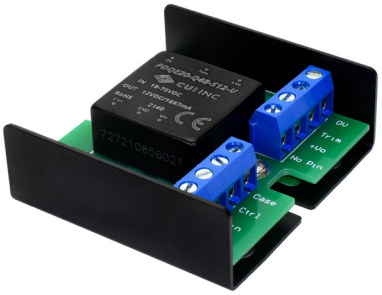
CUI INC
a bel group

SERIES: PDQE20-U | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 20 W isolated output
- 1,500 Vdc isolation
- ultra-wide 4:1 input range (9~36 Vdc, 18~75 Vdc)
- same side input/output connections
- single/dual regulated outputs
- input under-voltage, output short-circuit, over-current, & over-voltage protections
- wide operating temperature range (-40~105°C)
- efficiency up to 91%
- EN/BS EN 62368-1
- meets UL 62368

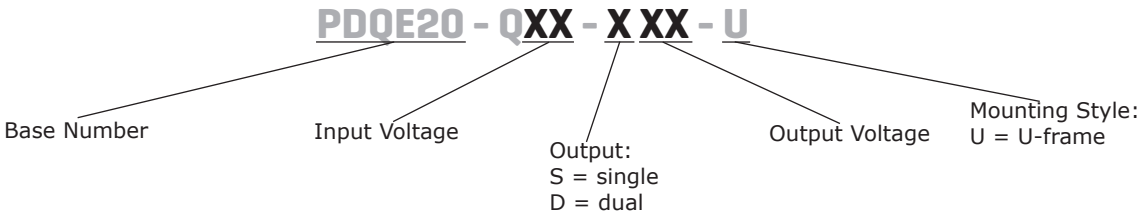


RoHS CE

MODEL	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
PDQE20-Q24-D5-U[3]	24	9~36	±5	0	±2000	20	200	87
PDQE20-Q24-D12-U[3]	24	9~36	±12	0	±833	20	200	90
PDQE20-Q24-D15-U[3]	24	9~36	±15	0	±667	20	200	90
PDQE20-Q24-D24-U[3]	24	9~36	±24	0	±417	20	200	89
PDQE20-Q24-S3-U[3]	24	9~36	3.3	0	5000	16.5	100	88
PDQE20-Q24-S5-U[3]	24	9~36	5	0	4000	20	100	90
PDQE20-Q24-S6-U[3]	24	9~36	6	0	3333	20	100	89
PDQE20-Q24-S12-U[3]	24	9~36	12	0	1667	20	100	90
PDQE20-Q24-S15-U[3]	24	9~36	15	0	1333	20	100	91
PDQE20-Q24-S24-U[3]	24	9~36	24	0	833	20	100	91
PDQE20-Q48-D5-U	48	18~75	±5	0	±2000	20	200	86
PDQE20-Q48-D12-U	48	18~75	±12	0	±833	20	200	90
PDQE20-Q48-D15-U	48	18~75	±15	0	±667	20	200	90
PDQE20-Q48-D24-U	48	18~75	±24	0	±417	20	200	90
PDQE20-Q48-S3-U	48	18~75	3.3	0	5000	16.5	100	88
PDQE20-Q48-S5-U	48	18~75	5	0	4000	20	100	90
PDQE20-Q48-S12-U	48	18~75	12	0	1667	20	100	91
PDQE20-Q48-S15-U	48	18~75	15	0	1333	20	100	91
PDQE20-Q48-S24-U	48	18~75	24	0	833	20	100	91

Notes:
1. From 5~100% load, 20 MHz bandwidth oscilloscope, using the "parallel cable" method for testing. From 0~5% load, ripple and noise is <5% Vo.
2. Measured at nominal input voltage and rated load.
3. Model is not CE certified.
4. All specifications are measured at Ta=25°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 48 Vdc input models			9 18	24 48	36 75	Vdc Vdc
start-up voltage	24 Vdc input models 48 Vdc input models					9 18	Vdc Vdc
surge voltage	for maximum of 1 second 24 Vdc input models 48 Vdc input models			 -0.7 -0.7		 50 100	 Vdc Vdc
under voltage shutdown	24 Vdc input models 48 Vdc input models			5.5 12	6.5 15.5		Vdc Vdc
current (full load/no load)	dual output models	24 Vdc input models			958/10	980/20	mA
		48 Vdc input models			484/5	496/11	mA
	single output models	24 Vdc input models	3.3 Vdc output		782/30	800/50	mA
			5 Vdc output		926/35	947/55	mA
			6 Vdc output		936/50	958/70	mA
			12 Vdc output		926/6	947/15	mA
			15 Vdc output		916/6	937/15	mA
			24 Vdc output		916/10	937/20	mA
		48 Vdc input models	3.3 Vdc output		391/15	400/30	mA
			5 Vdc output		463/20	474/30	mA
			12, 15 Vdc output		458/3	469/15	mA
			24 Vdc output		458/4	469/15	mA
remote on/off (CTRL)	module ON (3.5~12 Vdc or CTRL pin open circuit or pulled high) module OFF (0~1.2 Vdc CTRL pin pulled low to GND) input current when switched off				2	7	mA
start-up time	nominal input, constant resistance load				10		ms
filter	Pi filter						

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load[5]	3.3, 5, 6 Vdc output models			10,000	µF
	±5 Vdc output models			2,000	µF
	12 Vdc output models			1,600	µF
	±12 Vdc output models			800	µF
	15 Vdc output models			1,000	µF
	±15 Vdc output models			600	µF
	24 Vdc output models			500	µF
	±24 Vdc output models			300	µF
voltage accuracy[5]	0% to full load		±1	±3	%
line regulation	from low line to high line, full load positive outputs negative outputs		 ±0.2 ±0.4	 ±0.5 ±1	 % %
load regulation[7]	from 5% to full load		±0.5	±1	%

OUTPUT (CONTINUED)

parameter	conditions/description	min	typ	max	units
cross regulation	dual output models: positive output 50% load secondary output from 10~100% load			±5	%
switching frequency[8]	PWM mode 3.3, 5, 6 Vdc output models all other output models		300 270		kHz kHz
transient recovery time	25% load step change, nominal input voltage		300	500	µs
transient response deviation	25% load step change, nominal input voltage 3.3, 5, ±5, 6 Vdc output model all other output models		±3 ±3	±8 ±5	% %
temperature coefficient	at full load			±0.03	%/°C

Note: 5. Specified maximum capacitive load for positive and negative outputs is identical.
6. Output voltage accuracy of dual output models for 0%~5% load is ±4%.
7. Load regulation for 0%~100% load is ±5%.
8. Switching frequency is measured at full load. Module reduces switching frequency at light load (blow 50%), to increase efficiency.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection		110		160	%
over current protection	single output models dual output models	110 110	150 150	190 200	% %
short circuit protection	continuous, auto recovery				

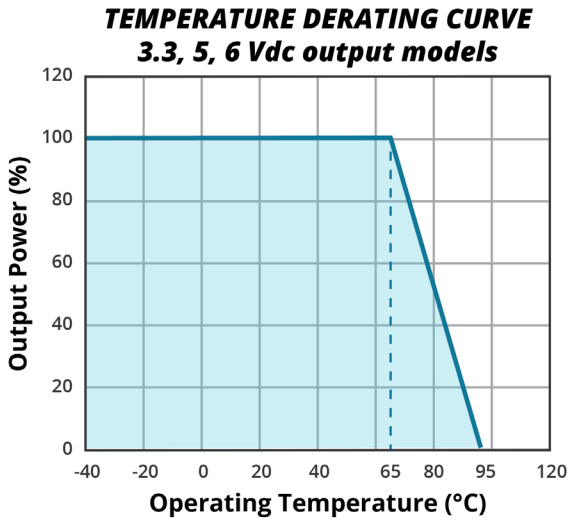
SAFETY AND COMPLIANCE

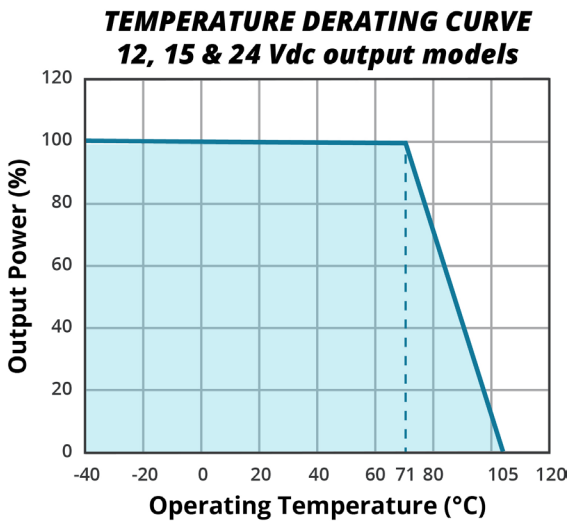
parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA input to output-case for 1 minute at 1 mA	1,500 1,000			Vdc Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		2,000		pF
safety approvals	certified to 62368: EN, BS EN				
conducted emissions	CISPR32/EN55032 CLASS B (see Fig. 3-2) EN50121-3-2 150kHz-500kHz 99dBuV (see Fig. 3-2) EN55016-2-1 500kHz-30MHz 93dBuV (see Fig. 3-2)				
radiated emissions	CISPR32/EN55032 CLASS B (see Fig. 3-2) EN50121-3-2 30MHz-230MHz 40dBuV/m at 10m (see Fig. 3-2) EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m (see Fig. 3-2)				
ESD	IEC/EN61000-4-2 Contact ±4kV, perf. Criteria B EN50121-3-2 Contact ±6kV/Air ±8kV, perf. Criteria A				
radiated immunity	IEC/EN61000-4-3 10V/m, perf. Criteria A EN50121-3-2 20V/m, perf. Criteria A				
EFT/burst	IEC/EN61000-4-4 ±2kV (see Fig. 3-1), perf. Criteria B EN50121-3-2 ±2kV 5/50ns 5kHz (see Fig. 3-1), perf. Criteria A				
surge	IEC/EN61000-4-4 ±2kV (see Fig. 3-1), perf. Criteria B EN50121-3-2 line to line ±1kV (42Ω , 0.5µF)) (see Fig. 3-1), perf. Criteria A				
conducted immunity	IEC/EN61000-4-6 3 Vr.m.s, perf. Criteria A EN50121-3-2 0.15MHz-80MHz 10V r.m.s, perf. Criteria A				
MTBF	as per MIL-HDBK-217F, 25°C	1,000,000			hours
RoHS	yes				

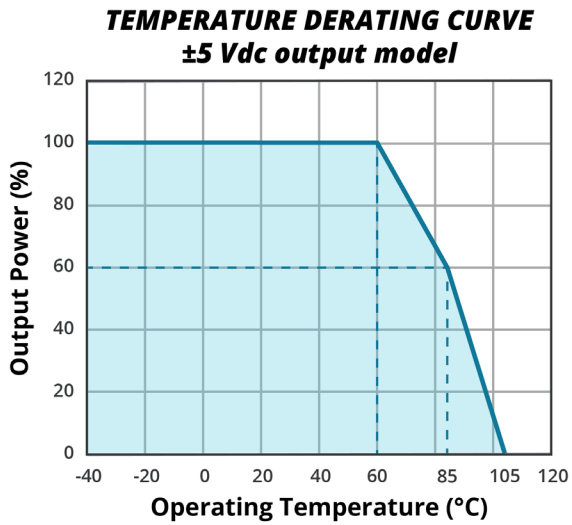
ENVIRONMENTAL

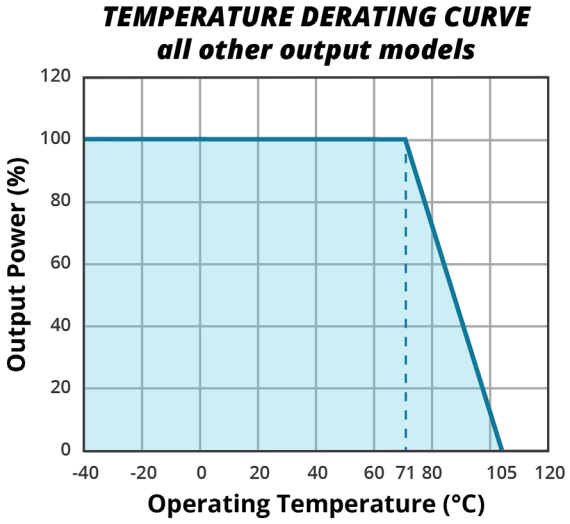
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve 3.3, 5, 6 Vdc output all other output models	 -40 -40		 95 105	 °C °C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%

DERATING CURVES









SOLDERABILITY

parameter	conditions/description	min	typ	max	units
pin soldering resistance temperature	1.5 mm from case for 10 seconds			300	°C

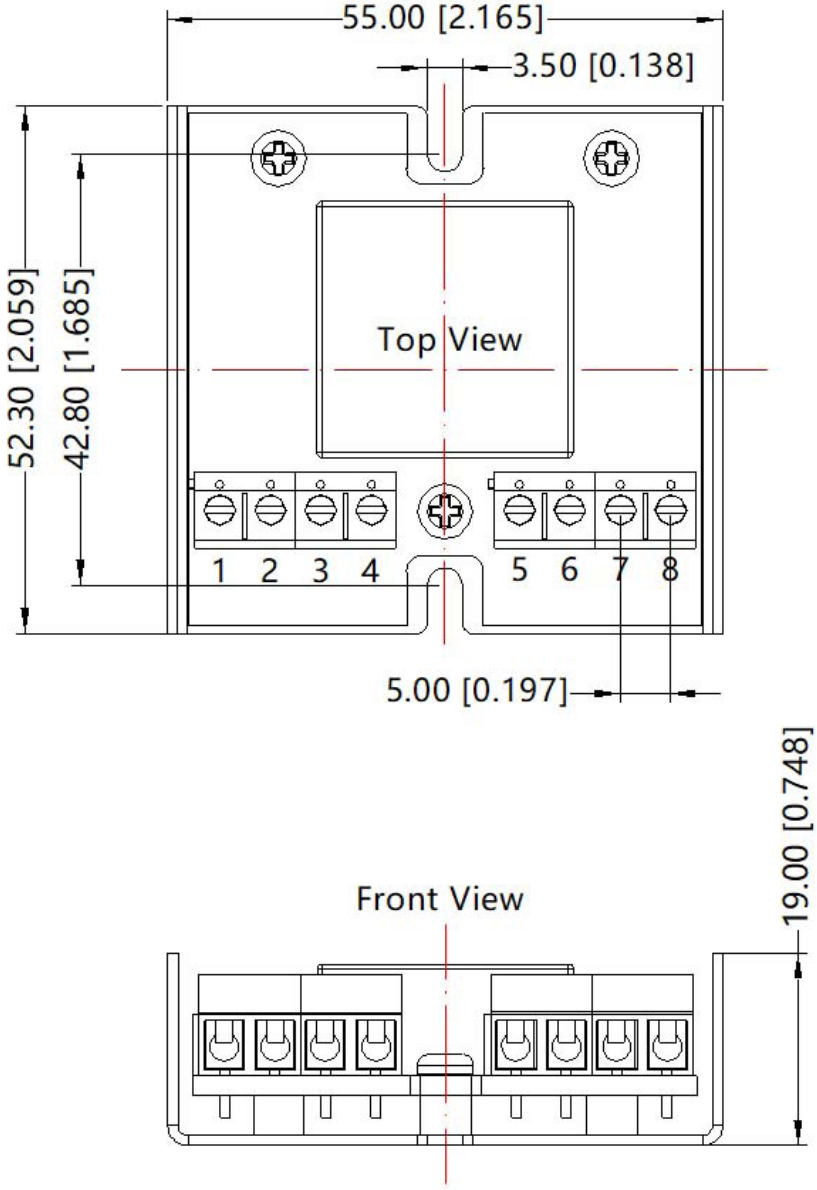
MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	55.00 x 52.30 x 19.00 [2.165 x 2.059 x 0.748 inch]				mm
case material	aluminum alloy				
weight			46		g

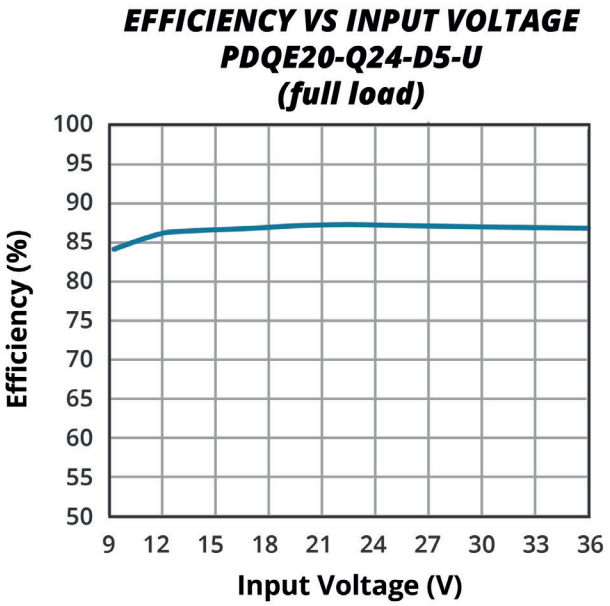
MECHANICAL DRAWING

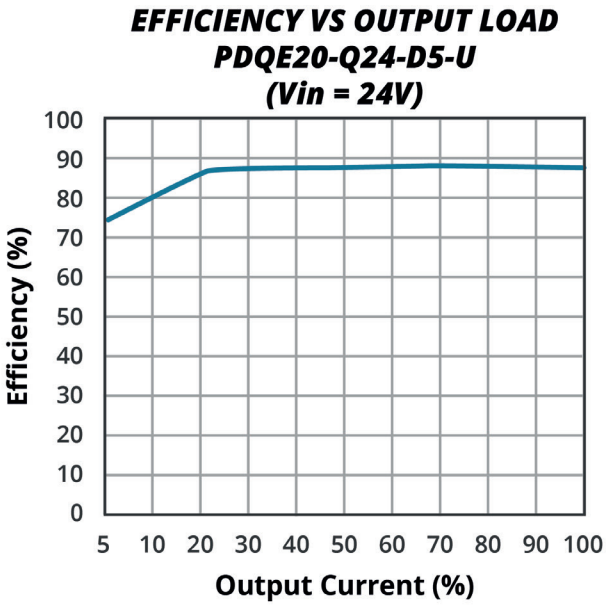
units: mm [inch]
wire range: 24-12 AWG
tolerance: ±1.00[±0.039]
tightening torque: Max 0.4 N·m

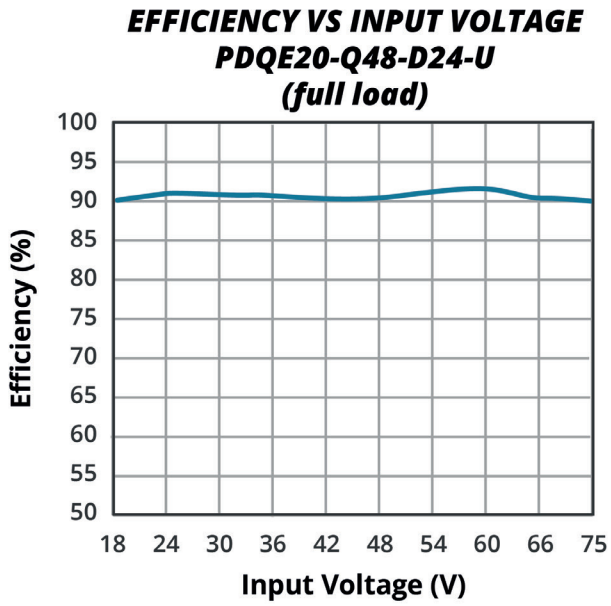
PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	GND	GND
2	Vin	Vin
3	Ctrl	Ctrl
4	Case	Case
5	NC	NC
6	+Vo	+Vo
7	Trim	0V
8	0V	-Vo

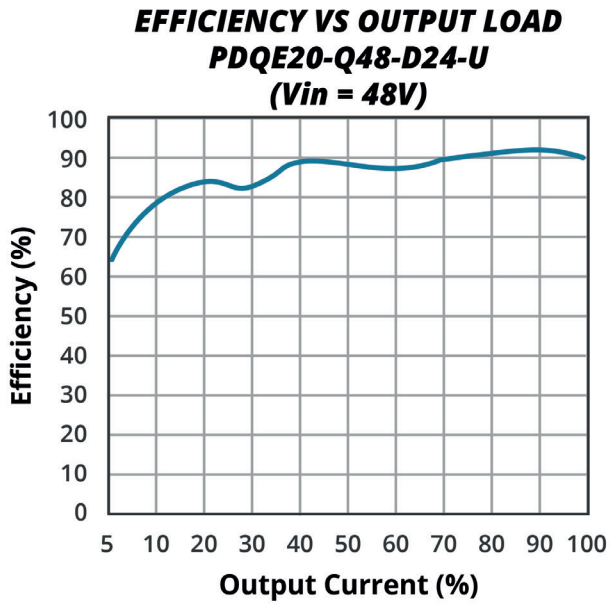


EFFICIENCY CURVES

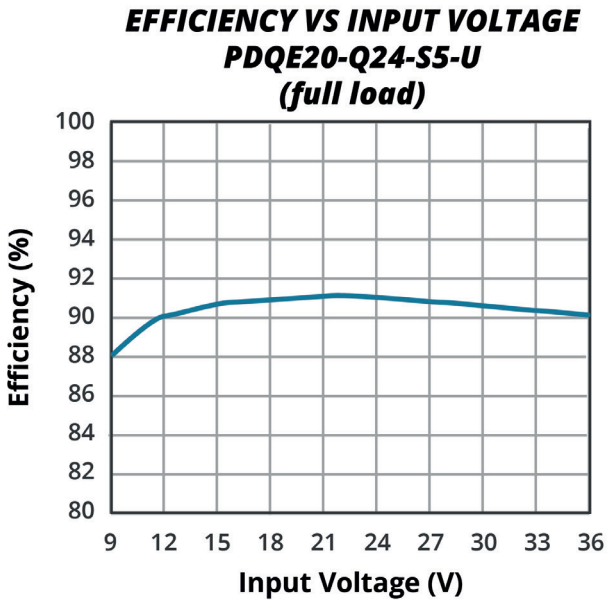


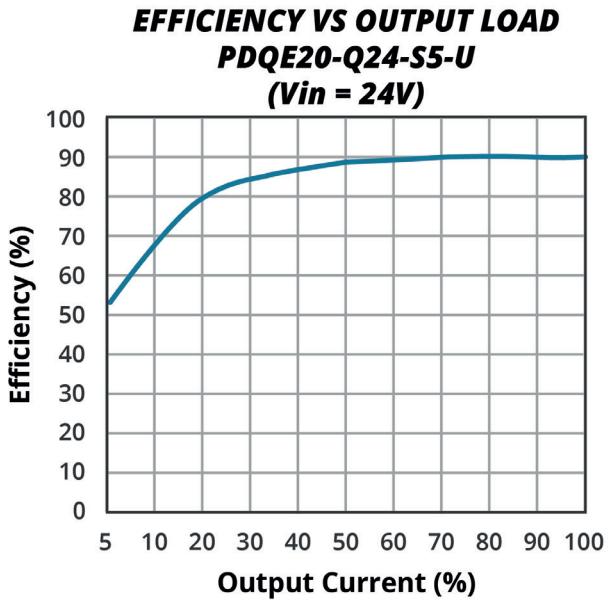


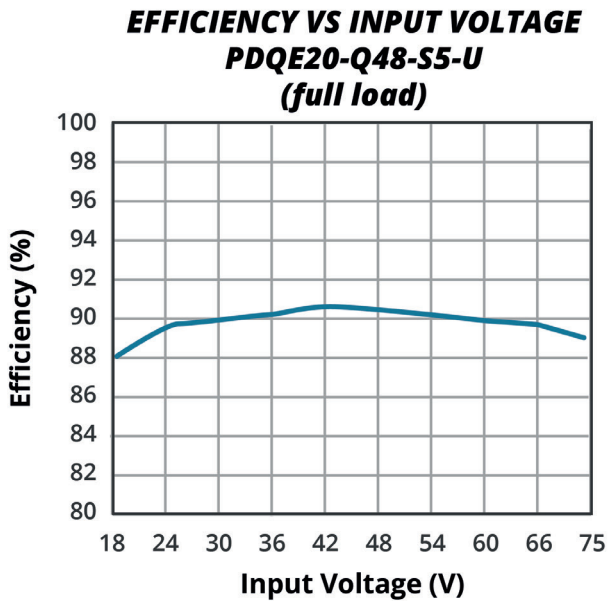


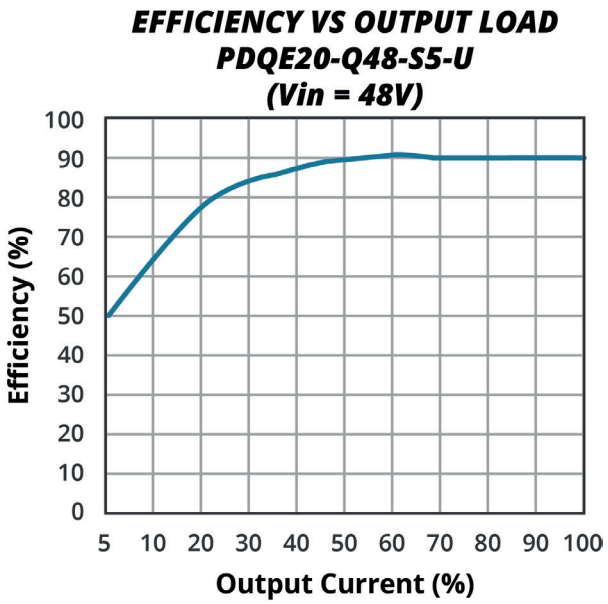


EFFICIENCY CURVES (CONTINUED)









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 series resistance (ESR) provided that the capacitance is less than the maximum capacitive load of the model.

Figure 1
Single Output Models

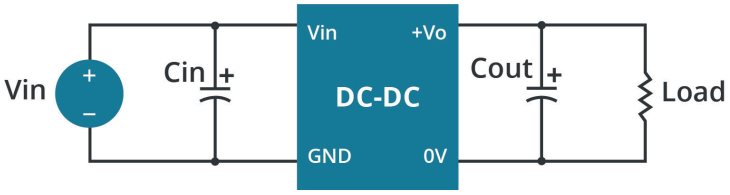


Figure 2
Dual Output Models

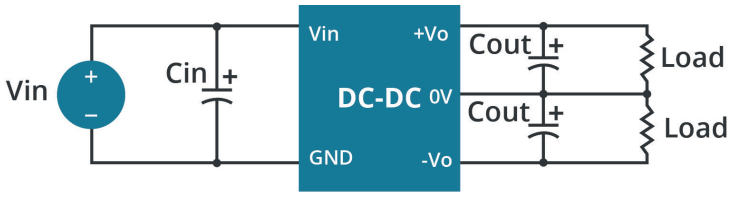


Table 1

Vin (Vdc)	Cin (μF/V)	Vout (Vdc)	Cout (μF/V)
24	100/50	±5	10/16
		±12/±15	10/25
		±24	10/50
		3.3/5/6	100/16
		12/15	100/25
		24	47/50
48	10~47/50	±5	10/16
		±12/±15	10/25
		±24	10/50
	100/100	3.3/5	100/16
		12/15	100/25
		24	47/50

EMC RECOMMENDED CIRCUIT

Figure 3

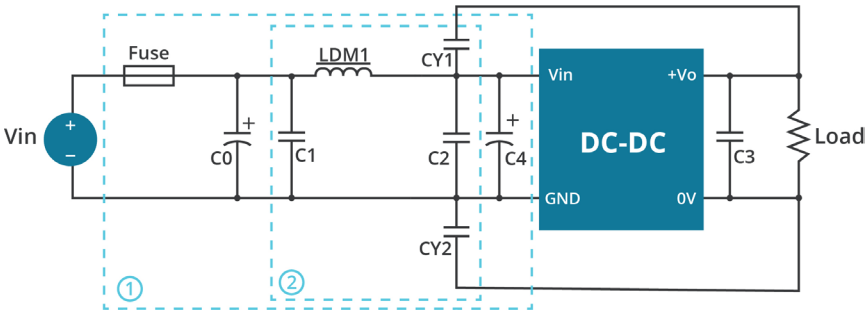


Table 2

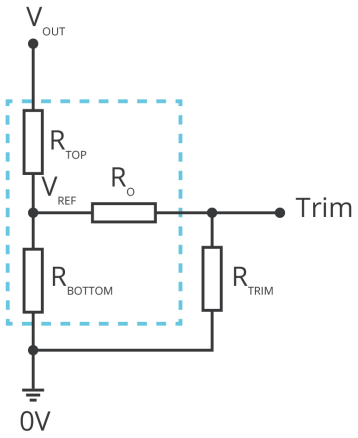
Recommended External Circuit Components			
Vin (Vdc)		24	48
FUSE		choose according to actual input current	
C0/C4		330μF / 50V	330μF / 100V
C1/C2		4.7μF / 50V	4.7μF / 100V
C3		refer to the Cout in Figure 1 & 2	
LDM1	single	2.2uH/4A	202uH/2A
	dual	4.7μH	
CY1, CY2		1nF / 2kV	

APPLICATION NOTES

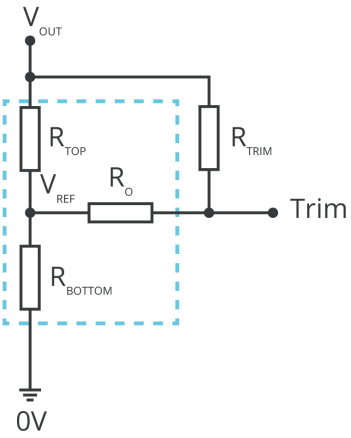
Open if unused.

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 3

V_{OUT}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)
3.3	4.80	2.87	15	1.25
5	2.894	2.87	10	2.5
6	4.064	2.87	10	2.5
12	11.000	2.87	17.4	2.5
15	14.494	2.87	17.4	2.5
24	24.872	2.87	20	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

REVISION HISTORY

rev.	description	date
1.0	initial release	12/06/2021
1.01	Vref updated for 3.3 Vdc output model	02/07/2022
1.02	CE certification updated for 24V models	11/29/2022

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.

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