CUI INC
a bel group

SERIES: VHK100W | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 100 W isolated output
- rugged metal enclosure with integrated heat sink
- 4:1 input range (9~36 Vdc, 18~75 Vdc)
- single output from 3.3~48 Vdc
- 1,500 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 87%

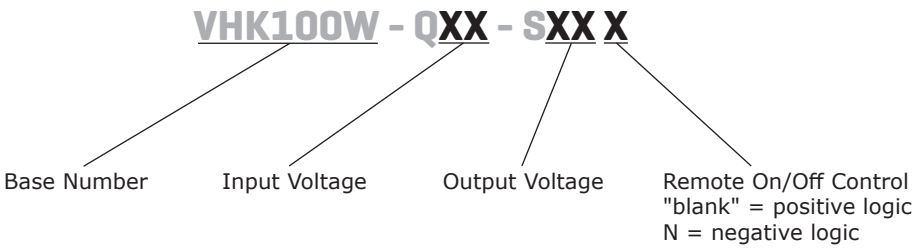
RoHS CE

MODEL

MODEL	input voltage range (Vdc)	output voltage (Vdc)	output current max (A)	output power max (W)	ripple and noise[1] max (mVp-p)	efficiency typ (%)
VHK100W-Q24-S3R3	9 ~ 36	3.3	20	66	100	80
VHK100W-Q24-S5	9 ~ 36	5	20	100	100	82
VHK100W-Q24-S12	9 ~ 36	12	8.3	100	150	84
VHK100W-Q24-S15	9 ~ 36	15	6.7	100	150	85.5
VHK100W-Q24-S24	9 ~ 36	24	4.17	100	240	85
VHK100W-Q24-S28	9 ~ 36	28	3.57	100	280	86
VHK100W-Q24-S48	9 ~ 36	48	2.08	100	480	84
VHK100W-Q48-S3R3	18 ~ 75	3.3	20	66	100	79
VHK100W-Q48-S5	18 ~ 75	5	20	100	100	84.5
VHK100W-Q48-S12	18 ~ 75	12	8.3	100	150	85.5
VHK100W-Q48-S15	18 ~ 75	15	6.7	100	150	86.5
VHK100W-Q48-S24	18 ~ 75	24	4.17	100	240	87
VHK100W-Q48-S28	18 ~ 75	28	3.57	100	280	86
VHK100W-Q48-S48	18 ~ 75	48	2.08	100	480	85

Note: 1. Ripple and noise are measured at full load, 20 MHz BW with 10µF tantalum capacitor and 1µF ceramic capacitor across output. The 48 Vdc output models only require the 1µF ceramic capacitor across the output.

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
under voltage shutdown	24 Vdc input	power up power down		8.8 8		Vdc Vdc
	48 Vdc input	power up power down		17 16		Vdc Vdc
CTRL[1]	positive logic	models ON (>3.5 Vdc or open circuit)				
		models OFF (0~1.8 Vdc)				
	negative logic	models ON (0~1.8 Vdc)				
		models OFF (>3.5 Vdc or open circuit)				
filter	pi filter					
input fuse	20A time delay fuse for 24 Vin models, 10A time delay fuse for 48 Vin models					

Note: 1. Open collector refer to -Vin

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	3.3 and 5 V output models 12 V output models 15 V output models 24 & 28 V output models 48 V output models	 47		20,000 8,300 6,700 2,200 470	µF µF µF µF µF
line regulation[2]	measured from high line to low line			±0.2	%
load regulation[2]	measured from full load to zero load			±0.2	%
voltage accuracy[2]				±1.5	%
adjustability			±10		%
switching frequency			250		kHz
transient response	25% step load change			500	µs
temperature coefficient			±0.03		%/°C

Note: 2. A 47 µF aluminum capacitor is required on the output for 48 Vdc output models.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous				
over current protection	% nominal output current	110		140	%
over voltage protection		115		140	%
over temperature protection	shutdown		105		°C

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	for 1 minute: input to output; input to case; output to case	1,500			Vdc
isolation resistance		10			MΩ
RoHS	2011/65/EU (CE)				

ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		105	°C

MECHANICAL

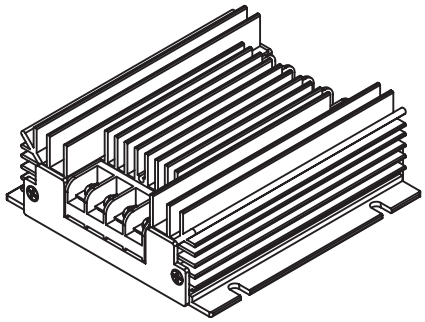
parameter	conditions/description	min	typ	max	units
dimensions	4.23 x 4.01 x 1.50 [107.5 x 101.8 x 38.0 mm]				inch
case material	steel and aluminum extrusion				
weight			502		g

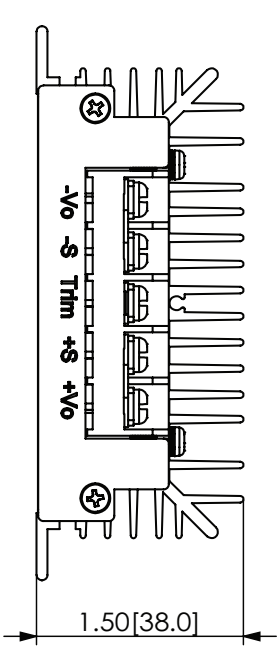
MECHANICAL DRAWING

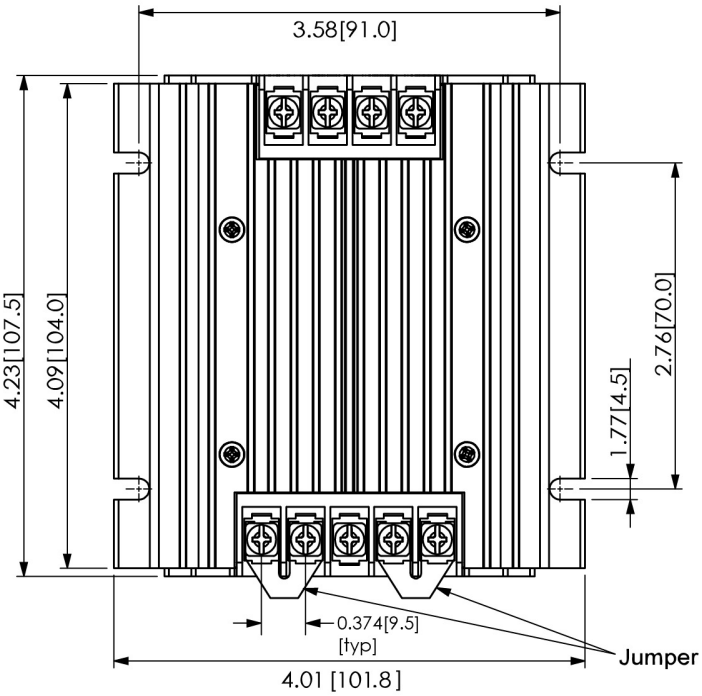
units: inch[mm]
general tolerance: ±0.04[±1.0]

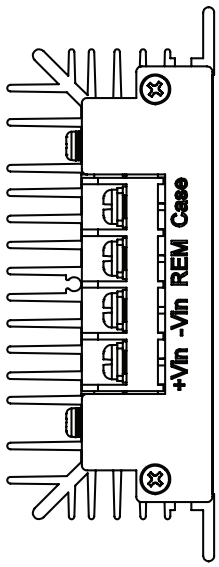
wire range: 22~12 AWG
screw size: #6-32
connector tightening torque: 1.4 N·m (max)

PIN CONNECTIONS	
PIN	FUNCTION
1	-Vo
2	-S
3	trim
4	+S
5	+Vo
6	case
7	REM
8	-Vin
9	+Vin

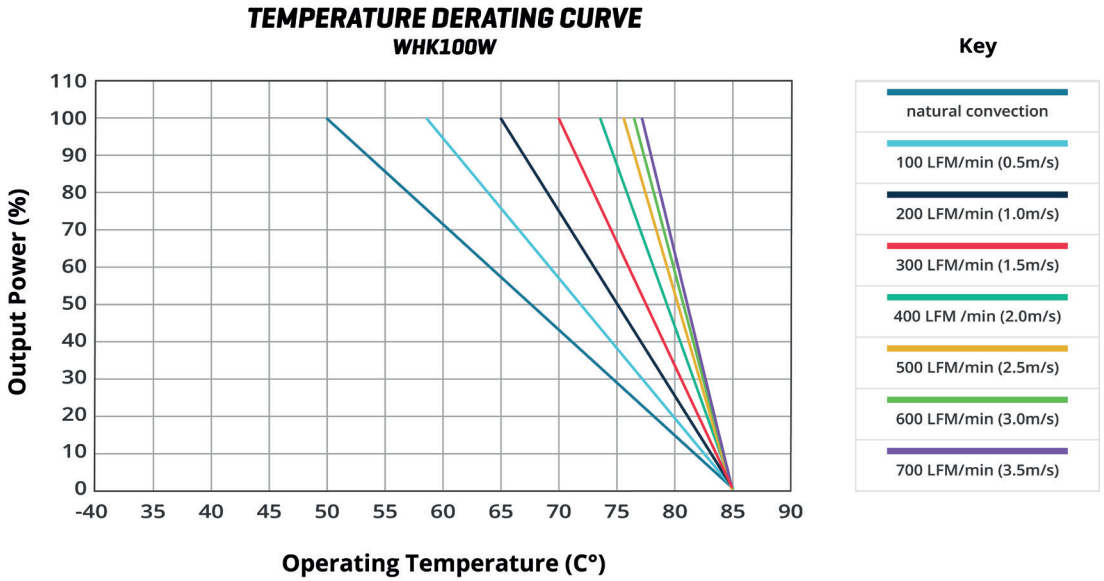








DERATING CURVES



TEST CONFIGURATION

Figure 1

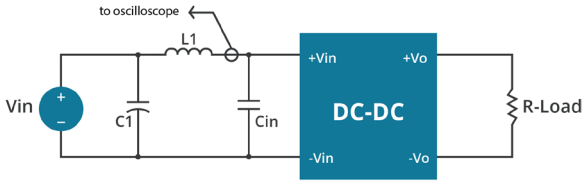


Table 1

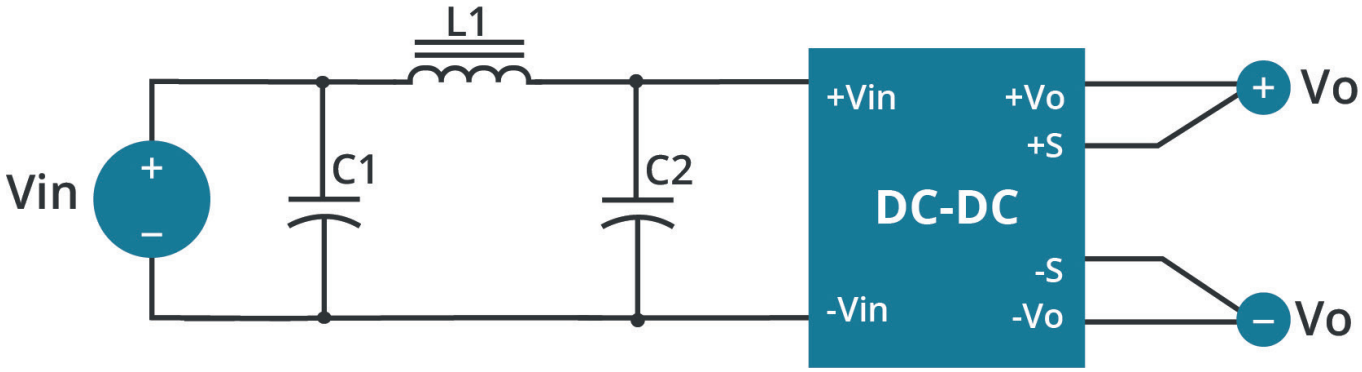
External components	
L1	12µH
C1	220µF, ESR < 0.1Ω at 100 KHz
Cin	33µF, ESR < 0.7Ω at 100 KHz

Note: Input reflected-ripple current is measured with an inductor L1 and Capacitor C1 to simulate source impedance.

EMC RECOMMENDED CIRCUITS

EN55022 CLASS A

Figure 2
Recommended Circuit for EN55022 Class A
(for all models)



EMC RECOMMENDED CIRCUITS (CONTINUED)

EN55022 CLASS A

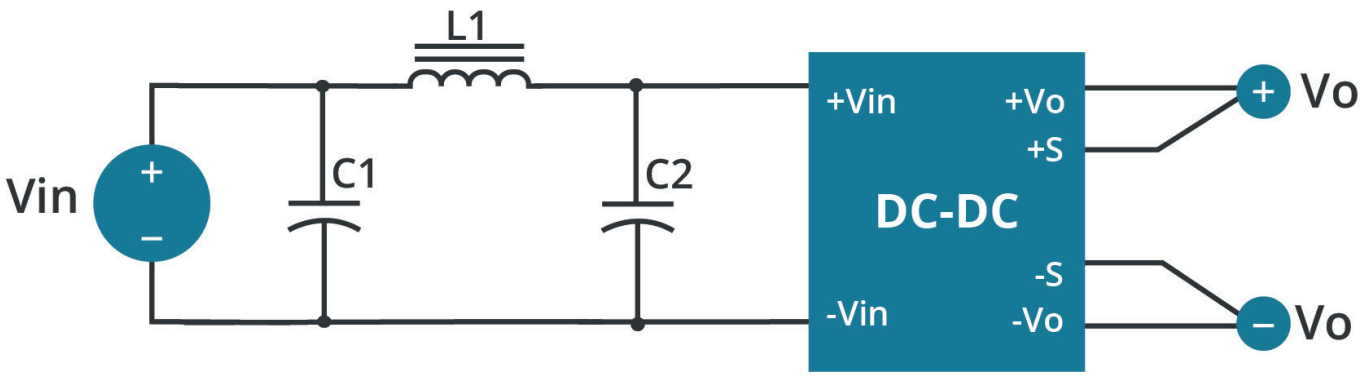
Table 2
Class A Recommended Components

Model	C1[1]	C2[1]	L1
VHK100W-Q24-S3R3	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S5	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S12	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S15	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S24	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S28	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q24-S48	47 µF/50 V	47 µF/50 V	3.4 µH
VHK100W-Q48-S3R3	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S5	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S12	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S15	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S24	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S28	47 µF/100 V	47 µF/100 V	3.4 µH
VHK100W-Q48-S48	47 µF/100 V	47 µF/100 V	3.4 µH

Note: 1. Aluminum capacitors

EN55022 CLASS B

Figure 3
Recommended Circuit for EN55022 Class B
(for all 3.3, 5, 12, 15, 24, & 28 Vdc output models)



EMC RECOMMENDED CIRCUITS (CONTINUED)

EN55022 CLASS B

Figure 4
Recommended Circuit for EN55022 Class B
(for all 48 Vdc output models)

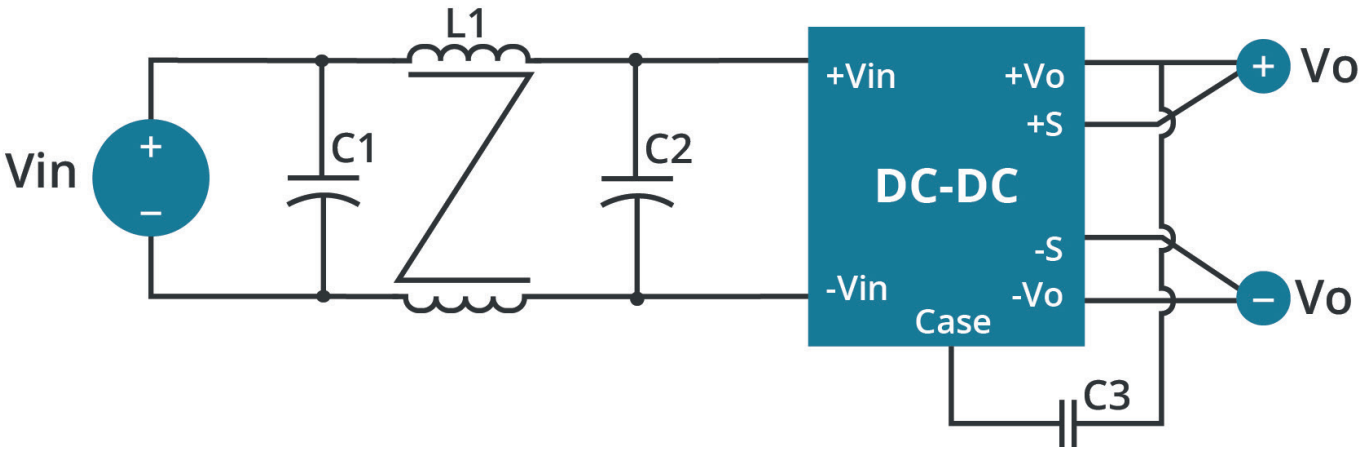


Table 3
Class B Recommended Components

Model	C1[1]	C2[1]	C3[2]	L1
VHK100W-Q24-S3R3	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S5	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S12	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S15	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S24	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S28	220 µF/50 V	220 µF/50 V	NC	3.4 µH
VHK100W-Q24-S48	100 µF/50 V	100 µF/50 V	2200 pF/2 KV	0.53 mH
VHK100W-Q48-S3R3	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S5	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S12	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S15	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S24	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S28	47 µF/100 V	47 µF/100 V	NC	3.4 µH
VHK100W-Q48-S48	47 µF/100 V	47 µF/100 V	2200 pF/2 KV	0.53 mH

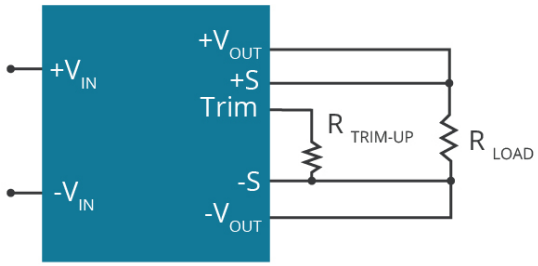
Note: 1. Aluminum capacitors
2. Ceramic capacitors

APPLICATION NOTES

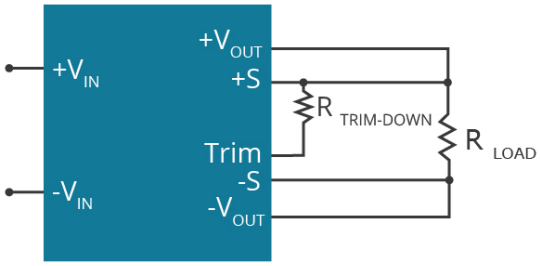
1. **Output Voltage Trimming**
   Leave open if not used.

Figure 5

Trim up



Trim down



$$R_{TRIM} = \left(\frac{R_{TOP}\,(V_{REF} - V_F\,(\frac{R_{BOTTOM}}{R_{BOTTOM} + R_O}))}{V_{OUT} - V_{OUT,\,NOM}} \right) - \frac{R_{BOTTOM} R_O}{R_{BOTTOM} + R_O} \quad (K\,\Omega)$$

Formula for Trim up

$$R_{TRIM} = \frac{R_{TOP}\,(V_{OUT} - V_{REF})}{V_{OUT,\,NOM} - V_{OUT}} - R_{BOTTOM} \quad (K\,\Omega)$$

Formula for Trim down

Table 4

V_{NOM}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}	V_F
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)	(V)
3.3	3	12	4.3	1.24	0.46
5	2.32	3.3	0	2.5	0
12	9.1	51	5.1	2.5	0.46
15	12	56	8.25	2.5	0.46
24	20	100	7.5	2.5	0.46
28	23.7	150	6.2	2.5	0.53
48	36	270	5.1	2.5	0.46

Note: Value for R_{TOP}, R_{BOTTOM}, R_O, V_{REF} ,and V_F 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

Note: 1. All specifications are measured at Ta=25°C, nominal input voltage and full output load unless otherwise specified.

REVISION HISTORY

rev.	description	date
1.0	initial release	10/11/2006
1.01	new template applied	12/21/2011
1.02	misc. updates and corrections	03/13/2012
1.03	updated mechanical drawing	03/27/2012
1.04	V-Infinity branding removed	06/27/2012
1.05	updated spec	03/14/2013
1.06	added trimming and EMI information	12/16/2013
1.07	company logo updated	02/08/2021
1.08	derating curve and circuit figures updated	09/06/2021
1.09	mechanical tolerance updated	04/13/2022
1.10	pin connections table updated	04/07/2023
1.11	output voltage trimming updated	05/30/2023

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

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