



## SERIES: PYBE10 | DESCRIPTION: DC-DC CONVERTER

### FEATURES

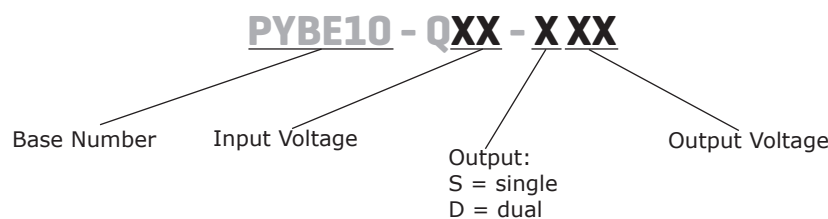
- up to 10 W isolated output
- industry standard pin-out
- 4:1 input range (9~36 Vdc, 18~75 Vdc)
- single/dual regulated outputs
- 1500 Vdc isolation
- continuous short circuit protection
- efficiency up to 88%
- operating temperature range (-40~+85°C)



MODEL	input voltage		output voltage (Vdc)	output current		output power max (W)	ripple & noise <sup>1</sup> max (mVp-p)	efficiency <sup>2</sup> typ (%)
	typ (Vdc)	range (Vdc)		min (mA)	max (mA)			
PYBE10-Q24-S3	24	9~36	3.3	0	2400	7.92	80	87
PYBE10-Q24-S5	24	9~36	5	0	2000	10	80	88
PYBE10-Q24-S12 <sup>3</sup>	24	9~36	12	0	833	10	80	87
PYBE10-Q24-S15 <sup>3</sup>	24	9~36	15	0	667	10	80	87
PYBE10-Q24-S24 <sup>3</sup>	24	9~36	24	0	416	10	80	88
PYBE10-Q24-D5 <sup>3</sup>	24	9~36	±5	0	±1000	10	80	83
PYBE10-Q24-D12 <sup>3</sup>	24	9~36	±12	0	±416	10	80	87
PYBE10-Q24-D15 <sup>3</sup>	24	9~36	±15	0	±333	10	80	87
PYBE10-Q48-S3	48	18~75	3.3	0	2400	7.92	80	86
PYBE10-Q48-S5	48	18~75	5	0	2000	10	80	87
PYBE10-Q48-S12 <sup>3</sup>	48	18~75	12	0	833	10	80	87
PYBE10-Q48-S15 <sup>3</sup>	48	18~75	15	0	667	10	80	87
PYBE10-Q48-S24 <sup>3</sup>	48	18~75	24	0	416	10	80	88
PYBE10-Q48-D5 <sup>3</sup>	48	18~75	±5	0	±1000	10	80	83
PYBE10-Q48-D12 <sup>3</sup>	48	18~75	±12	0	±416	10	80	87
PYBE10-Q48-D15 <sup>3</sup>	48	18~75	±15	0	±333	10	80	87

- Notes:
1. From 5~100% load, nominal input, 20 MHz bandwidth oscilloscope, with 10  $\mu$ F tantalum and 1  $\mu$ F ceramic capacitors on the output. From 0~5% load, ripple and noise is <5%  $V_o$ .
  2. Measured at nominal input voltage, full load.
  3. CE approved.
  4. All specifications are measured at  $T_a=25^\circ\text{C}$ , humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

## PART NUMBER KEY



## INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	24 Vdc input models	9	24	36	Vdc
	48 Vdc input models	18	48	75	Vdc
start-up voltage	24 Vdc input models			9	Vdc
	48 Vdc input models			18	Vdc
surge voltage	for maximum of 1 second				
	24 Vdc input models	-0.7		50	Vdc
	48 Vdc input models	-0.7		100	Vdc
under voltage shutdown	24 Vdc input models	5.5	6.5		Vdc
	48 Vdc input models	12	15.5		Vdc
current	24 Vdc input models			388	mA
		3.3 Vdc output models		484	mA
		5 Vdc output models all other models		515	mA
	48 Vdc input models			197	mA
				245	mA
				258	mA
remote on/off (CTRL) <sup>5</sup>	turn on (3.5~12 Vdc or open circuit) turn off (<1.2 Vdc) input current when switched off		6	10	mA
filter	Pi filter				
no load power consumption			0.12		W

Notes: 5. The voltage of the CTRL pin is referenced to input GND pin.

## OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load <sup>6</sup>	3.3 Vdc output models			1,200	μF
	5, ±5 Vdc output models			1,000	μF
	12, ±12 Vdc output models			470	μF
	15, ±15 Vdc output models			330	μF
	all other models			100	μF
voltage accuracy <sup>7</sup>	0% to full load, 3.3, 5 Vdc output models		±0.5	±2	%
	0% to full load, all other models		±1	±3	%
line regulation	from low line to high line, full load				
	positive outputs		±0.2	±0.5	%
	negative outputs		±0.5	±1	%
load regulation <sup>8</sup>	from 5% to full load				
	positive outputs		±0.5	±1	%
	negative outputs		±0.5	±1.5	%

Note: 6. Tested at input voltage range and full load.

7. At 0~5% load, the max output voltage accuracy for the ±5 Vdc output models is ±5%, and the 3.3, and 5 Vdc models is ±3%.

8. At 0~100% load, the max load regulation is ±5%.

**OUTPUT (CONTINUED)**

parameter	conditions/description	min	typ	max	units
cross regulation	dual output models: main output 50% load secondary output from 25~100% load			±5	%
switching frequency <sup>9</sup>	PWM mode		350		kHz
transient recovery time	25% load step change, nominal input voltage		300	500	µs
transient response deviation	25% load step change, nominal input voltage		±5	±8	%
	3.3, 5 Vdc output models all other models		±3	±5	%
temperature coefficient	at full load			±0.03	%/°C

Note: 9. Value is based on full load. At loads <50%, the switching frequency decreases with decreasing load

**PROTECTIONS**

parameter	conditions/description	min	typ	max	units
over voltage protection		110		160	%
over current protection	3.3, 5 Vdc output models	110	160	230	%
	all other models	110	140	190	%
short circuit protection	continuous, self recovery				

**SAFETY AND COMPLIANCE**

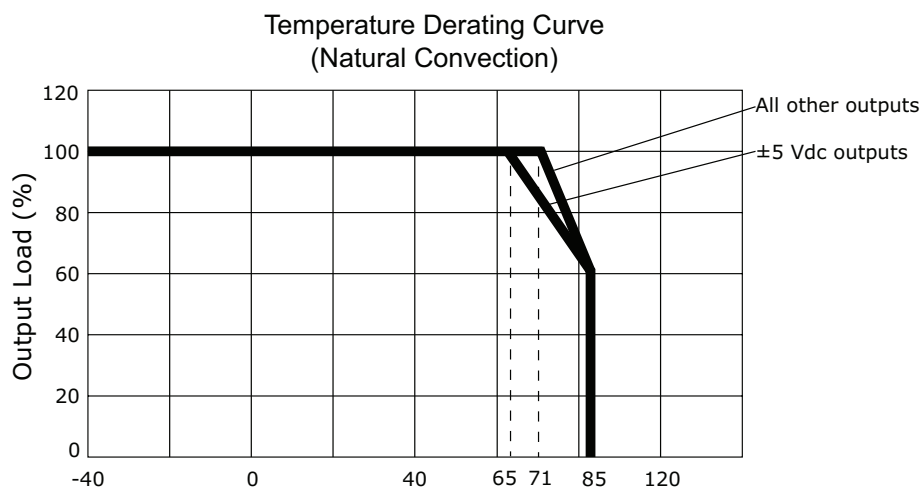
parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA	1,500			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		2,000		pF
safety approvals <sup>10</sup>	EN 62368-1				
conducted emissions	CISPR32/EN55032, class A (no external circuit); class B (external circuit required, see Figure 3-b, 4-b)				
radiated emissions	CISPR32/EN55032, class A (no external circuit); class B (external circuit required, see Figure 3-b, 4-b)				
ESD	IEC/EN61000-4-2, contact ± 4kV, class B				
radiated immunity	IEC/EN61000-4-3, 10V/m, class A				
EFT/burst	IEC/EN61000-4-4, ± 2kV, class B (external circuit required, see Figure 3-a, 4-a)				
surge	IEC/EN61000-4-5, line-line ± 2kV, class B (external circuit required, see Figure 3-a, 4-a)				
conducted immunity	IEC/EN61000-4-6, 10 Vr.m.s, class A				
voltage dips & interruptions	IEC/EN61000-4-29, 0%-70%, class B				
MTBF	as per MIL-HDBK-217F, 25°C	1,000,000			hours
RoHS	yes				

Note: 10. See specific models with CE approval on page 1.

## ENVIRONMENTAL

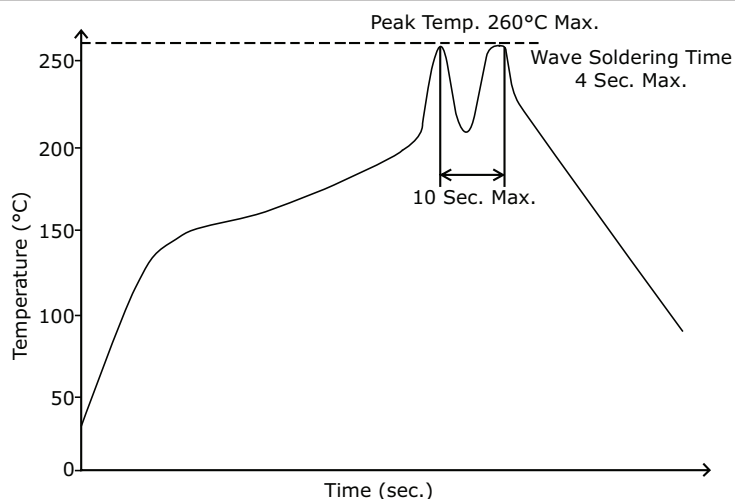
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-40		85	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%
vibration	10~150 Hz, 0.75 mm, on each axis		5		G

## DERATING CURVES



## SOLDERABILITY

parameter	conditions/description	min	typ	max	units
hand soldering	1.5 mm from case for 10 seconds			300	°C
wave soldering	see wave soldering profile			260	°C



## MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	32.00 x 20.00 x 10.80 [1.260 x 0.787 x 0.425 inch]				mm
case material	aluminum alloy				
weight			14		g

## MECHANICAL DRAWING

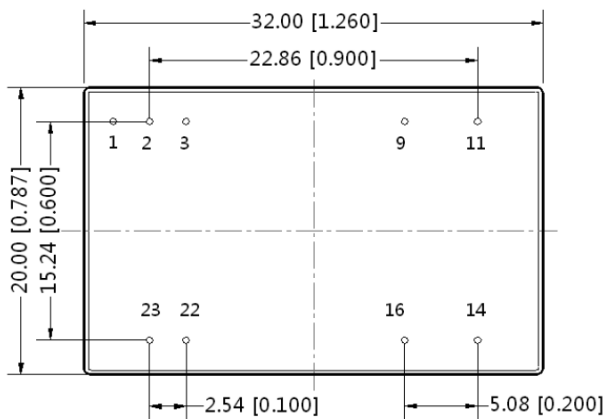
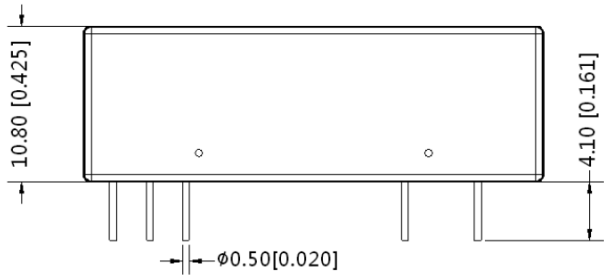
units: mm [inch]

tolerance:  $\pm 0.50[\pm 0.020]$

pin diameter tolerance:  $\pm 0.10[\pm 0.004]$

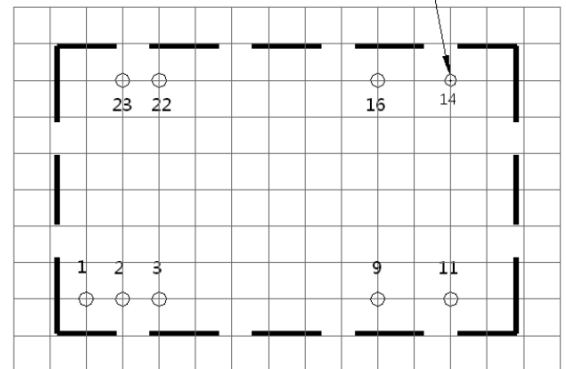
PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	CTRL	CTRL
2, 3	GND	GND
9	no pin	0V
11	NC	-Vo
14	+Vo	+Vo
16	0V	0V
22, 23	Vin	Vin

Note: NC = no connect



THIRD ANGLE PROJECTION

$\phi 1.00 [\phi 0.039]$



Note: Grid 2.54\*2.54mm  
Recommended PCB Layout  
Top View

## APPLICATION CIRCUIT

This series has been tested according to the following recommended circuits (Figures 1 & 2) before leaving the factory. If you want to further reduce the input and output ripple, you can increase the input and output capacitors or select capacitors of low equivalent impedance provided that the capacitance is less than the maximum capacitive load of the model.

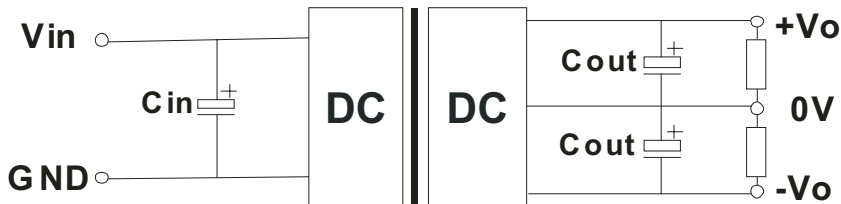
**Figure 1**  
Single Output Models



**Table 1**

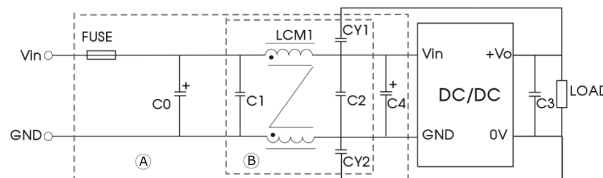
Vin (Vdc)	Cin (μF)	Cout (μF)
24	100	10
48	10~47	10

**Figure 2**  
Dual Output Models

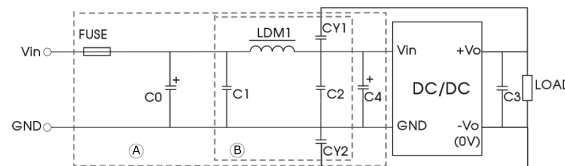


## EMC RECOMMENDED CIRCUIT

**Figure 3**  
3.3 & 5 Vdc Output Models



**Figure 4**  
All Other Models



**Table 2**

Recommended External Circuit Components		
Vin (Vdc)	24	48
FUSE	choose according to actual input current	
C0, C4	330 μF / 50 V	330 μF / 100 V
C1, C2	10 μF / 50 V	10 μF / 100 V
LDM1	10 μH	
LCM1	1.4~1.7 mH	
CY1, CY2	1 nF / 2 kV	
C3	10 μF	

## PACKAGING

units: mm

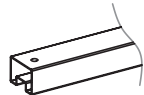
Tube Size: 23.5 x 19 mm

Inner Carton Size: 575 x 135 x 100 mm

Outer Carton Size: 600 x 285 x 225 mm

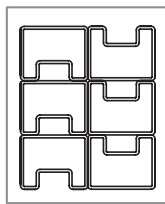
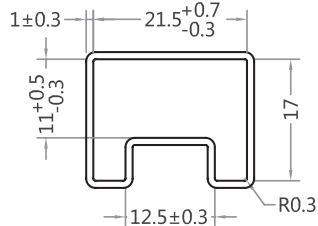
Outer Carton QTY: 1,080 pcs

2 PCS of 17mm nails



packaging tube

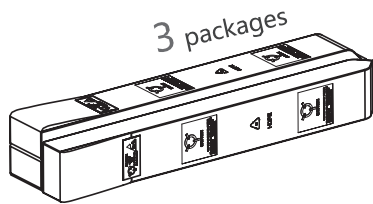
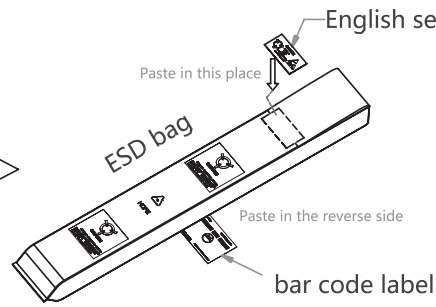
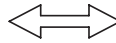
15 products in one packing tube



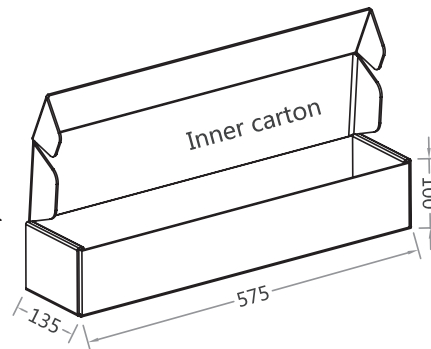
ESD bag

6 tubes in one ESD bag

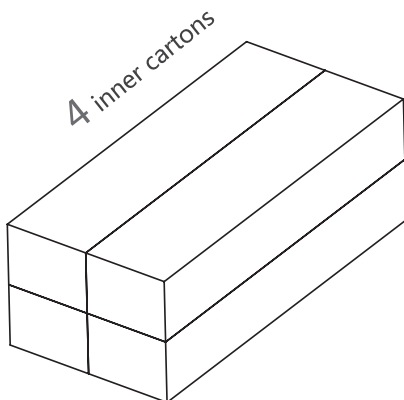
Using rubber bands to tie the both ends of 6 tubes, then put into the ESD bag



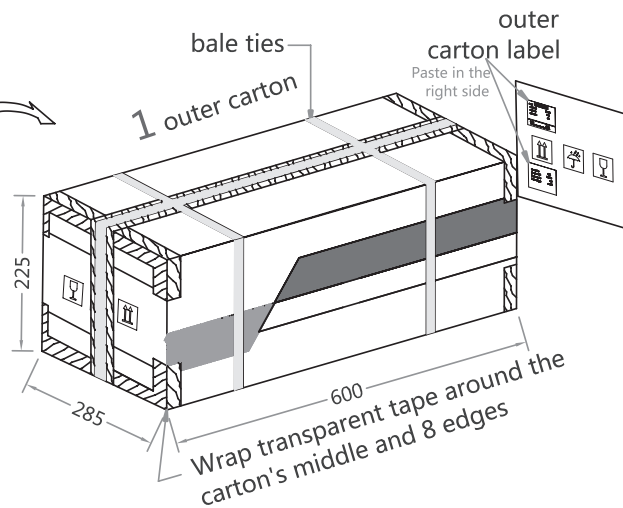
3 packages



Inner carton



4 inner cartons



1 outer carton

bale ties

outer carton label

Paste in the right side

Wrap transparent tape around the carton's middle and 8 edges

## REVISION HISTORY

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rev.	description	date
1.0	initial release	01/24/2019

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



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