

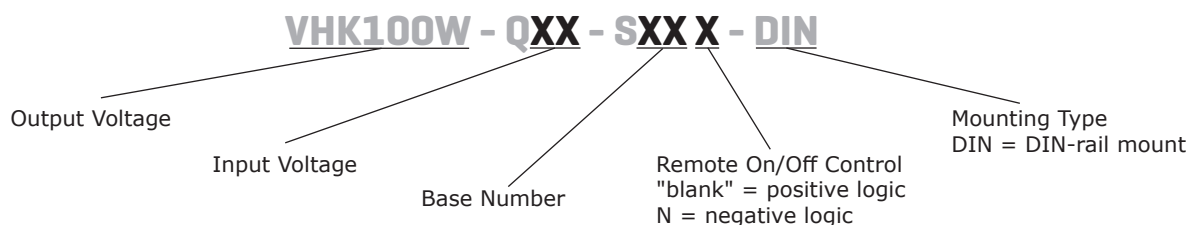
SERIES: VHK100W-DIN | DESCRIPTION: DC-DC CONVERTER
FEATURES

- 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%
- comes with DIN-rail mount



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

Note: 1. Ripple and noise are measured at full load, 20 MHz BW with 10 μ F tantalum capacitor and 1 μ F ceramic capacitor across output. The 48 Vdc output models only require the 1 μ 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 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			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 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 2.07 (107.5 x 101.8 x 52.6 mm)				inch
case material	steel and aluminum extrusion				
weight			651		g

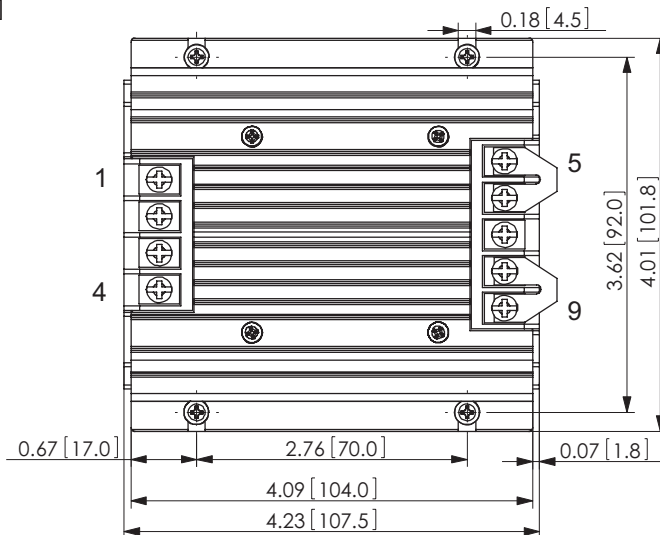
MECHANICAL DRAWING

units: inch[mm]

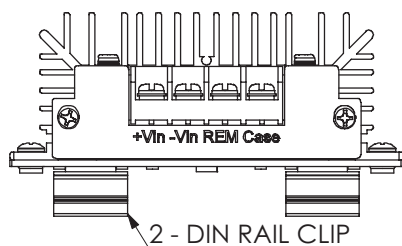
tolerance: X.XX = ±0.02[±0.5]
 X.XXX = ±0.010[±0.25]

wire range: 22~12 AWG
 screw size: #6-32
 mounts to TS35 rails

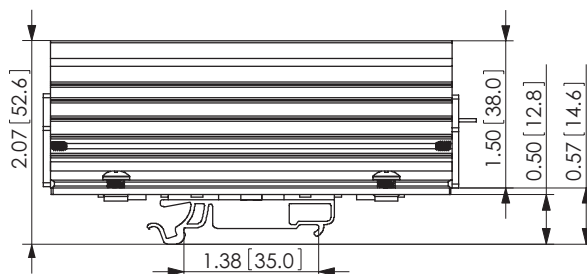
PIN CONNECTIONS	
PIN	FUNCTION
1	+Vin
2	-Vin
3	REM
4	CASE
5	+Vo
6	+S
7	TRIM
8	-S
9	-Vo



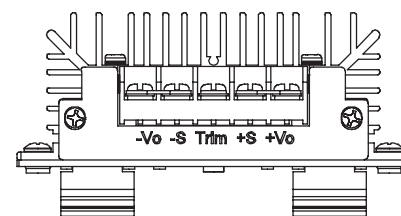
Top View



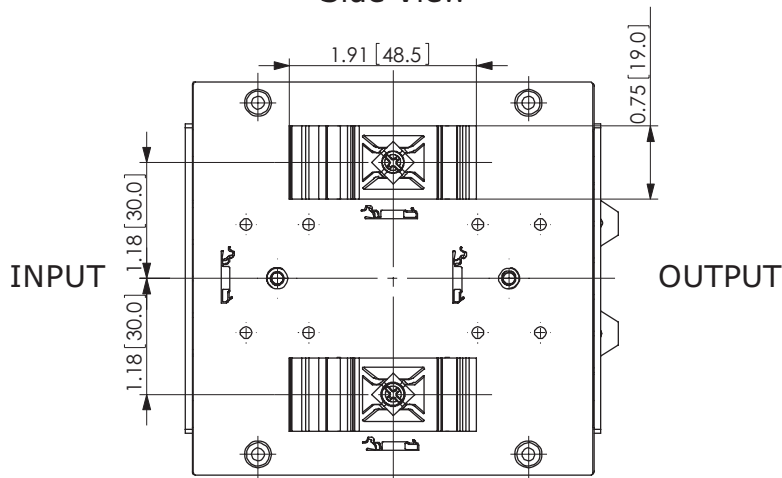
Front View



Side View

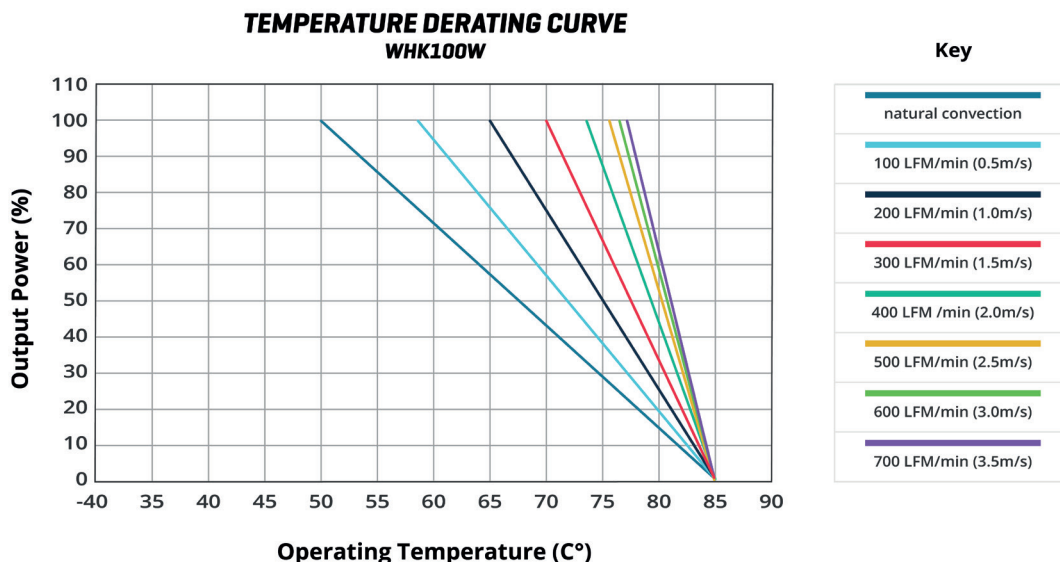


Back View



Bottom View

DERATING CURVES



TEST CONFIGURATION

Figure 1

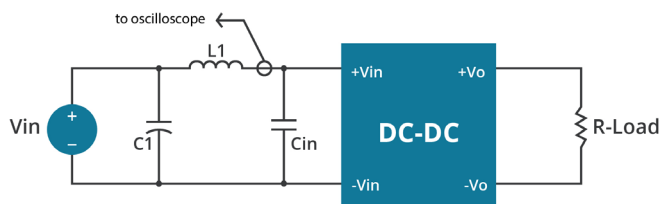


Table 1

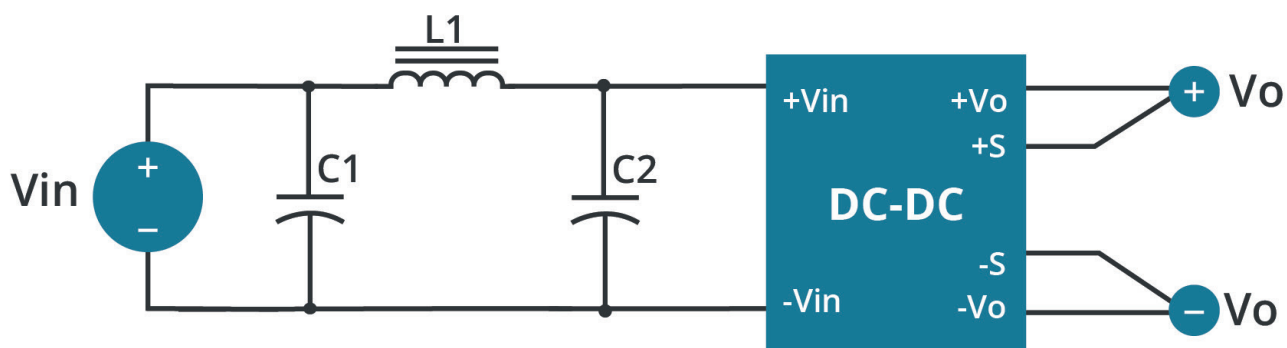
External components	
L1	12μH
C1	220μF, ESR < 0.1Ω at 100 KHz
Cin	33μF, ESR < 0.7Ω at 100 KHz

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

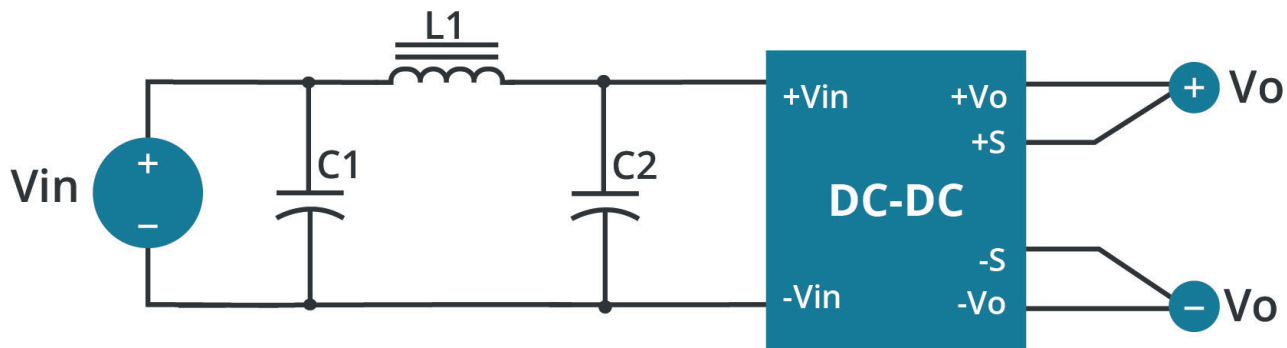
Table 2
Class A Recommended Components

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)

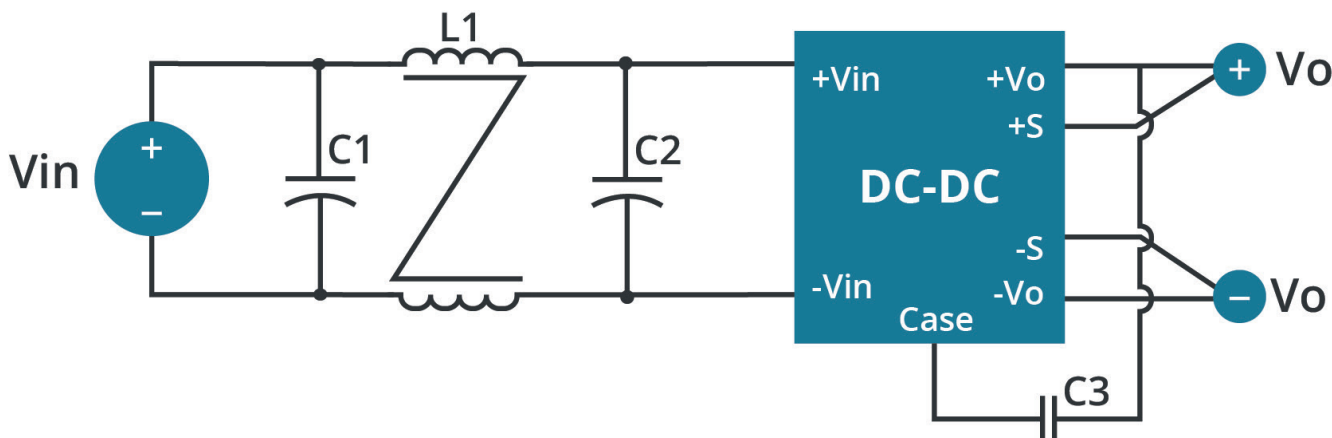


Table 3
Class B Recommended Components

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

Note: 1. Aluminum capacitors
 2. Ceramic capacitors

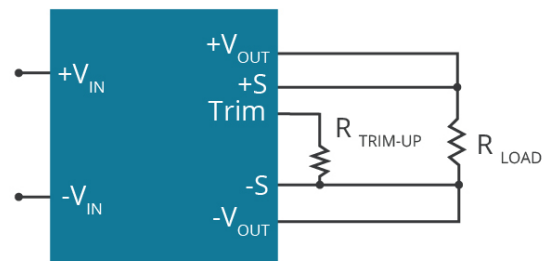
APPLICATION NOTES

1. Output Voltage Trimming

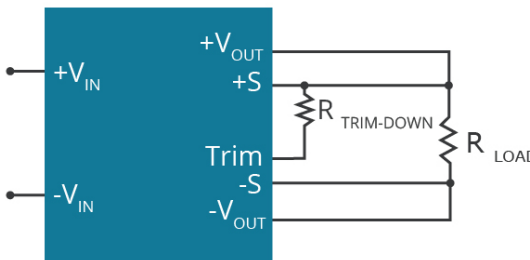
Leave open if not used.

Figure 5

Trim up



Trim down



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

Formula for Trim up

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

Formula for Trim down

Table 4

V_{NOM} (Vdc)	R_{TOP} (k Ω)	R_{BOTTOM} (k Ω)	R_O (k Ω)	V_{REF} (V)	V_F (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 $T_a=25^\circ\text{C}$, nominal input voltage and full output load unless otherwise specified.

REVISION HISTORY

rev.	description	date
1.0	initial release	12/16/2013
1.01	changed DIN-rail mount	06/16/2014
1.02	company logo updated	02/08/2021
1.03	derating curve and circuit figures updated	09/06/2021
1.04	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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