CUI INC
a bel group

SERIES: PQA50-T | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 50 W isolated output
- 2:1 input range (18~36 Vdc, 36~75 Vdc)
- single, regulated output
- 1,500 Vdc isolation
- short circuit, over current, input under voltage protection
- inverse polarity protection
- remote on/off
- operating temperature range (-40~85°C)
- six sided metal shielding
- efficiency up to 91%

RoHS CE

MODEL

MODEL	input voltage typ (Vdc)	input voltage range (Vdc)	output voltage (Vdc)	output current min (mA)	output current max (A)	output power max (W)	ripple and noise[1] max (mVp-p)	efficiency typ (%)
PQA50-D24-S3-T[2,*]	24	18~36	3.3	500	10	33	150	89
PQA50-D24-S5-T[2,*]	24	18~36	5	500	10	50	150	91
PQA50-D24-S12-T[2]	24	18~36	12	208	4.167	50	150	91
PQA50-D24-S15-T[2]	24	18~36	15	167	3.333	50	150	91
PQA50-D24-S24-T[2,*]	24	18~36	24	104	2.083	50	150	91
PQA50-D48-S3-T*	48	36~75	3.3	500	10	33	150	89
PQA50-D48-S5-T*	48	36~75	5	500	10	50	150	91
PQA50-D48-S12-T*	48	36~75	12	208	4.167	50	150	91
PQA50-D48-S15-T*	48	36~75	15	167	3.333	50	150	91
PQA50-D48-S24-T*	48	36~75	24	104	2.083	50	150	91

Notes:
1. Ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 µF ceramic and 10 µF electrolytic capacitors on the output.
2. Model is not CE certified.
3. * Discontinued model.

PART NUMBER KEY

PQA50 - DXX - SXX - TX

- PQA50 — Base Number
- DXX — Input Voltage
- SXX — Output Voltage
- TX — Mounting Type: T = Chassis Mount
- Heatsink*: "blank" = no heatsink; H = with heatsink

Notes: *Discontinued heatsink versions.

DISCONTINUED

INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	24 Vdc input models	18	24	36	Vdc
	48 Vdc input models	36	48	75	Vdc
start-up voltage	input under voltage protection				
	24 Vdc input models	18			Vdc
	48 Vdc input models	36			Vdc
	input over voltage protection				
	24 Vdc input models			36	Vdc
	48 Vdc input models			75	Vdc
under/over voltage shutdown	input under voltage protection				
	24 Vdc input models			16	Vdc
	48 Vdc input models			32	Vdc
	input over voltage protection				
	24 Vdc input models	40			Vdc
	48 Vdc input models	81			Vdc
surge voltage	for maximum of 1 second				
	24 Vdc input models	-0.7		50	Vdc
	48 Vdc input models	-0.7		100	Vdc
start-up time	nominal input, constant load		10		ms
CTRL[1]	models ON (CTRL open or connect TTL high level, 3~12 Vdc)				
	models OFF (CTRL connect GND or low level, 0~1.2 Vdc)				
	input current (models OFF)		6		mA
filter	pi filter				

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	10% to 100% load		±0.5	±1	%
voltage accuracy			±1	±3	%
adjustability			±10		%
switching frequency	PWM mode		320		kHz
transient recovery time	25% load step change		300	500	μs
transient response deviation	25% load step change		±3	±5	%
temperature coefficient	100% load		±0.02		%/°C

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection[2]	3.3 Vdc output models		3.9		Vdc
	5 Vdc output models		6.2		Vdc
	12 Vdc output models		15		Vdc
	15 Vdc output models		18		Vdc
	24 Vdc output models		30		Vdc
over current protection			135		%
short circuit protection	continuous, automatic recovery, hiccup				
over temperature protection			110		°C

Note 2. Module needs to be re-started after over voltage protection.

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SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output at 1 mA for 1 minute	1,500			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output at 100 kHz, 0.1 Vdc		2,000		pF
safety approvals	certified to 60950: EN				
conducted emissions	CISPR22/EN55022 class B (external circuit required, see figure 1)				
radiated emissions	CISPR22/EN55022 class B (external circuit required, see figure 1)				
ESD	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 figure 1)				
surge	IEC/EN61000-4-5 class B, ± 2kV (external circuit required, see figure 1)				
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	2011/65/EU				

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, operating temperature curve range			105	°C
vibration	10~55 Hz, 30 min. along x, y, and z			10	G

MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	chassis mount: 76.0 x 31.5 x 21.2 chassis mount with heatsink: 76.0 x 31.5 x 25.1				mm mm
case material	aluminum alloy				
weight	chassis mount chassis mount with heatsink		57 65		g g

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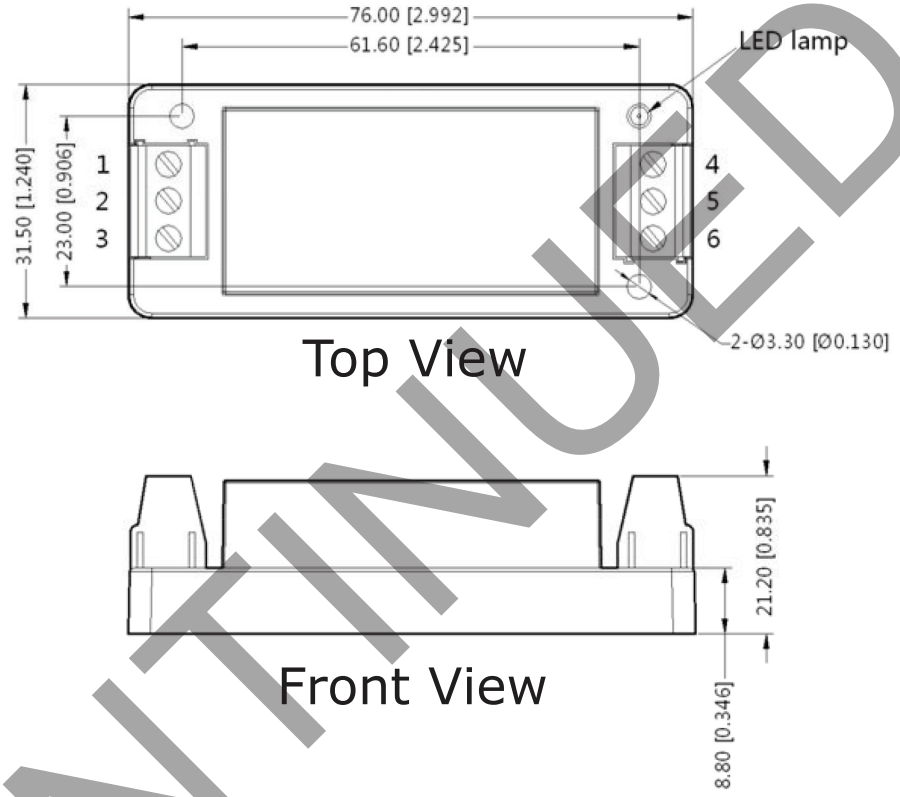
MECHANICAL DRAWING

CHASSIS MOUNT

units: mm[inch]
tolerance: ±0.50[±0.020]

wire range: 24~12 AWG

PIN CONNECTIONS	
PIN	Function
1	CTRL
2	GND
3	Vin
4	Trim
5	0V
6	+Vo

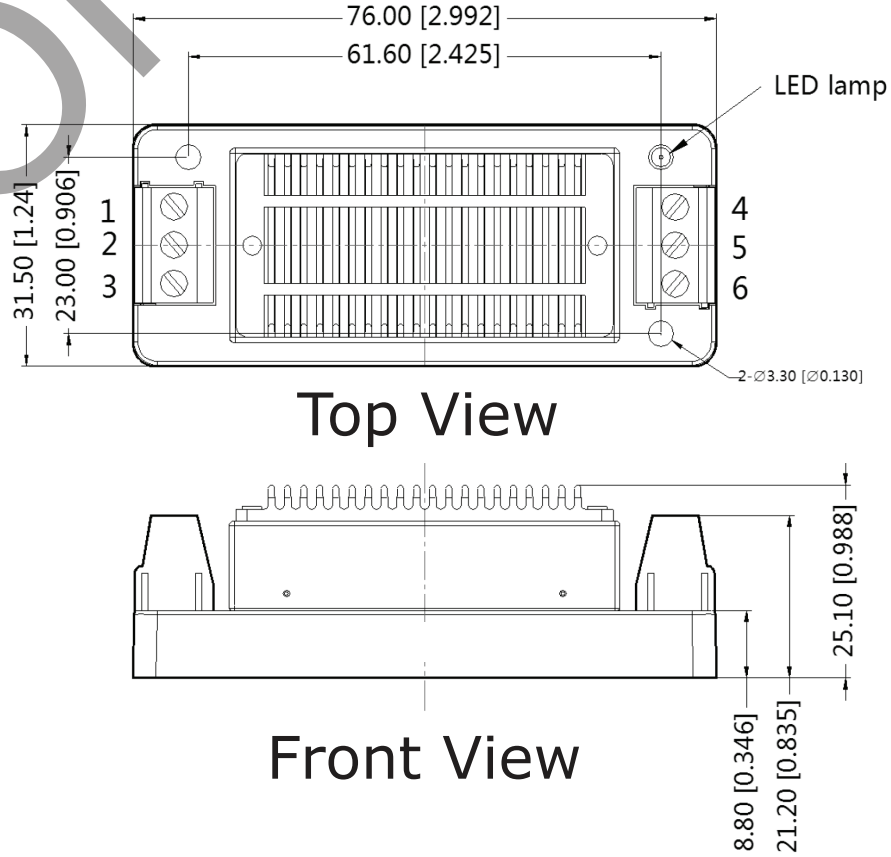


CHASSIS MOUNT WITH HEATSINK

units: mm[inch]
tolerance: ±0.50[±0.020]

wire range: 24~12 AWG

PIN CONNECTIONS	
PIN	Function
1	CTRL
2	GND
3	Vin
4	Trim
5	0V
6	+Vo



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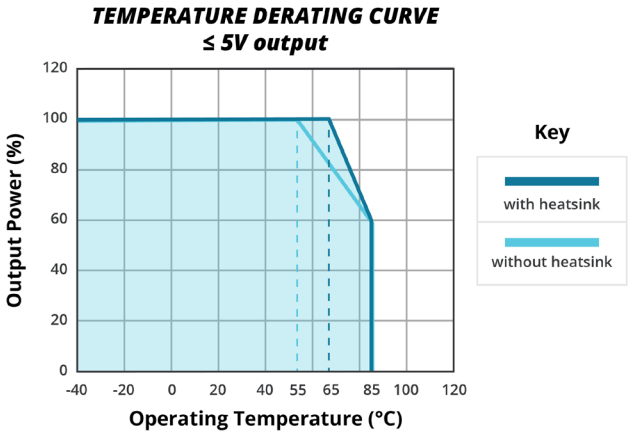
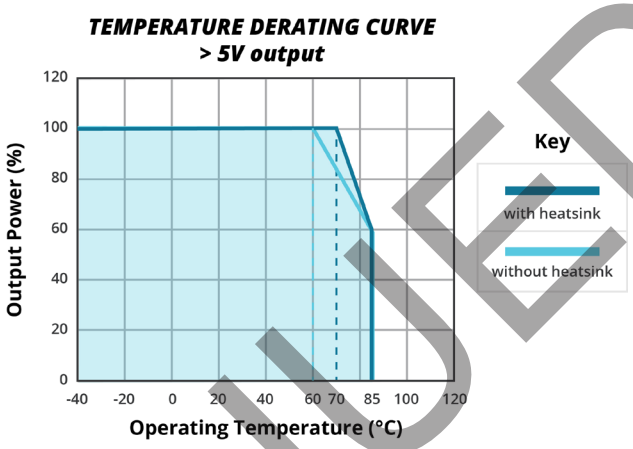
DERATING CURVES





EMC RECOMMENDED CIRCUIT

Figure 1

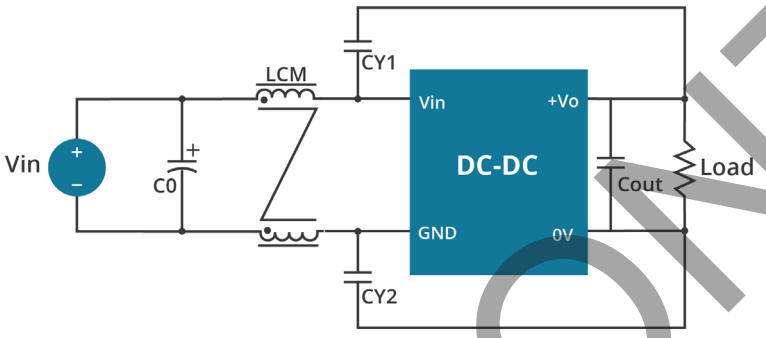


Table 1

Recommended external circuit components		
Vin (Vdc)	24	48
C0	330µF/50V	330µF/100V
CY1, CY2	1nF/2kV	1nF/2kV
LCM	2.2mH	2.2mH

Note: 1. See Table 3 for Cout values.

TEST CONFIGURATION

Figure 2

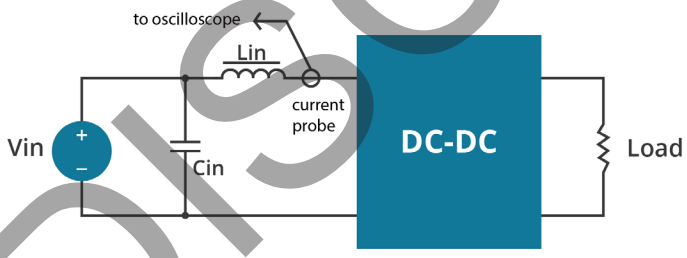


Table 2

External components	
Lin	4.7µH
Cin	220µF, ESR < 1.0Ω at 100 kHz

Note: 1. Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.

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APPLICATION NOTES

1. **Requirement on output load**
   To ensure this module can operate efficiently and reliably, the minimum output load cannot be less than 5% of the full load during operation. If the actual output power is small, please connect a resistor at the output end in parallel to increase the load.

2. **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 capacitance properly or choose capacitors with low ESR (see table 3). However, the capacitance must not exceed the maximum capacitive load or a start-up problem might arise (see table 4).

Figure 3

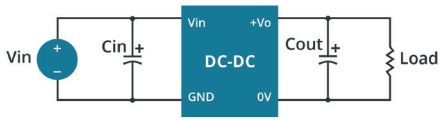

Table 3

Vout (Vdc)	Cin (μF)	Cout (μF)
3.3	100	220
5	100	220
12	100	100
15	100	100
24	100	47

Table 4

Vout (Vdc)	Max. Capacitive Load (μF)
3.3	27000
5	18900
12	3700
15	2000
24	1000

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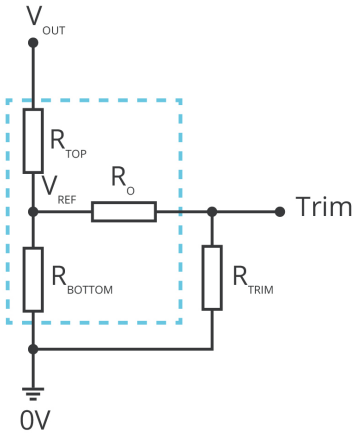
APPLICATION NOTES (CONTINUED)

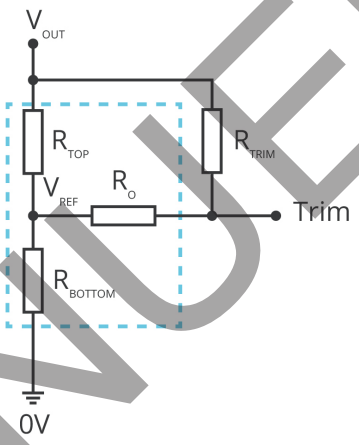
1. **Output Voltage Trimming**
   Leave open if not used.

Figure 4

Trim up



Trim down



$$R_{TRIM} = \frac{a \cdot R_{BOTTOM}}{R_{BOTTOM} - a} - R_O \qquad a = \frac{V_{REF}}{V_{OUT} - V_{REF}} \cdot R_{TOP}$$

Formula for Trim up

$$R_{TRIM} = \frac{a \cdot R_{TOP}}{R_{TOP} - a} - R_O \qquad a = \frac{V_{OUT} - V_{REF}}{V_{REF}} \cdot R_{BOTTOM}$$

Formula for Trim down

Table 5

V_{OUT}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)
3.3	4.788	2.87	15	1.24
5	2.87	2.87	12.1	2.5
12	11	2.87	22	2.5
15	15	3	22	2.5
24	20	2.308	15	2.5

Note: Value for R_{TOP}, R_{BOTTOM}, R_O, and V_{REF} refer to Table 3 (fixed internal values).
R_{TRIM}: Trim resistance
a: User-defined parameter, no actual meanings
V_{OUT}: Nominal output voltage

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Notes:
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.
2. Maximum capacitive load is tested at input voltage range and full load.
3. All specifications are measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.

REVISION HISTORY

rev.	description	date
1.0	initial release	01/21/2014
1.01	updated datasheet	07/15/2015
1.02	discontinued heat sink versions	02/07/2019
1.03	company logo updated	03/30/2021
1.04	derating curves and circuit figures updated	08/31/2021
1.05	CE certification removed for 24V models	11/10/2022
1.06	discontinued model PQA50-D24-S24-T, PQA50-D24-S3-T, PQA50-D24-S5-T, PQA50-D48-S12-T, PQA50-D48-S15-T, PQA50-D48-S24-T, PQA50-D48-S3-T & PQA50-D48-S5-T	11/11/2022

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.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

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