ST10-DXX-AC

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- Operating ambient temperature range: -40℃ to +85℃
- Up to 85% efficiency
- No-load power consumption < 0.1W
- 5000m altitude application
- OVC Ⅲ (meet EN61558-1)
- EMI performance meets CISPR32/EN55032 CLASS B, EN55014

RoHS

3-Year Warranty

Description

ST10-DXX-AC series AC-DC converters features ultra-wide AC input and at the same time accepts DC input voltage, low power consumption, low ripple & noise, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/EN/UL62368, EN60335, EN61558 standards. The converters are widely used in industrial, power, home appliances, instrumentation, communication and civil applications. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230Vdc (%) Typ.	Capacitance Load (μF) Max.
/	ST10-D03-AC	8.6W	3.3V/2600mA	74	6600
	ST10-D05-AC	10W	5V/2000mA	79	5000
	ST10-D09-AC		9V/1100mA	81	3600
	ST10-D12-AC		12V/830mA	84	2000
	ST10-D15-AC		15V/660mA	84	820
	ST10-D24-AC		24V/410mA	85	470

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.23	A
	230VAC	--	--	0.15	
Inrush Current	115VAC	--	25	--	
	230VAC	--	40	--	
Leakage Current	277VAC/50Hz	0.1mA RMS Max.			
Fuse (A2S/A4S package series include fuse)		2A/300V, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±2	--	%
Line Regulation	Full load	--	±0.5	--	
Load Regulation	0%-100% load	--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	50	100	mV
Stand-by Power Consumption	3.3/5/9/12/15V	--	0.10	--	W
	24V	--	0.12	--	
Temperature Coefficient		--	±0.02	--	%/℃
Short Circuit Protection		Hiccup, continuous, self-recover			
Over-current Protection		⩾110%Io, self-recover			
Over-voltage Protection	3.3/5 V	⩽7.5VDC (Output voltage clamp or hiccup)			
	9 V	⩽15VDC (Output voltage clamp or hiccup)			
	12/15 V	⩽20VDC (Output voltage clamp or hiccup)			
	24 V	⩽30VDC (Output voltage clamp or hiccup)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC	--	8	--	ms
	230VAC	--	40	--	

Note: *The “Tip and barrel method” is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information.

General Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1min., leakage current <5mA		4200	--	--	VAC
Insulation Resistance	Input-output	At 500VDC		100	--	--	MΩ
Operating Temperature				-40	--	+85	℃
Storage Temperature				-40	--	+85	
Storage Humidity				--	--	95	%RH
Soldering Temperature		Wave-soldering		260 ± 5℃; time: 5 - 10s			
		Manual-welding		360 ± 10℃; time: 3 - 5s			
Switching Frequency				--	65	--	kHz
Power Derating		-40℃ to -25℃	85VAC - 115VAC	2.2	--	--	%/℃
		+50℃ to +70℃	3.3/5V	2.5	--	--	
		+55℃ to +70℃	9/12/15/24V	3.33	--	--	
		+70℃ to +85℃		0.66	--	--	
		85VAC - 100VAC		0.83	--	--	%/VAC
		2000m - 5000m		6.7	--	--	%/Km
Safety Standard				IEC/UL62368-1, EN61558-1, EN60335-1 safety approval & EN62368-1 (Report)			
Safety Class				CLASS I I			
MTBF				MIL-HDBK-217F@25℃ >3,200,000 h			
Designed life		230VAC	Ta: 25℃ 100% load	>130x10$_3$ h			
			Ta: 55℃ 100% load	>20x10$_3$ h			
			Ta: 55℃ 80% load	>27x10$_3$ h			

Mechanical Specifications

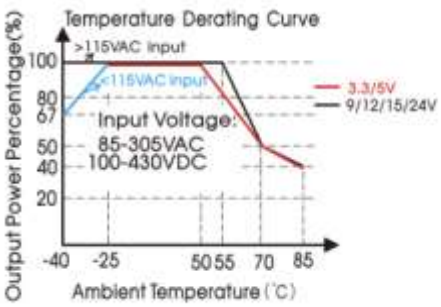
Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	DIP package	40.00 x 25.40 x 21.00 mm
	A2S chassis mounting	76.00 x 31.50 x 29.80 mm
	A4S Din-Rail mounting	76.00 x 31.50 x 34.40 mm
Weight	DIP mounting	34g (Typ.)
	A2S chassis mounting	54g (Typ.)
	A4S Din-Rail mounting	74g (Typ.)
Cooling method		Free air convection

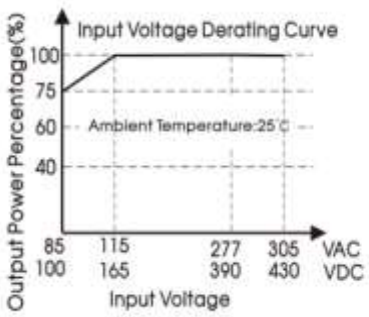
EMC Specifications

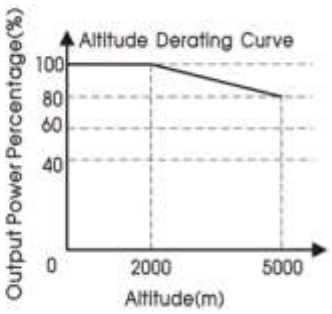
Emissions	CE	CISPR32/EN55032 CLASS B	
		EN55014-1	
	RE	CISPR32/EN55032 CLASS B	
		EN55014-1	
Immunity	ESD	IEC/EN61000-4-2 Contact ± 8KV/Air ±15KV	perf. Criteria B
		EN55014-2	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
		EN55014-2	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (See Fig. 3 for recommended circuit)	perf. Criteria A
		EN55014-2	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±1KV	perf. Criteria B
		IEC/EN61000-4-5 line to line ±2KV (See Fig. 2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-5 line to line ±2KV/line to PE ±4KV (See Fig. 3 for recommended circuit)	perf. Criteria B
		EN55014-2	perf. Criteria B
	CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A
		EN55014-2	perf. Criteria A
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70%	perf. Criteria B
		EN55014-2	perf. Criteria B

Note: ①When the output terminal of the product needs to be connected to PE through a Y capacitor, or close to the metal frame, please refer to the Fig. 3 for recommended circuit;
②Unless otherwise specified, EMC performance indicators are tested according to typical application circuits (Fig. 1).

Product Characteristic Curve

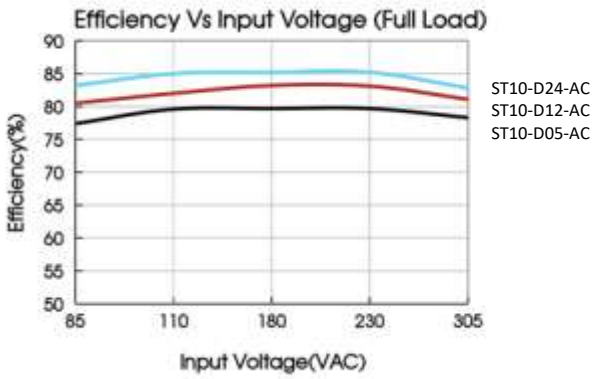


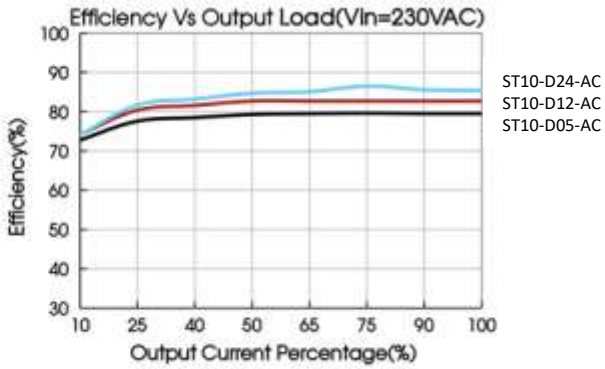




Note:
① With an AC input between 85-115VAC and a DC input between 100-165VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling;

Product Characteristic Curve





Design Reference

1. Typical application

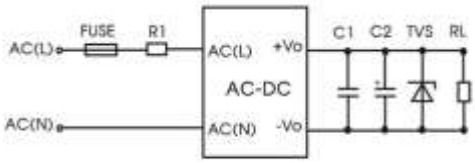


Fig. 1: Typical circuit diagram

Part No.	FUSE	R1	C1	C2	TVS
ST10-D03-AC	2A/300V, slow-blow, required	6.8Ω/3W (wire-wound resistor, required)	1uF/50V	220uF/16V	SMBJ7.0A
ST10-D05-AC				220uF/16V	SMBJ7.0A
ST10-D09-AC				100uF/25V	SMBJ12A
ST10-D12-AC				100uF/25V	SMBJ20A
ST10-D15-AC				100uF/25V	SMBJ20A
ST10-D24-AC				100uF/35V	SMBJ30A

Output Filter Components:

We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC Recommended Circuit

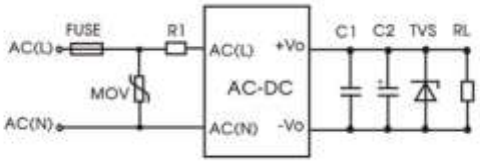


Fig. 2: EMC application circuit with higher requirements

Component	Recommended value
MOV	S14K350

Design Reference

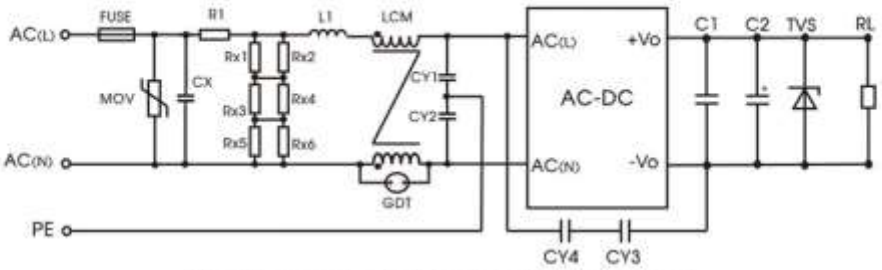


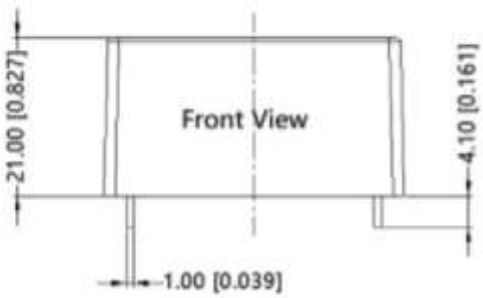
Fig. 3: Recommended circuit for class I equipment

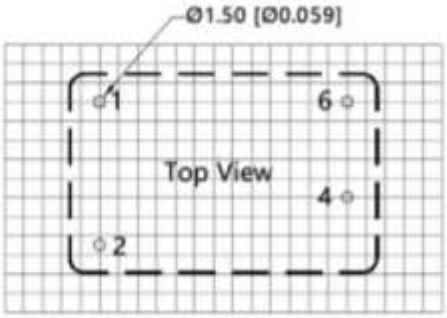
(Recommended when the output terminal of the product needs to be connected to PE or connected to PE through a Y capacitor)

Component	Recommended value
FUSE	2A/300V, slow-blow, required
MOV	S14K350
CX	334K/305VAC
R1	12Ω/5W (wire-wound resistor, required)
L1	1.2mH/0.5A
CY1/CY2	2.2nF/400VAC
CY3/CY4	1nF/400VAC
GDT	300V/1KA
LCM	20 mH, P/N: FL2D-10-203 (MORNSUN) is recommended
Note: Rx1/Rx2/Rx3/Rx4/Rx5/Rx6 is the bleeder resistance of CX, and the recommended resistance value is 1.5MΩ/150VDC.	

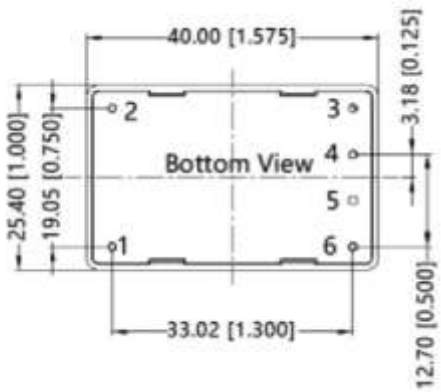
Dimensions and Recommended Layout

PIN CONNECTIONS	
PIN	Function
1	AC(L)
2	AC(N)
3	no pin
4	+Vo
5	no pin
6	-Vo





Note: Grid 2.54*2.54mm



units: mm [inch]
pin diameter tolerance: ±0.10 [±0.004]
tolerance: ±0.50 [±0.020]

Note:1. 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;