

date 08/15/2013

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# **SERIES:** PYB10 | **DESCRIPTION:** DC-DC CONVERTER

#### **FEATURES**

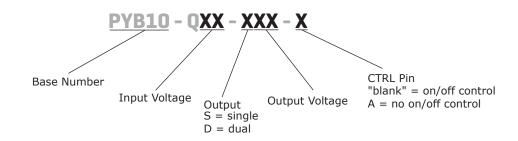
- up to 10 W isolated output
- industry standard pinout
- 4:1 input range (9~36 V, 18~75 V)
- smaller package
- single/dual regulated outputs
- 1,500 Vdc isolation
- continuous short circuit, over voltage protection
- temperature range (-40~85°C)
- six-sided metal shielding
- efficiency up to 88%



MODEL		nput oltage	output voltage		ıtput rrent	output power	ripple and noise¹	efficiency
	<b>typ</b> (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	<b>max</b> (mVp-p)	<b>typ</b> (%)
PYB10-Q24-S3	24	9~36	3.3	120	2400	8	80	79
PYB10-Q24-S5	24	9~36	5	100	2000	10	80	82
PYB10-Q24-S12	24	9~36	12	42	833	10	80	86
PYB10-Q24-S15	24	9~36	15	33	667	10	80	87
PYB10-Q24-S24	24	9~36	24	21	416	10	80	87
PYB10-Q24-D5	24	9~36	±5	±50	±1000	10	80	83
PYB10-Q24-D12	24	9~36	±12	±21	±416	10	80	86
PYB10-Q24-D15	24	9~36	±15	±16	±333	10	80	88
PYB10-Q48-S3	48	18~75	3.3	120	2400	8	80	79
PYB10-Q48-S5	48	18~75	5	100	2000	10	80	82
PYB10-Q48-S12	48	18~75	12	42	833	10	80	86
PYB10-Q48-S15	48	18~75	15	33	667	10	80	87
PYB10-Q48-S24	48	18~75	24	21	416	10	80	87
PYB10-Q48-D5	48	18~75	±5	±50	±1000	10	80	83
PYB10-Q48-D12	48	18~75	±12	±21	±416	10	80	86
PYB10-Q48-D15	48	18~75	±15	±16	±333	10	80	88

Notes: 1. Ripple and noise are measured at 20 MHz BW by "parallel cable" method

# **PART NUMBER KEY**



# **INPUT**

parameter	conditions/description	min	typ	max	units
operating input voltage	24 V input models	9	24	36	Vdc
	48 V input models	18	48	75	Vdc
start up voltage	24 V input models			9	Vdc
start-up voltage	48 V input models			18	Vdc
	for maximum of 1 second				
surge voltage	24 V input models	-0.7		50	Vdc
	48 V input models	-0.7		100	Vdc
filter	pi filter				
	models ON (CTRL open or connect high le	evel, 3.5-12 Vdc)			
CTRL <sup>1</sup>	models OFF (CTRL connect GND or low le	vel, 0-1.2 Vdc)			
	input current (models OFF)		1	3	mA

Note: 1. CTRL pin voltage is referenced to GND.

# **OUTPUT**

parameter	conditions/description	min	typ	max	units
line regulation	full load, input voltage from low to high		±0.2	±0.5	%
load regulation	5% to 100% load		±0.5	±1	%
cross regulation	dual output models: main output 50% load, secondary output from 10% to 100% load			±5	%
voltage accuracy			±1	±2	%
voltage balance <sup>2</sup>	dual output, balanced loads		±0.5	±1.5	%
switching frequency	PWM mode		350		KHz
transient recovery time	25% load step change		300	500	μs
transient response deviation	25% load step change		±3	±5	%
temperature coefficient	100% load			±0.03	%/°C

Note: 2. For dual output models, unbalanced load can not exceed  $\pm 5\%$ . If  $\pm 5\%$  is exceeded, it may not meet all specifications.

# **PROTECTIONS**

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, automatic recovery				
over voltage protection		110	120	140	%Vo

# **SAFETY AND COMPLIANCE**

parameter	conditions/description	min	typ	max	units	
isolation voltage	for 1 minute at 1 mA max.	1,500			Vdc	
isolation resistance	solation resistance at 500 Vdc 1,000			ΜΩ		
conducted emissions	CISPR22/EN55022, class A, class B (external circuit required, see Figure 1-b)					
radiated emissions CISPR22/EN55022, class A, class B (external circuit required, see Figure 1-b)						
ESD	SD IEC/EN61000-4-2, class B, contact ± 4kV					
radiated immunity	IEC/EN61000-4-3, class A, 10V/m					
EFT/burst	IEC/EN61000-4-4, class B, ± 2kV (external	circuit required, see F	igure 1-a)			
surge	IEC/EN61000-4-5, class B, ± 2kV (external	circuit required, see F	igure 1-a)			
conducted immunity	IEC/EN61000-4-6, class A, 3 Vr.m.s					
voltage dips & interruptions	IEC/EN61000-4-29, class B, 0%-70%					
MTBF	as per MIL-HDBK-217F @ 25°C	1,000,000			hours	
RoHS compliant	yes					

### **ENVIRONMENTAL**

parameter conditions/description		min	typ	max	units
operating temperature see derating curve		-40		85	°C
storage temperature		-55		125	°C
storage humidity non-condensing		5		95	%
case temperature at full load, Ta=71°C				105	°C
vibration 10~55 Hz for 30 min. along X, Y and Z axis 10		10		G	

#### **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	50.8 x 25.4 x 11.8				mm
case material aluminum alloy					
weight			22		g

# **MECHANICAL DRAWING**

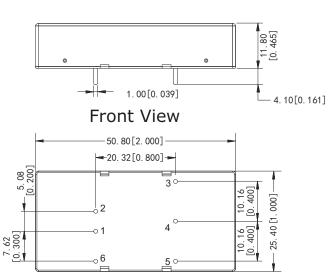
units: mm[inch]

tolerance:  $\pm 0.3[\pm 0.012]$ 

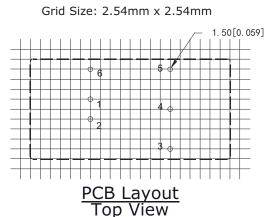
pin diameter tolerance:  $\pm 0.10[\pm 0.004]$ pin height tolerance:  $\pm 0.50[\pm 0.020]$ 

PIN CONNECTIONS				
PIN	Single Output	Dual Output		
1	GND	GND		
2	Vin	Vin		
3	+Vo	+Vo		
4	No Pin	0V		
5	0V	-Vo		
6*	CTRL	CTRL		

Note: \* "No Pin" option available.

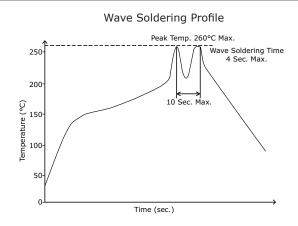


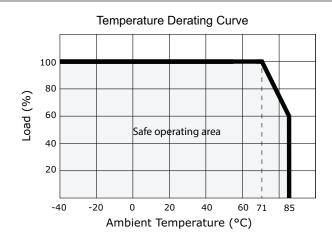
**Bottom View** 



TOP VIEW

#### **DERATING CURVES**





# **EMC RECOMMENDED CIRCUIT**

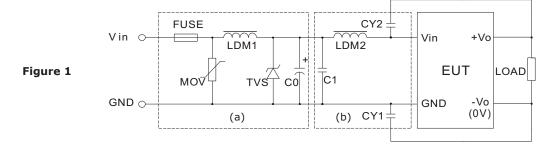


Table 1

Recommended external circuit components					
Vin (Vdc)	24	48			
FUSE	Choose according to input curre				
MOV	S14K35	S14K60			
LDM1	56µH	56μH			
TVS	SMCJ48A	SMCJ90A			
C0	330µF/50V	330µF/100V			
C1	1μF/50V	1µF/100V			
LDM2	4.7µH	4.7µH			
CY1	1 nF/2 KV	1 nF/2 KV			
CY2	1 nF/2 KV	1 n/2 KV			

### **TEST CONFIGURATION**

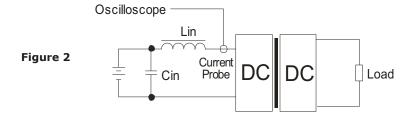


Table 2

External components			
Lin	4.7µH		
Cin	$220\mu\text{F, ESR} < 1.0\Omega$ at 100 KHz		

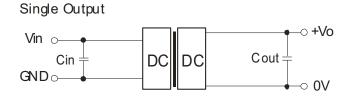
Note: Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.

#### **APPLICATION NOTES**

#### Recommended circuit

This series has been tested according to the following recommended testing circuit before leaving the factory. This series should be tested under load (see Figure 3). If you want to further decrease the input/output ripple, you can increase the capacitance accordingly or choose capacitors with low ESR (see table 3). However, the capacitance of the output filter capacitor must be appropriate. If the capacitance is too high, a startup problem might arise. For every channel of the output, to ensure safe and reliable operation, the maximum capacitance must be less than the maximum capacitive load (see Table 4).

Figure 3



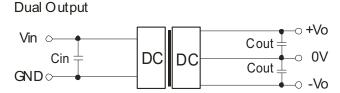


Table 3

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

Table 4

Single Vout (Vdc)	Max. Capacitive Load	Dual Vout (Vdc)	Max. Capacitive Load <sup>4</sup>
(vac)	(µF)	(vac)	(µF)
3.3	2200		
5	2200	5	680
12	470¹	12	220³
15	330²	15	100
24	100		

Notes:

- 1. 330  $\mu F$  for 48Vin. 2. 220  $\mu F$  for 48Vin.
- 3. 150  $\mu F$  for 48Vin. 4. For each output.

Note: 1. Minimum load shouldn't be less than 5%, otherwise ripple may increase dramatically. Operation under minimum load will not damage the converter, however, they may not meet all specifications listed.

<sup>2.</sup> Maximum capacitive load is tested at input voltage range and full load.

<sup>3.</sup> All specifications are measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.

CUI Inc | SERIES: PYB10 | DESCRIPTION: DC-DC CONVERTER

#### **REVISION HISTORY**

rev.	description	date
1.0	initial release	06/26/2013
1.01	updated spec	08/15/2013

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



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CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

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