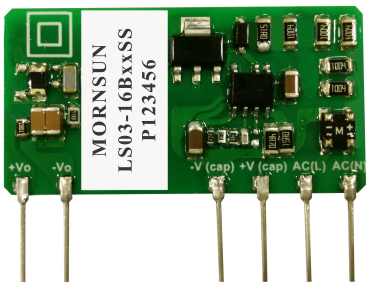
3W, AC/DC converter



FEATURES

- Ultra wide input voltage rang: 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: 4K VAC
- Used in such as electrical, instrumentation industries
- Output short circuit, over-current protection
- Meets UL60950, EN60950, FCC part 15 standards (Pending)

LS03-16BxxSS 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,

Note: Please refer to Design Reference when module being used in a bad EMC 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 (Pending)	LS03-16B03SS	1.65W	3.3V/500mA	63	2200
	LS03-16B05SS	2.5W	5V/500mA	67	1100
	LS03-16B09SS	3W	9V/333mA	70	680
	LS03-16B12SS		12V/250mA	76	680
	LS03-16B15SS		15V/200mA	76	560
	LS03-16B24SS		24V/125mA	76	470

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	3.3V output		--	±6	--	%
	Others		--	±5	--	
Line Regulation	Full load	3.3V output	--	±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		--	--	0.5	W
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, the output capacitor is required to be connected to the typical application circuit, 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			-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			
Power Derating		+55℃to +85℃	2.0	--	--	%/℃
		-40℃to -20℃	3.0	--	--	
Safety Standard			IEC60950/EN60950/UL60950			
Safety Certification			EN60950/UL609509 (Pending)			
Safety Class			CLASS I I			
MTBF			MIL-HDBK-217F@25℃ ≥ 300,000 h			

Physical Specifications

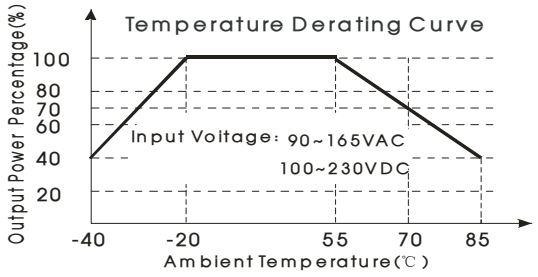
Dimension	44.50 *13.00*24.00mm
Weight	8.0 g(Typ.)
Cooling Method	Free air convection

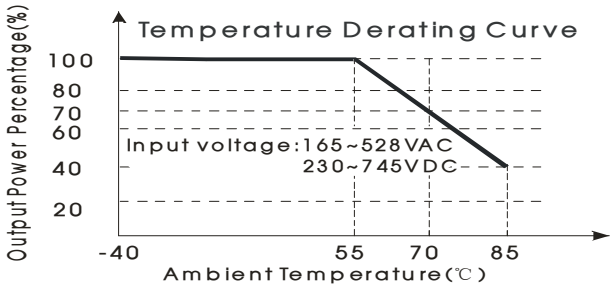
EMC Specifications

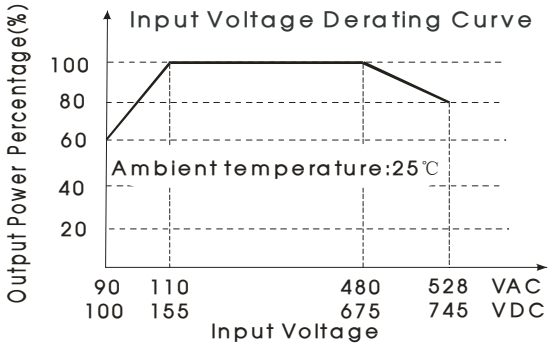
EMI*	CE	CISPR22/EN55022/FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR22/EN55022/FCC part 15 CLASS B (See Fig. 3 for recommended circuit)	
	RE	CISPR22/EN55022/FCC part 15 CLASS A (See Fig. 1 for typical application circuit)	
		CISPR22/EN55022/FCC part 15 CLASS B (See Fig. 3 for recommended circuit)	
EMS	ESD	IEC/EN 61000-4-2 Contact ±4KV	Perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m(See Fig. 3 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. 3 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. 3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s (See Fig. 3 for recommended circuit)	perf. Criteria A
	PFM	IEC/EN61000-4-8 10A/m (See Fig. 3 for recommended circuit	perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11 0%,70%(See Fig. 3 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 see Fig. 1 for typical application circuit);
②If the product is working at full load at ambient temperature of -40℃ to -20℃, Please see Fig. 2 for 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

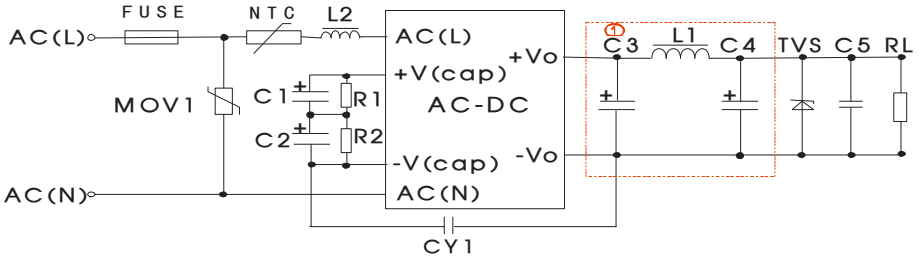


Fig. 1
Note:① is Pi filter circuit

Part No.	C1/C2 (necessary)	L2	R1/R2 (necessary)	C3 (necessary)	L1 (necessary)	C4 (necessary)	C5	CY1	FUSE (necessary)	TVS
LS03-16B03SS	10μF/450V	1.2mH	3MΩ	270μF/16V (Solid Capacitor)	4.7μH	100μF/35V	0.1μF/50V	470pF/500VAC	2.0A	SMBJ7.0A
LS03-16B05SS										SMBJ7.0A
LS03-16B09SS										SMBJ12A
LS03-16B12SS										SMBJ20A
LS03-16B15SS				680μF/25V						SMBJ20A
LS03-16B24SS				220μF/35V						SMBJ30A

Note:
1. C1/C2: is filtering electrolytic capacitor (which is required), and the value of C1/C2 is 10μF/450V, recommended the same brand, the same model, the same batch of electrolytic capacitors
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 mee operation voltage.
3. 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. Voltage derating of capacitors should be 80% o above. 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 should be 80% or above. TVS is a recommended component to protect post-circuits (if converter fails). External input NTC is recommended to use 10D-10.External input MOV1 is recommended to use S14K550.

2. Typical application circuit（Full load use of low temperature）

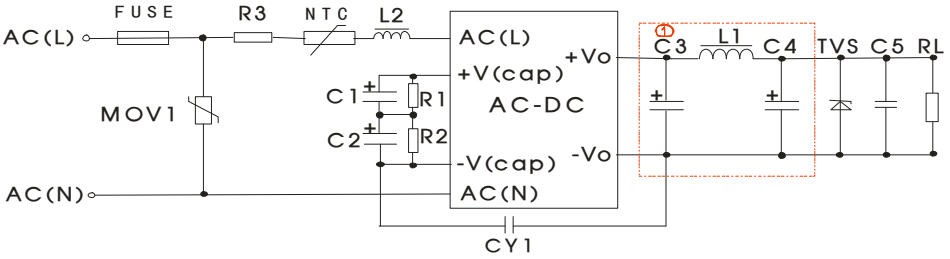


Fig. 2

Note:① is Pi filter circuit

Element model	Recommended value
C1/C2 (necessary)	33μF/450V
R1/R2 (necessary)	1 MΩ
R3 (necessary)	12Ω/3W

Note:

1. Using typical application circuit Fig. 2, the product can work at full load at ambient temperature of -40℃ to -20℃;
2. C1/C2: is filtering electrolytic capacitor (which is required), and the value of C1/C2 is 33μF/450V, recommended the same brand, the same model, the same batch of electrolytic capacitors;
3. 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;
4. R3：12Ω/3W，Winding resistance;
5. Other devices recommended value the same with typical application circuit Fig. 1 recommended value.

3. EMC solution-recommended circuit

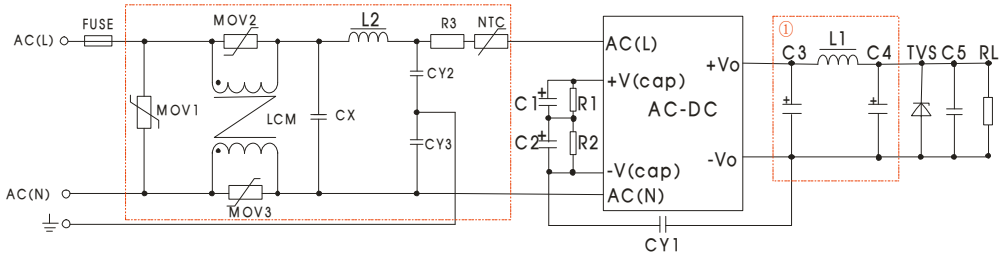
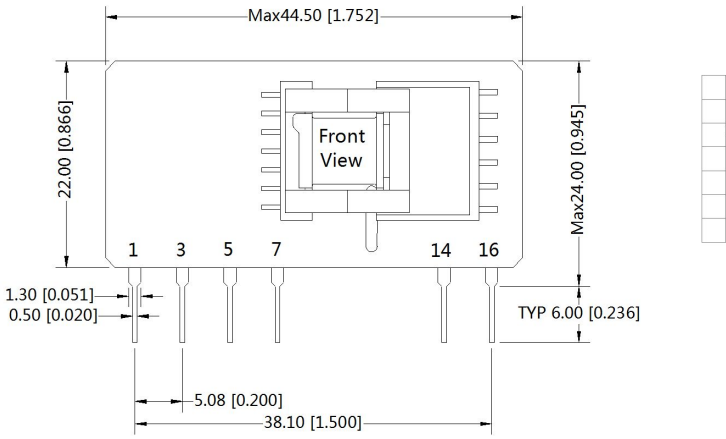


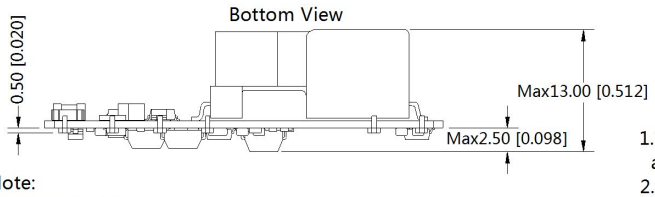
Fig. 3

Element model	Recommended value
MOV1	S14K550
MOV2、MOV3	S07K300
CY1	470pF/500VAC
CY2、CY3	470pF/500VAC
CX	0.1μF/530VAC
LCM	4.5mH
L1	4.7μH
L2	1.2mH
NTC	10D-10
R3	12Ω/3W
FUSE	2.0A，slow fusing, necessary

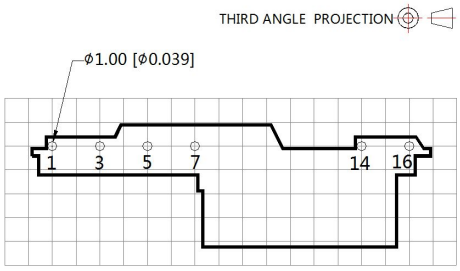
For more information Please find the application note on www.mornsun-power.com

Dimensions and Recommended Layout





Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.50[±0.020]



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.

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com.
   Packing bag number: 58220032;
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. The maximum capacitive load offered were tested at input voltage range and full load;
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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