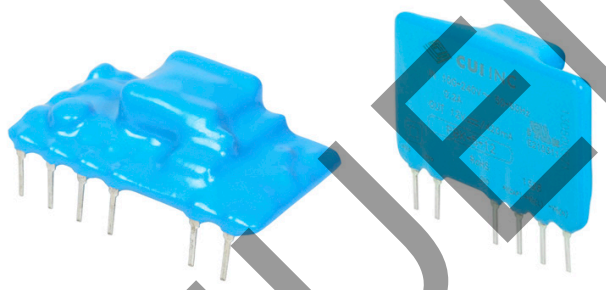
CUI INC®

SERIES: PBK-5 | DESCRIPTION: AC-DC POWER SUPPLY

FEATURES

- up to 5 W continuous output
- ultra compact SIP package
- universal input voltage: (85~264 Vac / 100~400 Vdc)
- single regulated outputs from 3.3~24 Vdc
- 3,000 Vac isolation
- over current, short circuit, and over voltage protections
- UL 60950-1 safety approval
- efficiency up to 75%



RoHS c UL us

MODEL

MODEL	output voltage (Vdc)	output current max (A)	output power max (W)	ripple and noise[1] max (mVp-p)	efficiency typ (%)
PBK-5-3	3.3	1	3.3	150	65
PBK-5-5	5	1	5	120	70
PBK-5-9	9	0.56	5	120	72
PBK-5-12	12	0.42	5	120	74
PBK-5-15	15	0.34	5	120	75
PBK-5-24	24	0.21	5	150	75

Note: 1. Measured at 20 MHz bandwidth, see Test Configuration section.

PART NUMBER KEY

PBK-5- **XX** - **X**

- PBK-5- : Base Number
- XX : Output Voltage
- X : Orientation "blank" = vertical, B = right-angle

INPUT

parameter	conditions/description	min	typ	max	units
voltage		85 100		264 400	Vac Vdc
frequency		47		440	Hz
current	at 115 Vac at 230 Vac			200 100	mA mA
inrush current	at 115 Vac at 230 Vac		20 30		A A
leakage current	CY0 is 1nF/400Vac			0.25	mA
no load power consumption				0.5	W
input fuse	1 A/250 V, slow-blow type (external, recommended)				

OUTPUT

parameter	conditions/description	min	typ	max	units
output current		10			%
capacitive load	3.3 Vdc output models 5 Vdc output models 9 Vdc output models 12 Vdc output models 15 Vdc output models 24 Vdc output models			2200 1500 680 470 330 100	µF µF µF µF µF µF
line regulation	at full load		±0.1	±0.5	%
load regulation	at 10%~100% load		±1.0	±1.5	%
voltage set accuracy	PBK-5-3		±2	±3	%
	all other models		±1	±2	%
hold-up time	at 115 Vac at 230 Vac	20 80			ms ms
switching frequency			100		kHz
temperature coefficient			±0.02		%/°C

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, auto restart				
over current protection	auto restart	110			%
over voltage protection	zener diode clamp				

SAFETY & COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 5mA	3,000			Vac
isolation resistance		100			MΩ
safety approvals	UL 60950-1				
safety standards	UL 60950-1				
safety class	class II				
conducted emissions	CISPR22/EN55022 external circuit required, Class A (see figure 2); Class B (see figure 3)				
radiated emissions	CISPR22/EN55022 external circuit required, Class B (see figures 2 or 3)				
ESD	IEC/EN61000-4-2 Class B, contact ±4 kV				
radiated immunity	IEC/EN61000-4-3 Class A, 10V/m				
EFT/burst	IEC/EN61000-4-4 Class B, ±2 kV (external circuit required, see figure 2)				
	IEC/EN61000-4-4 Class B, ±4 kV (external circuit required, see figure 3)				

SAFETY & COMPLIANCE (CONTINUED)

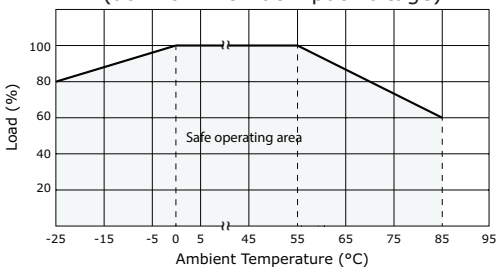
parameter	conditions/description	min	typ	max	units
surge	IEC/EN61000-4-5 Class B, ±1 kV/±2 kV (external circuit required, see figure 3)				
conducted immunity	IEC/EN61000-4-6 Class A, 3 Vr.m.s (external circuit required, see figure 3)				
PFM	IEC/EN61000-4-8 Class A, 10 A/m				
voltage dips & interruptions	IEC/EN61000-4-11 Class B, 0%-70%				
MTBF	at 25°C, max. load	300,000			hours
RoHS	2011/65/EU				

ENVIRONMENTAL

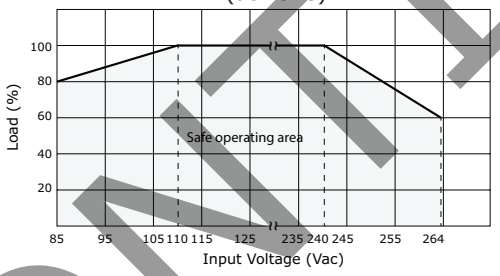
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-25		85	°C
storage temperature		-40		105	°C
case temperature				100	°C
humidity	non-condensing			85	%

DERATING CURVES

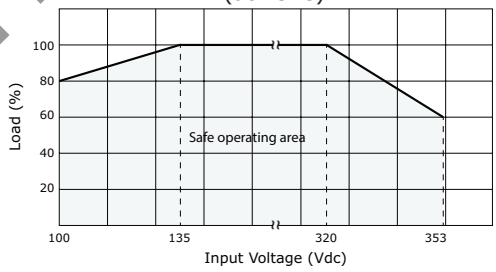
load vs. ambient temperature
(at 110~240 Vac input voltage)



load vs. input voltage (Vac)
(at 25°C)

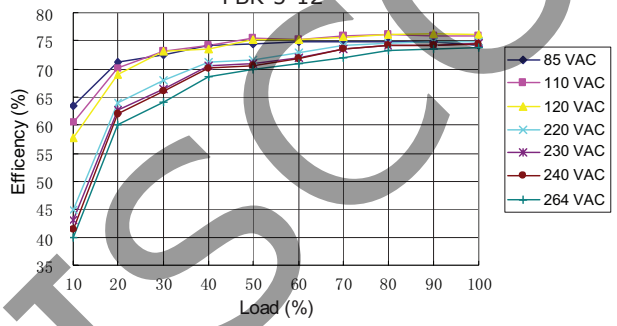


load vs. input voltage (Vdc)
(at 25°C)

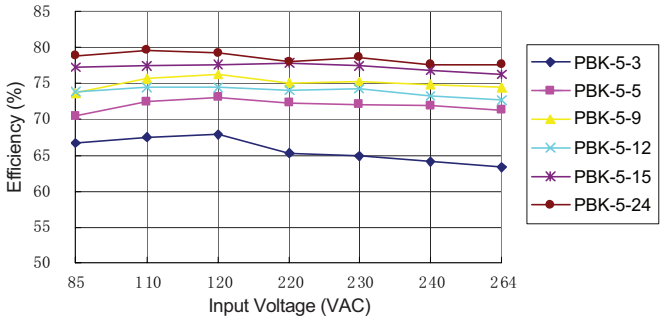


EFFICIENCY CURVES

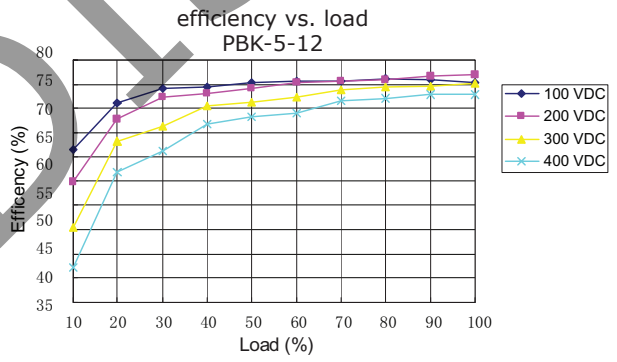
efficiency vs. load
PBK-5-12



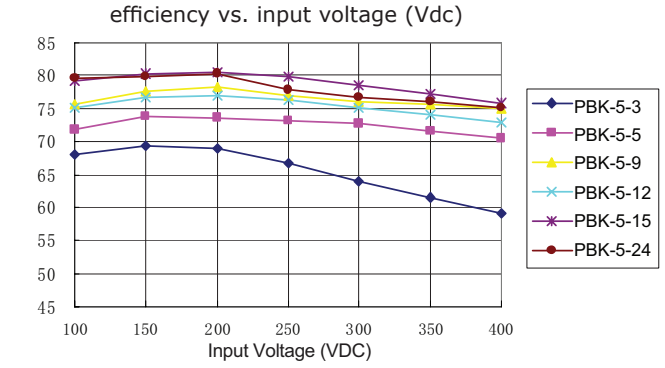
efficiency vs. input voltage (Vac)



efficiency vs. load
PBK-5-12



efficiency vs. input voltage (Vdc)



SOLDERABILITY

parameter	conditions/description	min	typ	max	units
hand soldering	for 3~5 seconds	350	360	370	°C
wave soldering	for 5~10 seconds	255	260	265	°C

MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	vertical models: 42 x 11 x 27 right-angle models: 42 x 25 x 13				mm mm
material	UL94V-0				
weight			10		g

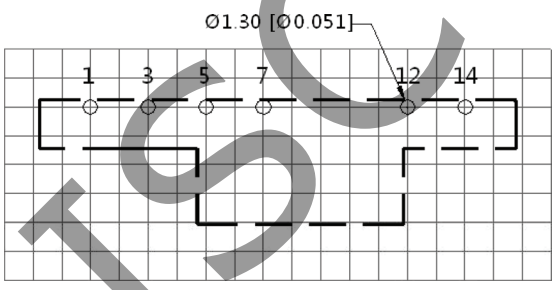
MECHANICAL DRAWING

VERTICAL ORIENTATION

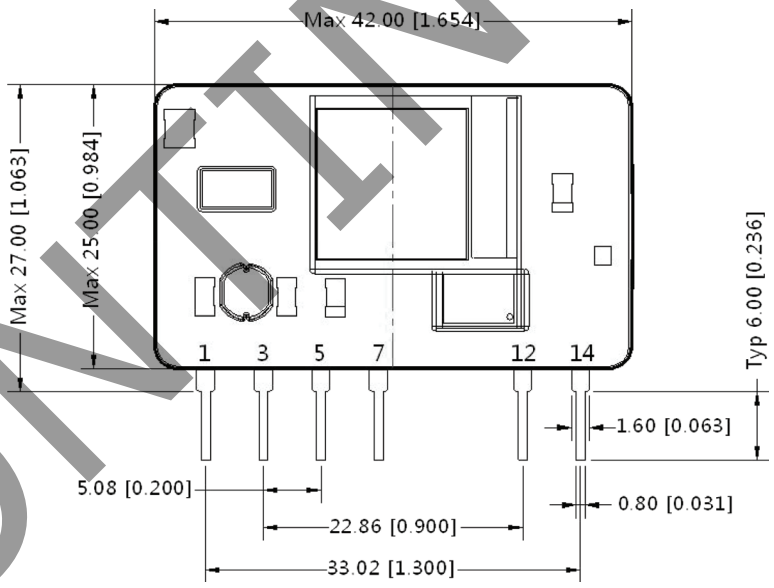
units: mm[inch]
tolerance: ±0.5[±0.020]
pin tolerance: ±0.1[±0.004]

PIN CONNECTIONS	
PIN	FUNCTION
1	-Vin (N)
3	+Vin (L)
5	+V(CAP)
7	-V(CAP)
12	-Vo
14	+Vo

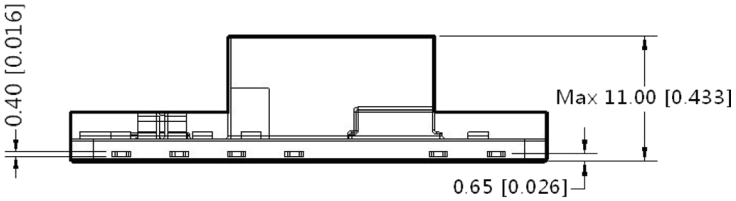
Note: 1. It is required to add C1 between pins 5 & 7 (see application circuits).



Top View
PCB Layout



Front View



Bottom View

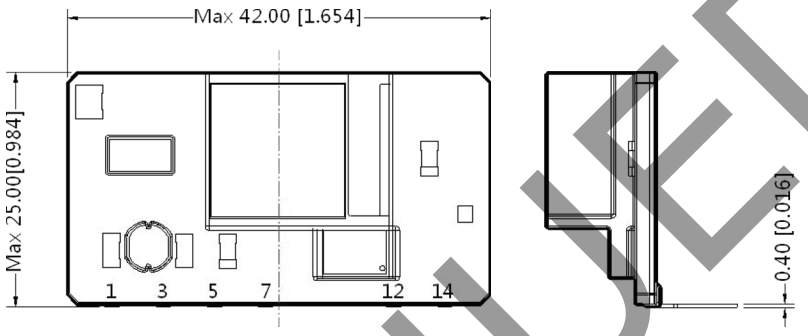
MECHANICAL DRAWING (CONTINUED)

RIGHT-ANGLE ORIENTATION

units: mm[inch]
tolerance: ±0.5[±0.020]
pin tolerance: ±0.1[±0.004]

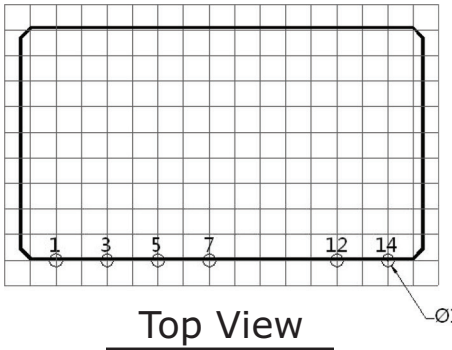
PIN CONNECTIONS	
PIN	FUNCTION
1	-Vin (N)
3	+Vin (L)
5	+V(CAP)
7	-V(CAP)
12	-Vo
14	+Vo

Note: 1. It is required to add C1 between pins 5 & 7 (see application circuits).

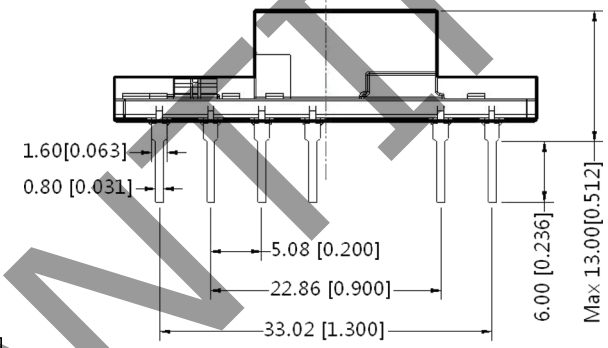


Front View Side View

Note:Grid 2.54*2.54mm



Top View
PCB Layout



Bottom View

TEST CONFIGURATION

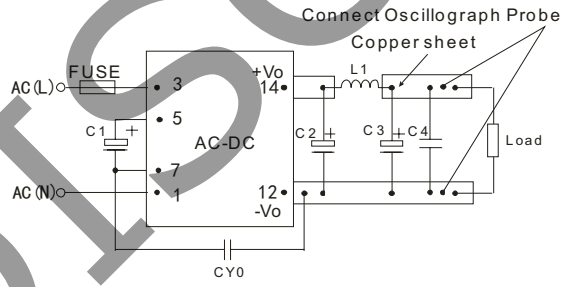


Figure 1

Table 1

Recommended External Circuit Components						
V_{OUT} (Vdc)	C1[1]	C2[1]	L1[1]	C3[1]	C4	CY0 (Y1 capacitor)
3.3	22μF/400V	470μF/10V	0.47μH	150μF/35V	100nF/50V	1nF/400Vac
5	22μF/400V	470μF/16V	0.47μH	150μF/35V	100nF/50V	1nF/400Vac
9	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	1nF/400Vac
12	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	1nF/400Vac
15	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	1nF/400Vac
24	22μF/400V	100μF/35V	4.7μH	47μF/35V	100nF/50V	1nF/400Vac

Note: 1. Required components.
2. 1 A/250 V fuse required.

TYPICAL APPLICATION CIRCUIT

Figure 2

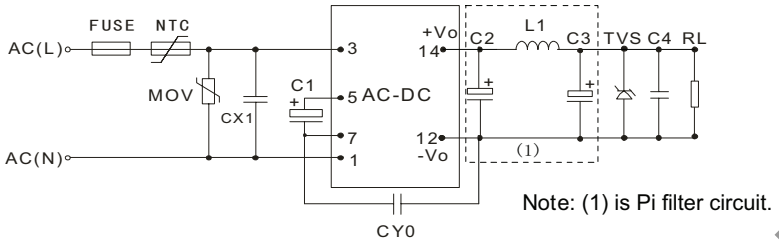


Table 2

Recommended external circuit components											
V_{OUT} (Vdc)	C1[1]	C2[1]	L1[1]	C3[1]	C4	CX1	CY0	FUSE	NTC	MOV	TVS
3.3	22μF/400V	470μF/10V	0.47μH	150μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ7.0A
5	22μF/400V	470μF/16V	0.47μH	150μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ7.0A
9	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ12A
12	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ20A
15	22μF/400V	330μF/25V	1μH	150μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ20A
24	22μF/400V	100μF/35V	4.7μH	47μF/35V	100nF/50V	0.1μF/275Vac	1nF/400Vac	1A/250V	5D-9	S14K350	SMBJ30A

Note: 1. Required components.

EMC RECOMMENDED CIRCUIT

Figure 3

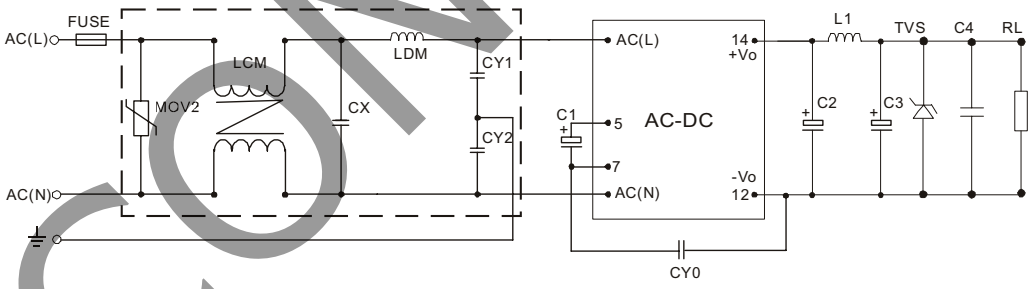


Table 3

Recommended External Circuit Components	
MOV2	S10K300
CY1, CY2	1nF/400Vac
CX	0.1μF/275Vac
LCM	3.5mH
LDM	5mH
FUSE	1A/250V

Note: 1. Also refer to Table 2.

Notes:
1. C1, C2, and C3 are electrolytic capacitors. They are required for both AC input and DC input.
2. For AC input, C1 is used as a filter capacitor. The recommended C1 value is 22 μF/400 V.
3. For DC input, C1 is used as an EMC filter capacitor. The recommended C1 value is 10μF/400V. When the input voltage is above 370VDC, we recommend a 10μF/450V capacitor.
4. C2 and C3 are output filer capacitors, we recommend high frequency and low impedance electrolytic capacitors. For capacitance and rated ripple current of capacitors refer to the datasheets provided by the manufacturers, voltage derating of capacitors should be 80% or above.
5. C4 is a ceramic capacitor which is used to filter high frequency noise.
6. C2, C3 and L1 form a pi-type filter circuit. For the current of L1, refer to the datasheets provided by the manufacturers, current derating should be 80% or above.
7. TVS is a recommended component to protect post-circuits (if converter fails).
8. For standard EMC requirements, please refer to figure 2. If a higher EMC is required, please refer to figure 3.
9. All specifications measured at Ta=25C, humidity <75%, 115 Vac & 230 Vac input voltage, and rated output load, unless otherwise specified.

REVISION HISTORY

rev.	description	date
1.0	initial release	08/09/2013
1.01	added bent pin model options, updated emc recommendations	06/20/2014
1.02	updated pin connection tables	06/07/2016

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

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