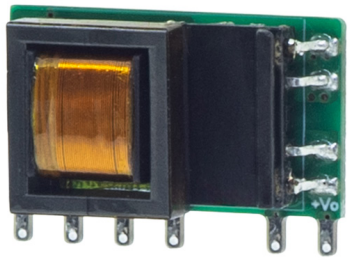
SERIES: PBO-5E | **DESCRIPTION:** AC-DC POWER SUPPLY

FEATURES

- small size, industrial design
- PCB SIP mounting
- universal input voltage range 85~305 Vac / 100~430 Vdc
- IEC/EN/UL 62368-1 certified
- designed to meet IEC/EN 61558 & IEC/EN 60335
- operating temperature -40°C ~ 85°C
- short-circuit, over current, and over voltage protection
- isolation voltage 4,000 Vac
- OVC III



MODEL

MODEL	output voltage (Vdc)	output current max (mA)	output power max (W)	ripple and noise[1] max (mVp-p)	efficiency typ (%)
PBO-5E-3	3.3	1,000	3.3	180	73
PBO-5E-5	5	1,000	5.0	180	76
PBO-5E-9	9	560	5.0	180	77
PBO-5E-12	12	420	5.0	180	78
PBO-5E-15	15	340	5.0	180	79
PBO-5E-24	24	210	5.0	180	81

Notes:
1. 20 MHz bandwidth oscilloscope, 10% to full load, the output is in parallel with 10μF electrolytic capacitor and 1μF ceramic capacitor.
2. For optimal performance, it is recommended to operate at a load of above 5%.
   If the load falls below 5%, the ripple index of the product may exceed specifications; however, this does not impact the product's reliability.
3. All specifications are measured at Ta=25°C, humidity <75%, 115 or 230 Vac input voltage, and rated output load unless otherwise specified.

PART NUMBER KEY

INPUT

parameter	conditions/description	min	typ	max	units
voltage[4]	ac input dc input	85 100		305 430	Vac Vdc
frequency		47	50~60	63	Hz
current	at 110 Vac at 230 Vac			0.15 0.07	A A
fuse	1A, slow-blow, required				
no load power consumption	at 230 Vac		0.10		W

Notes: 4. The input voltage must remain within the specified range to prevent potential permanent and irreparable damage.

OUTPUT

parameter	conditions/description	min	typ	max	units
capacitive load[5]	3.3, 5 Vdc output model 9 Vdc output model 12 Vdc output model 15 Vdc output model 24 Vdc output model			1,500 680 470 330 100	µF µF µF µF µF
initial set point accuracy	from 10~100% load		±5		%
line regulation	at rated load 3.3 Vdc output model all other models		 ±2.5 ±1.5		 % %
load regulation	from 10~100% load		±3		%
temperature coefficient			±0.15		%/°C
hold-up time	at 115 Vac at 230 Vac		8 40		ms ms

Notes: 5. The maximum capacitive load is tested within the input voltage range and under full load conditions.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over current protection		110			%
short circuit protection	continuous, auto recovery				

SAFETY & COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute, 5mA max	4,000			Vac
safety approvals	certified to 62368-1: IEC, EN, UL designed to meet 61558-1: IEC, EN designed to meet 60335-1: IEC, EN				
safety class	Class II				
conducted emissions	CISPR32/EN55032 CLASS A (see application circuit) CISPR32/EN55032 CLASS B (see EMC recommended circuit)				
radiated emissions	CISPR32/EN55032 CLASS A (see application circuit) CISPR32/EN55032 CLASS B (see EMC recommended circuit)				
ESD	IEC/EN61000-4-2 Contact ±6 kV / Air ±8 kV, perf. Criteria B				
radiated immunity	IEC/EN61000-4-3 10 V/m, perf. Criteria A				
EFT/burst	IEC/EN61000-4-4 ±2 kV, perf. Criteria B (see application circuit) IEC/EN61000-4-4 ±4 kV, perf. Criteria B (see EMC recommended circuit)				
surge	IEC/EN61000-4-5 line to line ±1 kV, perf. Criteria B (see application circuit) IEC/EN61000-4-5 line to line ±2 kV, perf. Criteria B (see EMC recommended circuit)				
conducted immunity	IEC/EN61000-4-6 10 Vrms, perf. Criteria A				
MTBF	as per MIL-HDBK-217F at 25 °C	1,000,000			hours
RoHS	yes				

ENVIRONMENTAL

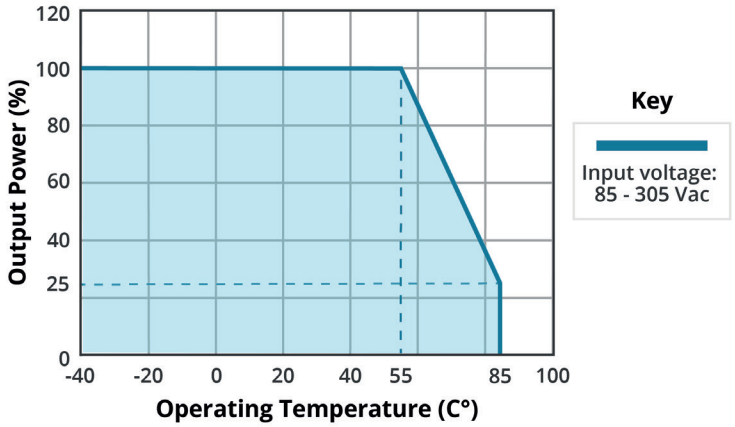
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-40		85	°C
storage temperature		-40		105	°C
operating altitude				2,000	m

SOLDERABILITY

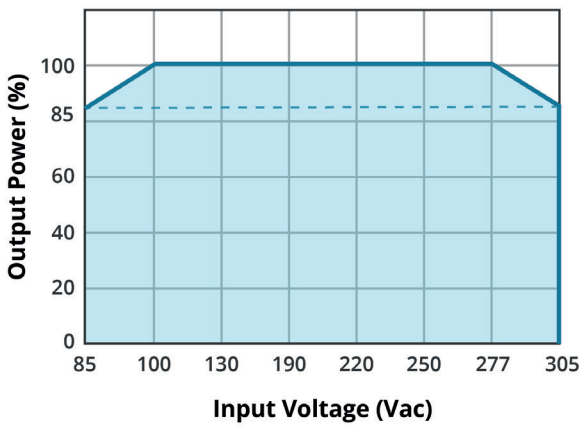
parameter	conditions/description	min	typ	max	units
wave soldering	for 5~10 seconds	255	260	265	°C
hand soldering	for 3~5 seconds	355	360	365	°C

DERATING CURVES

TEMPERATURE DERATING CURVE

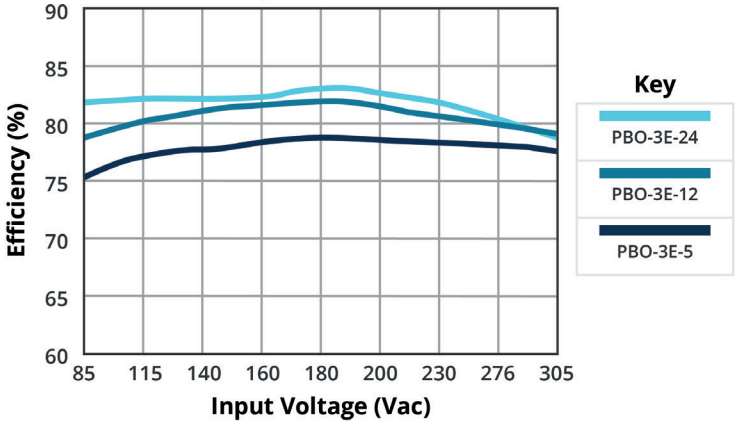


INPUT VOLTAGE DERATING CURVE (25°C)

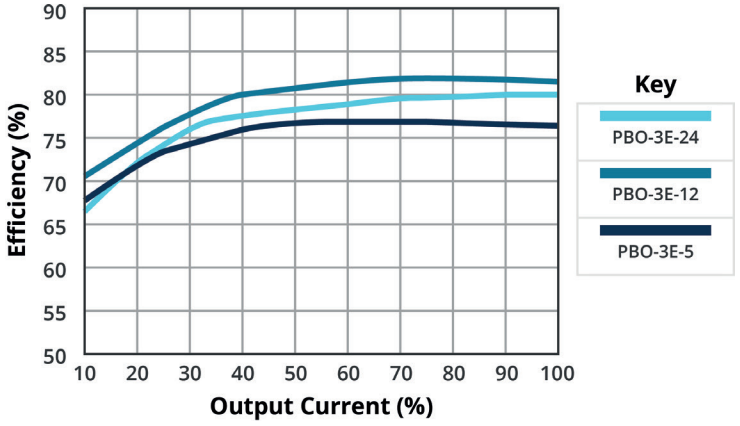


EFFICIENCY CURVES

EFFICIENCY VS INPUT VOLTAGE (full load)



EFFICIENCY VS OUTPUT CURRENT (Vin = 230 Vac)



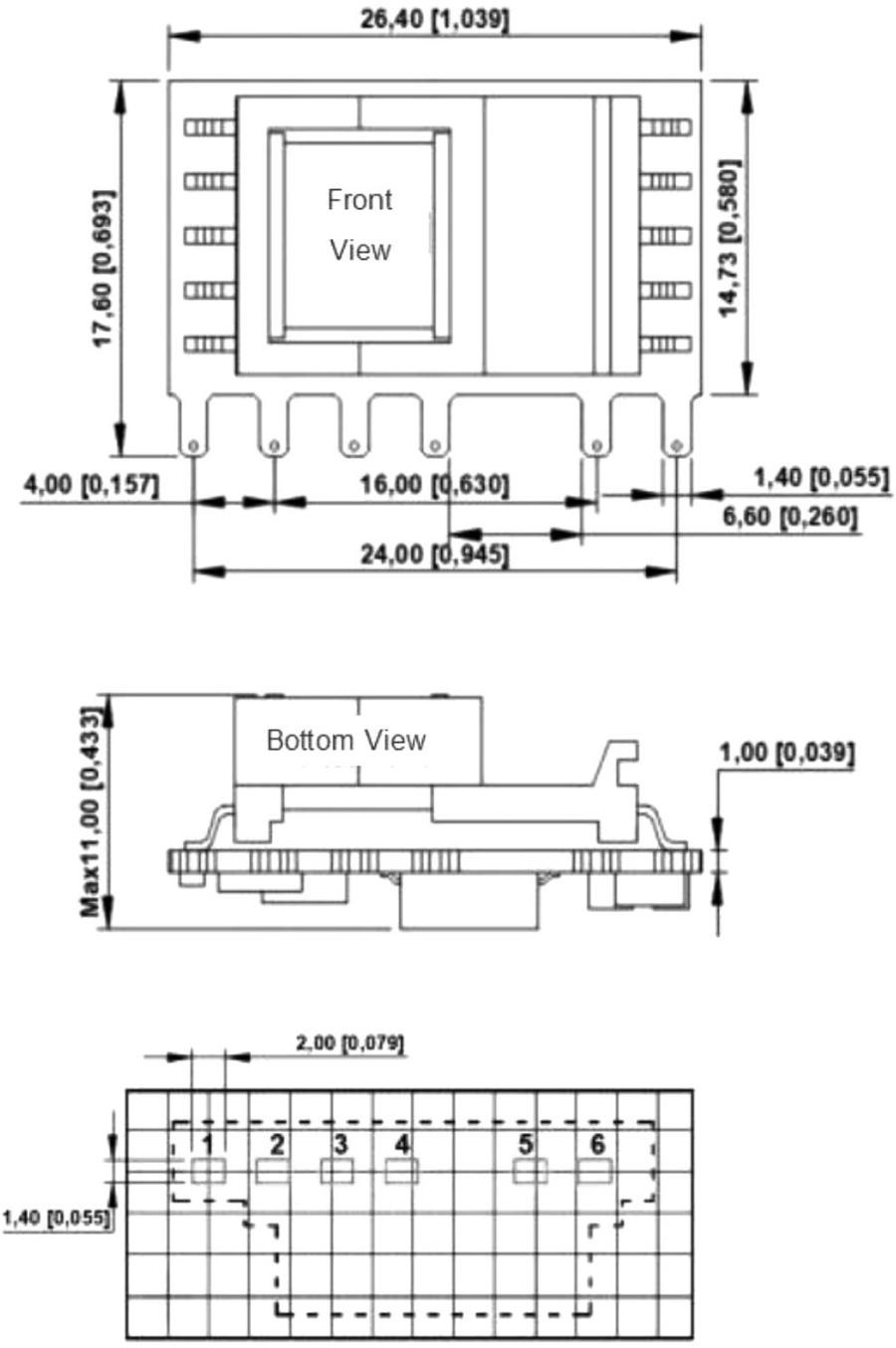
MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	26.40 x 17.60 x 11.00 [1.039 x 0.623 x 0.433 inch]				mm
weight			5.9		g
cooling	natural convection				

MECHANICAL DRAWING

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

PIN CONNECTIONS	
PIN	Function
1	AC (L)
2	AC (N)
3	+V(CAP)
4	-V(CAP)
5	-Vo
6	+Vo



APPLICATION DESIGN REFERENCE

Figure 1

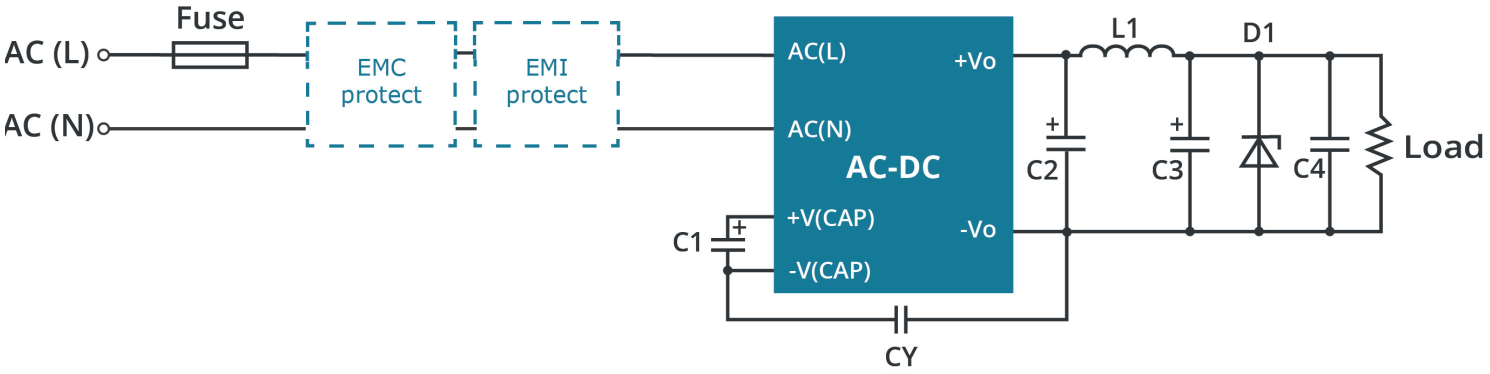


Table 1

Additional component selection guide							
Vout	C1 (required)	C2 (required)	L1 (required)	C3 (required)	C4	CY (required)	D1
5	10μF/450V	560μF/16V (solid-state capacitor)	2.2μH 3A 40 mΩ max	100μF/16V	0.1μF/50V	1nF/400V	D1 is a TVS transistor that can protect the downstream circuit in case of module abnormalities. It is recommended to choose a model that is 1.2 times the output voltage
12		330μF/25V (solid-state capacitor)		100μF/25V			
15, 24		330μF/35V	3.3μH 2A 40 mΩ max	47μF/35V			

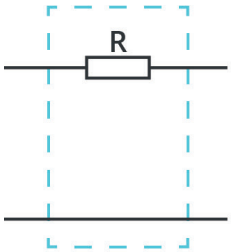
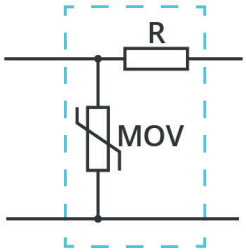
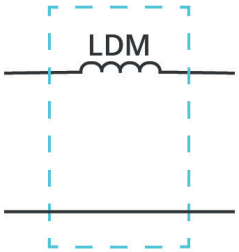
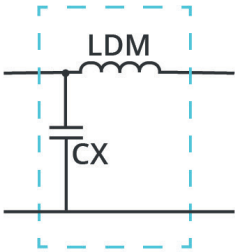
Note: 1. FUSE, EMC protection, and EMI protection are selected based on actual application needs.
2. C1 is a filtering electrolytic capacitor, which is a required component. It is recommended to use ripple current> 400mA at 100KHz electrolytic capacitors.
3. C2, C4, and L1 form a Pi type filtering circuit, and it is recommended to use high-frequency low resistance electrolytic capacitors or solid-state capacitors. When selecting L1, ripple requirements can be considered, while paying attention to current and internal resistance values.
4. L1 selection can take into account the ripple requirements, while paying attention to current and internal resistance values.

Table 2

Environmental and EMC selection guide						
Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	EMI	EMS
1	Basic application	None	85 ~ 305 Vac	-40° ~ 88°C	Class A	Class III
2	Indoor civil environment	Smart home / Home appliances		-25° ~ 55°C	Class B	Class III
	Indoor general environment	Intelligent building / Intelligent agriculture				
3	Indoor industrial environment	Manufacturing workshop		-25° ~ 55°C	Class B	Class IV
4	Oudoor general environment	Intelligent transportation / Charging point / Communication / Security		-40° ~ 85°C	Class A	Class IV

APPLICATION DESIGN REFERENCE (CONTINUED)

Figure 2

Additional circuits design reference			
Immunity design circuits for reference		Emissions design circuits for reference	
Class III	Class IV	Class A	Class B
			

EMC RECOMMENDED CIRCUIT

Figure 3

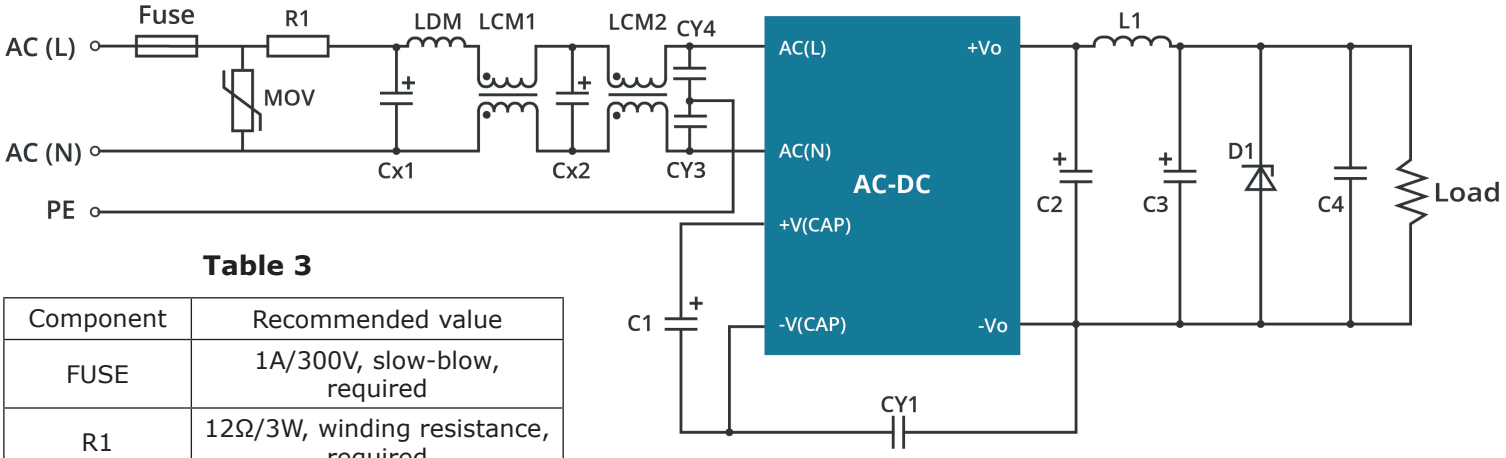


Table 3

Component	Recommended value
FUSE	1A/300V, slow-blow, required
R1	12Ω/3W, winding resistance, required
MOV	14D561
LDM	2.2mH/max: 4Ω/min: 0.2A
LCM1	200μH 0.8A
LCM2	12.6mH/min 0.5A
CX1/CX2	0.1μF/310Vac
CY1/CY3/CY4	1nF/400Vac
other	Reference Table for Peripheral Device Selection

REVISION HISTORY

rev.	description	date
1.0	initial release	07/10/2025

The revision history provided is for informational purposes only and is believed to be accurate.

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