

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

**FEATURES**

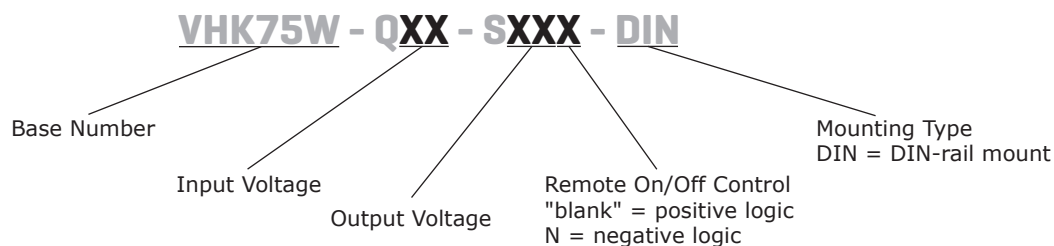
- up to 75 W isolated output
- rugged metal enclosure with integrated heat sink
- 4:1 input range (9~36 Vdc, 18~75 Vdc)
- single output from 3.3~48 Vdc
- 1,500 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 84%
- comes with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



MODEL	input voltage range	output voltage	output current max	output power max	ripple and noise <sup>1</sup> max	efficiency typ
	(Vdc)	(Vdc)	(A)	(W)	(mVp-p)	(%)
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 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	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 (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 <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				±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

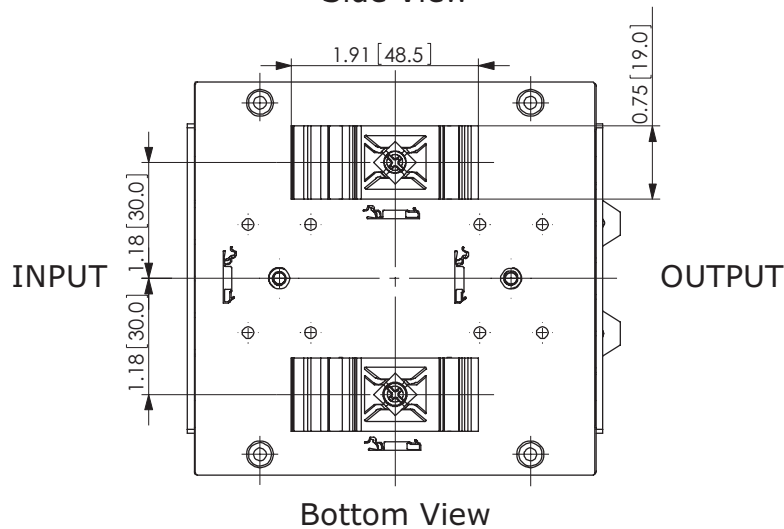
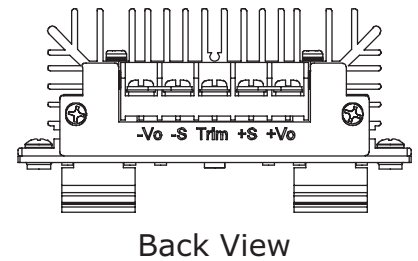
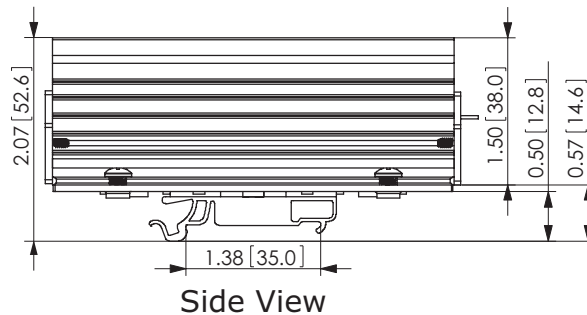
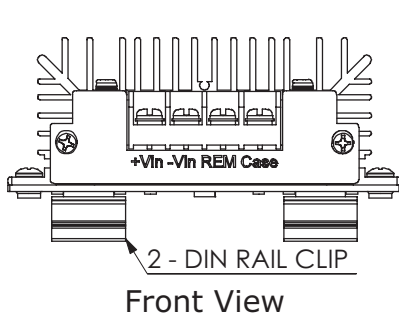
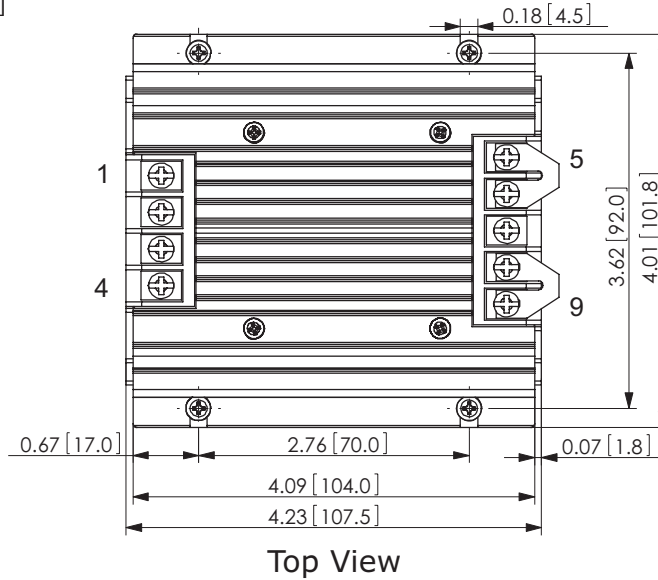
## MECHANICAL DRAWING

units: inch[mm]

tolerance: X.XX =  $\pm 0.02[\pm 0.5]$   
 X.XXX =  $\pm 0.010[\pm 0.25]$

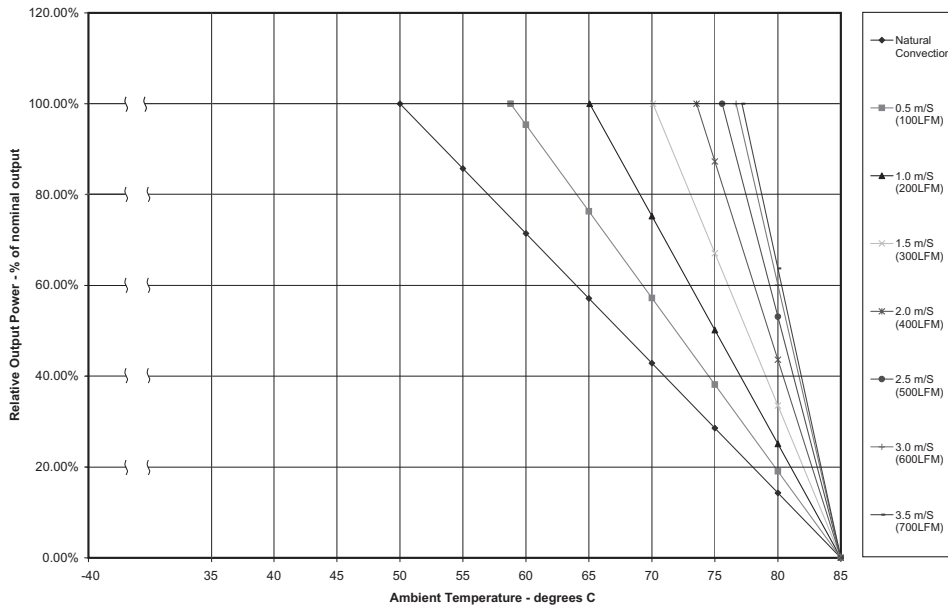
wire range: 22~12 AWG  
 screw size: #6-32  
 mounts to TS35 rails

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



## DERATING CURVES

VHK75W Power Derating Curves At Nominal Input



## TEST CONFIGURATION

Figure 1

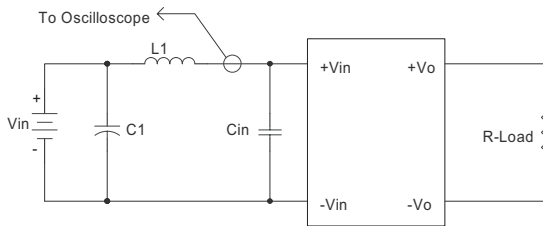


Table 1

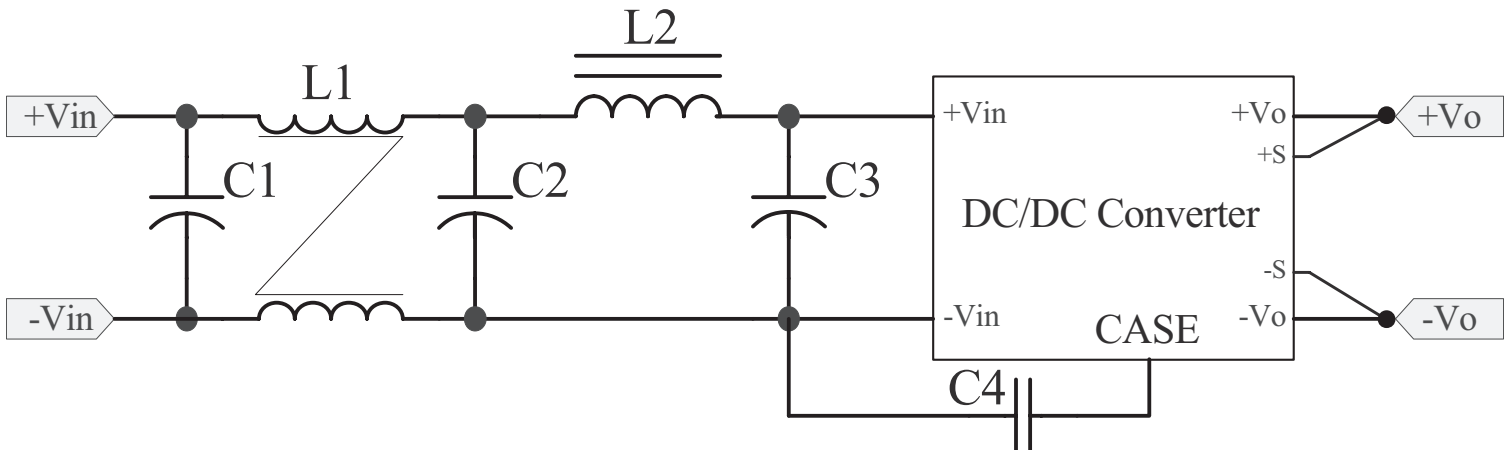
External components	
L1	12μH
C1	220μF, ESR < 0.1Ω at 100 KHz
Cin	100μF, ESR < 0.1Ω at 100 KHz

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

## EMC RECOMMENDED CIRCUITS

### EN55022 CLASS A

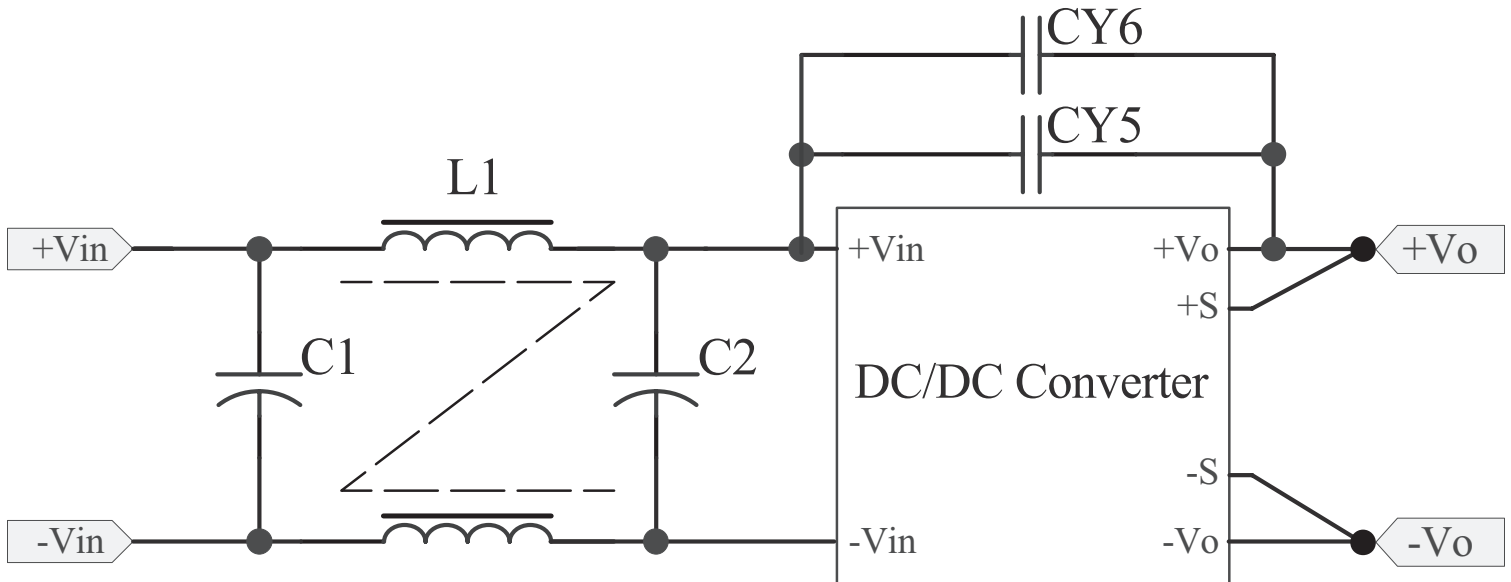
Figure 2  
Recommended Circuit for EN55022 Class A  
(for all 3.3, 5, 12, 15, & 24 Vdc output models)



## 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**

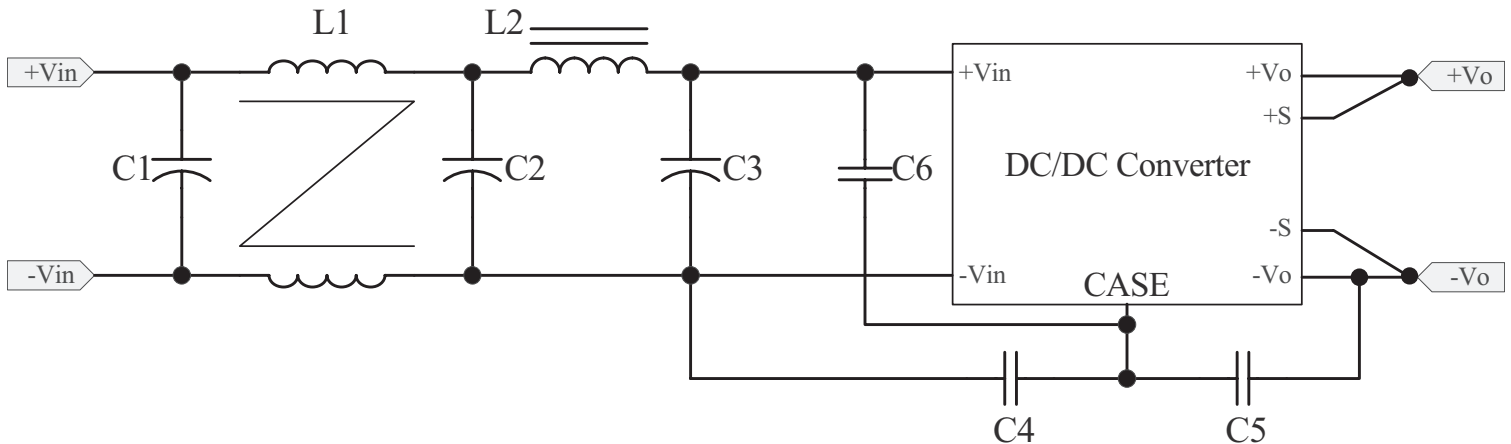
Model	C1 <sup>1</sup>	C2 <sup>1</sup>	C3 <sup>1</sup>	C4 <sup>2</sup>	CY5 <sup>2</sup>	CY6 <sup>2</sup>	L1	L2
VHK75W-Q24-S3R3	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S5	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 kV	NC	NC	Short	3.4 µH
VHK75W-Q24-S12	NC	47 µF/50 V	47 µF/50 V	2200 pF/2 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.

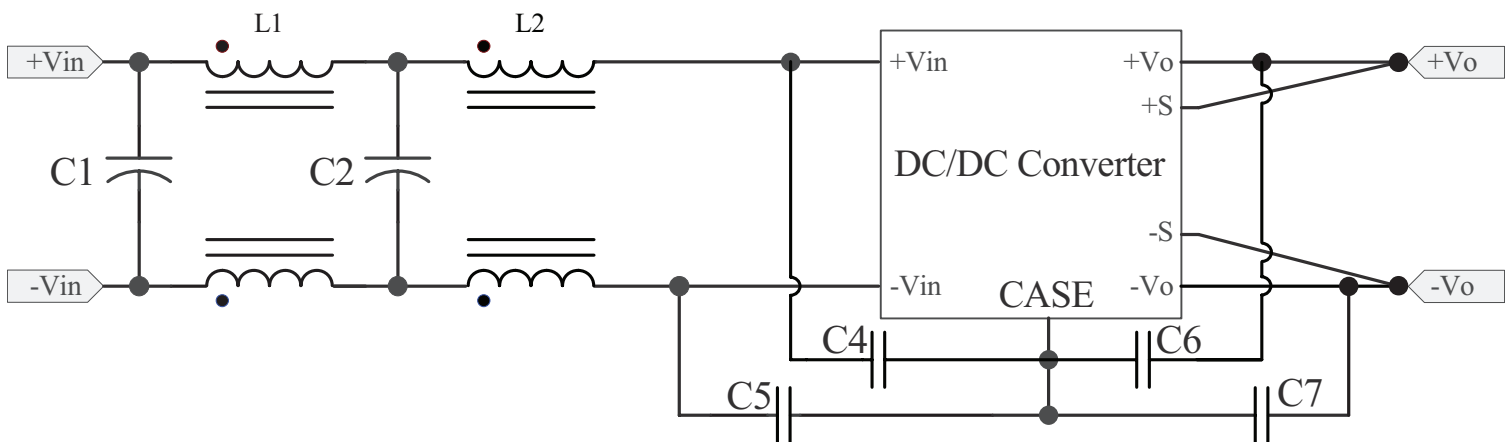
## EMC RECOMMENDED CIRCUITS (CONTINUED)

### 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)

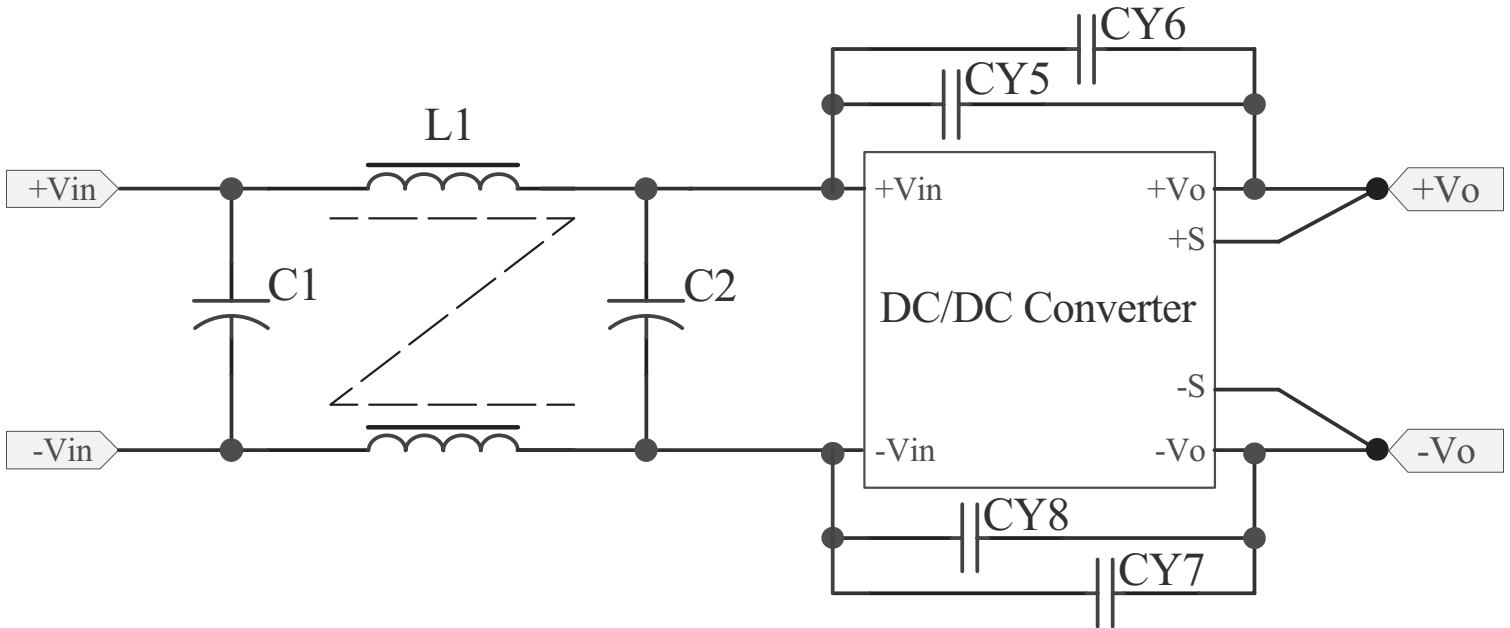
Model	C1 <sup>1</sup>	C2 <sup>1</sup>	C3 <sup>1</sup>	C4 <sup>2</sup>	C5 <sup>2</sup>	C6 <sup>2</sup>	C7 <sup>2</sup>	L1	L2
VHK75W-Q24-S3R3	47 μF/50 V	47 μF/50 V	47 μF/50 V	3300 pF/2 kV	3300 pF/2 kV	1000 pF/2 kV	NC	1.5 mH	3.4 μH
VHK75W-Q24-S5	47 μF/50 V	47 μF/50 V	47 μF/50 V	2200 pF/2 kV	3300 pF/2 kV	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 <sup>1</sup>	C2 <sup>1</sup>	CY5 <sup>2</sup>	CY6 <sup>2</sup>	CY7 <sup>2</sup>	CY8 <sup>2</sup>	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.

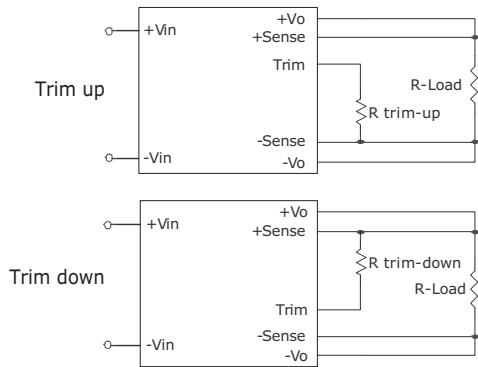
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 7**

Application Circuit for Trim pin



### Formula for Trim Resistor

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

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

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  $V_f$  are internal (see Table 5).

**Table 5**

Vout (Vdc)	R1 (K $\Omega$ )	R2 (K $\Omega$ )	R3 (K $\Omega$ )	Vr (V)	Vf (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



## REVISION HISTORY

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<b>rev.</b>	<b>description</b>	<b>date</b>
1.0	initial release	12/16/2013
1.01	changed DIN-rail mount	06/16/2014

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



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