CUI INC
a bel group

SERIES: PRQ100W-D | DESCRIPTION: DC-DC CONVERTER

FEATURES

- 100W isolated output
- ¼-Brick package with industry standard pin-out
- ultra-wide input voltage range
- single regulated output
- high efficiency up to 94%
- output short circuit, over current, over voltage, & over temperature protection
- 2250 Vdc isolation
- EN 62368 approved
- available with heat sink or base plate
- CTRL pin

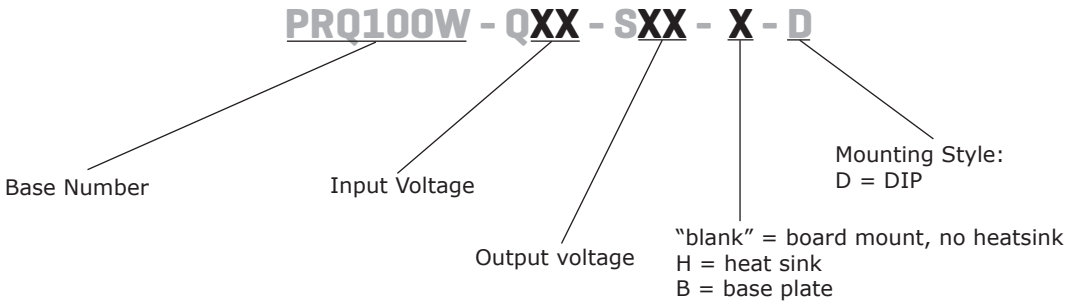
RoHS CE UKCA

MODEL

MODEL	input voltage		output voltage	output current	output power	ripple & noise[1] Vo1/Vo2	efficiency[2]
	max (Vdc)	range (Vdc)	(Vdc)	max (A)	max (W)	max (mVp-p)	min/typ (%)
PRQ100W-Q24-S5[3]	40	9~36	5	20	100	250	87/89
PRQ100W-Q24-S12[3]	40	9~36	12	8.3	100	200	88/90
PRQ100W-Q24-S15[3]	40	9~36	15	6.7	100	200	88/90
PRQ100W-Q24-S24[3]	40	9~36	24	4.2	100	250	88/90
PRQ100W-Q24-S48[3]	40	9~36	48	2.1	100	250	88/90
PRQ100W-Q48-S5	80	18~75	5	20	100	250	91/93
PRQ100W-Q48-S12	80	18~75	12	8.3	100	200	91/93
PRQ100W-Q48-S15	80	18~75	15	6.7	100	200	92/94
PRQ100W-Q48-S24	80	18~75	24	4.2	100	250	91/93
PRQ100W-Q48-S48	80	18~75	48	2.1	100	250	91/93

Notes:
1. 20MHz bandwidth, nominal input, full load
2. Efficiency is measured with 24 V input voltage and rated output load.
3. Model is not CE certified.

PART NUMBER KEY



INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage		9	24	40	Vdc
start-up voltage				9	Vdc
surge voltage	for maximum of 1 second	-0.7		50	Vdc
current	full load / no load 24 Vdc input models 48 Vdc input models		 4.68/0.12 2.26/0.05	 4.79/0.16 2.34/0.08	 A A
filter	Pi filter				
CTRL	module on: CTRL open or pulled high (3.5~12 V) module off: CTRL pulled low to GND (0~1.2 V)				

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	output voltage 5 Vdc 12 Vdc & 15 Vdc 24 Vdc 48 Vdc			 6,000 2,000 1,000 470	 µF µF µF µF
voltage accuracy	0% to full load			±3	%
line regulation	from low line to high line, full load			±0.5	%
load regulation	5% to full load			±0.75	%
switching frequency	PWM mode		250		kHz
transient recovery time	25% load step change, nominal input voltage		200	500	µs
transient response deviation	25% load step change, nominal input voltage		±3	±5	%
temperature coefficient	at full load			±0.03	%/°C
adjustability	see trim resistor connection			±10	%
remote sense	see remote sense application circuit			110	%Vo

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection		110		160	%
over current protection		110		150	%
short circuit protection	continuous, auto recovery, hiccup				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output input to case output to case	2,250 1,600 500			Vdc Vdc Vdc
isolation resistance	input to output at 500 Vdc	100			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		2,200		pF
safety approvals	certified to 62368-1: EN, BS EN designed to meet 62368-1: UL (Q24 models only) designed to meet 50155: EN (Q24 models only)				
EMI/EMC	CISPR 32/EN 55032 Class A & Class B (see the recommended circuit)				
concucted emissions	EN50121-3-2 150kHz-500kHz 99dBuV, EN55016-2-1 500kHz-30MHz 93dBuV				
radiated emissions	EEN50121-3-2 30MHz-230MHz 40dBuV/m at 10m, EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m				
ESD	IEC/EN 61000-4-2 Contact ±6KV/Air ±8KV, perf. Criteria B EN 50121-3-2 Contact ±6KV/Air ±8KV				
radiated immunity	IEC/EN 61000-4-3 20 V/m, perf. Criteria A, EN50121-3-2 80MHz-800MHz 20V/m(rms)				
EFT/burst	IEC/EN 61000-4-4 ±2KV (see the recommended circuit), perf. Criteria A EN 50121-3-2 ±2kV 5/50ns 5kHz				
surge	EN 50121-3-2 line to line ±1KV (42Ω 0.5uF see the recommended circuit)				
conducted immunity	IEC/EN 61000-4-6 10 Vr.m.s, perf. Criteria A, EN50121-3-2 0.15MHz-80MHz 10Vr.m.s				
MTBF	as per MIL-HDBK-217F, 25°C	500			K hours
RoHS	yes				

ENVIRONMENTAL

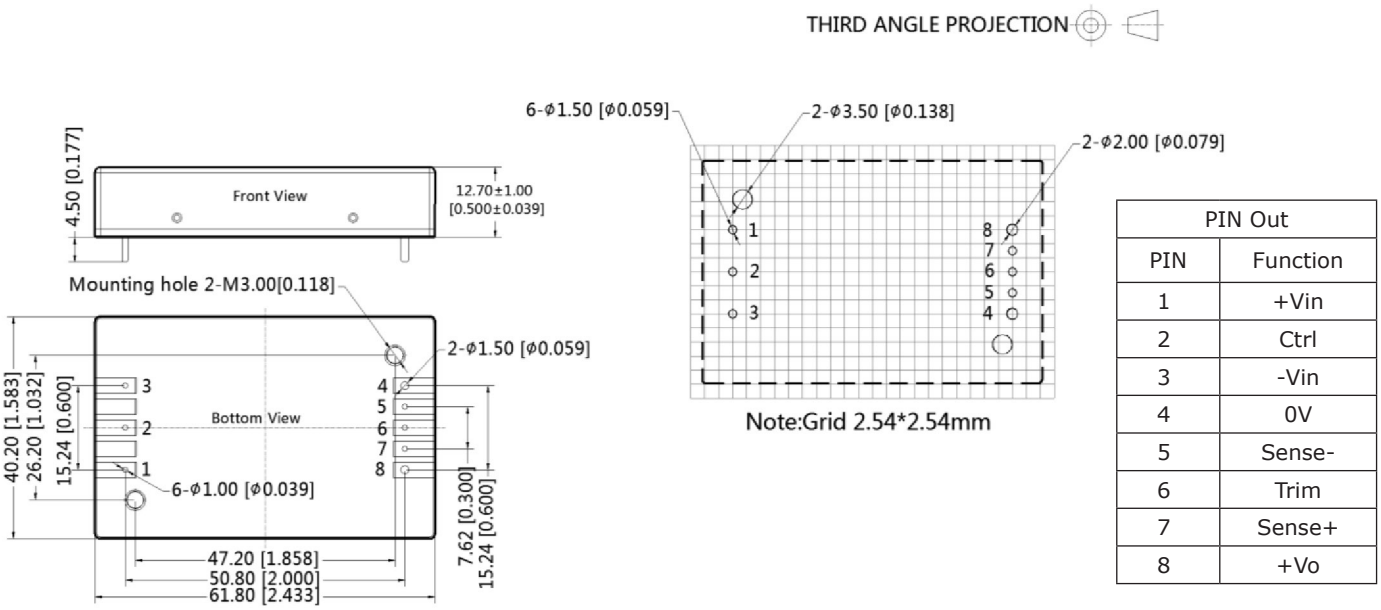
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%

MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	61.8 × 40.2 × 12.7 [2.43 x 1.58 x 12.5 inch]				mm
	with base plate 62.0 × 56.0 × 14.6 [2.44 x 2.2 x 0.57 inch]				mm
	with heat sink 61.8 × 40.2 × 27.7 [2.43 x 1.58 x 1.09 inch]				mm
case material	aluminum alloy				
weight			86		g
	with base plate		106		g
	with heat sink		117		g

MECHANICAL DRAWING

units: mm [inch]
pin 1, 2, 3, 5, 6, 7's diameter: 1.00 [0.039]
pin 4, 8's diameter: 1.50 [0.059]
pin diameter tolerance: ±0.10 [±0.004]
general tolerance: ±0.50[±0.020]
mounting hole screwing torque: Max 0.4 N·m



PIN Out	
PIN	Function
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

MECHANICAL DRAWING

units: mm [inch]
pin 1, 2, 3, 5, 6, 7's diameter: 1.00 [0.039]
pin 4, 8's diameter: 1.50 [0.059]
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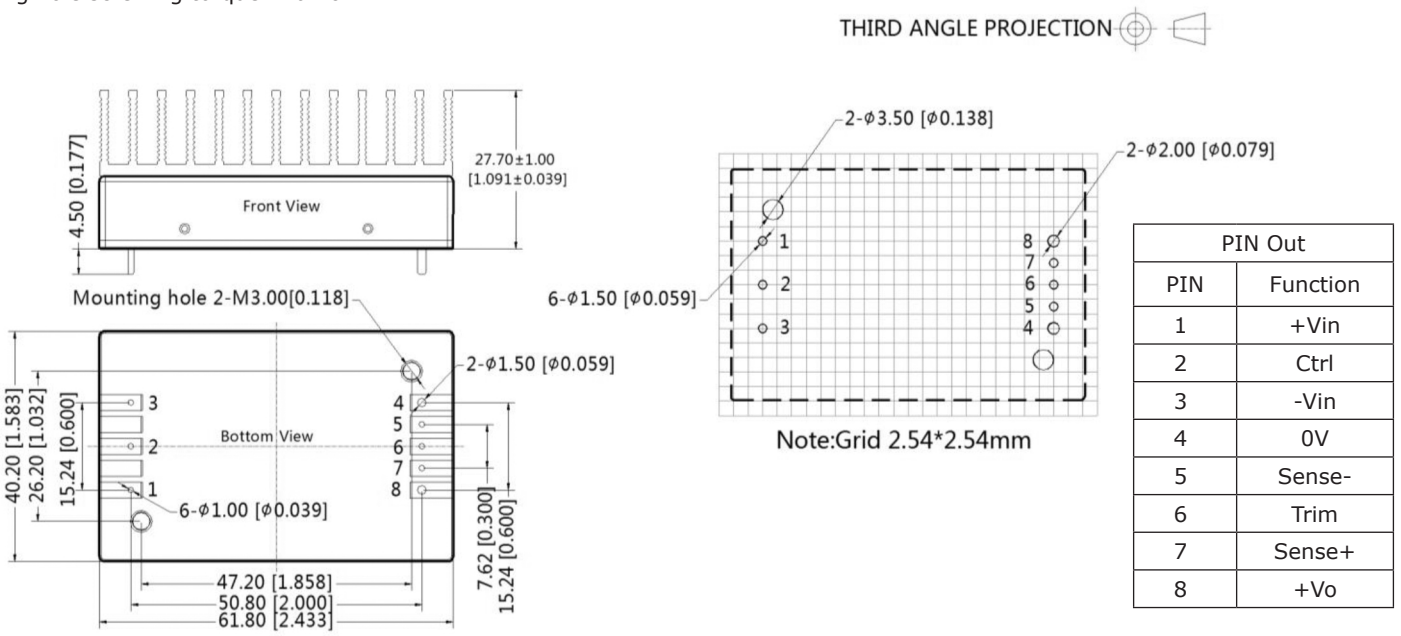

PIN Out	
PIN	Function
1	+Vin
2	Ctrl
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5	Sense-
6	Trim
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units: mm [inch]
pin 1, 2, 3, 5, 6, 7's diameter: 1.00 [0.039]
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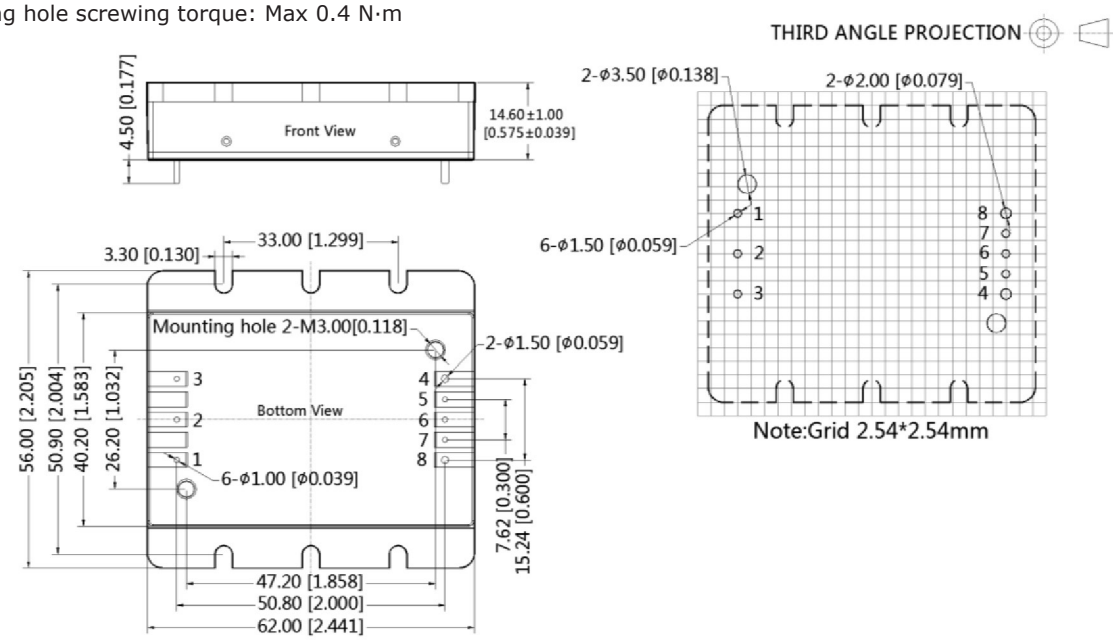
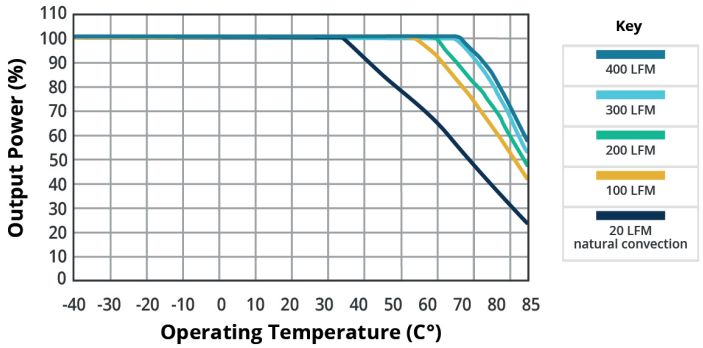


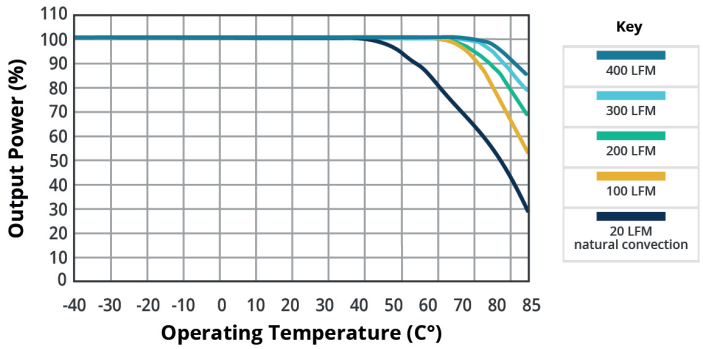
PIN Out	
PIN	Function
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

DERATING CURVES

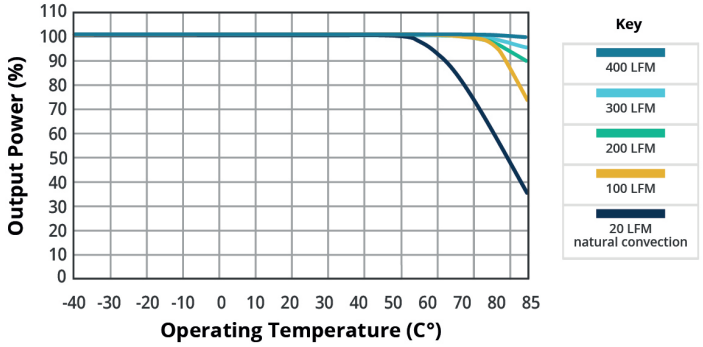
TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-D



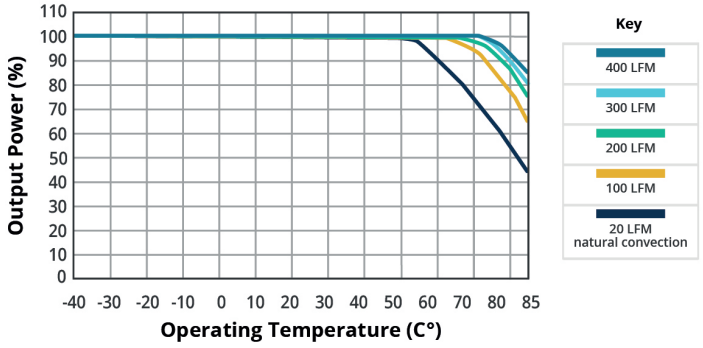
TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-B-D (base plate option)



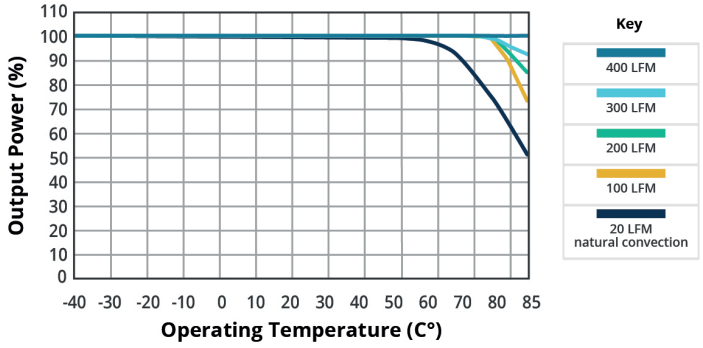
TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-H-D (with heatsink)



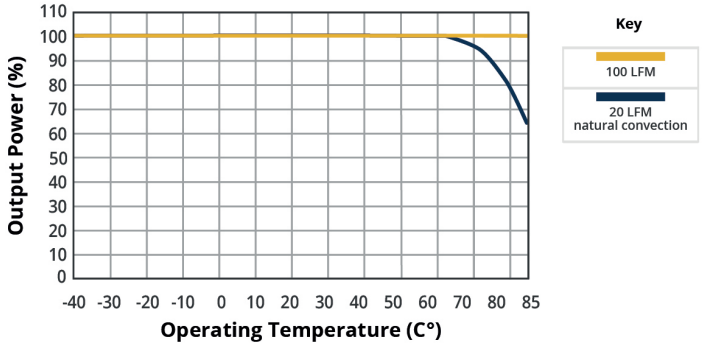
TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-D



TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-B-D (base plate option)



TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-B-D (with heatsink)



APPLICATION CIRCUIT

Figure 1

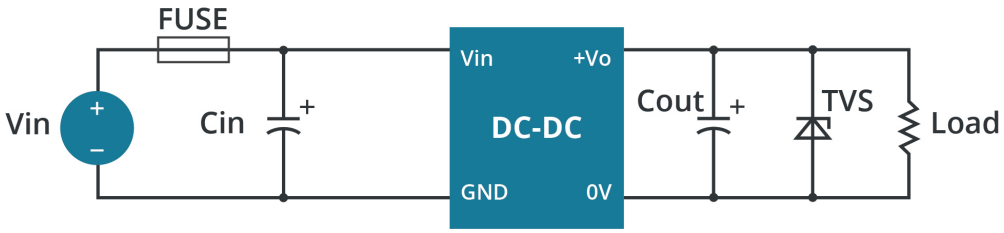


Table 1

Vin (Vdc)	Vout (Vdc)	Fuse	Cin[1]	Cout	TVS
24	5	20A slow blow	220µF	470µF	SMDJ7.0A
	12			220µF	SMDJ15A
	15				SMDJ18A
	24			100µF	SMDJ30A
	28				SMDJ36A
	48				SMDJ64A
48	5	10A slow blow	220µF	470µF	SMDJ6.0A
	12			220µF	SMDJ14A
	15				SMDJ17A
	24			100µF	SMDJ28A
	48				SMDJ54A

Note: 1. Please pay attention to the ambient temperature of the product when using an external capacitor. Increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low (such as -25°C).

EMC RECOMMENDED CIRCUIT

Figure 2

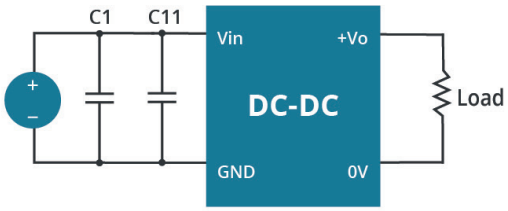


Table 2

Capacitor	Recommended value	Function
C1	150 µF electrolytic capacitor	Meets EFT and surge
C11	47 µF electrolytic capacitor	

EMC RECOMMENDED CIRCUIT (CONTINUED)

Figure 3
24 V input models

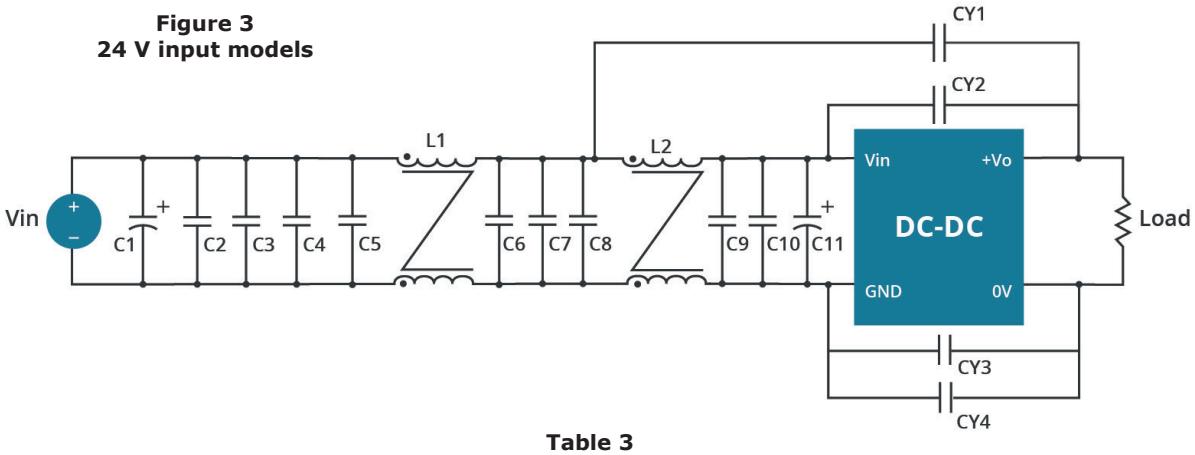


Table 3

Class A components	Class B components	Recommended component value	Function
C1		150µF electrolytic capacitor	Meets conducted emission and radiated emission
C11		47µF electrolytic capacitor	
C2, C3, C4, C5, C6, C7, C8, C9, C10		10µF ceramic capacitor	
L1, L2		1.6mH common mode inductor	
CY3	CY1, CY2	2.2nF Y1 safety capacitor	
	CY3, CY4	1nF Y1 safety capacitor	

Figure 4
48 V input models

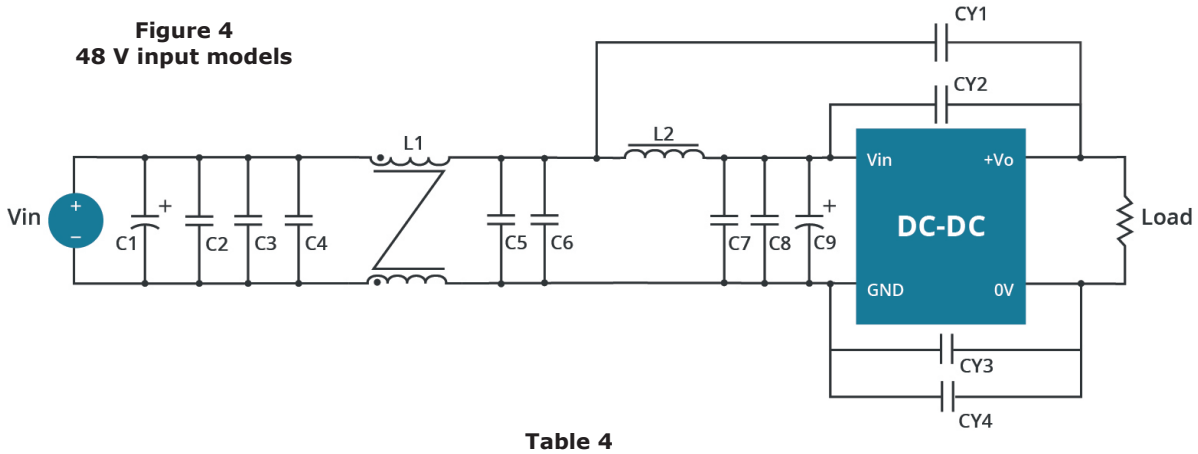


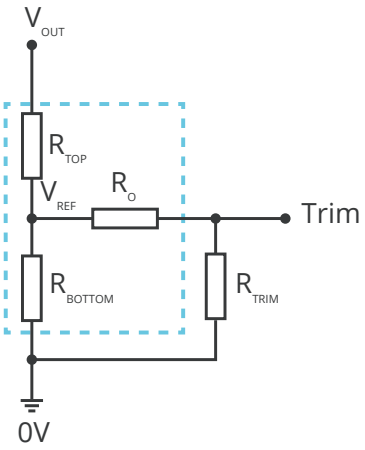
Table 4

Class A components	Class B components	Recommended component value	Function
C1		150µF electrolytic capacitor	Meets EFT and surge
C9		47µF electrolytic capacitor	
C1		150µF electrolytic capacitor	Meets conducted emission and radiated emission
C9		47µF electrolytic capacitor	
C2, C3, C4, C5, C6, C7, C8		2.2µF ceramic capacitor	
L1		1.0mH common mode inductor	
L2		1.5µH inductance	
CY3	CY1, CY2, CY3, CY4	1nF Y1 safety capacitor	

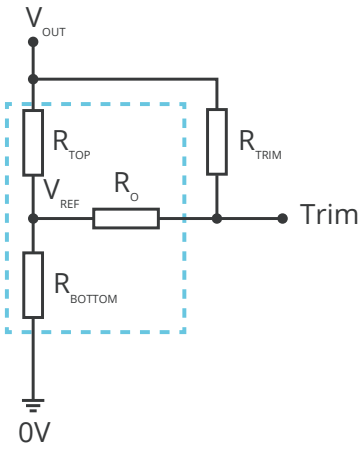
TRIM RESISTOR CONNECTION

Figure 5

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

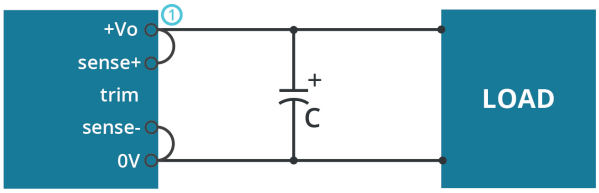
V_{IN}	V_{NOM}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}
(Vdc)	(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)
24	5	3.036	3	10	2.5
	12	11.00	2.87	15	2.5
	15	14.03	2.8	15	2.5
	24	24.872	2.87	15	2.5
	28	29.201	2.851	15	2.5
	48	53.017	2.894	15	2.5
48	5	3.036	3	10	2.5
	12	11.00	2.87	15	2.5
	15	14.03	2.8	15	2.5
	24	24.872	2.87	15	2.5
	48	53.017	2.913	15	2.5

Note: Value for R_{TOP}, R_{BOTTOM}, R_O, and V_{REF} refer to Table 5 (fixed internal values).
R_{TRIM}: Trim resistance
a: User-defined parameter, no actual meanings
V_{NOM}: Nominal output voltage
V_{OUT}: Target output voltage
V_{IN}: Input voltage

REMOTE SENSE APPLICATION

Figure 6

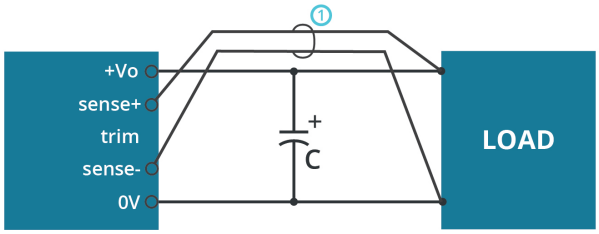
REMOTE SENSE CONNECTION IF NOT USED



Note: 1. Lines must be kept as short as possible.
2. If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V at the dc-dc converter pins and will compensate for voltage drop across pins only.
3. The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and /or causing unstable operation of the power module.

Figure 7

REMOTE SENSE CONNECTION USED FOR COMPENSATION



Note: 1. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.
2. Using remote sense with long wires may cause unstable operation. Note that large wire impedance may cause oscillation of the output volt age and/or increased ripple. Consult technical support or factory for further advice of sense operation.
3. We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.

REVISION HISTORY

rev.	description	date
1.0	initial release	09/03/2020
1.01	derating curves and circuit figures updated	09/06/2021
1.02	input current updated	02/15/2022
1.03	CE certification for 24V model updated, UKCA mark added	10/25/2022
1.04	output voltage trimming updated	05/30/2023
1.05	derating curves and circuts updated	10/24/2023

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.

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CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.