Hold-up Time	230VAC input	--	40	--	ms

Note: * The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Test	Input-output	Electric Strength Test for 1min.	4000	--	--	VAC
Operating Temperature		Work in the power drop curve range	-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	85	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
		Manual-welding	360 ± 10℃; time: 3 - 5s			
Switching Frequency			--	70	--	kHz
Power Derating		+55℃ to +85℃	2.0	--	--	%/℃
		-40℃ to -20℃	3.0	--	--	
Safety Standard			IEC60950-1, EN/BS EN62368-1 Safety Approval; Design refer to UL60950-1			
Safety Class			CLASS II			
MTBF		MIL-HDBK-217F@25℃	≥ 300,000 h			

Mechanical Specifications

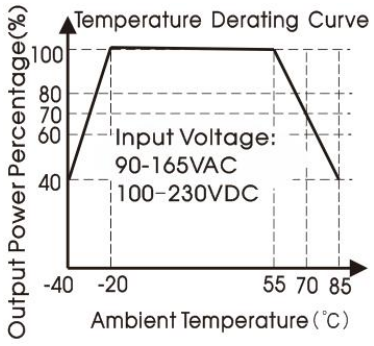
Dimension	44.50 x 13.00 x 24.00 mm
Weight	8g (Typ.)
Cooling Method	Free air convection

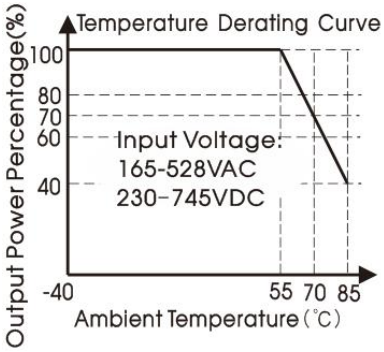
Electromagnetic Compatibility (EMC)

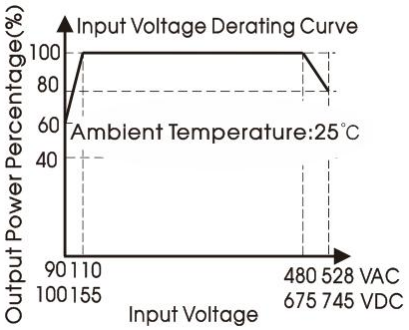
Emissions*	CE	CISPR32/EN55032 FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR32/EN55032 FCC part 15 CLASS B (See Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032 FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR32/EN55032 FCC part 15 CLASS B (See Fig. 2 for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m (See Fig. 2 for recommended circuit)	perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±2KV (See Fig. 1 for typical application circuit)	perf. Criteria B
		IEC/EN 61000-4-4 ±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5 line to line ±1KV (See Fig. 1 for typical application circuit)	perf. Criteria B
		IEC/EN 61000-4-5 line to line ±2KV/ line to PE ±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 3Vr.m.s (See Fig. 2 for recommended circuit)	perf. Criteria A
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70% (See Fig. 2 for recommended circuit)	perf. Criteria B

Note: *This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Product Characteristic Curve







Note:
① With an AC input between 90 - 110VAC / 480 - 528VAC and a DC input between 100 - 155VDC/675-745VDC, the output power must be derated as per temperature derating curves;
② Please refer to typical application for operating the product at full load with an ambient temperature at -40℃ to -20℃;
③ This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.

Design Reference

1. Typical application

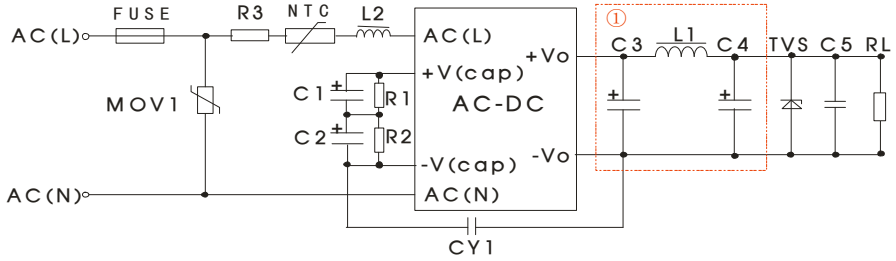


Fig. 1: Typical circuit diagram
Note: ① is a Pi filter circuit

Part No.	MOV1	C1/C2 (required)	L2	R1/R2 (required)	C3 (required)	L1 (required)	C4 (required)	C5	CY1	FUSE (required)	NTC (required)	R3 (required)	TVS
LS03-16B03SS(-F)	S14K550	22uF/450V	1.2mH	3MΩ	270uF/16V (Solid Capacitor)	4.7uH	100uF/35V	0.1uF/50V	470pF/500VAC	2.0A	5D-9	7.5Ω/2W	SMBJ7.0A
LS03-16B05SS(-F)													SMBJ7.0A
LS03-16B09SS(-F)													SMBJ12A
LS03-16B12SS(-F)													SMBJ20A
LS03-16B15SS(-F)					470uF/35V								SMBJ20A
LS03-16B24SS(-F)													SMBJ30A

Note:
1. For best results we recommended using identical electrolytic filter capacitors for C1 and C2 (brand, model, batch, etc.);
2. R1/R2: The maximum operation voltage of R1 and R2 should be above 450V. We recommend using several chip resistors in series to meet this type of operation voltage;
3. R3 refers to the winding resistance;
4. Output filter: We recommend using an electrolytic capacitor with high frequency, high ripple current and low ESR rating for C3 and C4 (refer to manufacture's datasheet). Combined with L1, they form a pi-type filter circuit. Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. The same type of margins should be chosen for L1 and L2 current ratings. C5 is a ceramic capacitor, used to filtering high frequency noise. A suppressor diode (TVS) is a recommended to protect the application in case of a converter failure.
5. For full load operation at an ambient temperature of -40℃ to -20℃, we recommend using following parameter changes to component values: 33uF/450V for C1/C2, 1 MΩ for R1/R2, 12Ω/2W for R3 and 10D-10 for the NTC.

2. EMC compliance recommended circuit

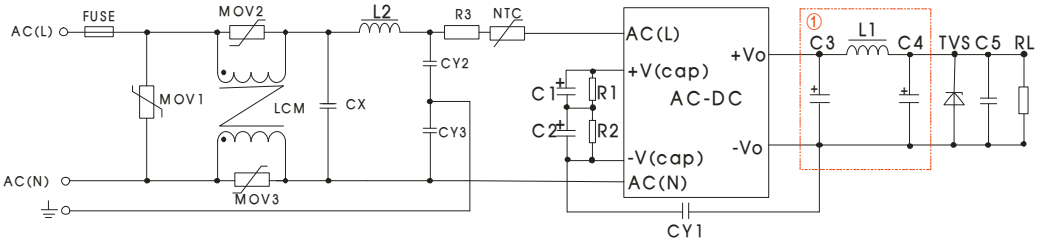
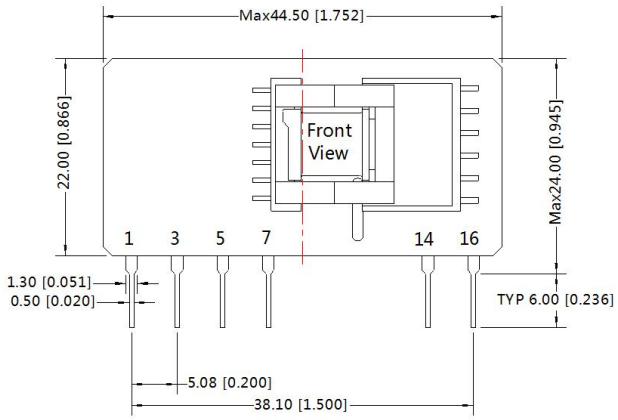


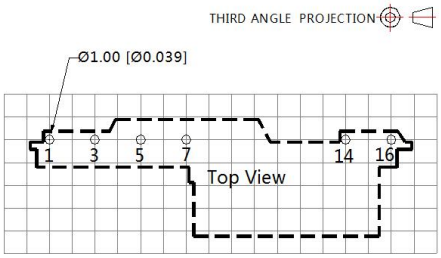
Fig. 2 : EMC application circuit

Component	Recommended value
MOV1	S14K550
MOV2, MOV3	S07K300
CY2, CY3	470pF/500VAC
CX	0.1uF/530VAC
LCM	4.5mH
L2	1.2mH
NTC	10D-10
R3	12Ω/2W
FUSE	2.0A, slow-blow, required
Note: The recommended values of other components are shown in typical application.	

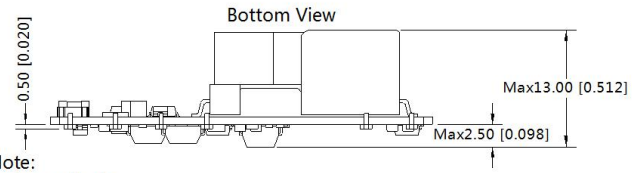
3. For additional information please refer to application notes on www.mornsun-power.com

LS03-16BxxSS Dimensions and Recommended Layout





Note: Grid 2.54*2.54mm

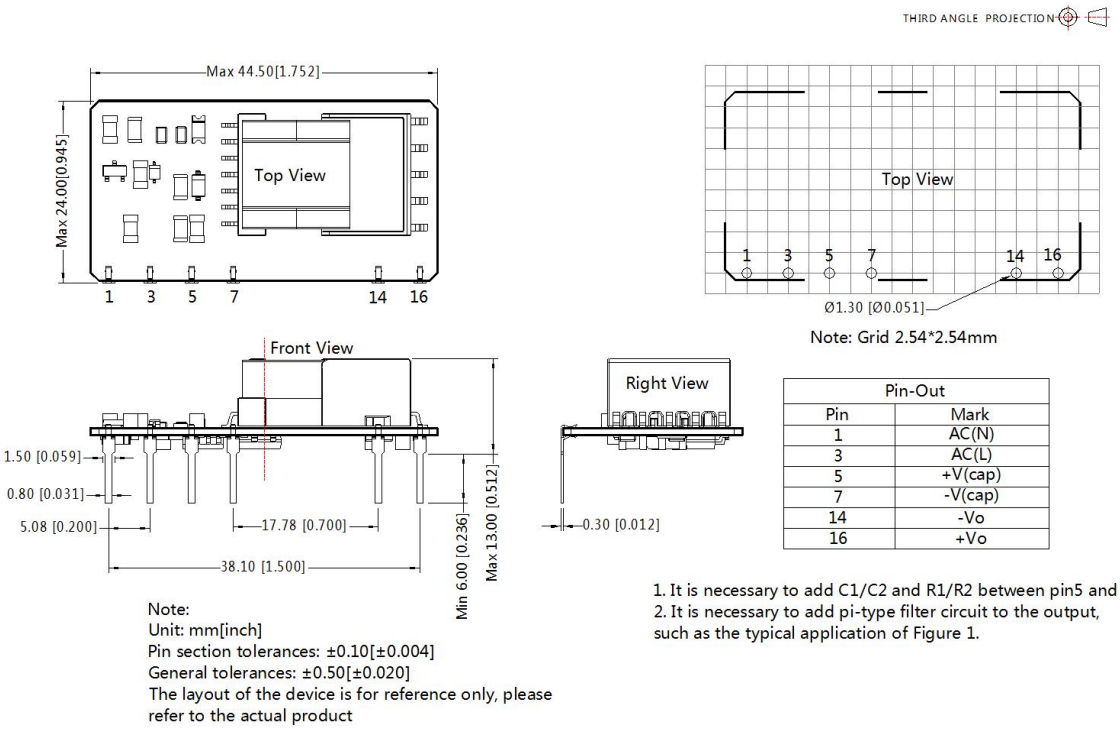


Pin-Out	
Pin	Mark
1	AC(N)
3	AC(L)
5	+V(cap)
7	-V(cap)
14	-Vo
16	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
The layout of the device is for reference only, please refer to the actual product

1. It is necessary to add C1/C2 and R1/R2 between pin5 and pin 7.
2. It is necessary to add pi-type filter circuit to the output, such as the typical application of Figure 1.

LS03-16BxxSS-F Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	AC(N)
3	AC(L)
5	+V(cap)
7	-V(cap)
14	-Vo
16	+Vo

1. It is necessary to add C1/C2 and R1/R2 between pin5 and pin 7.
2. It is necessary to add pi-type filter circuit to the output, such as the typical application of Figure 1.

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
The layout of the device is for reference only, please refer to the actual product

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220085 (LS03-16BxxSS), 58220026(LS03-16BxxSS-F);
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. This part is open frame, at least 10mm safety distance between the primary and secondary external components of the module is needed to meet the safety requirement;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, typical application circuit with nominal input voltage and rated output load;
5. In order to improve the efficiency at light load, there will be audible noise generated, but it does not affect product performance and reliability;
6. The module needs to be glued and fixed after assembly;
7. All index testing methods in this datasheet are based on our company corporate standards;
8. We can provide product customization service, please contact our technicians directly for specific information;
9. Specifications are subject to change without prior notice;
10. Products are related to laws and regulations: see "Features" and "EMC";
11. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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