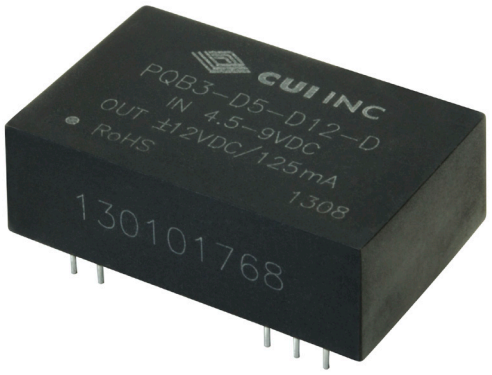
CUI INC
a bel group

SERIES: PQB3-D | DESCRIPTION: DC-DC CONVERTER

FEATURES

- 3 W isolated output
- smaller package
- single/dual regulated output
- 1,500 Vdc isolation
- short circuit protection
- temperature range (-40~105°C)
- high efficiency at light load
- efficiency up to 86%
- EN/BS EN 62368-1



MODEL	input voltage		output voltage	output current		output power	ripple and noise[3]	efficiency
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
PQB3-D5-S5-D[2]	5	4.5~9	5	30	600	3	80	74
PQB3-D5-S12-D[2]	5	4.5~9	12	12	250	3	80	77
PQB3-D5-S15-D[2]	5	4.5~9	15	10	200	3	80	77
PQB3-D5-D5-D[2]	5	4.5~9	±5	±15	±300	3	80	76
PQB3-D5-D12-D[2]	5	4.5~9	±12	±6	±125	3	80	78
PQB3-D5-D15-D[2]	5	4.5~9	±15	±5	±100	3	80	78
PQB3-D12-S3-D[2,*]	12	9~18	3.3	46	909	3	80	74
PQB3-D12-S5-D[2]	12	9~18	5	30	600	3	80	81
PQB3-D12-S12-D[2]	12	9~18	12	12	250	3	80	83
PQB3-D12-S15-D[2]	12	9~18	15	10	200	3	80	82
PQB3-D12-S24-D[2]	12	9~18	24	6	125	3	80	83
PQB3-D12-D5-D[2]	12	9~18	±5	±15	±300	3	80	81
PQB3-D12-D9-D[2]	12	9~18	±9	±8	±166	3	80	84
PQB3-D12-D12-D[2]	12	9~18	±12	±6	±125	3	80	84
PQB3-D12-D15-D[2]	12	9~18	±15	±5	±100	3	80	85
PQB3-D24-S3-D[2]	24	18~36	3.3	46	909	3	80	78
PQB3-D24-S5-D[1,2]	24	18~36	5	30	600	3	80	81
PQB3-D24-S12-D[2]	24	18~36	12	12	250	3	80	86
PQB3-D24-S15-D[2]	24	18~36	15	10	200	3	80	86
PQB3-D24-S24-D[2]	24	18~36	24	6	125	3	80	85
PQB3-D24-D5-D[2]	24	18~36	±5	±15	±300	3	80	82
PQB3-D24-D12-D[2]	24	18~36	±12	±6	±125	3	80	84
PQB3-D24-D15-D[2]	24	18~36	±15	±5	±100	3	80	84
PQB3-D48-S3-D*	48	36~75	3.3	46	909	3	80	76
PQB3-D48-S5-D	48	36~75	5	30	600	3	80	82
PQB3-D48-S12-D	48	36~75	12	12	250	3	80	86
PQB3-D48-S15-D	48	36~75	15	10	200	3	80	86

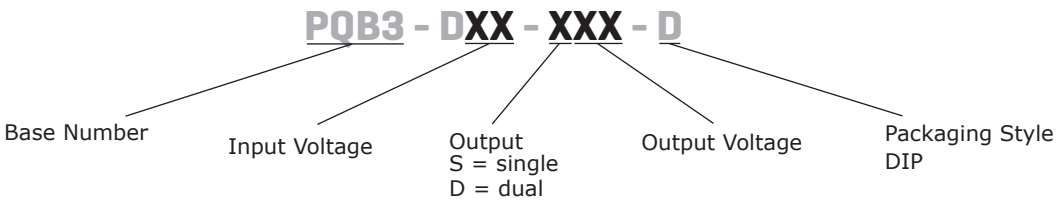
Notes:
1. UL approved
2. Model is not CE certified.
3. Ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 µF ceramic and 10 µF electrolytic capacitors on the output.
4. * Discontinued model

MODEL (CONTINUED)

	input voltage		output voltage	output current		output power	ripple and noise[3]	efficiency
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	typ (mVp-p)	typ (%)
PQB3-D48-D5-D*	48	36~75	±5	±15	±300	3	80	82
PQB3-D48-D12-D	48	36~75	±12	±6	±125	3	80	84
PQB3-D48-D15-D	48	36~75	±15	±5	±100	3	80	85

Notes: 1. UL approved.
2. Model is not CE certified.
3. 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.
4. * Discontinued model

PART NUMBER KEY



INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	5 Vdc input models	4.5	5	9	Vdc
	12 Vdc input models	9	12	18	Vdc
	24 Vdc input models	18	24	36	Vdc
	48 Vdc input models	36	48	75	Vdc
start-up voltage	5 Vdc input models			4.5	Vdc
	12 Vdc input models			9	Vdc
	24 Vdc input models			18	Vdc
	48 Vdc input models			36	Vdc
surge voltage	for maximum of 1 second				
	5 Vdc input models	-0.7		12	Vdc
	12 Vdc input models	-0.7		25	Vdc
	24 Vdc input models	-0.7		50	Vdc
	48 Vdc input models	-0.7		100	Vdc
filter	pi filter				

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		±0.2	±0.5	%
voltage accuracy			±1	±3	%
no-load voltage accuracy			±1.5	±5	%
voltage balance[3]	dual output, balanced loads		±0.5	±1	%
switching frequency	100% load, nominal input voltage, PFM mode		200		kHz
transient recovery time	25% load step change		0.5	2	ms
transient response deviation	25% load step change		±2	±5	%
temperature coeffecient	100% load		±0.02	±0.03	%/°C

Notes: 3. For dual output models, unbalanced loads should not exceed ±5%. If ±5% is exceeded, it may not meet all specifications.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection[4]				1	s

Notes: 4. The supply voltage must be discontinued at the end of the short circuit duration

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA max.	1,500			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
safety approvals[1]	certified to 62368-1: EN/BS EN certified to 60950-1: UL				
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	IEC/EN61000-4-2, class B, contact ± 4kV/air ± 8kV				
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-a)				
surge	IEC/EN61000-4-5, class B, ± 2kV (external circuit required, see Figure 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	2011/65/EU				

Notes: 1. See specific model noted on page 1

ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing			95	%
temperature rise	at full load, Ta=25°C		25		°C

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

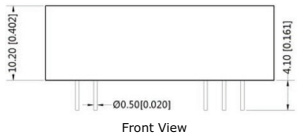
parameter	conditions/description	min	typ	max	units
dimensions	31.60 x 20.30 x 10.20 (1.244 x 0.799 x 0.402 inch)				mm
case material	plastic (UL94-V0)				
weight			14		g

MECHANICAL DRAWING

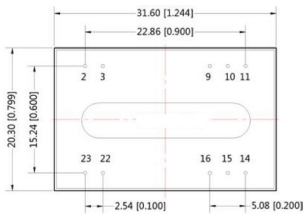
units: mm[inch]
tolerance: ±0.50[±0.020]
pin section tolerance: ±0.10[±0.004]

PIN CONNECTIONS		
PIN	Single Output	Dual Output
2, 3	GND	GND
9	NC	0V
10,15	NC	NC
11	NC	-Vo
14	+Vo	+Vo
16	0V	0V
22, 23	Vin	Vin

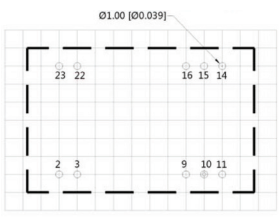
NC: No Connection



Front View



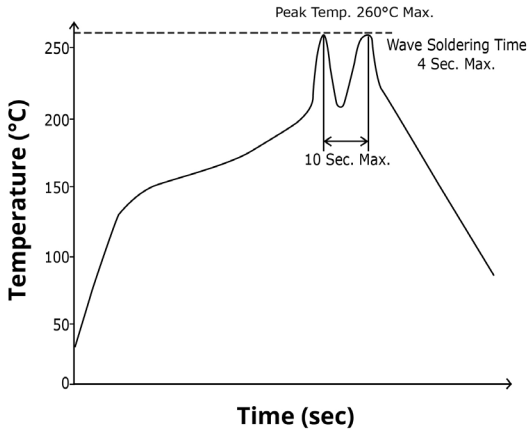
Bottom View



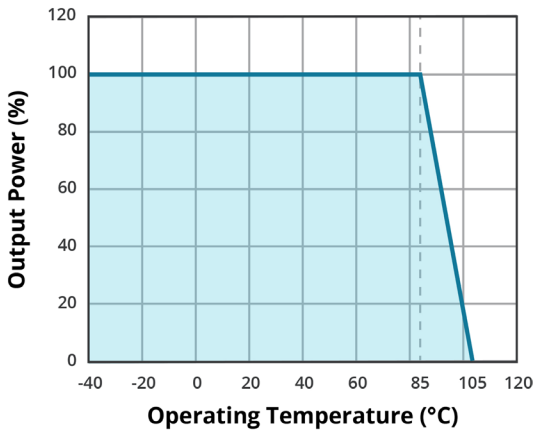
PCB Layout
Top View

DERATING CURVES

WAVE SOLDERING PROFILE



TEMPERATURE DERATING CURVE



EMC RECOMMENDED CIRCUIT

Figure 1

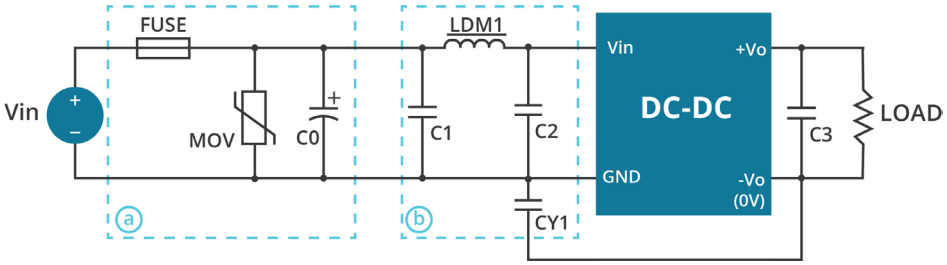


Table 1

Recommended external circuit components				
Vin (Vdc)	5	12	24	48
FUSE	choose according to practical input current			
MOV	--	S14K25	S14K35	S14K60
C0	1000µF/16V	1000µF/25V	330µF/50V	330µF/100V
C1	4.7µF/50V	4.7µF/50V	4.7µF/50V	4.7µF/100V
LDM1	12µH	12µH	12µH	12µH
C2	4.7µF/50V	4.7µF/50V	4.7µF/50V	4.7µF/100V
C3	10µF	10µF	10µF	10µF
CY1	1nF/2kV	1nF/2kV	1nF/2kV	1nF/2kV

APPLICATION NOTES

1. **Output load requirement**
   To ensure this module can operate efficiently and reliably, the minimum output load may not be less than 5% of the full load during operation. If the actual output power is low, 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 2 & Table 2). If you want to further decrease the input/output ripple, you can increase the capacitance accordingly or choose capacitors with low ESR. 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 3).

Figure 2

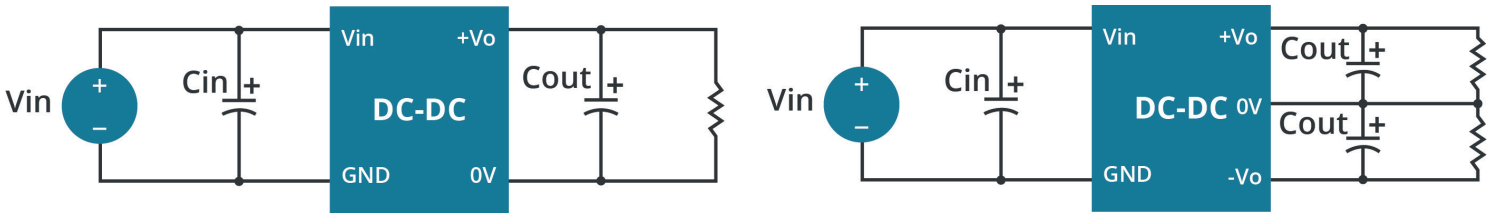


Table 2

Vin (Vdc)	Cin (μF)	Cout (μF)
5	100	10
12	100	10
24	10~47	10
48	10~47	10

Table 3

Single Vout (Vdc)	Max. Capacitive Load (μF)	Dual Vout (Vdc)	Max. Capacitive Load[1] (μF)
3.3	4700	--	--
5	4700	5	2200
12	2700	9	2000
15	2200	12	1800
24	1800	15	1000

Note: 1. For each output.

3. **Input Current**
   When it is used in an unregulated condition, make sure that the input fluctuations and ripple voltage do not exceed the module standard. Refer to Figure 3 and Table 4 for the startup current of this dc-dc module.

Figure 3

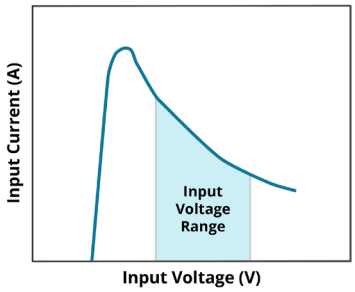


Table 4

Vin (Vdc)	Ip (mA)
5	1400
12	620
24	310
48	150

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.
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	03/19/2013
1.01	added models, added UL approval to model, updated datasheet	08/12/2015
1.02	safeties updated in features and safety approvals line	01/15/2021
1.03	derating curve and circuit figures updated	07/15/2021
1.04	CE certification removed for 5V, 12V, 24V models	10/11/2022
1.05	discontinued models PQB3-D12-S3-D, PQB3-D48-D5-D & PQB3-D48-S3-D	09/26/2023

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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