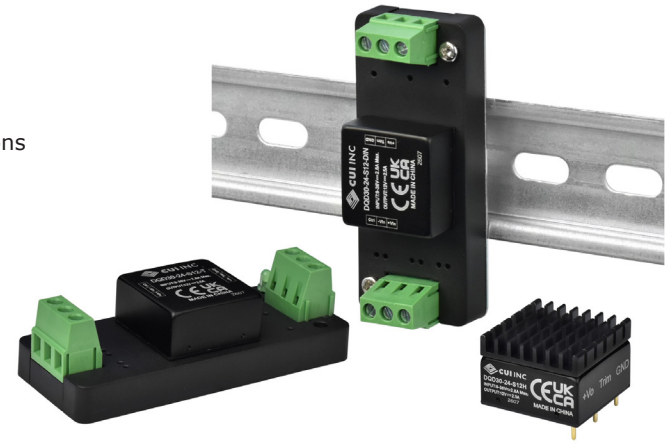
SERIES: DQD30 | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 30 W isolated output
- single regulated outputs
- over voltage, input under voltage, short circuit, and over current protections
- remote on/off control
- 1,500 Vdc isolation
- -40 ~ 105°C temperature range, with derating
- certified to IEC/EN 62368-1
- PCB, chassis and DIN-rail mount options



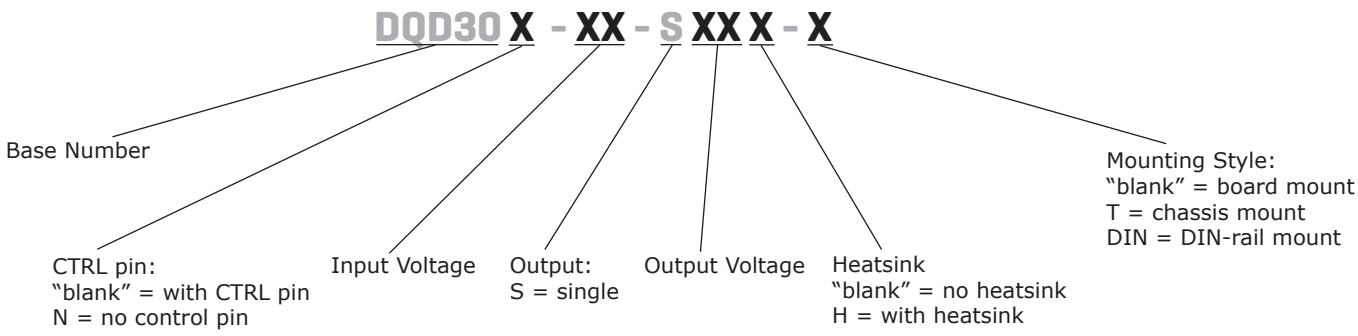
RoHS CE UKCA

MODEL

MODEL	input voltage		output voltage	output current	output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	typ (Vdc)	max (mA)	max (W)	max (mVp-p)	typ (%)
DQD30-24-S3	24	9~36	3.3	6,000	19.8	100	87
DQD30-24-S5	24	9~36	5	6,000	30	100	88
DQD30-24-S6	24	9~36	6	5,000	30	100	89
DQD30-24-S9	24	9~36	9	3,333	30	100	90
DQD30-24-S12	24	9~36	12	2,500	30	100	90
DQD30-24-S15	24	9~36	15	2,000	30	100	90
DQD30-24-S24	24	9~36	24	1,250	30	100	90
DQD30-24-S48	24	9~36	48	625	30	100	88
DQD30-48-S3	48	18~75	3.3	6,000	19.8	100	87
DQD30-48-S5	48	18~75	5	6,000	30	100	88
DQD30-48-S9	48	18~75	9	3,333	30	100	90
DQD30-48-S12	48	18~75	12	2,500	30	100	91
DQD30-48-S15	48	18~75	15	2,000	30	100	91
DQD30-48-S24	48	18~75	24	1,250	30	100	90

Notes:
1. The ripple and noise is measured at 0%~100% load and 20MHz bandwidth.
2. The efficiency is tested at full load.
3. Unless otherwise specified, all values or indicators in this manual are tested at Ta=25°C, humidity<75%RH, rated input voltage and rated load (pure resistance load).

PART NUMBER KEY



INPUT

parameter	conditions/description	min	typ	max	units
input voltage range	24 Vdc input models	9	24	36	Vdc
	48 Vdc input models	18	48	75	Vdc
input current (full load/no load)	24 Vdc input; 3.3 Vdc output model		948/40		mA
	24 Vdc input; 5 Vdc output model		1,420/40		mA
	24 Vdc input; 6 Vdc output model		1,404/40		mA
	24 Vdc input; 9, 12, 15 Vdc output models		1,388/40		mA
	24 Vdc input; 24 Vdc output models		1,388/3		mA
	24 Vdc input; 48 Vdc output models		1,420/8		mA
	48 Vdc input; 3.3 Vdc output models		474/40		mA
	48 Vdc input; 5 Vdc output model		710/40		mA
	48 Vdc input; 9, 12, 15 Vdc output models		694/40		mA
	48 Vdc input; 24 Vdc output model		694/2		mA
maximum input current	24 Vdc input models			4.4	A
	48 Vdc input models			2.1	A
surge voltage	1 second max				
	24 Vdc input models	-0.7		50	Vdc
	48 Vdc input models	-0.7		100	Vdc
start-up voltage	24 Vdc input models		8	9	Vdc
	48 Vdc input models		15	18	Vdc
input undervoltage protection	24 Vdc input models	5	7	9	Vdc
	48 Vdc input models	11	13	18	Vdc
filter	Pi filter				
no load power consumption	24 Vdc output models		0.08		W
	48 Vdc output models		0.2		W
	all other output models		1.0		W
remote on/off[5]	module on	CTRL pin left open or pulled high (3.3~12 Vdc)			
	module off	CTRL pin connected to -Vin or pulled low (0~1.2 Vdc)			
input current when off			2		mA
reflected ripple current	at nominal input		30		mA

Notes: 5. The voltage of CTRL pin is relative to -Vin pin.

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	24 Vdc input; 3.3, 5 Vdc output models			10,000	µF
	24 Vdc input; 6 Vdc output models			8,000	µF
	24 Vdc input; 9 Vdc output models			3,000	µF
	24 Vdc input; 12 Vdc output models			2,000	µF
	24 Vdc input; 15 Vdc output models			1,500	µF
	24 Vdc input; 24 Vdc output models			750	µF
	24 Vdc input; 48 Vdc output models			330	µF
	48 Vdc input; all output models			10,000	µF
voltage accuracy			±1	±3	%
voltage regulation	full voltage range, nominal load		±0.2	±0.5	%
load regulation	10% ~ 100% load		±0.5	±1	%
transient response recovery	25% rated load step change		300	500	µs
transient response deviation	25% rated load step change				
	≤6 Vdc output models		±5	±8	%
	all other models		±3	±5	%
start-up time	at nominal input		20		ms
switching frequency	PWM mode		280		kHz
adjustability	via trim	90		110	%
temperature coefficient	at full load			±0.03	%/°C

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over current protection		110	140	260	%
over voltage protection		120	140	220	%
short circuit protection	continuous, auto recovery, hiccup				
output overshoot				10	%

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute, 1 mA max input/output to case for 1 minute, 1 mA max	1,500 1,000			Vdc Vdc
isolation capacitance	input to output, (100 kHz, 0.1V)		1,000		pF
safety approvals	certified to 62368-1: IEC, EN				
conducted emissions	CISPR32/EN55032 Class B (see recommended circuit)				
radiated emissions	CISPR32/EN55032 Class B (see recommended circuit)				
ESD	IEC/EN 61000-4-2 Contact ±6 kV, Perf. Criteria B				
radiated immunity	IEC/EN 61000-4-3 10 V/m, Perf. Criteria A (see recommended circuit)				
conducted immunity	IEC/EN 61000-4-6 3 Vrms, Perf. Criteria A (see recommended circuit)				
surge	IEC/EN 61000-4-5 ±2 kV, Perf. Criteria B (see recommended circuit)				
EFT	IEC/EN 61000-4-4 ±2 kV Perf. Criteria B (see recommended circuit)				
vibration	10–150 Hz, 5 G, 0.75 mm along X, Y, Z axis				
MTBF	as per MIL-HDBK-217F at 25 °C	1,000,000			hours
RoHS	yes				

ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		105	°C
max case temperature				105	°C
storage temperature		-55		125	°C
operating humidity	non condensing	5		95	%

SOLDERING

parameter	conditions/description	min	typ	max	units
pin soldering temperature	solder joint 1.5 mm from housing, 10 s			300	°C

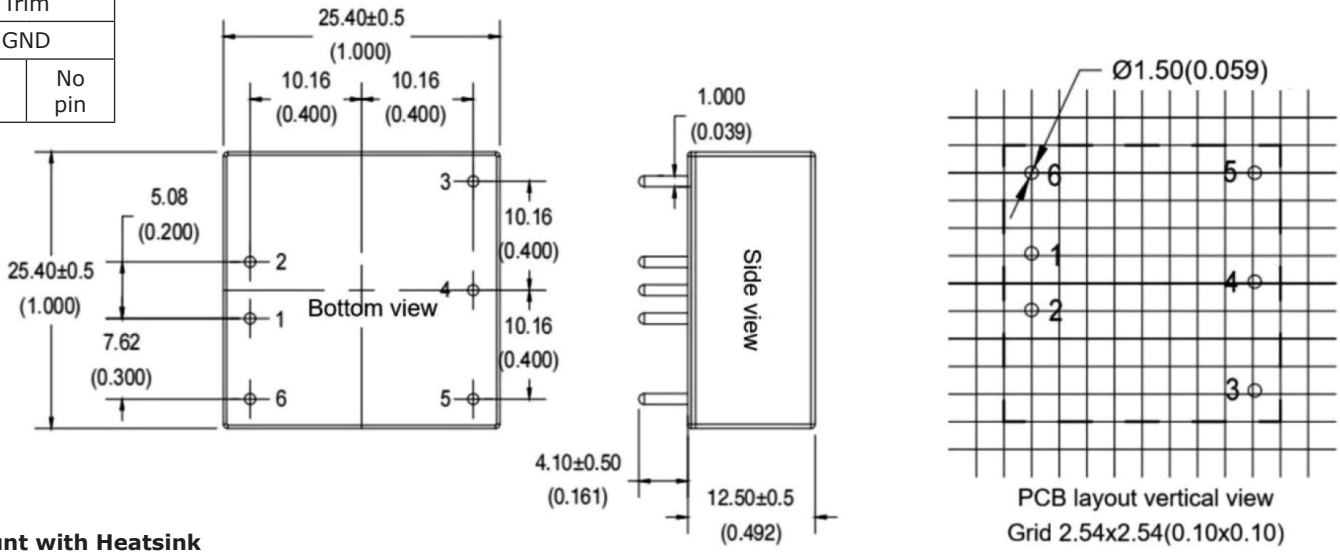
MECHANICAL

parameter	conditions/description		min	typ	max	units
dimensions	board mount: 25.4 x 25.4 x 12.5 [1.000 x 1.000 x 0.492 inches] board mount with heatsink: 25.4 x 25.4 x 17.5 [1.000 x 1.000 x 0.689 inches] chassis mount: 76.0 x 31.5 x 21.3 [2.990 x 1.240 x 0.838 inches] chassis mount with heatsink 76.0 x 31.5 x 26.0 [2.990 x 1.240 x 1.023 inches] DIN-rail mount: 76.0 x 31.5 x 26.0 [2.990 x 1.240 x 1.023 inches] DIN-rail mount with heatsink: 76.0 x 31.5 x 30.8 [2.990 x 1.240 x 1.212 inches]					mm mm mm mm mm mm
case material	aluminum					
weight	single output models	board mount board mount with heatsink chassis mount chassis mount with heatsink DIN-rail mount DIN-rail mount with heatsink		18 21 39 42 59 62		g g g g g g
cooling	natural convection					

MECHANICAL DRAWING

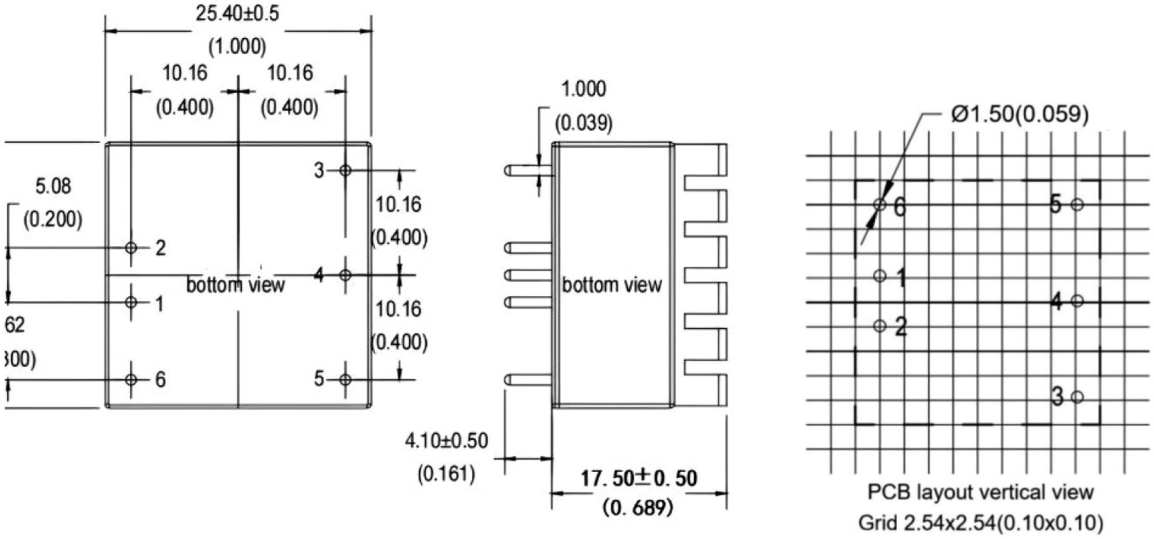
Board Mount
units: mm [inch]
pin diameter tolerance: ±0.10 [±0.004]
general tolerance: ±0.50 [±0.020]

PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin



Board Mount with Heatsink
units: mm [inch]
pin diameter tolerance: ±0.10 [±0.004]
general tolerance: ±0.50 [±0.020]

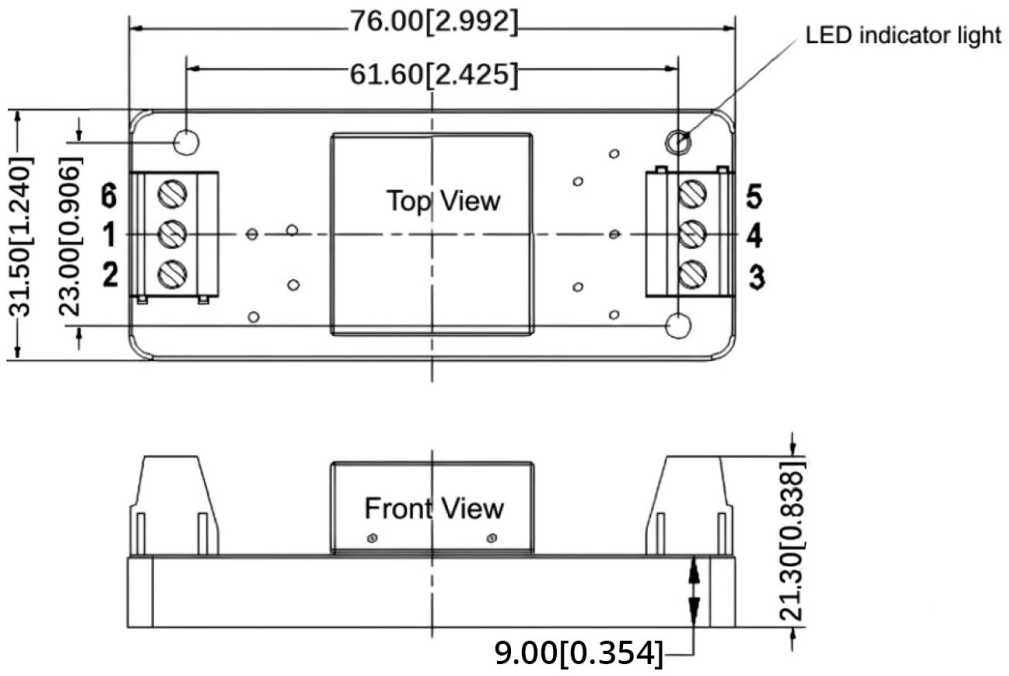
PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin



MECHANICAL DRAWING (CONTINUED)

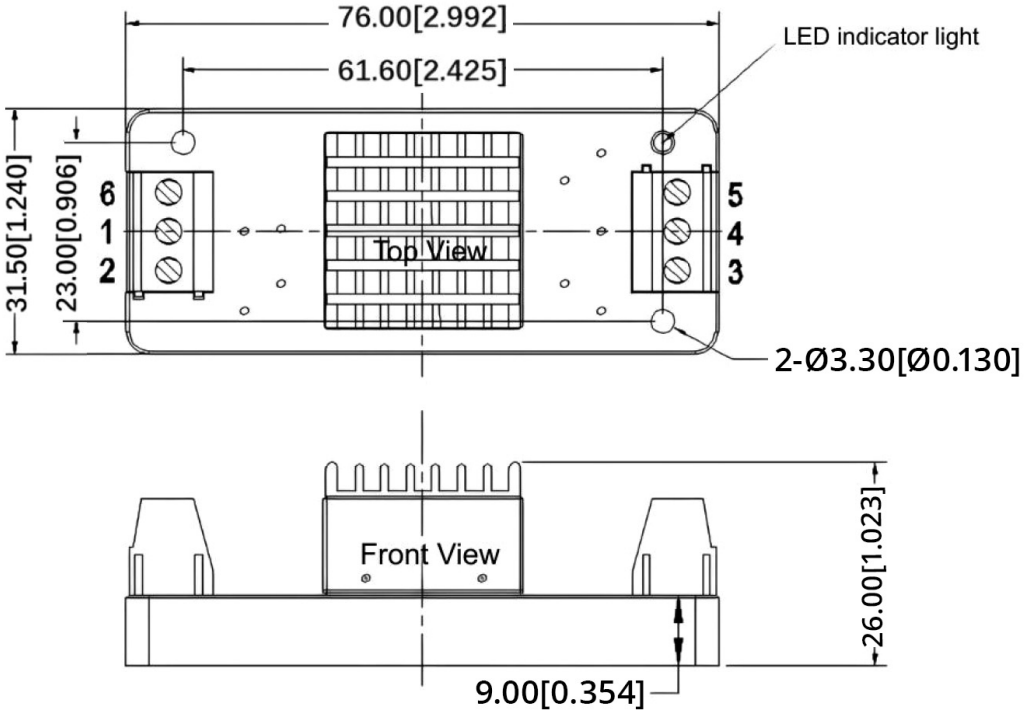
Chassis Mount
units: mm [inch]
general tolerance: ±1.00 [±0.039]
wire range: 24~12 AWG
tightening torque: max 0.4 N·m

PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin



Chassis Mount with Heatsink
units: mm [inch]
general tolerance: ±1.00 [±0.039]
wire range: 24~12 AWG
tightening torque: max 0.4 N·m

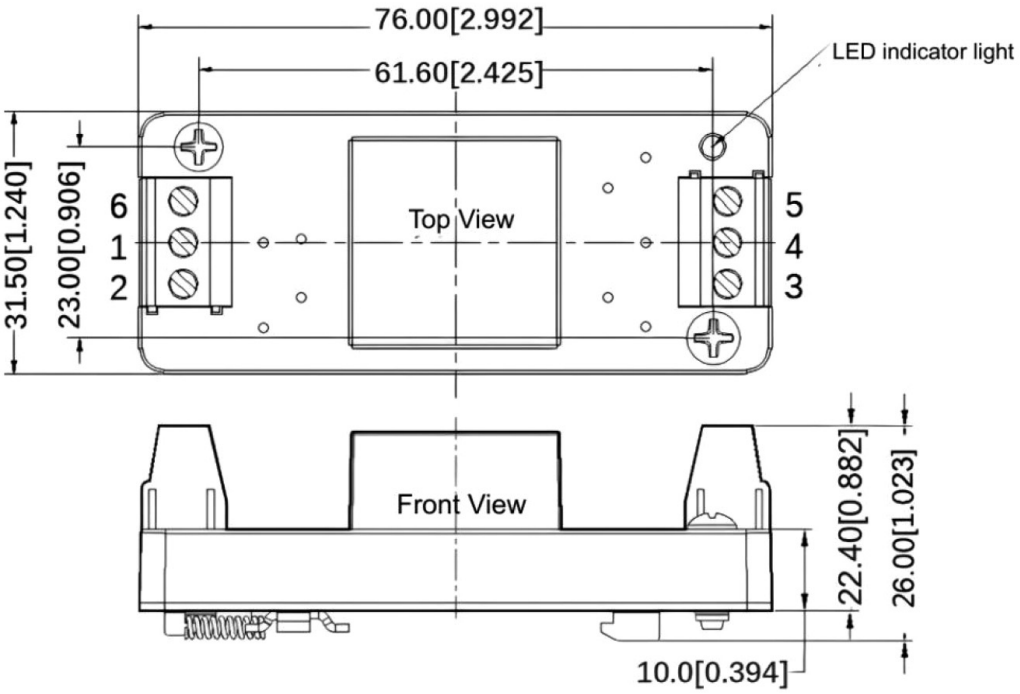
PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin



MECHANICAL DRAWING (CONTINUED)

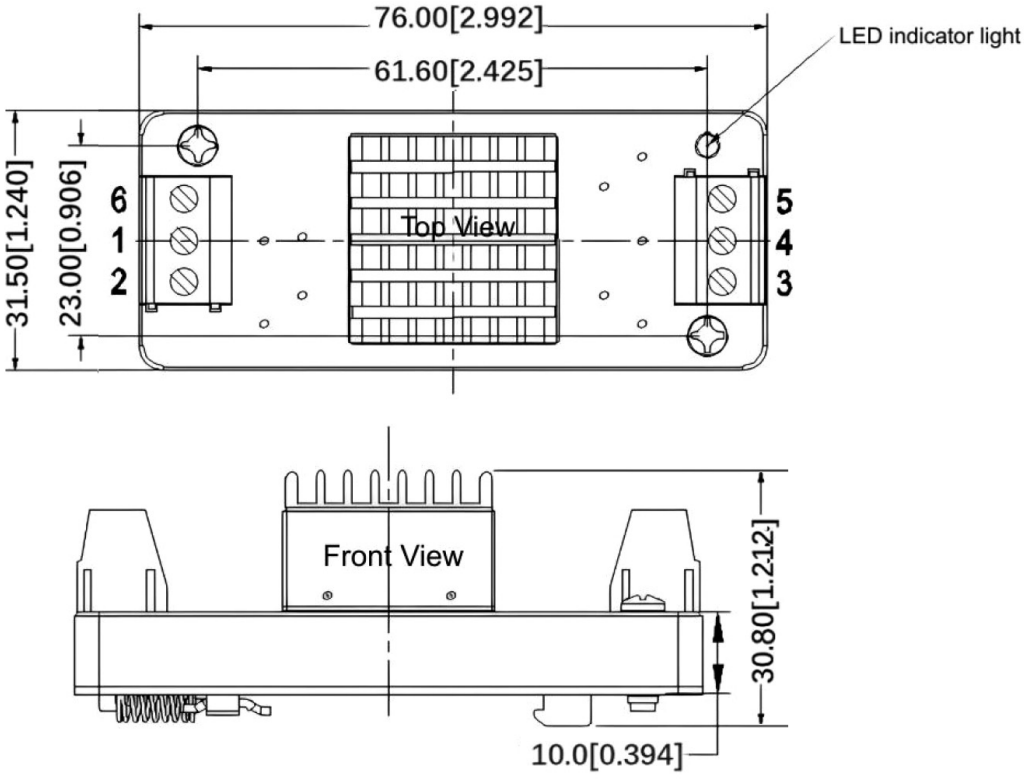
DIN-rail Mount
units: mm [inch]
general tolerance: ±1.00 [±0.039]
wire range: 24~12 AWG
tightening torque: max 0.4 N·m

PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin



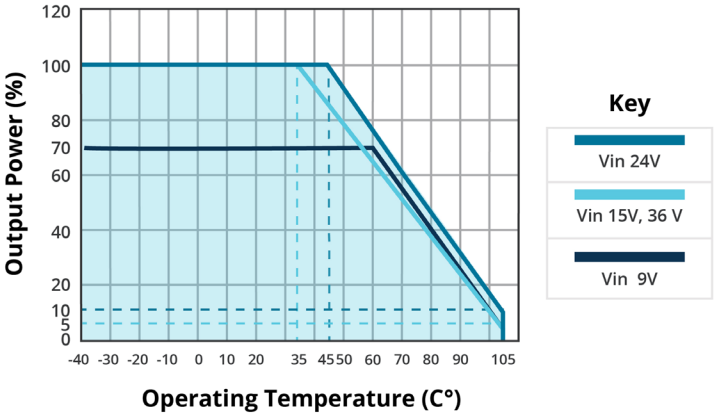
DIN-rail Mount with Heatsink
units: mm [inch]
general tolerance: ±1.00 [±0.039]
wire range: 24~12 AWG
tightening torque: max 0.4 N·m

PIN CONNECTIONS		
PIN	Function	
1	-Vin	
2	+Vin	
3	+Vo	
4	Trim	
5	GND	
6	Ctrl	No pin

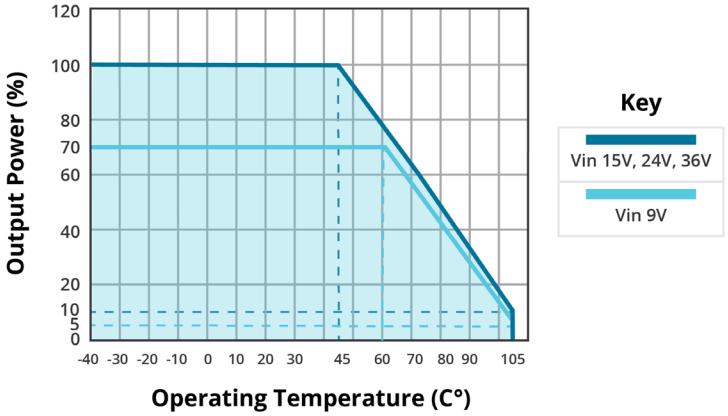


DERATING CURVES

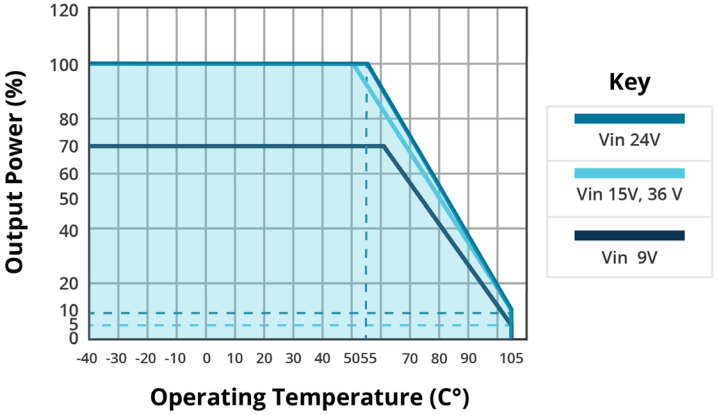
TEMPERATURE DERATING CURVE
DQD30-24-S3, DQD30-24-S5, DQD30-24-S6



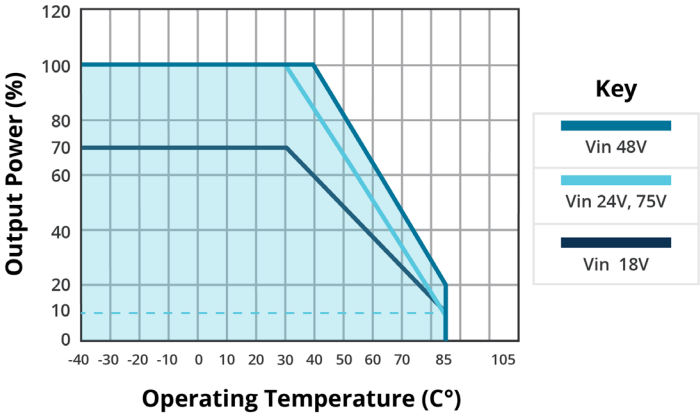
TEMPERATURE DERATING CURVE
DQD30-24-S9, DQD30-24-S12, DQD30-24-S48



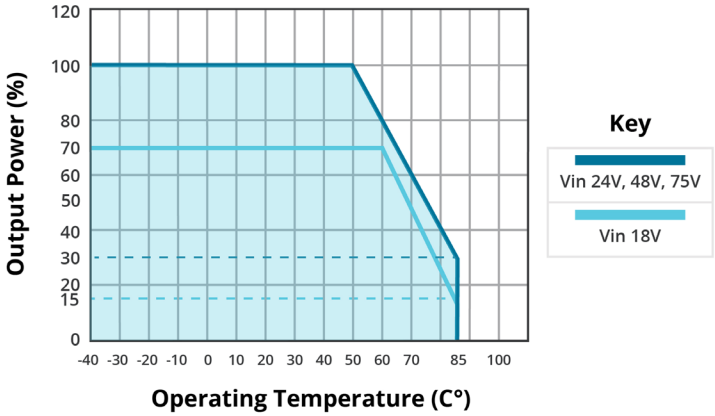
TEMPERATURE DERATING CURVE
DQD30-24-S15, DQD30-24-S24



TEMPERATURE DERATING CURVE
DQD30-48-S3, DQD30-48-S5, DQD30-48-S9

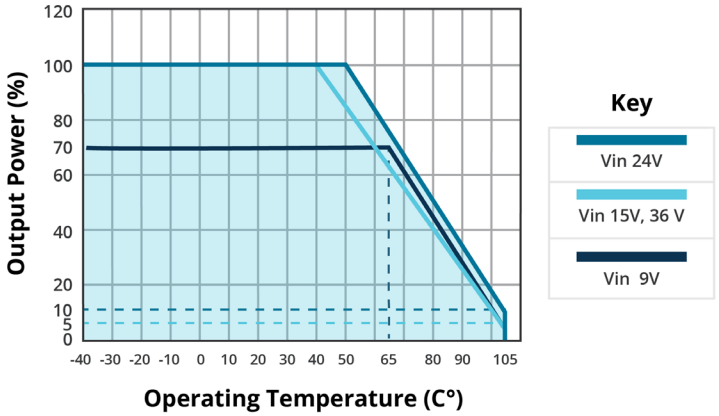


TEMPERATURE DERATING CURVE
DQD30-48-S12, DQD30-48-S15, DQD30-48-S24

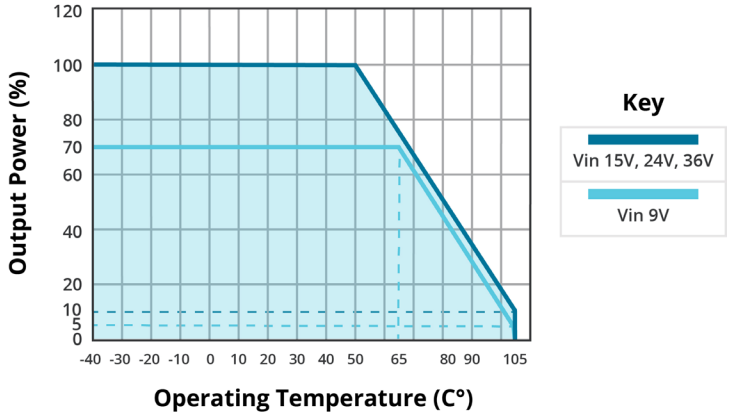


DERATING CURVES (CONTINUED)

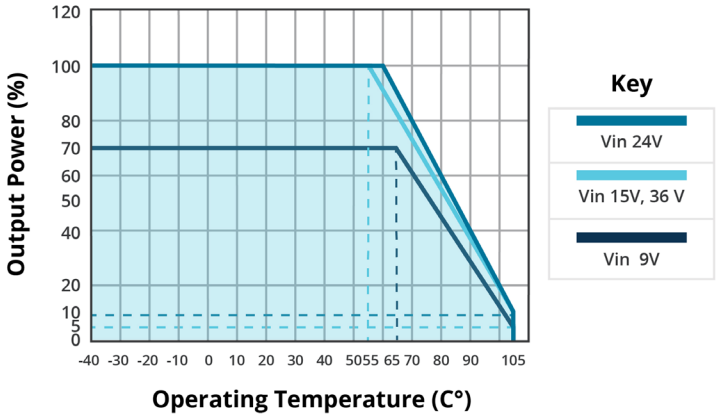
TEMPERATURE DERATING CURVE
DQD30-24-S3-H, DQD30-24-S5H, DQD30-24-S6H



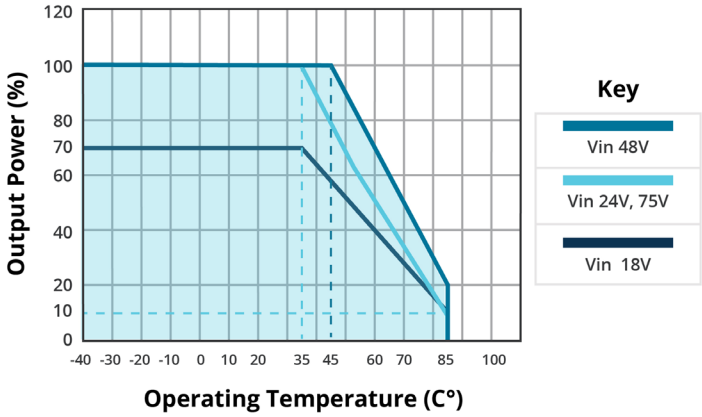
TEMPERATURE DERATING CURVE
DQD30-24-S9H, DQD30-24-S12H, DQD30-24-S48H



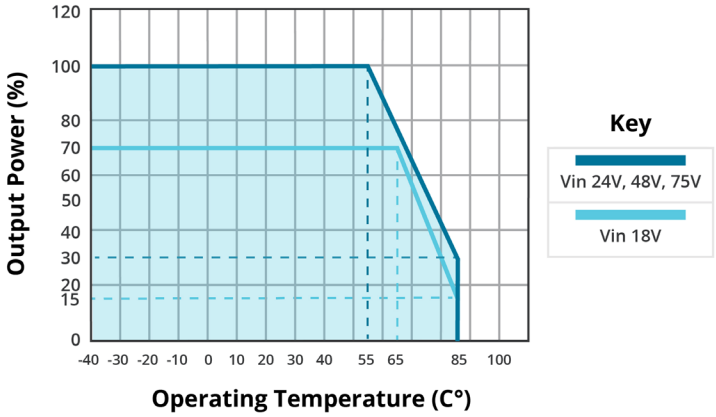
TEMPERATURE DERATING CURVE
DQD30-24-S15H, DQD30-24-S24H



TEMPERATURE DERATING CURVE
DQD30-48-S3H, DQD30-48-S5H, DQD30-48-S9H

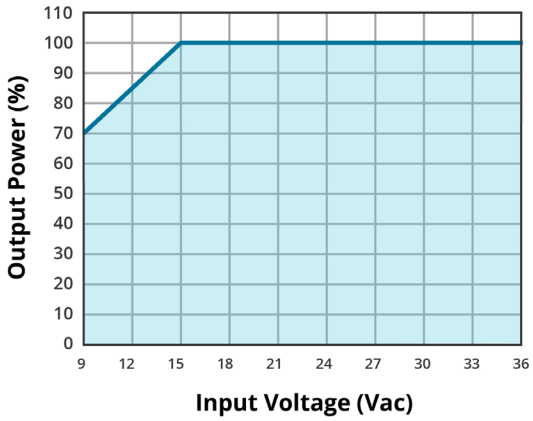


TEMPERATURE DERATING CURVE
DQD30-48-S12H, DQD30-48-S15H, DQD30-48-S24H

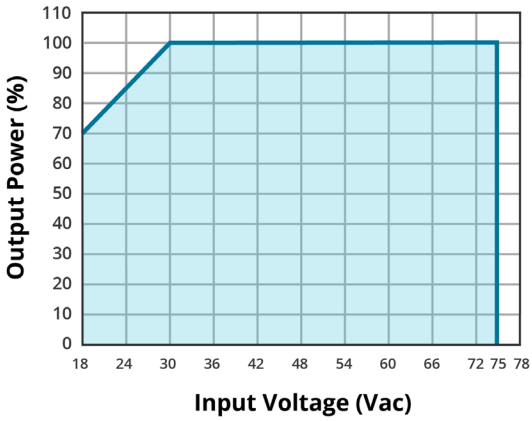


DERATING CURVES (CONTINUED)

INPUT VOLTAGE DERATING CURVE
Vin = 24 V

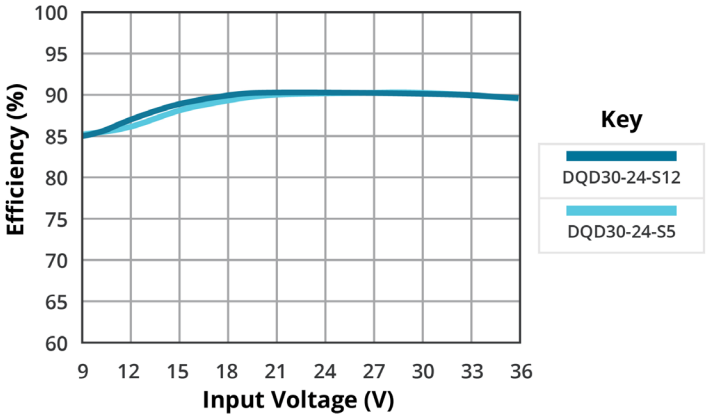


INPUT VOLTAGE DERATING CURVE
Vin = 48 V

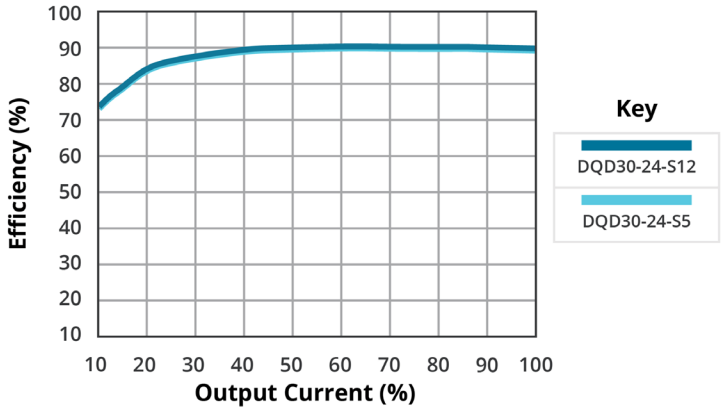


EFFICIENCY CURVES

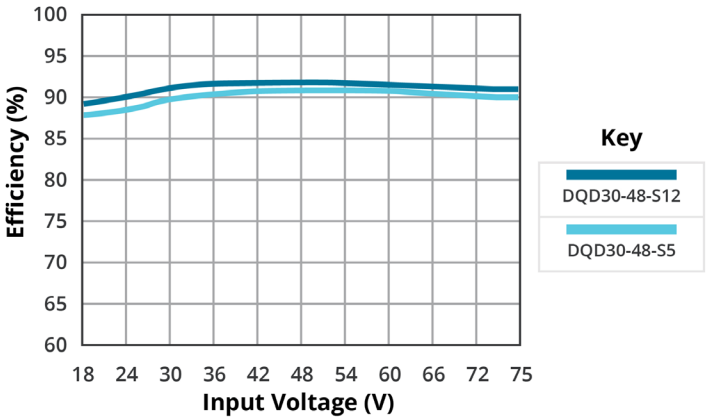
EFFICIENCY VS INPUT VOLTAGE
(full load)



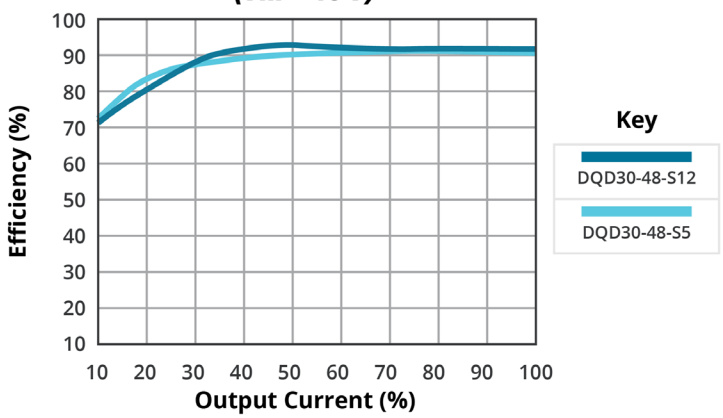
EFFICIENCY VS OUTPUT CURRENT
(Vin = 24 V)



EFFICIENCY VS INPUT VOLTAGE
(full load)



EFFICIENCY VS OUTPUT CURRENT
(Vin = 48 V)



RIPPLE AND NOISE TEST INSTRUCTION

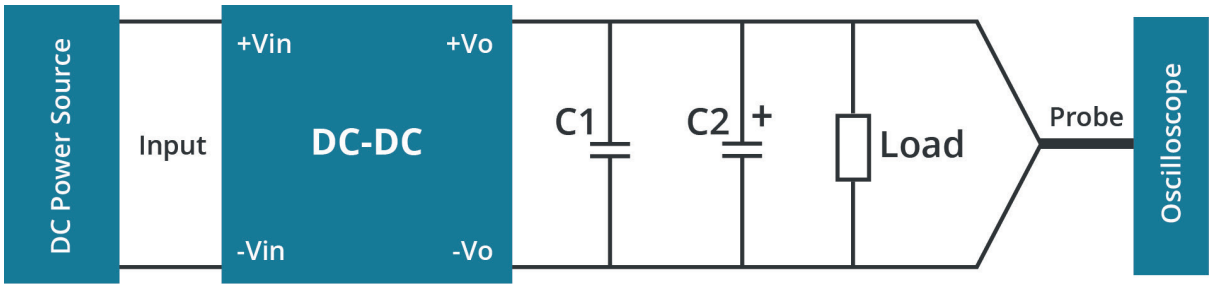
Ripple & Noise Test Procedure

1. Test Equipment Configuration
   - Cable Arrangement: Position test cables in parallel to minimize inductive effects.
   - Oscilloscope Settings: Select Sample Mode operation.
     Limit bandwidth to 20 MHz to reduce high-frequency noise interference.
     Utilize a 100 MHz bandwidth probe with the probe cap and ground lead removed for optimal signal fidelity.
   - Probe Compensation: Connect a 0.1 µF polypropylene capacitor (C1) and a 10 µF high-frequency, low-ESR electrolytic capacitor (C2) in parallel with the probe to filter transient disturbances.
2. Ripple & Noise Measurement Setup
   - Module Connection: Connect the module input to a regulated power source.
     Connect the module output to an electronic load via an appropriate test fixture.
   - Measurement Technique: Measure output voltage directly from the module's output pins using a dedicated sampling lead.
     Employ insulated power cables with an AWG rating suitable for the specified output current to ensure safety and accuracy.

Application Reference

1. Maximum Capacitive Load: Determined under pure resistive, full-load conditions for accurate assessment.
2. Technical Support: Bel offers comprehensive power solutions and custom product designs.
   For detailed inquiries or space-constrained applications, please contact our technical or sales team for further assistance.

Figure 1



RIPPLE AND NOISE TEST CIRCUIT

Input Reflected Ripple Current Test Circuit:

The capacitor (C) must be a low-ESR type with a voltage rating that exceeds the maximum input voltage of the product.

Figure 2

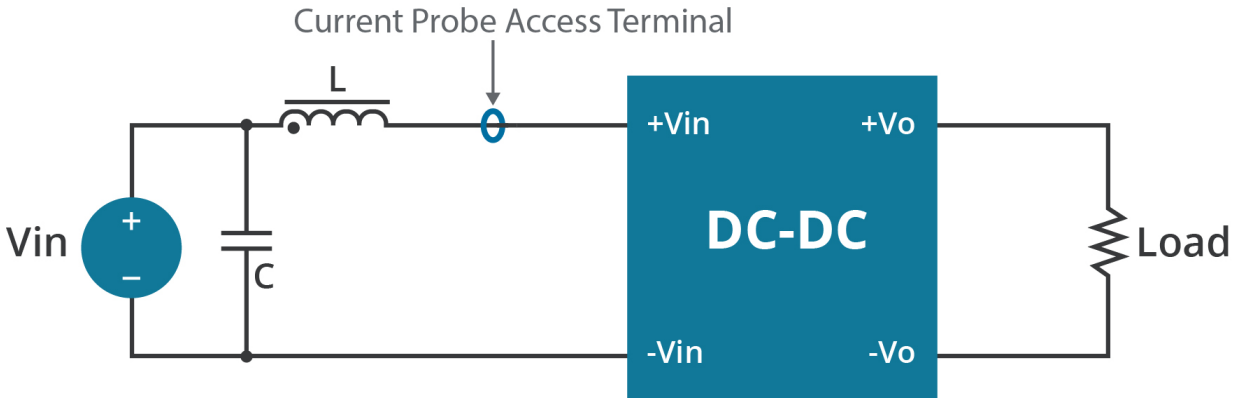


Table 1

COMPONENT	PARAMETER
C	220 µF/ 100 V
L	4.7 µH / 15 A

APPLICATION NOTES

Figure 3

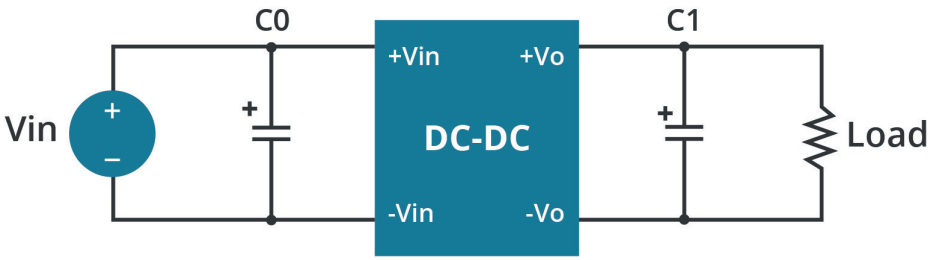
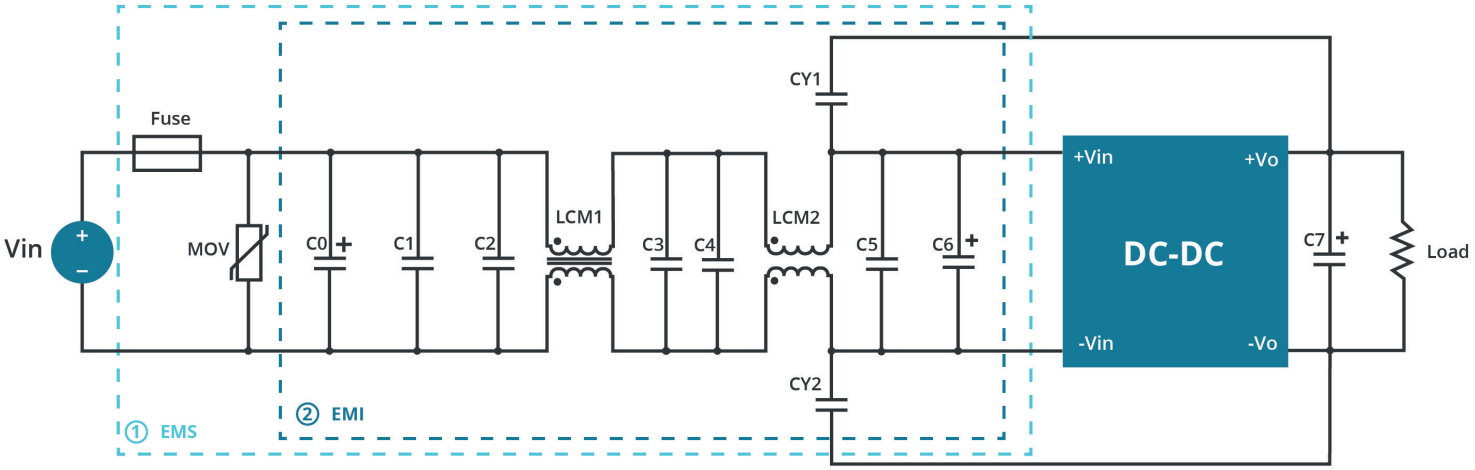


Table 2

COMPONENT	PARAMETER
C0	100 µF / 100 V
C1	100 µF / 50 V

EMC RECOMMENDED CIRCUIT

Figure 4



Note: Section 1 in the diagram is intended for EMS testing, while Section 2 is designated for EMI testing. Adjustments may be made as required.

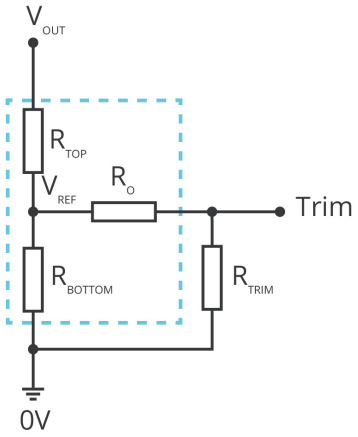
Table 3

COMPONENT	24 Vdc	48 Vdc
Fuse	TBD by customer	
MOV	14D560K	14D101K
LCM1	5 mH	
LCM2	250 µH	
C0	1000 µF/50 V	47 µF/100 V
C1, C2, C3, C4, C5	10 µF/50 V	10 µF/100 V
C6	470 µF/50 V	470 µF/100 V
C7	100 µF/50 V	
CY1, CY2	2.2 nF/2 kV	

TRIM RESISTOR AND CALCULATION (SINGLE OUTPUT MODELS ONLY)

Figure 7

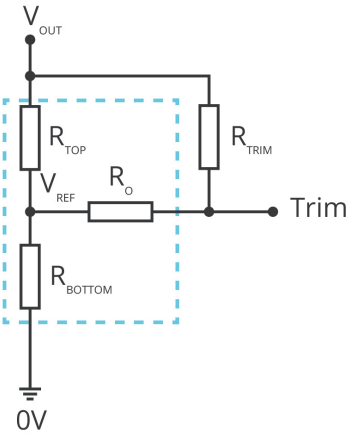
Trim up



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

Formula for Trim up

Trim down



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

Formula for Trim down

Table 4

V_{NOM}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)
3.3	4.22	2.55	12	1.25
5	5.10	5.10	20	2.50
6	6.20	4.44	20	2.50
9	9.31	3.57	24	2.50
12	18.0	4.73	33	2.50
15	18.0	3.59	25.5	2.50
24	30.0	3.47	30	2.50
48	45.3	2.47	18	2.50

Note: Value for R_{TOP}, R_{BOTTOM}, R_O, and V_{REF} refer to Table 4 (fixed internal values).
R_{TRIM}: Trim resistance
a: User-defined parameter, no actual meanings
V_{NOM}: Nominal output voltage
V_{OUT}: Target output voltage

REVISION HISTORY

rev.	description	date
1.0	initial release	06/01/2026

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

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