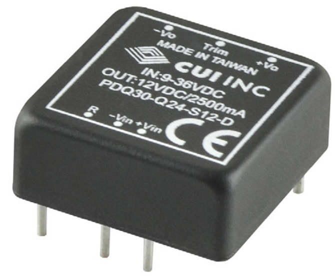
CUI INC
a bel group

SERIES: PDQ30-D | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 30 W isolated output
- industry standard 1" x 1" package
- 4:1 input range
- single/dual regulated output
- over voltage, input under voltage lockout, and short circuit protections
- 1,500 Vdc isolation voltage
- five-sided shielded case
- remote on/off control
- output trim
- -40 to 105°C temperature range
- efficiency up to 90%
- EN 62368-1
- meets UL 62368-1

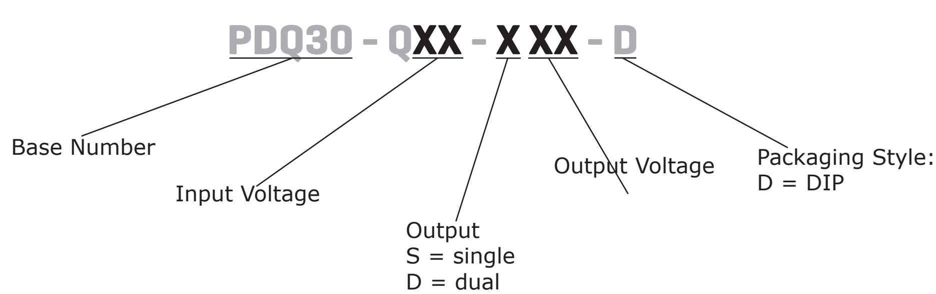


RoHS CE

MODEL	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency
	typ (Vdc)	range (Vdc)	(Vdc)	min (A)	max (A)	max (W)	max (mVp-p)	typ (%)
PDQ30-Q24-S3-D	24	9~36	3.3	0	7.5	24.75	75	88
PDQ30-Q24-S5-D	24	9~36	5	0	6.0	30	75	90
PDQ30-Q24-S12-D	24	9~36	12	0	2.5	30	100	89
PDQ30-Q24-S15-D	24	9~36	15	0	2.0	30	100	89
PDQ30-Q24-D12-D	24	9~36	±12	0	±1.25	30	100	88
PDQ30-Q24-D15-D	24	9~36	±15	0	±1.0	30	100	88
PDQ30-Q48-S3-D[3]	48	18~75	3.3	0	7.5	24.75	75	88
PDQ30-Q48-S5-D[3]	48	18~75	5	0	6.0	30	75	90
PDQ30-Q48-S12-D[3]	48	18~75	12	0	2.5	30	100	89
PDQ30-Q48-S15-D[3]	48	18~75	15	0	2.0	30	100	89
PDQ30-Q48-D12-D[3]	24	18~75	±12	0	±1.25	30	100	88
PDQ30-Q48-D15-D[3]	48	18~75	±15	0	±1.0	30	100	89

Notes:
1. At full load, nominal input, 20 MHz bandwidth oscilloscope, with 10 µF tantalum and 1 µF ceramic capacitors on the output.
2. All specifications are measured at Ta=25°C, nominal input voltage, and rated output load unless otherwise specified.
3. CE does not apply to 48 Vin models.

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
surge voltage	for maximum of 100 ms 24 Vdc input models 48 Vdc input models			 50 100	 Vdc Vdc
current	24 Vdc input models 48 Vdc input models			3.9 1.95	A A
under voltage shutdown	24 Vdc input models, power up 24 Vdc input models, power down 48 Vdc input models, power up 48 Vdc input models, power down		8.5 8.0 17 16		Vdc Vdc Vdc Vdc
remote on/off[1]	turn on (3.5~75 Vdc or open circuit) turn off (<1.2 Vdc)				
filter	pi filter				
input reverse polarity protection	no				
input fuse	6 A time delay fuse for 24 Vdc input models (recommended) 3 A time delay fuse for 48 Vdc input models (recommended)				

Notes: 1. CMOS or open collector TTL, reference to –Vin.

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	3.3 Vdc output models 5 Vdc output models 12 Vdc output models 15 Vdc output models ±12 Vdc output models ±15 Vdc output models			7,500 6,000 2,500 2,000 1,250 1,000	μF μF μF μF μF μF
voltage accuracy				±1.5	%
line regulation	from high line to low line single output models dual output models			 ±0.2 ±0.5	 % %
load regulation	from full load to minimum load single output models dual output models			 ±0.2 ±1.0	 % %
voltage balance	dual output models			±1.5	%
cross regulation	load cross variation 10%/100% (dual output models)			±5	%
turn-on delay time, from input	from Vin, min to 10% Vo		10		ms
turn-on delay time, from on/off control	from Von/off to 10% Vo		10		ms
rise time	from 10% Vo to 90% Vo		10		ms
adjustability[2]	see application notes		±10		%
switching frequency	3.3, 5 Vdc output models all other models		270 330		kHz kHz
dynamic load response	75%-100% step load change error band (Vout) recovery time		 5 250		 % μs
temperature coefficient			±0.03		%/°C

Note: 2. For single output models only.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection	zener or TVS clamp 3.3 Vdc output models 5 Vdc output models 12 Vdc output models (single and dual) 15 Vdc output models (single and dual)		 3.9 6.2 15 18		 Vdc Vdc Vdc Vdc
over current protection	hiccup mode	110	140	170	%
short circuit protection	continuous, automatic recovery				
over temperature protection	output shutdown, automatic recovery		110		°C

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute	1,500			Vdc
isolation resistance	input to output	1,000			MΩ
isolation capacitance	input to output		1,500		pF
safety approvals	62368-1: EN meets 62368-1: UL				
conducted emissions	EN 55022 Class A (external circuit required, see Figure 3)				
RoHS	2011/65/EU				

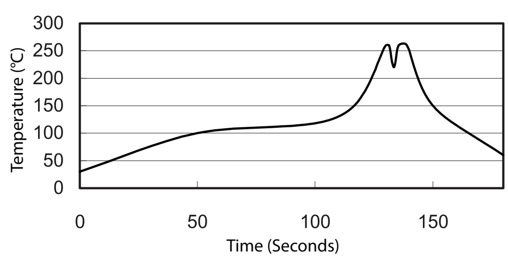
ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-40		105	°C
storage temperature		-55		125	°C
operating humidity	non-condensing			95	%

SOLDERABILITY

parameter	conditions/description	min	typ	max	units
wave soldering	see wave soldering profile			260	°C

Notes:
1. Soldering materials: Sn/Cu/Ni
2. Ramp up rate during preheat: 1.4°C/s (from 50°C to 100°C)
3. Soaking temperature: 0.5°C/s (from 100°C to 130°C), 60±20 seconds
4. Peak temperature: 260°C, above 250°C for 3~6 seconds
5. Ramp down rate during cooling: -10°C/s (from 260°C to 150°C)



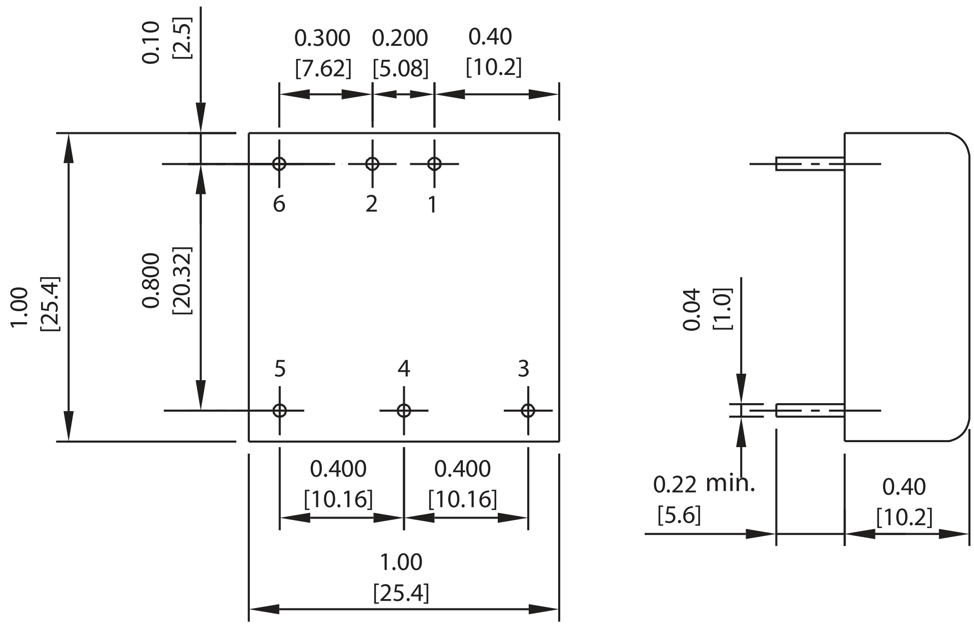
MECHANICAL

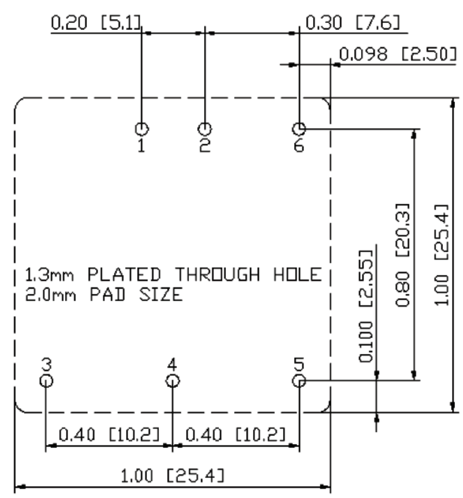
parameter	conditions/description	min	typ	max	units
dimensions	1.00 x 1.00 x 0.4 [25.4 x 25.4 x 10.2 mm]				inches
case material	black coated copper with non-conductive base				
weight			18		g

MECHANICAL DRAWING

units: inches [mm]
tolerance: X.XX ±0.02 [±0.5]
X.XXX ±0.010 [±0.25]
pin diameter tolerance: ±0.004[±0.1]

PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Common
5	-Vout	-Vout
6	Remote	Remote

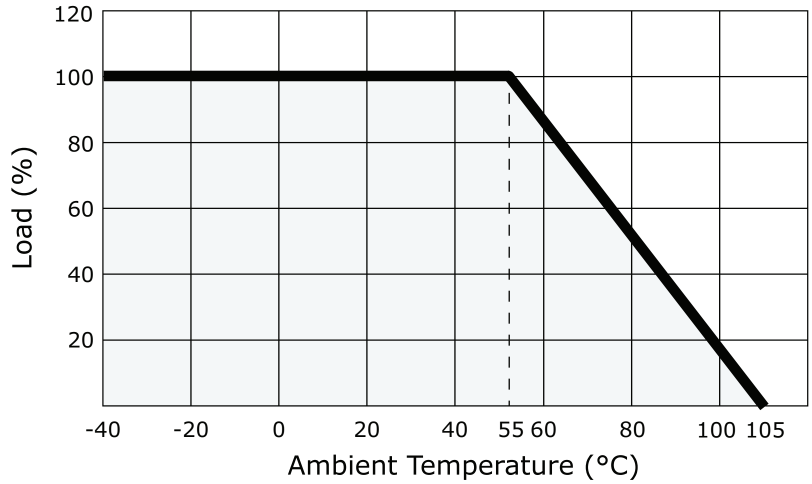




Recommended PCB Layout
Top View

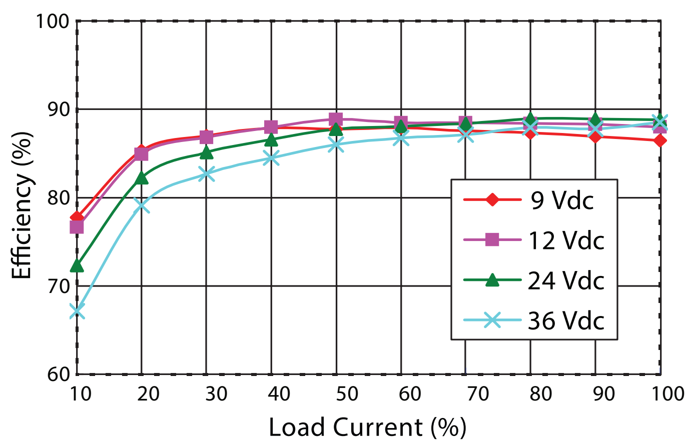
DERATING CURVE

Temperature Derating Curve
(Natural Convection)

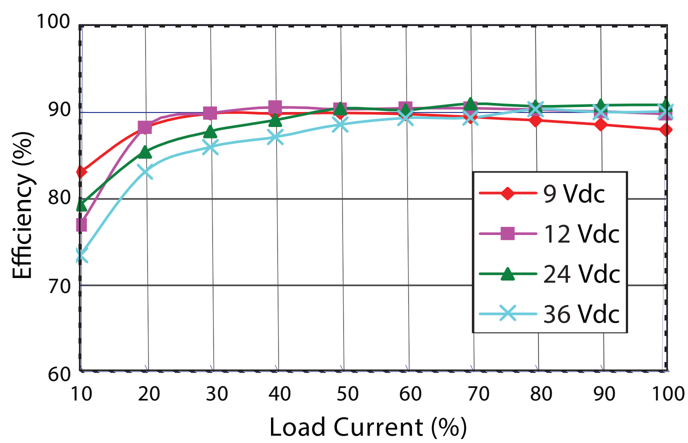


EFFICIENCY CURVES

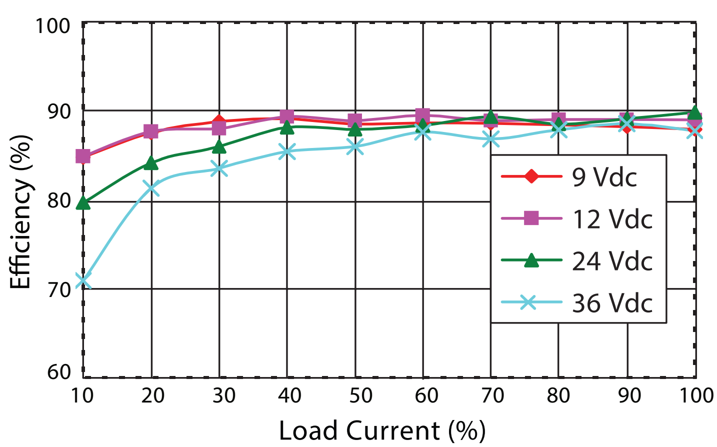
PDQ30-Q24-S3-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



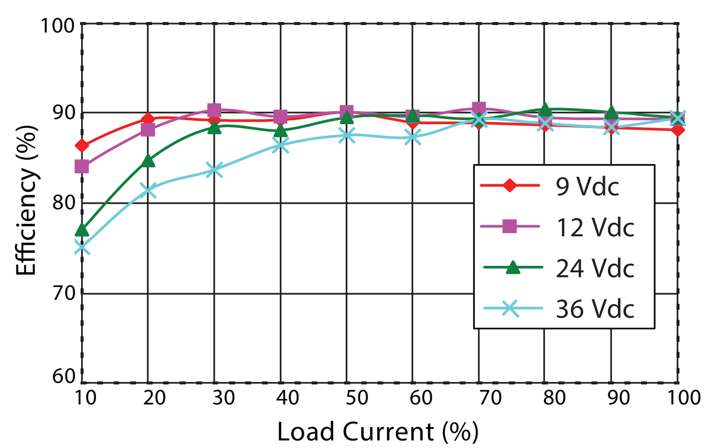
PDQ30-Q24-S5-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



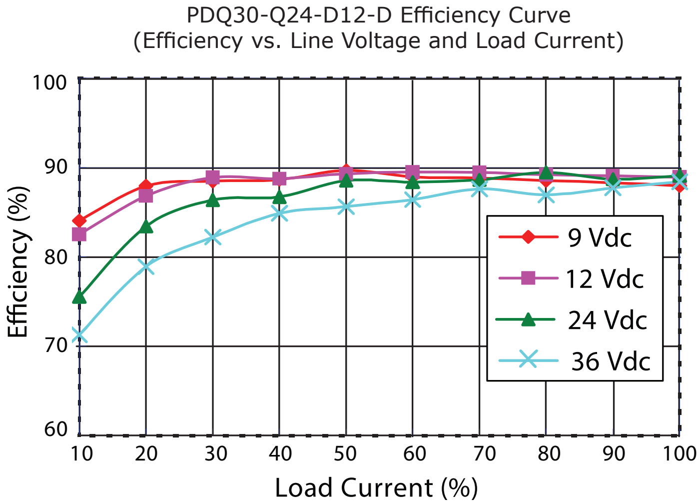
PDQ30-Q24-S12-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

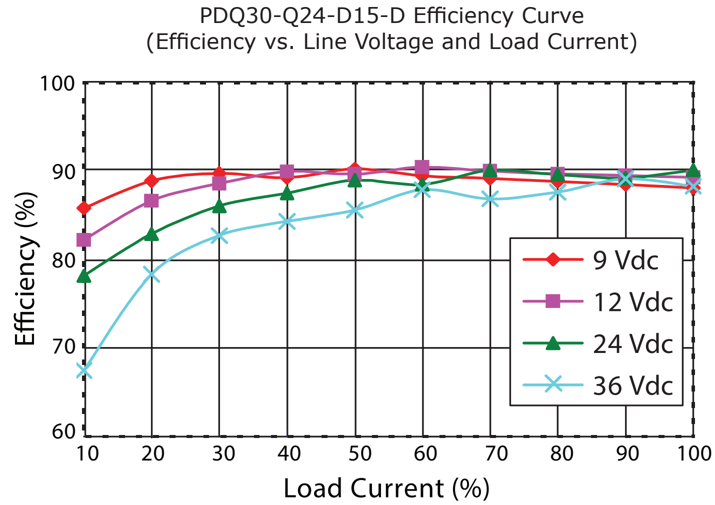


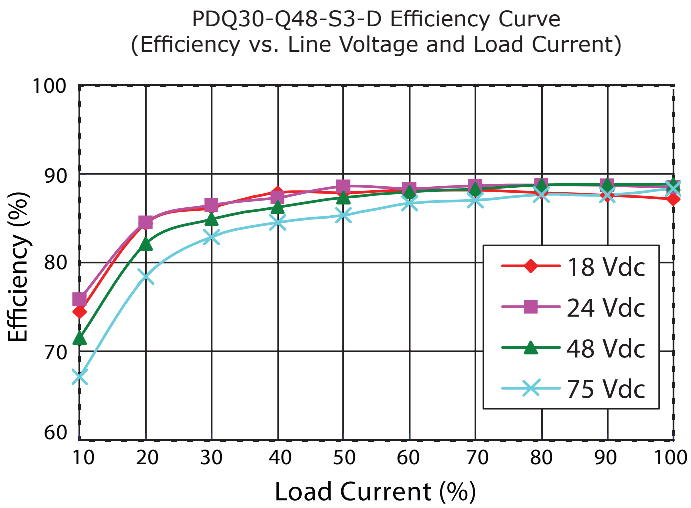
PDQ30-Q24-S15-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

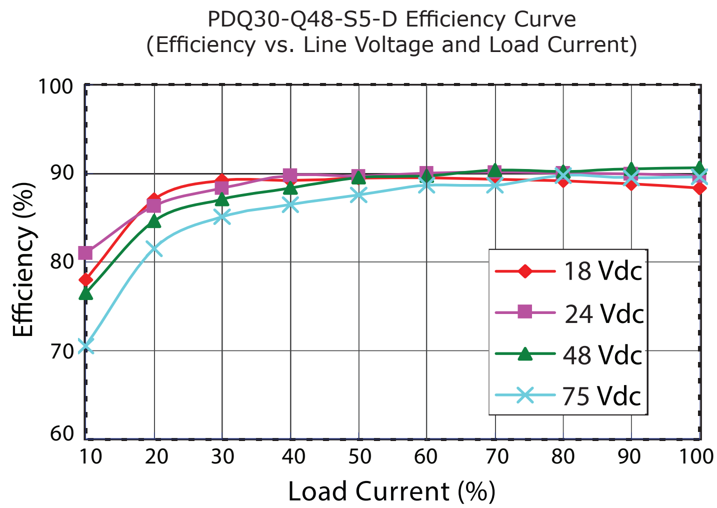


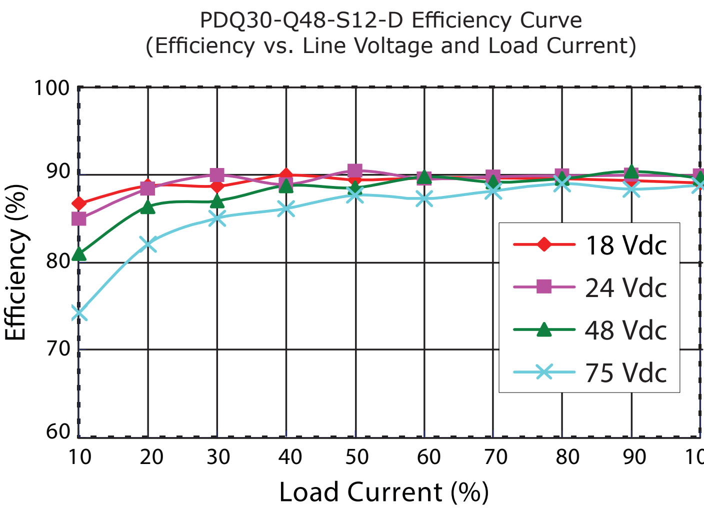
EFFICIENCY CURVES (CONTINUED)

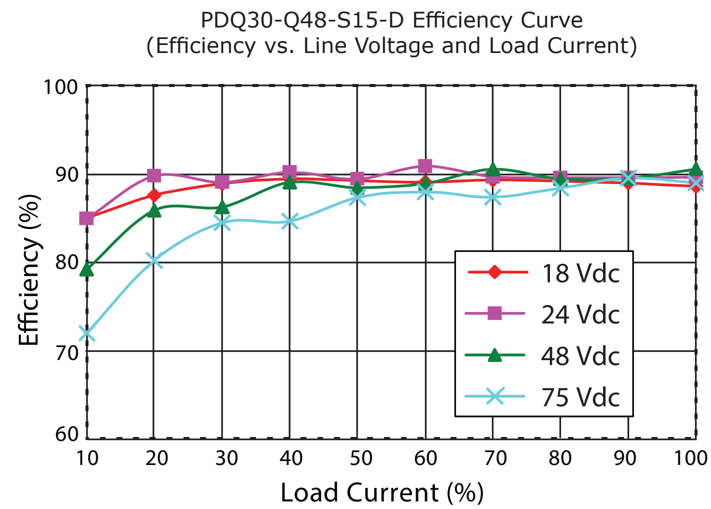






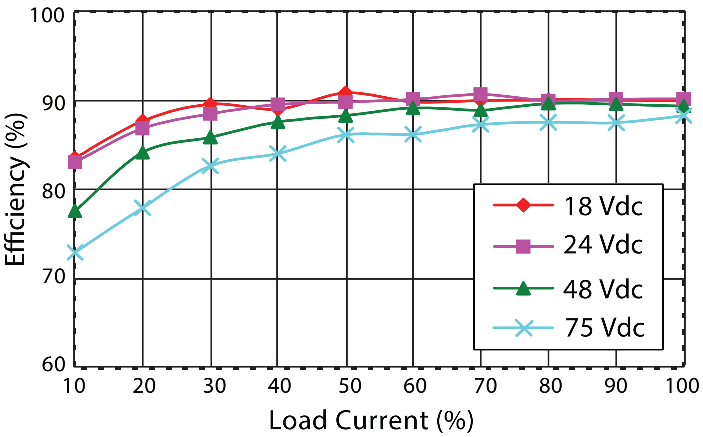




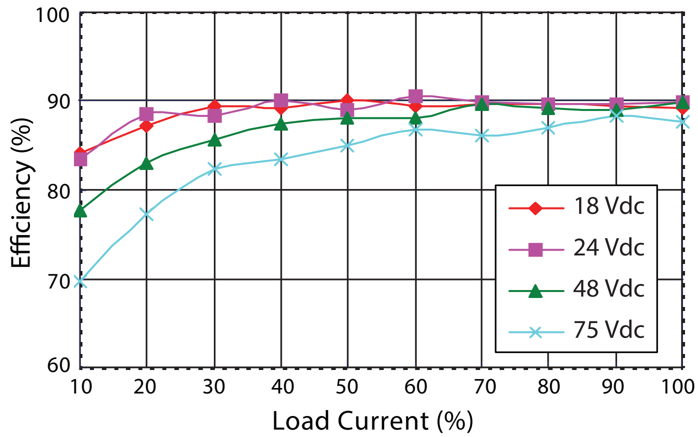


EFFICIENCY CURVES (CONTINUED)

PDQ30-Q48-D12-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



PDQ30-Q48-D15-D Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



TEST CONFIGURATIONS

Input Ripple Current & Output Noise

Figure 1 Measuring Input Ripple Current

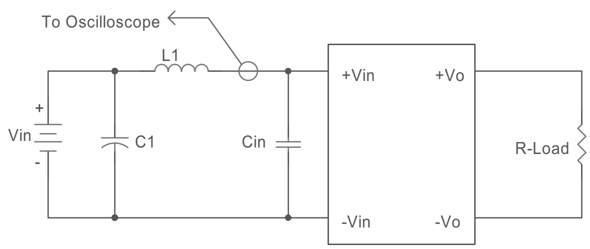


Table 1

L1	12 µH
C1	220 µF ESR < 0.1 Ω at 100 kHz
Cin	33 µF ESR < 0.7 Ω at 100 kHz

Figure 2 Measuring Output Ripple And Noise

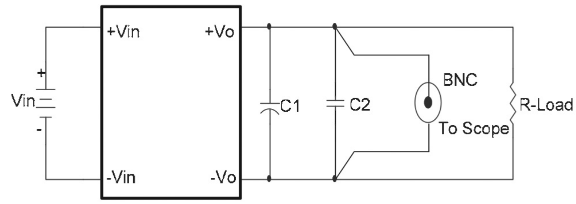


Table 2

C1	10 µF tantalum capacitor
C2	1 µF ceramic capacitor

EMC RECOMMENDED CIRCUIT

Test Condition
Input Voltage: Nominal
Output Load: Full Load

Figure 3 Conducted Emissions Test Circuit

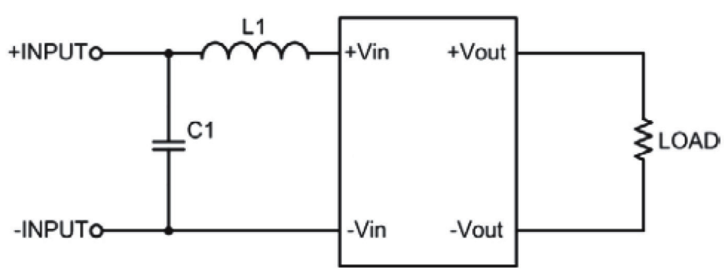


Table 3

EN55022 Class A Recommended External Circuit Components		
Input Voltage (Vdc)	C1	L1
24	100 µF / 50 V	0.47 µH
48	4.7 µF / 100 V	2.2 µH

APPLICATION NOTES

Output Voltage Trimming

The output voltage can be adjusted (single outputs only) by using the trim pin and the use of either an external trim pot or the use of a single fixed resistor (see Figures below). If the trim function is not needed, leave the trim pin open.

Figure 4 Trim Adjustments Using A Trimpot

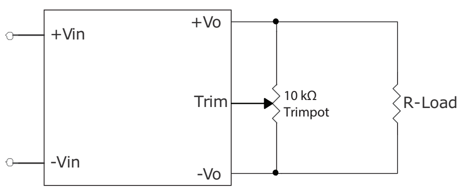


Figure 5 Trim Adjustments To Increase Output Voltage Using A Fixed Resistor

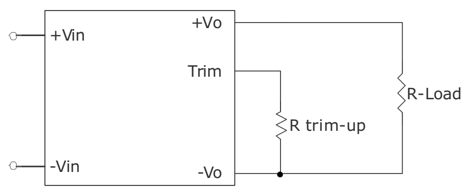
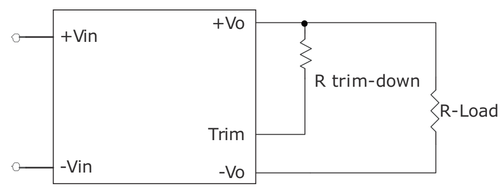


Figure 6 Trim Adjustments To Decrease Output Voltage Using A Fixed Resistor



Formula for Trim Resistor

$$R_{trim-up} = \left(\frac{Vr \times R1 \times (R2 + R3)}{(Vo - V_{o,\,nom}) \times R2}\right) - Rt \quad (\text{k}\Omega)$$

$$R_{trim-down} = R1 \times \left(\frac{Vr \times R1}{(V_{o,\,nom} - Vo) \times R2} - 1\right) - Rt \quad (\text{k}\Omega)$$

Note: $R_{trim\text{-}up}$ is the external resistor in kΩ
$R_{trim\text{-}down}$ is the external resistor in kΩ
$V_{O,\,nom}$ is the nominal output voltage
V_O is the desired output voltage
R1, R2, R3, Rt, and Vr are internal (see Table 4)

Table 4

Output Voltage (Vdc)	R1 (kΩ)	R2 (kΩ)	R3 (kΩ)	Rt (kΩ)	Vr (V)
3.3	2.74	1.8	0.27	9.1	1.24
5	2.32	2.32	0	8.2	2.5
12	6.8	2.4	2.32	22	2.5
15	8.06	2.4	3.9	27	2.5

REVISION HISTORY

rev.	description	date
1.0	initial release	07/12/2016
1.01	added 5 Vdc output efficiency curves	09/04/2018
1.02	safeties updated	05/25/2021

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

CUI INC
a bel group

Headquarters
20050 SW 112th Ave.
Tualatin, OR 97062
800.275.4899

Fax 503.612.2383
cui.com
techsupport@cui.com

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

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