DESCRIPTIONS

5W, AC/DC Converter

RoHS

Report Report

UL62368-1 EN62368-1 BS EN62368-1

FEATURES

- Ultra-wide 85 - 305VAC and 70 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range -40℃ to +85℃
- Multi application, flexible layout
- Compact size, high power density, green power
- Controllable life and adjustable cost
- No-load power consumption 0.1W
- Output short circuit, over-current protection

APPLICATIONS

- Industrial control
- Electric power
- Instrumentation
- Smart home applications

Selection Guide

Certification	Part No*	Output Power (W)	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
UL/EN/BS EN	APS05-03	3.3W	3.3V/1000mA	69	2200
	APS05-05	5W	5V/1000mA	76	1500
EN/BS EN	APS05-09		9V/560mA	77	680
UL/EN/BS EN	APS05-12		12V/420mA	79	470
EN/BS EN	APS05-15		15V/340mA	79	330
UL/EN/BS EN	APS05-24		24V/210mA	81	100
UL	APS05-03-F	3.3W	3.3V/1000mA	69	2200
UL/EN/BS EN	APS05-05-F	5W	5V/1000mA	76	1500
--	APS05-09-F		9V/560mA	77	680
UL/EN/BS EN	APS05-12-F		12V/420mA	79	470
--	APS05-15-F		15V/340mA	79	330
UL	APS05-24-F		24V/210mA	81	100

Note:
1. The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.
2. If the product is used in a severe vibration application, it needs to be glued and fixed.
3.*An "-F" suffix designates horizontal package vs. standard vertical mounting.
4.The product picture is for reference only. For details, please refer to the actual product.

Specifications

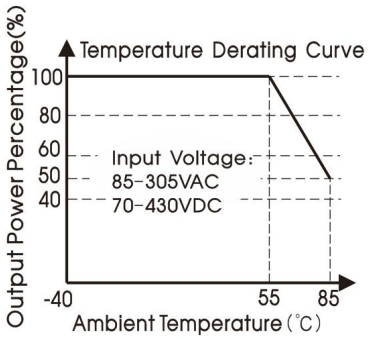
Product Specifications	Item		Operating Conditions	Min.	Typ.	Max.	Unit
Input Specifications	Input Voltage Range		AC input	85	--	305	VAC
			DC input	70	--	430	VDC
	Input Frequency			47	--	63	Hz
	Input Current		115VAC	--	--	0.2	A
			230VAC	--	--	0.1	
	Inrush Current		115VAC	--	20	--	
			230VAC	--	40	--	
	Recommended External Input Fuse			1A, slow-blow, required (The actual use needs to be selected according to the application environment)			
	Hot Plug			Unavailable			
Output Specifications	Output Voltage Accuracy		10% - 100% load	--	±5	--	%
	Line Regulation		Rated load	--	±1.5	--	
	Load Regulation		10% - 100% load	--	±3	--	
	Ripple & Noise*		20MHz bandwidth (peak-to-peak value), 10% - 100% load	--	80	150	mV
	Temperature Coefficient			--	±0.15	--	%/℃
	Stand-by Power Consumption		230VAC	--	0.10	0.15	W
	Short Circuit Protection			Hiccup, continuous, self-recovery			
	Over-current Protection			≥110% Io, self-recovery			
	Minimum Load			10	--	--	%
General Specifications	Isolation	Input-output	Electric Strength Test for 1min., leakage current<5mA	3600	--	--	VAC
				5000	--	--	VDC
	Operating Temperature			-40	--	+85	℃
	Storage Temperature			-40	--	+105	
	Storage Humidity			--	--	95	%RH
	Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
			Manual-welding	360 ± 10℃; time: 3 - 5s			
	Power Derating		+55℃ to +85℃	1.67	--	--	%/℃
			85VAC - 100VAC	1.33	--	--	%/VAC
			277VAC - 305VAC	0.72	--	--	
	Safety Class			CLASS II			
	MTBF		MIL-HDBK-217F@25℃	>1,000,000 h			
Mechanical Specifications	Dimension		APS05-xx	26.40 x 14.73 x 11.00 mm			
			APS05-xx-F	27.84 x 17.60 x 11.60 mm			
	Weight		APS05-xx	5.2g (Typ.)			
			APS05-xx-F	5.6g (Typ.)			
	Cooling method			Free air convection			

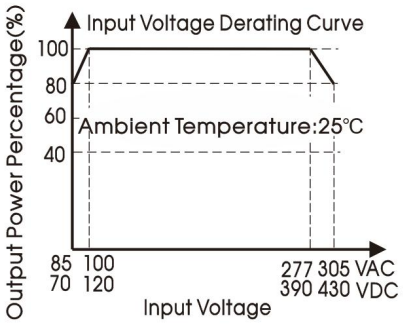
Note: 1. * The "parallel cable" method is used for ripple and noise test;
2. The product is able to work with 0% - 10% load and with stable output.

Electromagnetic Compatibility (EMC)

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

Characteristic Curve

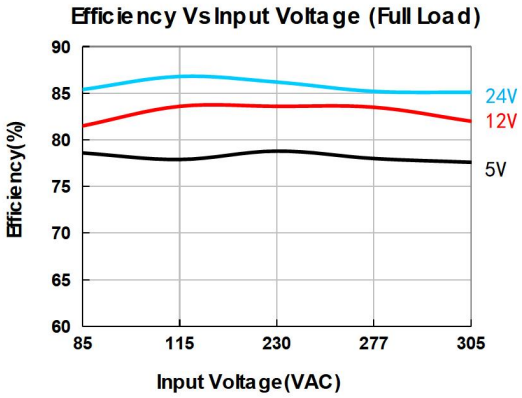


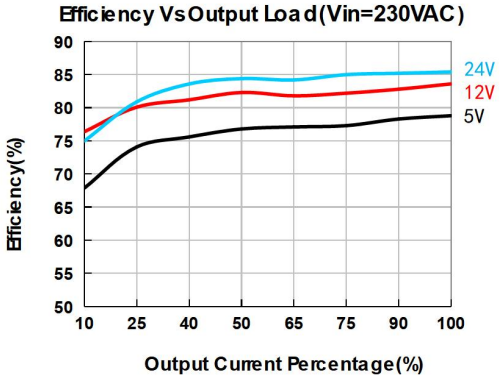


Note:

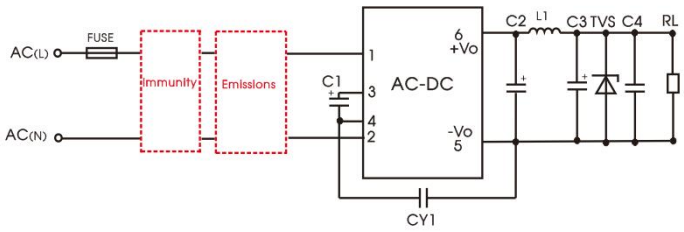
① With an AC input between 85 -100VAC/277- 305VAC and a DC input between 70 - 120VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling.





Additional Circuits Design Reference



APS series additional circuits design reference

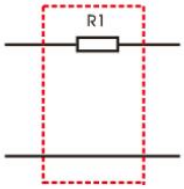
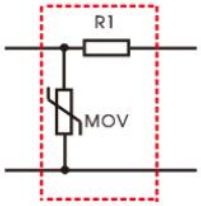
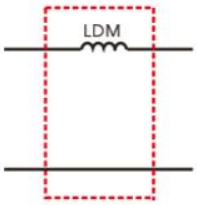
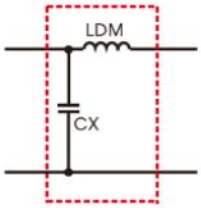
APS05(-F) series additional components selection guide (No EMC devices)							
Part No.	C1(required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)	TVS
APS05-03(-F)	10uF/450V (-25℃ to +85℃, 85-305VAC input; -40℃ to +85℃, 165-305VAC input) 22uF/450V (-40℃ to +85℃, 85-305VAC input)	820uF/6.3V (solid-state capacitor)	4.7uH/60mΩ /2.2A	100uF/35V	0.1uF/ 50V	1.0nF/ 400VAC	SMBJ7.0A
APS05-05(-F)		470uF/16V (solid-state capacitor)					
APS05-09(-F)		270uF/16V (solid-state capacitor)		47uF/35V			SMBJ12A
APS05-12(-F)							SMBJ20A
APS05-15(-F)		220uF/35V					
APS05-24(-F)							SMBJ30A

Note:

1. C1 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current > 200mA@100KHz.
2. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40℃≤1.1Ω) rating for C3 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise.
3. A suppressor diode (TVS) is recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.

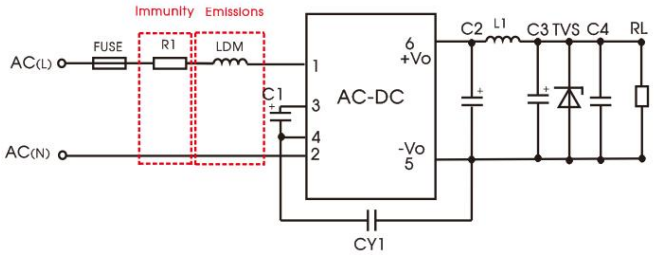
Environmental Application EMC Solution

APS series environmental application EMC solution selection table						
Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85 - 305VAC	-40℃ to +85℃	Class A	Level 3
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	Class B	Level 3
	Indoor general environment	Intelligent building/Intelligent agriculture				
3	Indoor industrial environment	Manufacturing workshop		-25℃ to +55℃	Class B	Level 4
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40℃ to +85℃	Class A	Level 4

Immunity design circuits for reference		Emissions design circuits for reference	
Level 3	Level 4	Class A	Class B
			

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1——Basic application

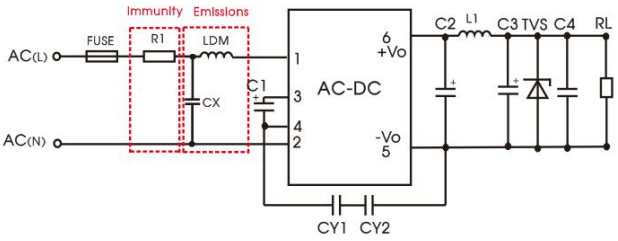


recommended circuit 1

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Basic application	-40℃ to +85℃	Level 3	Class A

FUSE (required)	1A/300V, slow-blow
R1 (wire-wound resistor, required)	12Ω/3W
LDM	4.7mH/Max: 15Ω/Min: 0.2A
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

2. Application circuit 2——Indoor civil /Universal system recommended circuits for general environment

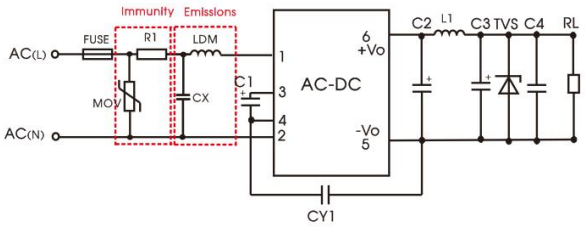


Recommended circuit 2

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Indoor civil /general	-25℃ to +55℃	Level 3	Class B

Component	Recommended value
R1 (wire-wound resistor, required)	12Ω/3W
LDM	1.2mH/Max: 4.0Ω/Min: 0.2A
CX	0.1uF/310VAC
FUSE (required)	1A/300V, slow-blow
Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/250VAC). Note 2: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard. Note 3: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

3. Application circuit 3——Universal system recommended circuits for indoor industrial environment

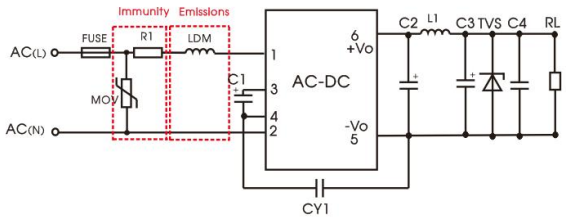


Recommended circuit 3

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Indoor industrial	-25℃ to +55℃	Level 4	Class B

Component	Recommended value
MOV	S14K350
CX	0.1uF/310VAC
LDM	1.2mH/Max: 4.0Ω/Min: 0.2A
R1 (wire-wound resistor, required)	12Ω/3W
FUSE (required)	2A/300V, slow-blow
Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard. Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

4. Application circuit 4——Universal system recommended circuits for outdoor general environment

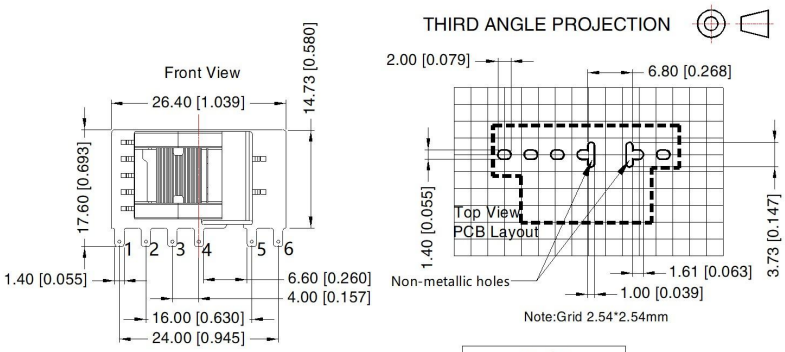


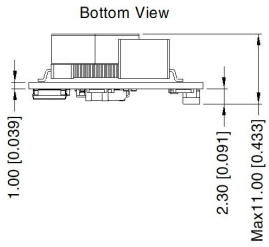
Recommended circuit 4

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Outdoor general environment	-40℃ to +85℃	Level 4	Class A

Component	Recommended value
MOV	S14K350
LDM	4.7mH/Max: 15Ω/Min: 0.2A
R1 (wire-wound resistor, required)	12Ω/2W
FUSE (required)	2A/300V, slow-blow
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

APS05-xx Dimensions and Recommended Layout

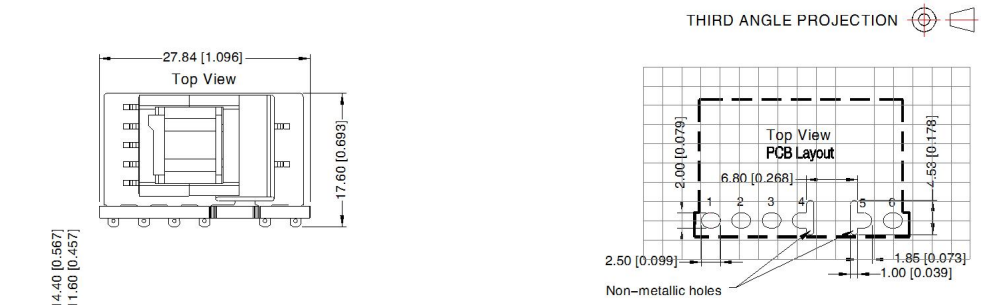




Pin–Out	
Pin	Function
1	AC(L)
2	AC(N)
3	+V(cap)
4	–V(cap)
5	–Vo
6	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 1.00[± 0.039]
The layout of the device is for reference only,
please refer to the actual product

APS05-xx-F Dimensions and Recommended Layout

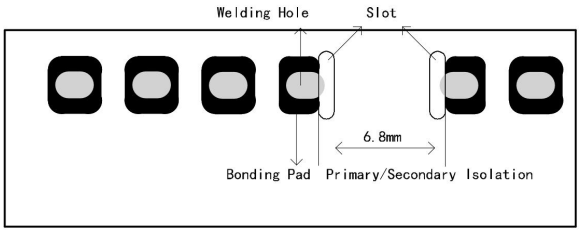


Pin–Out	
Pin	Mark
1	AC (L)
2	AC (N)
3	+V(cap)
4	–V(cap)
5	–Vo
6	+Vo

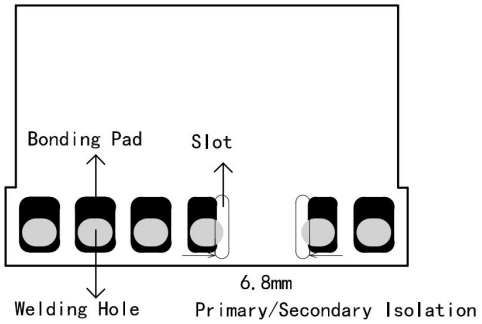
Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 1.0[± 0.040]
The layout of the device is for reference only,
please refer to the actual product

Recommended pad

APS05-xx series recommended pad



APS05-xx-F series recommended pad



Note: There is a slot(non-metallic hole) between pin 4/5, which the side pad were being cut off. For details, please refer to the recommended dimensions or pad.

Note:

1. External electrolytic capacitors are required to modules, more details refer to typical applications;
2. This part is open frame, at least 6.4mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement, refer to the recommended welding hole design in the external dimension drawing;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, nominal input voltage (115V and 230V) and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.