

SERIES: VHK75W-DIN | DESCRIPTION: DC-DC CONVERTER

FEATURES

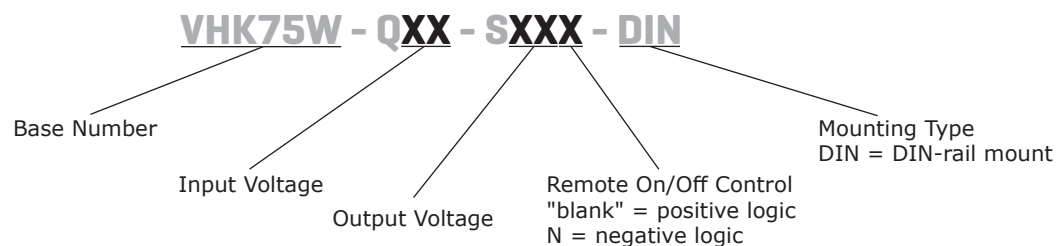
- up to 75 W isolated output
- rugged metal enclosure with integrated heat sink
- 4:1 input range (9~36 Vdc, 18~75 Vdc)
- single output from 3.3~48 Vdc
- 1,500 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 84%
- comes with DIN-rail mount



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 (%)
VHK75W-Q24-S3R3-DIN	9 ~ 36	3.3	15	50	100	77
VHK75W-Q24-S5-DIN	9 ~ 36	5	15	75	100	80
VHK75W-Q24-S12-DIN	9 ~ 36	12	6.25	75	150	81.5
VHK75W-Q24-S15-DIN	9 ~ 36	15	5	75	150	82.5
VHK75W-Q24-S24-DIN	9 ~ 36	24	3.12	75	240	83
VHK75W-Q24-S48-DIN	9 ~ 36	48	1.56	75	480	80
VHK75W-Q48-S3R3-DIN	18 ~ 75	3.3	15	50	100	78
VHK75W-Q48-S5-DIN	18 ~ 75	5	15	75	100	81
VHK75W-Q48-S12-DIN	18 ~ 75	12	6.25	75	150	82.5
VHK75W-Q48-S15-DIN	18 ~ 75	15	5	75	150	83.5
VHK75W-Q48-S24-DIN	18 ~ 75	24	3.12	75	240	84
VHK75W-Q48-S48-DIN	18 ~ 75	48	1.56	75	480	82

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	power up		8.8		Vdc
		power down		8		Vdc
	48 Vdc input	power up		17		Vdc
		power down		16		Vdc
CTRL ¹	positive logic	models ON (open circuit)				
		models OFF (0~0.8 Vdc)				
	negative logic	models ON (0~0.8 Vdc)				
		models OFF (open circuit)				
filter	pi filter					
input fuse	15A time delay fuse for 24 Vin models, 8A 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				15,000	μF
	12 V output models				6,250	μF
	15 V output models				5,000	μF
	24 V output models				3,120	μF
	48 V output models				1,560	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					±1	%
adjustability				±10		%
switching frequency				300		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		160	%
over voltage protection			115		140	%
over temperature protection	shutdown			100		°C
	restart threshold			70		°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

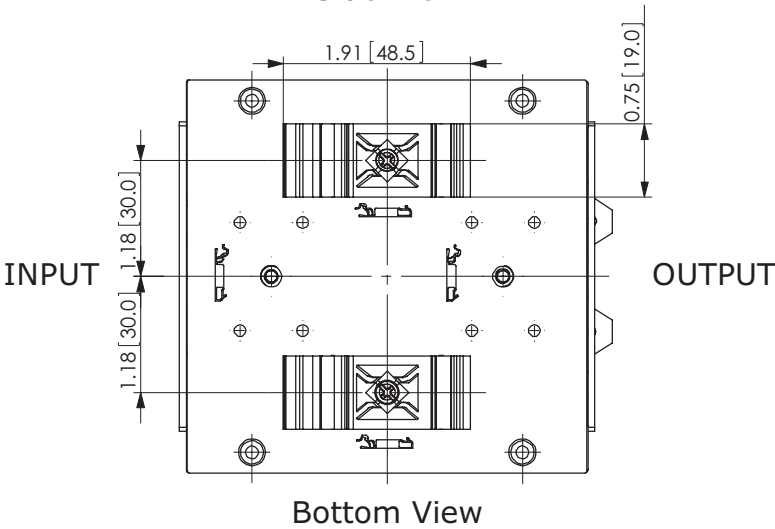
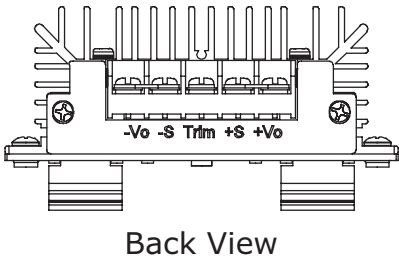
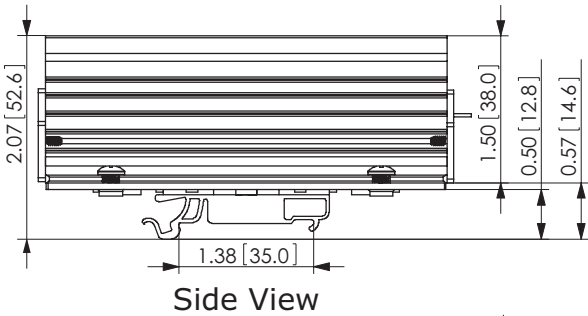
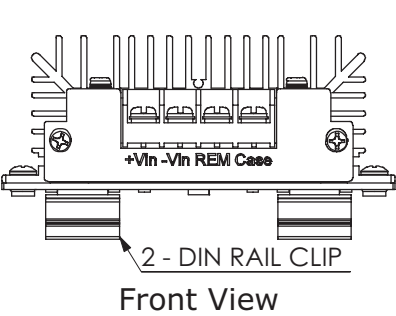
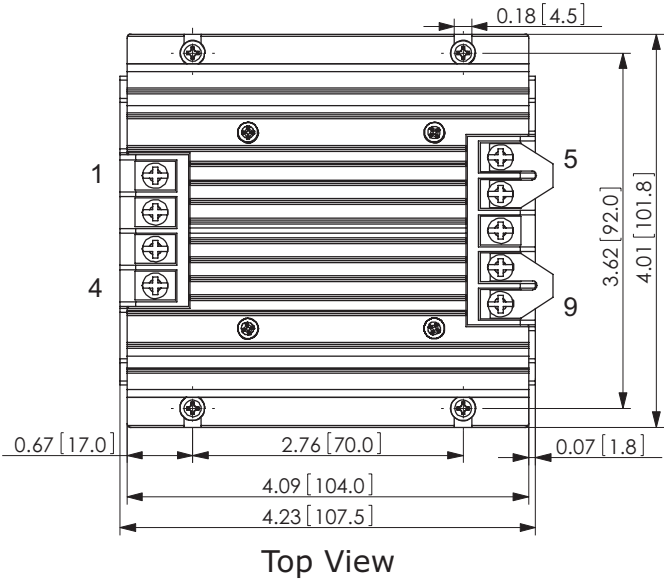
parameter	conditions/description	min	typ	max	units
dimensions	4.23 x 4.01 x 2.07 (107.5 x 101.8 x 52.6 mm)				inch
case material	steel and aluminum extrusion				
weight			651		g

MECHANICAL DRAWING

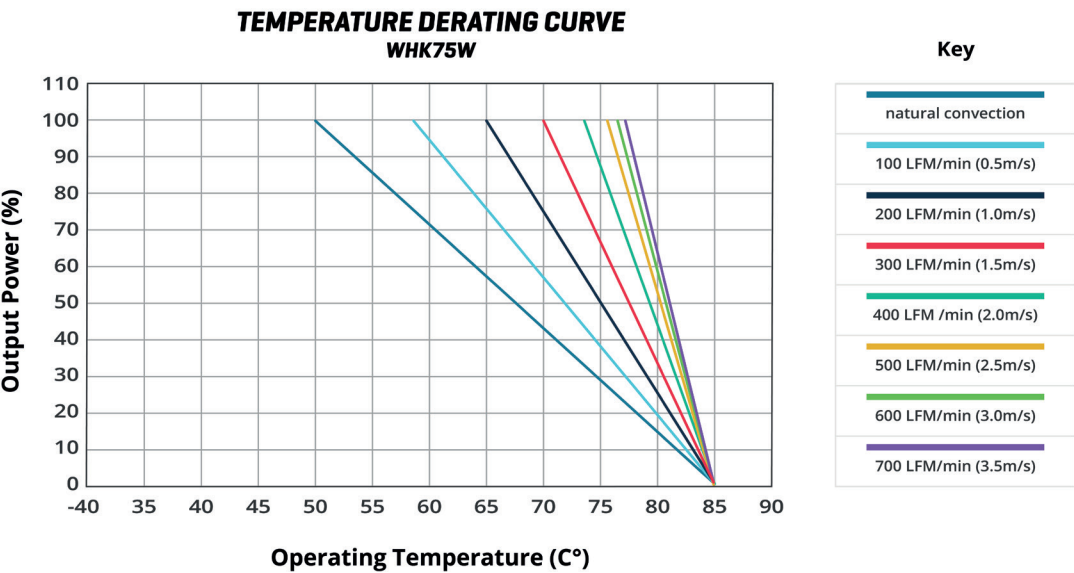
units: inch[mm]
tolerance: X.XX = ±0.02[±0.5]
 X.XXX = ±0.010[±0.25]

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



DERATING CURVES



TEST CONFIGURATION

Figure 1

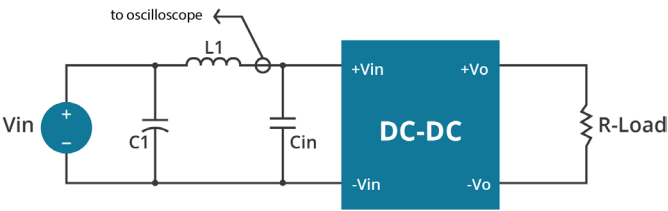


Table 1

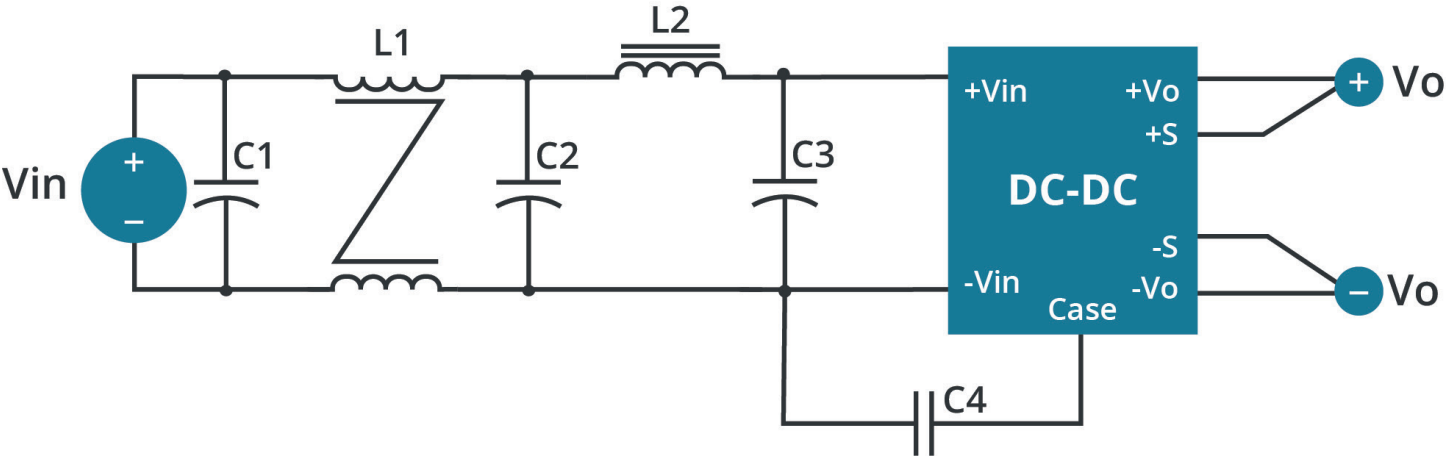
External components	
L1	12μH
C1	220μF, ESR < 0.1Ω at 100 KHz
Cin	100μF, ESR < 0.1Ω at 100 KHz

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 3.3, 5, 12, 15, & 24 Vdc output models)



EMC RECOMMENDED CIRCUITS (CONTINUED)

EN55022 CLASS A

Figure 3
Recommended Circuit for EN55022 Class A
(for all 48 Vdc output models)

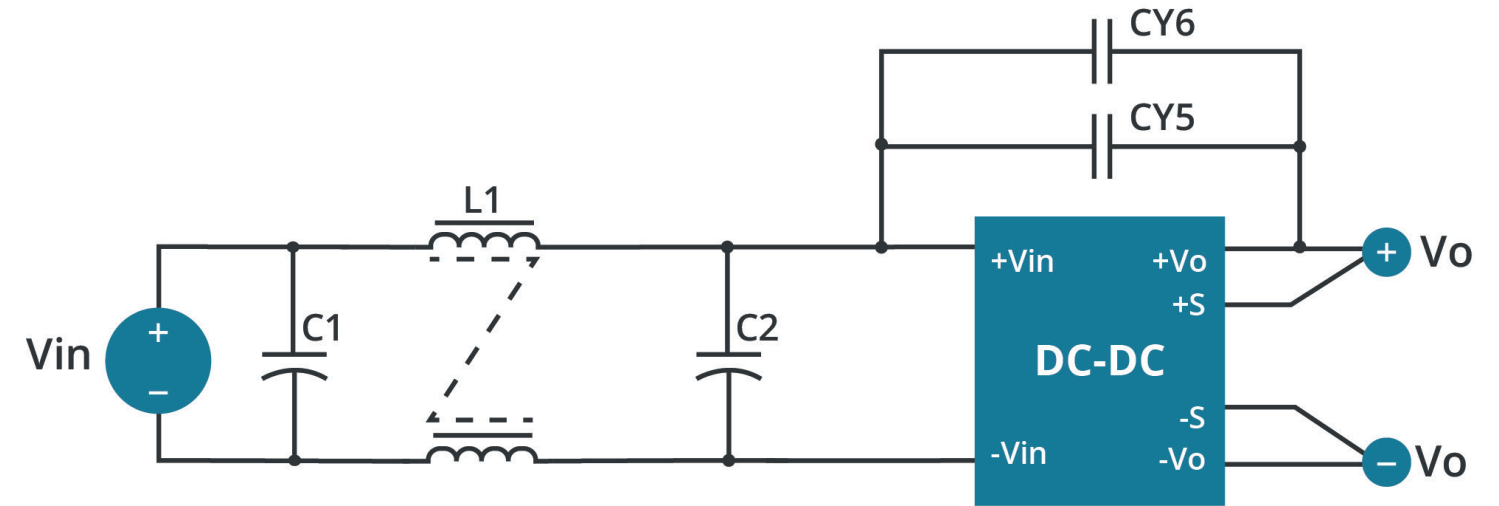


Table 2
Class A Recommended Components

Model	C1 ¹	C2 ¹	C3 ¹	C4 ²	CY5 ²	CY6 ²	L1	L2
VHK75W-Q24-S3R3	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S5	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S12	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S15	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S24	NC	100 µF/50 V	100 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S48	220 µF/50 V	100 µF/50 V	NC	NC	1000 pF/2 kV	1000 pF/2 kV	0.223 mH	NC
VHK75W-Q48-S3R3	NC	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q48-S5	NC	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q48-S12	NC	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q48-S15	NC	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q48-S24	NC	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q48-S48	56 µF/100 V	39 µF/100 V	NC	NC	1000 pF/2 kV	470 pF/2 kV	0.223 mH	NC

Note: 1. Aluminum capacitors.
2. Ceramic capacitors.

EMC RECOMMENDED CIRCUITS (CONTINUED)

EN55022 CLASS B

Figure 4
Recommended Circuit for EN55022 Class B
(for all 3.3, 5, 12, & 15 Vdc output models as well as VHK75W-Q48-S24)

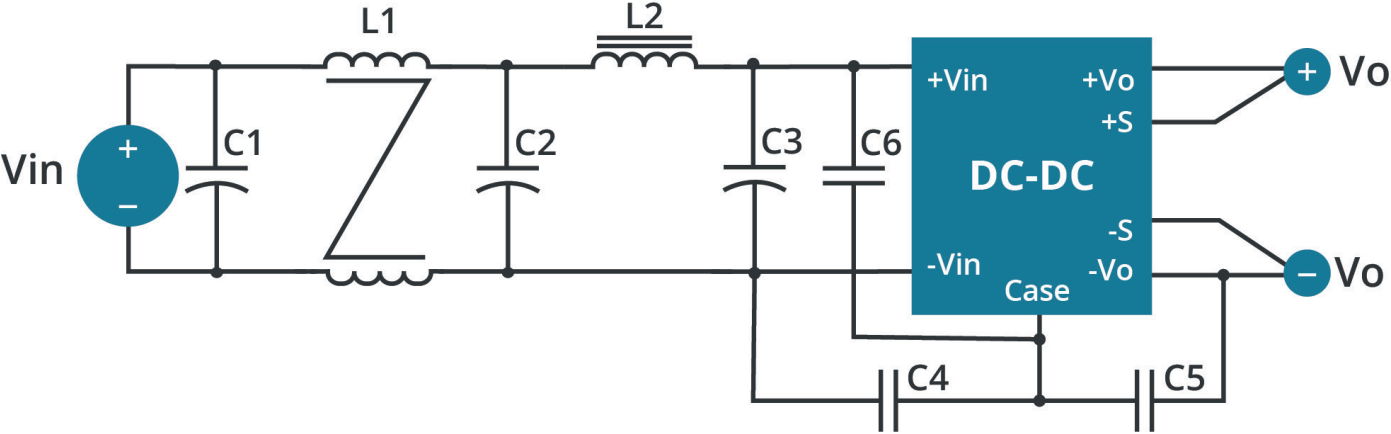


Figure 5
Recommended Circuit for EN55022 Class B
(for VHK75W-Q24-S24)

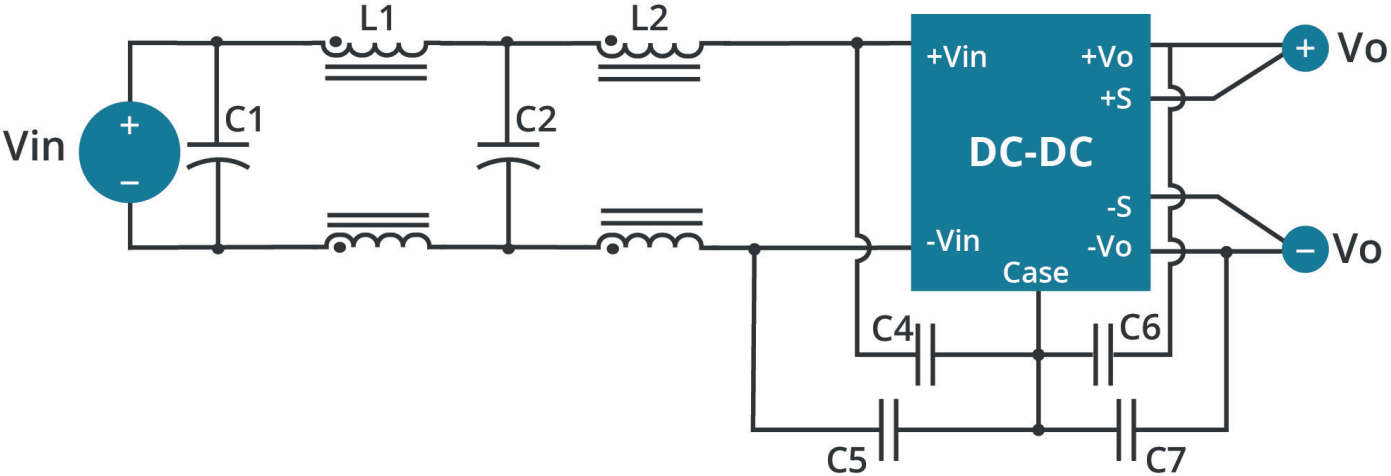


Table 3
Class B Recommended Components
(for all 3.3, 5, 12, 15, & 24 Vdc output models)

Model	C1 ¹	C2 ¹	C3 ¹	C4 ²	C5 ²	C6 ²	C7 ²	L1	L2
VHK75W-Q24-S3R3	47 µF/50 V	47 µF/50 V	47 µF/50 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q24-S5	47 µF/50 V	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q24-S12	47 µF/50 V	47 µF/50 V	47 µF/50 V	3300 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q24-S15	47 µF/50 V	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q24-S24	100 µF/50 V	100 µF/50 V	NC	1000 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	0.12 mH	0.34 mH
VHK75W-Q48-S3R3	47 µF/100 V	47 µF/100 V	47 µF/100 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q48-S5	47 µF/100 V	47 µF/100 V	47 µF/100 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q48-S12	47 µF/100 V	47 µF/100 V	47 µF/100 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q48-S15	47 µF/100 V	47 µF/100 V	47 µF/100 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH
VHK75W-Q48-S24	47 µF/100 V	47 µF/100 V	47 µF/100 V	2200 pF/2 kV	2200 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 µH

Note: 1. Aluminum capacitors.
2. Ceramic capacitors.

EMC RECOMMENDED CIRCUITS (CONTINUED)

EN55022 CLASS B

Figure 6
Recommended Circuit for EN55022 Class B
(for all 48 V output models)

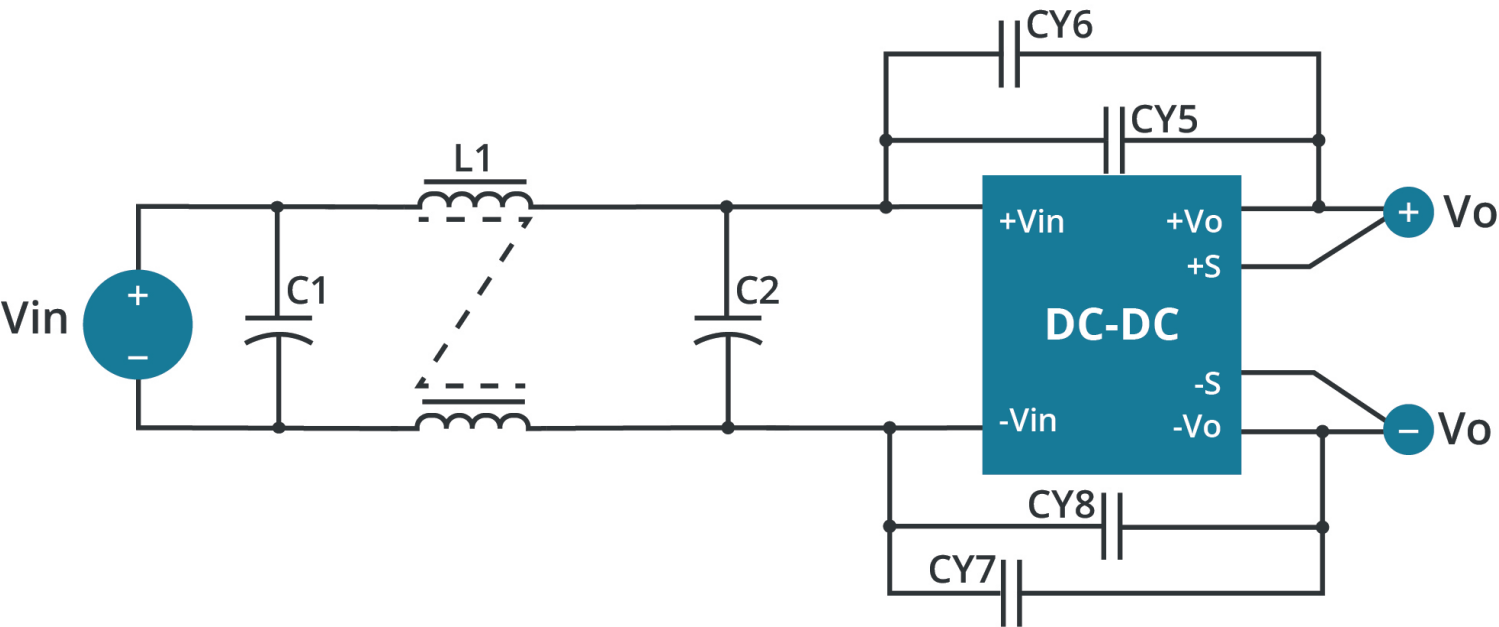


Table 4
Class B Recommended Components
(for all 48 V output models)

Model	C1 ¹	C2 ¹	CY5 ²	CY6 ²	CY7 ²	CY8 ²	L1
VHK75W-Q24-S48	220 µF/50 V	220 µF/50 V	1500 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	0.223 mH
VHK75W-Q48-S48	56 µF/100 V	56 µF/100 V	1000 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	1000 pF/2 kV	0.223 mH

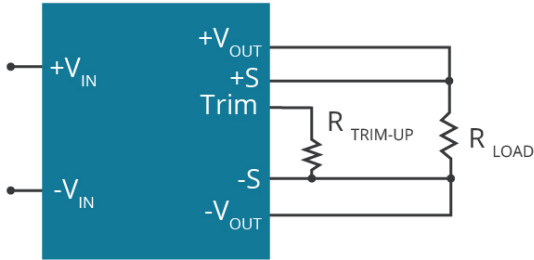
Note: 1. Aluminum capacitors.
2. Ceramic capacitors.

APPLICATION NOTES

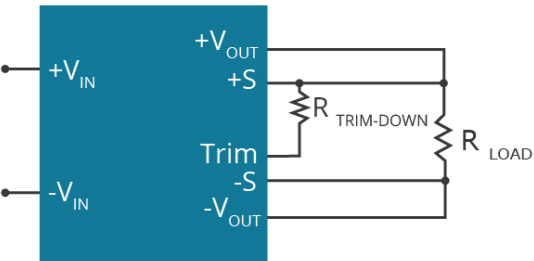
1. Output Voltage Trimming
- Leave open if not used.

Figure 7

Trim up



Trim down



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

Formula for Trim up

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

Formula for Trim down

Table 5

V _{NOM}	R _{TOP}	R _{BOTTOM}	R _O	V _{REF}	V _F
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)	(V)
3.3	3	12	18	1.24	0.46
5	2.32	8.2	0	2.5	0
12	9.1	51	18	2.5	0.46
15	12	82	18	2.5	0.46
24	20	100	20	2.5	0.46
48	36	270	14	3.085	1.15

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

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	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
1.05	company address updated	11/13/2024

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



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