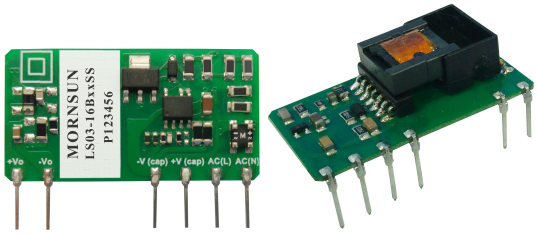
3W, AC/DC converter



FEATURES

- Ultra wide input voltage range: 90 - 528VAC/100 - 745VDC
- AC and DC dual-use (input from the same terminal)
- Operating temperature range: -40℃ to +85℃
- Compact size, high power density
- Isolation voltage: 4KVAC
- Used in such as electrical, instrumentation industries
- Output short circuit, over-current protection
- Meets UL60950, EN60950, FCC part 15 standards

LS03-16BxxSS (-F) series ---- a compact size power converter offered by Mornsun. It features ultra wide input voltage, taking both DC and AC input voltage, low power consumption, high efficiency, high reliability, safer isolation. Meets UL60950, EN60950, FCC part 15 standards. Widely used in industrial control and instrumentation, such as electric power for demanding volume, the requirement of wide input voltage range, the need to meet UL / CE certification and EMC less demanding applications. EMC application circuit must be added if the products need to be applied to EMC harsh environment.

Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current(Vo/Io)	Efficiency (230VAC, %/Typ.)	Max. Capacitive Load (μF)
UL/CE/CB	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: *The model of 90 degrees of corner is with "-F". For example the LS03-16B03SS of 90 degrees of corner product is LS03-16B03SS-F.

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 fusing, necessary			
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-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-recovery			
Over-current Protection		150 - 300%Io self-recovery			
Min. Load		10	--	--	%
Hold-up Time	230VAC input	--	40	--	ms
Note: *Parallel line test method is adopted to test the ripple and noise, please see AC-DC Converter Application Notes for specific operation methods.					

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output	Test time: 1min	4000	--	--	VAC
Operating Temperature		Work in the power drop curve range	-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	85	%RH
Welding 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/EN60950/UL60950			
Safety Certification			IEC60950/EN60950/UL60950			
Safety Class			CLASS II			
MTBF		MIL-HDBK-217F@25℃	≥ 300,000 h			

Physical Specifications

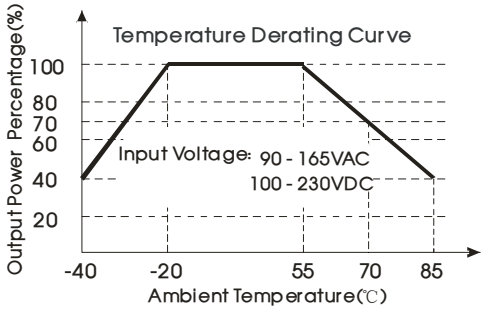
Dimension	44.50*13.00*24.00mm
Weight	8g (Typ.)
Cooling Method	Free air convection

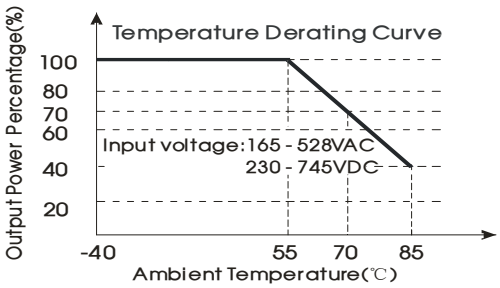
EMC Specifications

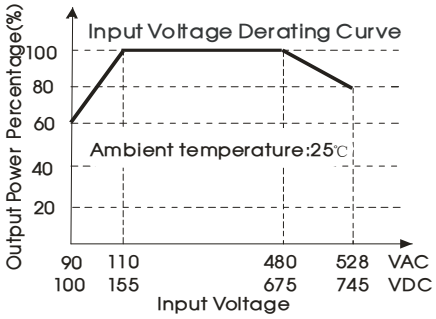
EMI*	CE	CISPR22/EN55022/FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR22/EN55022/FCC part 15 CLASS B (See Fig. 2 for recommended circuit)	
	RE	CISPR22/EN55022/FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR22/EN55022/FCC part 15 CLASS B (See Fig. 2 for recommended circuit)	
EMS	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 ground ±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 dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11 0%,70% (See Fig. 2 for recommended circuit)	perf. Criteria B

*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:
①When input 90 - 110VAC / 480 - 528VAC/100 - 155VDC/675-745VDC, it need to be voltage derated on basis of temperature derating; Please refer to typical application circuit;
②If the product is working at full load at ambient temperature of -40℃ to -20℃, Please refer to typical application circuit;
③This product is suitable for use in natural air cooling environments, if in a closed environment, please contact our company's FAE.

Design Reference

1. Typical application circuit

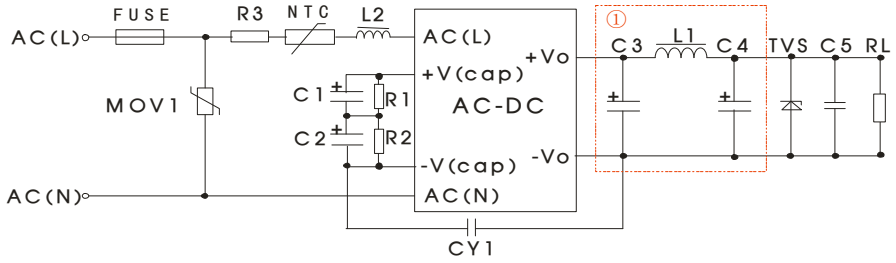


Fig. 1
Note:① is Pi filter circuit

Part No.	MOV1	C1/C2 (necessary)	L2	R1/R2 (necessary)	C3 (necessary)	L1 (necessary)	C4 (necessary)	C5	CY1	FUSE (necessary)	NTC (necessary)	R3 (necessary)	TVS
LS03-16B03SS(-F)	S14K550	22μF/450V	1.2 mH	3MΩ	270μF/16V (Solid Capacitor)	4.7μH	100μF/ 35V	0.1μF/ 50V	470pF/ 500VAC	2.0A	5D-9	7.5Ω /1W	SMBJ7.0A
LS03-16B05SS(-F)													SMBJ7.0A
LS03-16B09SS(-F)													SMBJ12A
LS03-16B12SS(-F)													SMBJ20A
LS03-16B15SS(-F)					470μF/35V								SMBJ20A
LS03-16B24SS(-F)													SMBJ30A

Note:
1. C1/C2: filtering electrolytic capacitor (which is required), recommended the same brand, the same model, the same batch of electrolytic capacitors; Such as the use of -25 C to +85 C environment, can use the recommended value of 10uF/450V capacitor;
2. R1/R2: max operation voltage of R1/R2 should be above 450V. While using chip resistors, it is recommended to use several chip resistors in series to meet operation voltage;
3. R3(which is required): winding resistance;
4. C3 and C4 are output filer capacitors (which is required), they are recommended to be high frequency and low impedance electrolytic capacitors. Capacitance and rated ripple current of capacitors refer to the datasheets provided by the manufactures. Capacitor voltage reduced to at least 80%. C5 is a ceramic capacitor, which is used to filter high frequency noise. C3, C4 and L1 form a pi-type filter circuit. Current of L1 and L2 refer to the datasheets provided by the manufactures, current derating to at least 80%. TVS is a recommended component to protect post-circuits (If converter fails);
5. When working at full load at ambient temperature of -40℃ to -20℃, following circuit parameters values are recommended: C1/C2 (necessary): 33μF/450V; R1/R2 (necessary): 1 MΩ; R3(necessary): 12Ω/2W; NTC(necessary): 10D-10.

2. EMC solution-recommended circuit

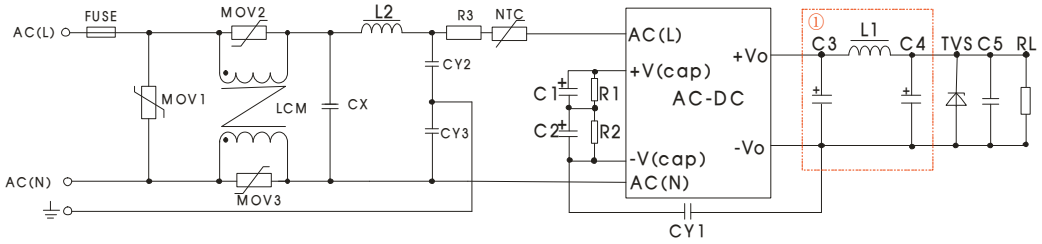
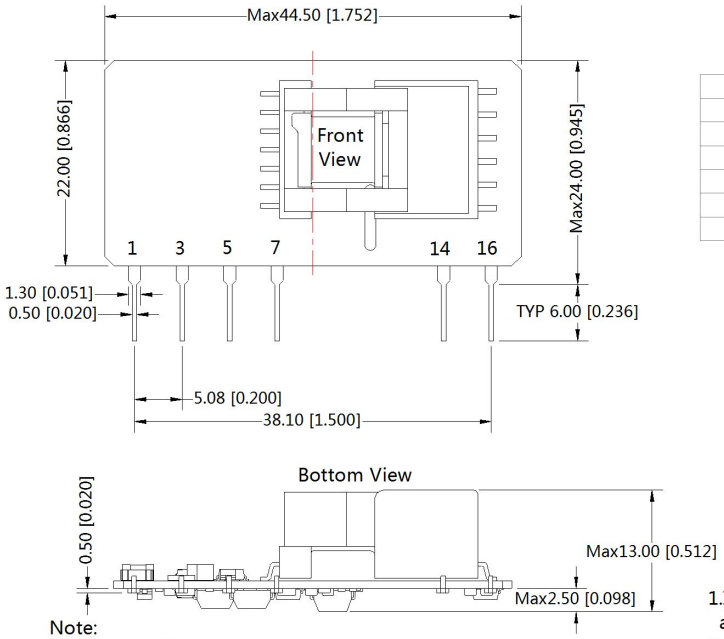


Fig. 2

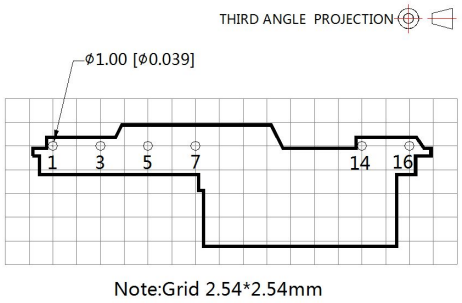
Element model	Recommended value
MOV1	S14K550
MOV2、MOV3	S07K300
CY2、CY3	470pF/500VAC
CX	0.1μF/530VAC
LCM	4.5mH
L2	1.2mH
NTC	10D-10
R3	12Ω/2W
FUSE	2.0A, slow fusing, necessary
Note: The recommended value of other components refers to typical application circuit.	

3. For more information Please find the application note on www.mornsun-power.com

LS03-16BxxSS Dimensions and Recommended Layout



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



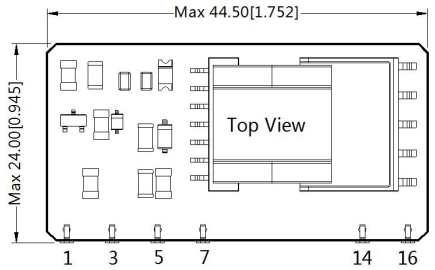
Note:Grid 2.54*2.54mm

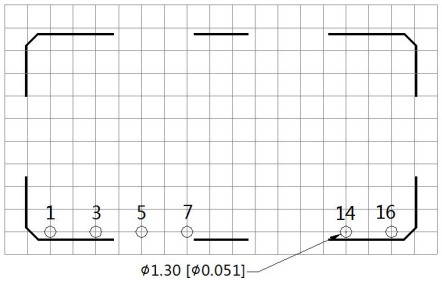
Pin-Out	
Pin	Function
1	AC(N)
3	AC(L)
5	+V(cap)
7	-V(cap)
14	-Vo
16	+Vo

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.

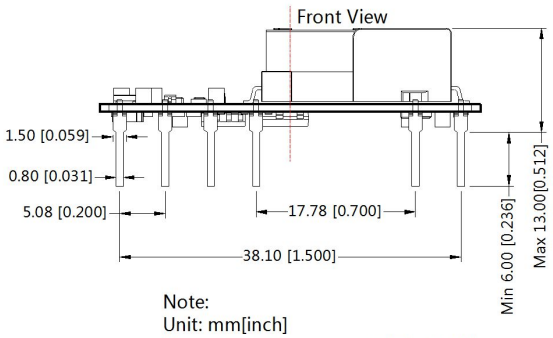
LS03-16BxxSS-F Dimensions and Recommended Layout

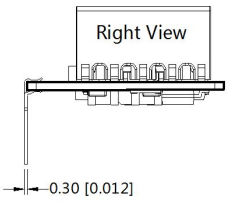
THIRD ANGLE PROJECTION





Note:Grid 2.54*2.54mm





Pin-Out	
Pin	Function
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.

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. LS03-16BxxSS packing bag number: 58220032; LS03-16BxxSS-F packing bag number: 58220026;
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 increase the conversion efficiency of the product with light load in the design, the product will have audio noise when it is operating, but don't affect the product's reliability and performance;
6. Module required dispensing fixed after assembled;
7. All index testing methods in this datasheet are based on our Company's 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.

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