

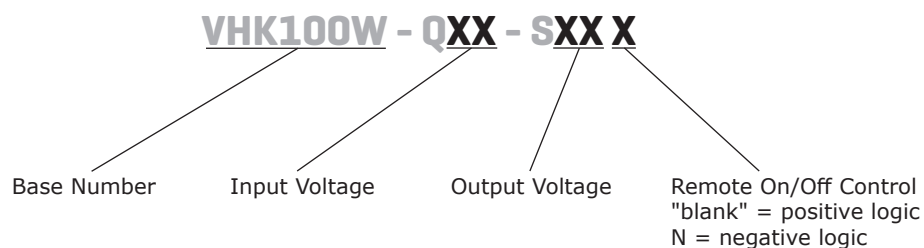
**SERIES: VHK100W | DESCRIPTION: DC-DC CONVERTER**
**FEATURES**

- 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%



MODEL	input voltage range (Vdc)	output voltage (Vdc)	output current max (A)	output power max (W)	ripple and noise <sup>1</sup> 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 10 $\mu$ F tantalum capacitor and 1 $\mu$ F ceramic capacitor across output. The 48 Vdc output models only require the 1 $\mu$ F ceramic capacitor across the output.

**PART NUMBER KEY**


## INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	24 Vdc input models	9	24	36	Vdc
	48 Vdc input models	18	48	75	Vdc
under voltage shutdown	24 Vdc input		8.8		Vdc
	power up power down		8		Vdc
	48 Vdc input		17		Vdc
	power up power down		16		Vdc
CTRL <sup>1</sup>	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			20,000	μF
	12 V output models			8,300	μF
	15 V output models			6,700	μF
	24 & 28 V output models			2,200	μF
	48 V output models	47		470	μF
line regulation <sup>2</sup>	measured from high line to low line			±0.2	%
load regulation <sup>2</sup>	measured from full load to zero load			±0.2	%
voltage accuracy <sup>2</sup>				±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]

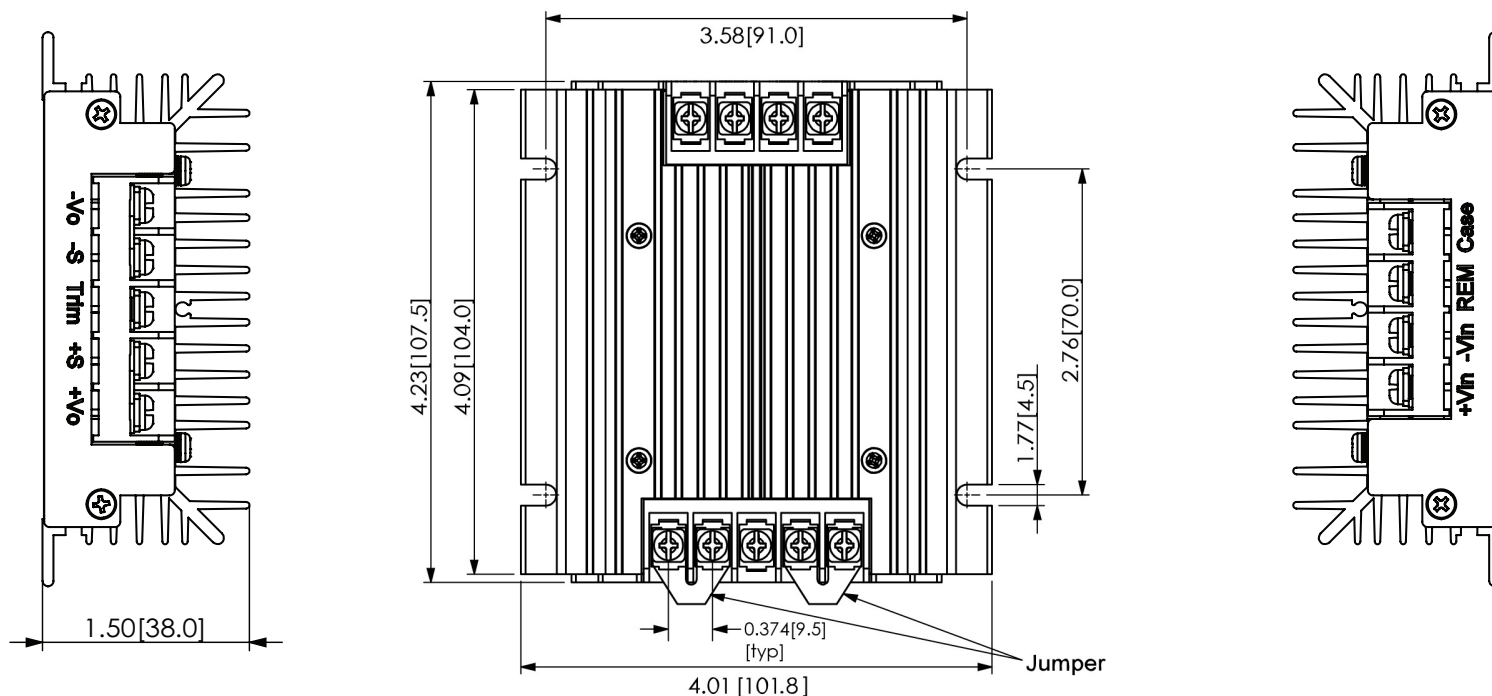
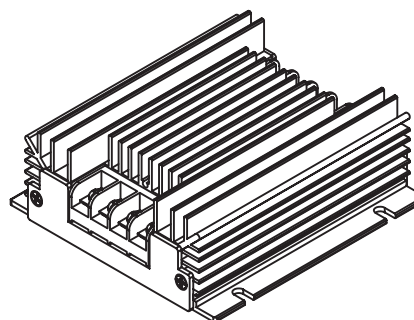
general tolerance: ±0.04[±1.0]

wire range: 22~12 AWG

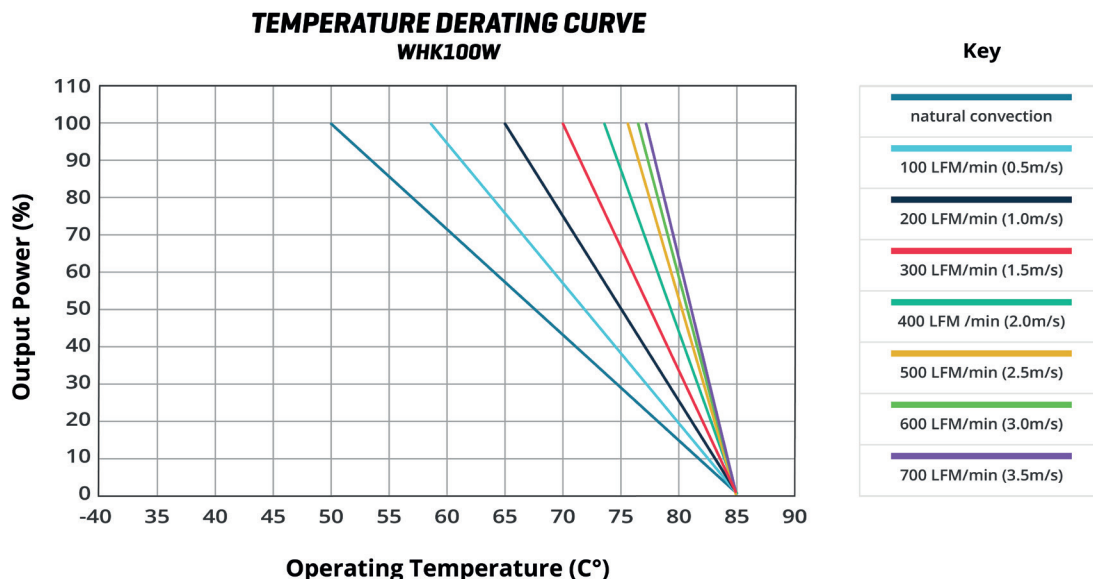
screw size: #6-32

connector tightening torque: 1.4 N·m (max)

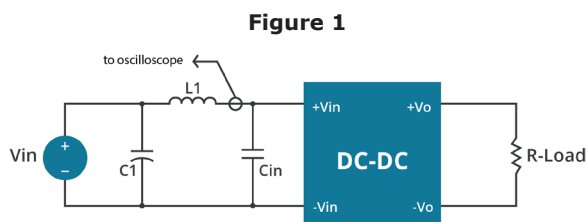
PIN CONNECTIONS	
PIN	FUNCTION
1	-Vo
2	-S
3	trim
4	+S
5	+Vo
6	case
7	on/off
8	-Vin
9	+Vin



## DERATING CURVES



## TEST CONFIGURATION



**Table 1**

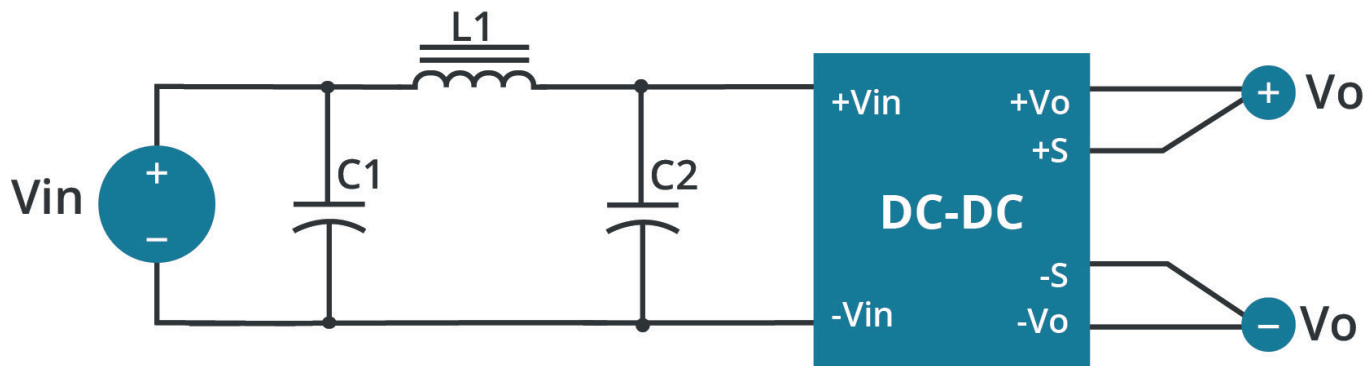
External components	
L1	12 $\mu$ H
C1	220 $\mu$ F, ESR < 0.1 $\Omega$ at 100 KHz
Cin	33 $\mu$ F, ESR < 0.7 $\Omega$ at 100 KHz

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

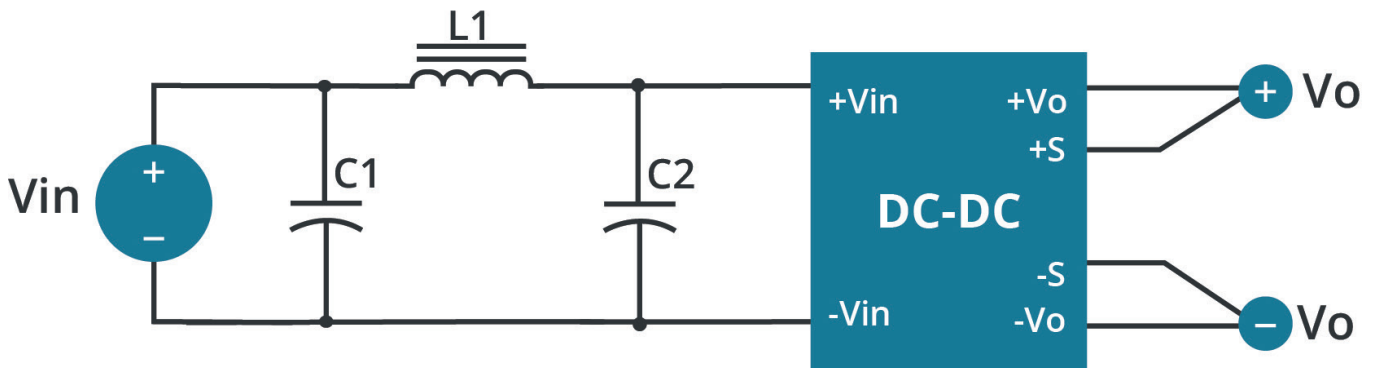
**Table 2**  
**Class A Recommended Components**

Model	C1 <sup>1</sup>	C2 <sup>1</sup>	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

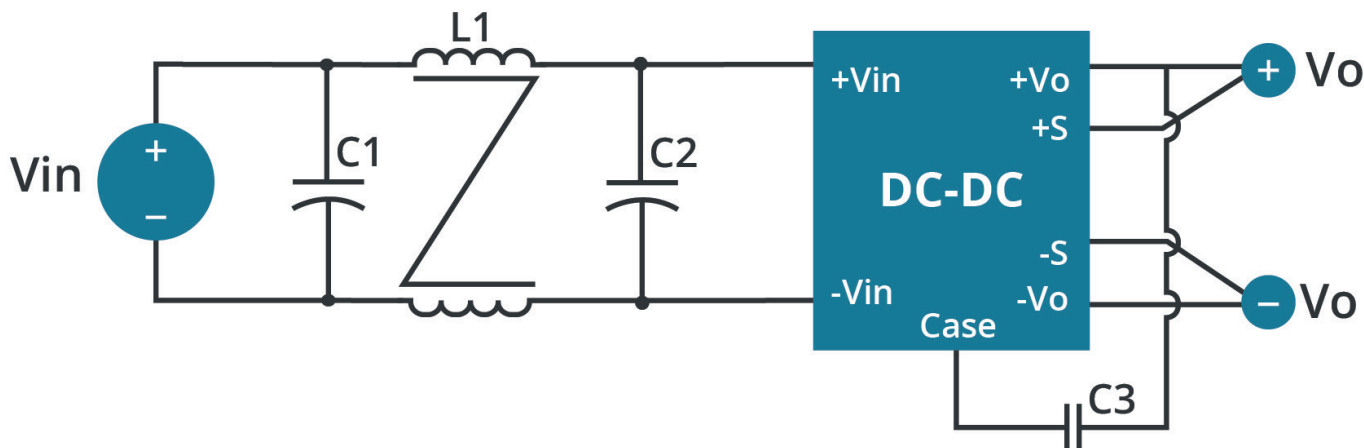
**Figure 3**  
**Recommended Circuit for EN55022 Class B**  
(for all 3.3, 5, 12, 15, 24, & 28 Vdc output models)



## 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 <sup>1</sup>	C2 <sup>1</sup>	C3 <sup>2</sup>	L1
VHK100W-Q24-S3R3	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S5	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S12	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S15	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S24	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S28	220 $\mu$ F/50 V	220 $\mu$ F/50 V	NC	3.4 $\mu$ H
VHK100W-Q24-S48	100 $\mu$ F/50 V	100 $\mu$ F/50 V	2200 pF/2 KV	0.53 mH
VHK100W-Q48-S3R3	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S5	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S12	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S15	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S24	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S28	47 $\mu$ F/100 V	47 $\mu$ F/100 V	NC	3.4 $\mu$ H
VHK100W-Q48-S48	47 $\mu$ F/100 V	47 $\mu$ F/100 V	2200 pF/2 KV	0.53 mH

Note: 1. Aluminum capacitors  
 2. Ceramic capacitors

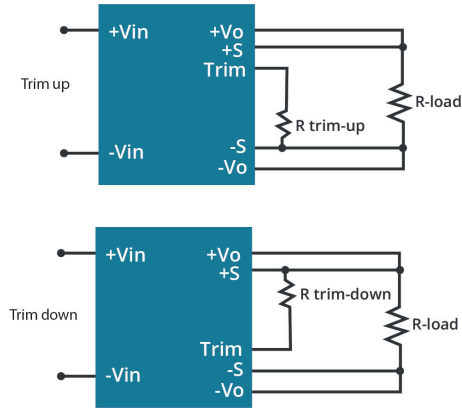
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 5**

Application Circuit for Trim pin



### Formula for Trim Resistor

$$R_{trim - up} = \left( \frac{R_1(V_r - V_f \left( \frac{R_2}{R_2 + R_3} \right))}{V_o - V_{o, nom}} \right) - \frac{R_2 R_3}{R_2 + R_3} (K\Omega)$$

$$R_{trim - down} = \frac{R_1(V_o - V_r)}{V_{o, nom} - V_o} - R_2 (K\Omega)$$

Note:  $R_{trim-up}$  is the external resistor in  $K\Omega$   
 $R_{trim-down}$  is the external resistor in  $K\Omega$   
 $V_{o, nom}$  is the nominal output voltage  
 $V_o$  is the desired output voltage  
 $R_1, R_2, R_3,$  and  $V_r$  are internal (see Table 4).

**Table 4**

Vout (Vdc)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Vr (V)	Vf (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

## 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

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



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