


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

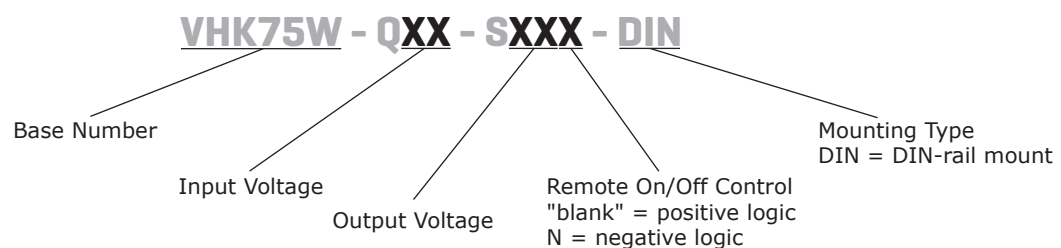
**FEATURES**

- 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<br>voltage<br>range<br>(Vdc) | output<br>voltage<br>(Vdc) | output<br>current<br>max<br>(A) | output<br>power<br>max<br>(W) | ripple<br>and noise <sup>1</sup><br>max<br>(mVp-p) | efficiency<br><br>typ<br>(%) |
|---------------------|------------------------------------|----------------------------|---------------------------------|-------------------------------|----------------------------------------------------|------------------------------|
| 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 $\mu$ 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                                                                   | power up<br>power down    |     | 8.8<br>8 |     | Vdc<br>Vdc |
|                         | 48 Vdc input                                                                   | power up<br>power down    |     | 17<br>16 |     | Vdc<br>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,<br>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;<br>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]

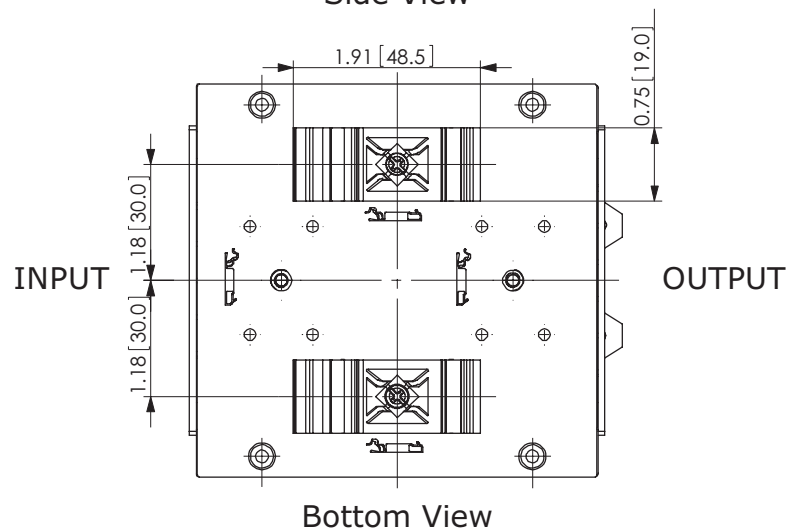
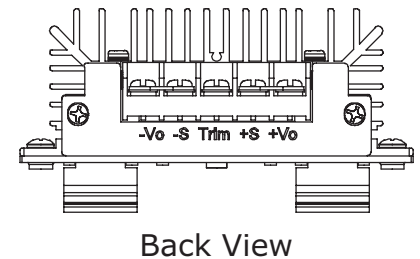
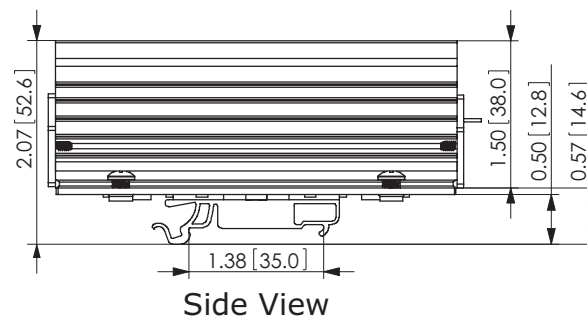
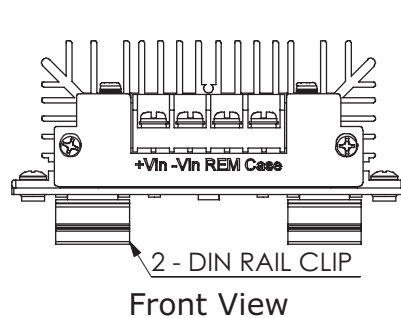
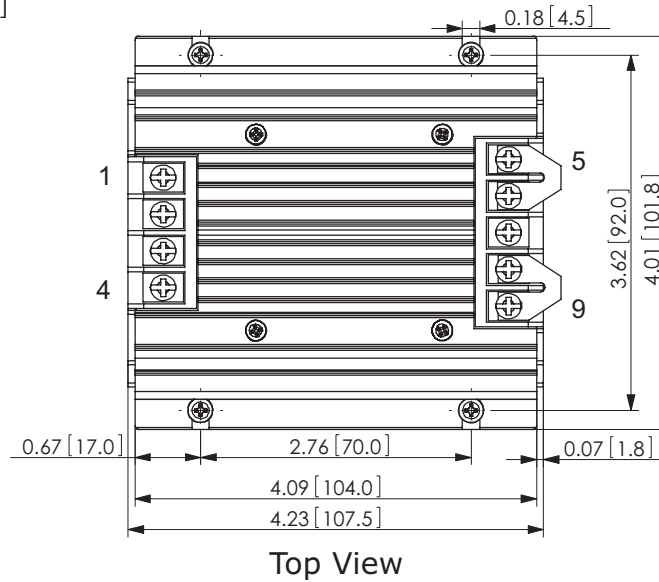
tolerance: X.XX =  $\pm 0.02$ [ $\pm 0.5$ ]X.XXX =  $\pm 0.010$ [ $\pm 0.25$ ]

wire range: 22~12 AWG

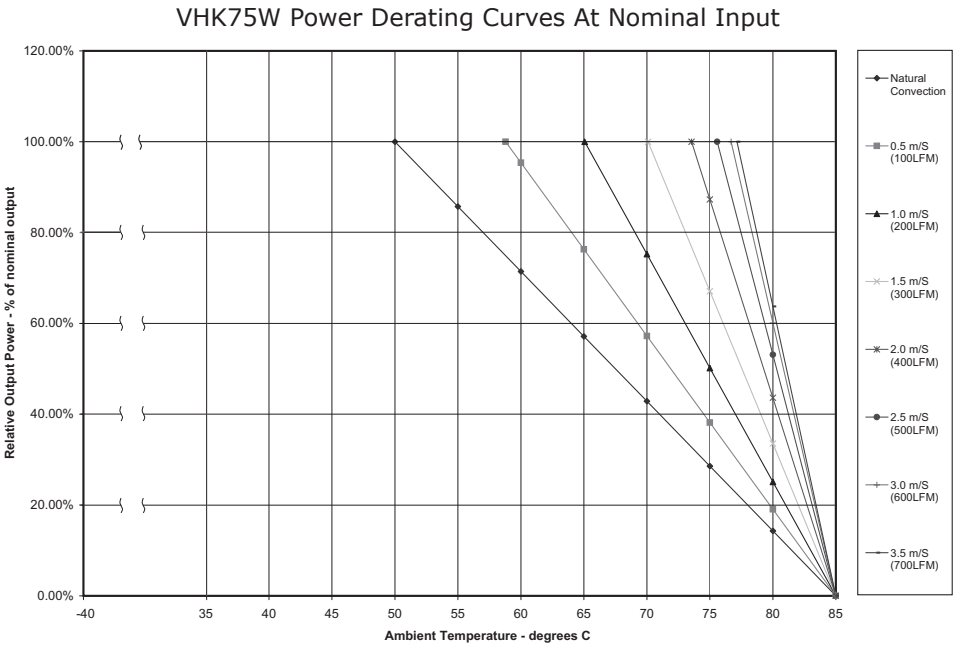
screw size: #6-32

mounts to TS35 rails

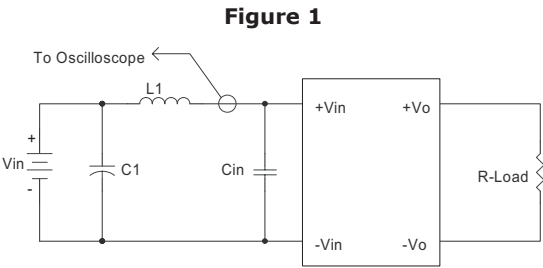
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | -Vin     |
| 3               | REM      |
| 4               | CASE     |
| 5               | +Vo      |
| 6               | +S       |
| 7               | TRIM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



DERATING CURVES



TEST CONFIGURATION



**Table 1**

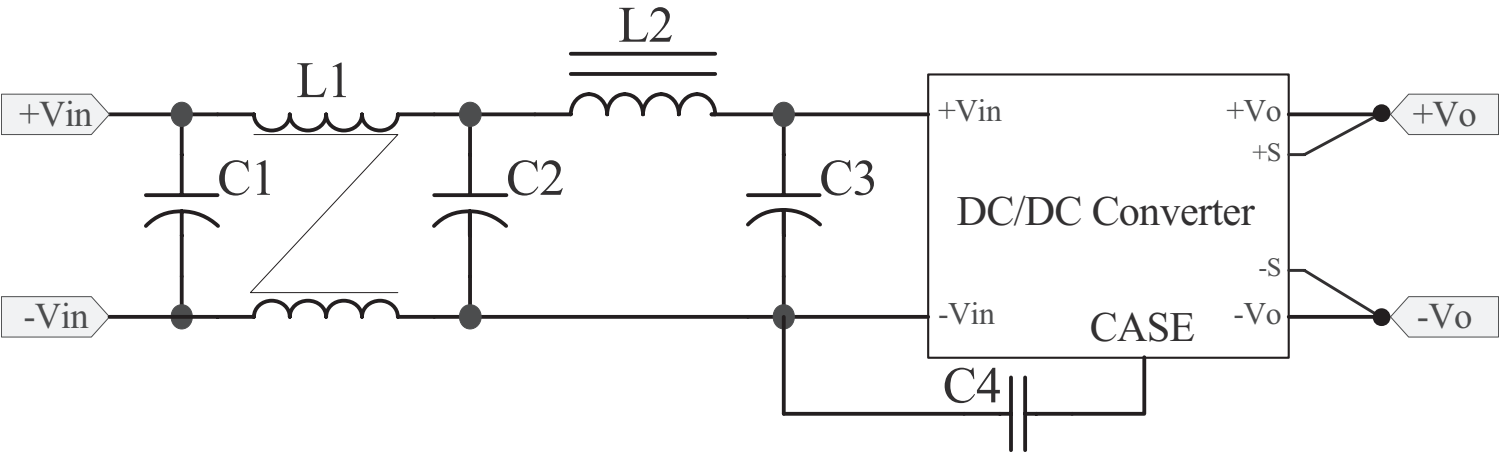
| External components |                              |
|---------------------|------------------------------|
| L1                  | 12μH                         |
| C1                  | 220μF, ESR < 0.1Ω at 100 KHz |
| Cin                 | 100μF, ESR < 0.1Ω at 100 KHz |

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

EMC RECOMMENDED CIRCUITS

EN55022 CLASS A

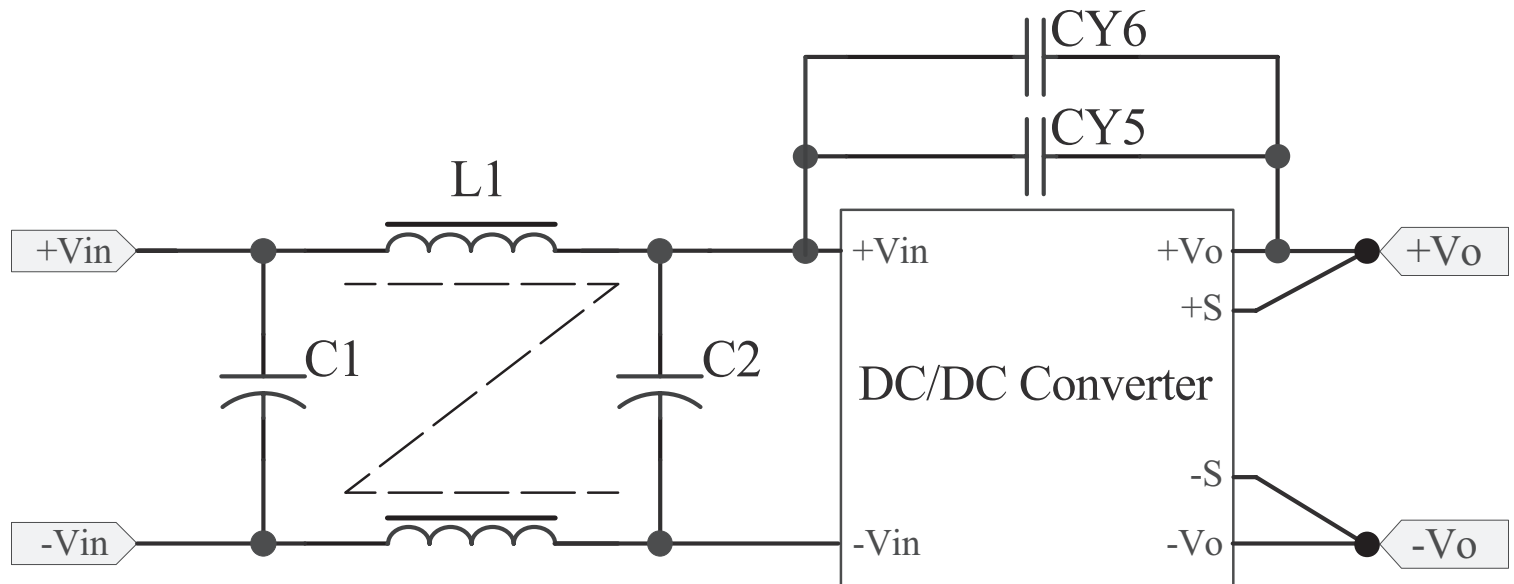
**Figure 2**  
**Recommended Circuit for EN55022 Class A**  
(for all 3.3, 5, 12, 15, & 24 Vdc output models)



## 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 $\mu$ F/50 V  | 47 $\mu$ F/50 V  | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q24-S5   | NC               | 47 $\mu$ F/50 V  | 47 $\mu$ F/50 V  | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q24-S12  | NC               | 47 $\mu$ F/50 V  | 47 $\mu$ F/50 V  | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q24-S15  | NC               | 47 $\mu$ F/50 V  | 47 $\mu$ F/50 V  | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q24-S24  | NC               | 100 $\mu$ F/50 V | 100 $\mu$ F/50 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q24-S48  | 220 $\mu$ F/50 V | 100 $\mu$ F/50 V | NC               | NC              | 1000 pF/2 kV     | 1000 pF/2 kV     | 0.223 mH | NC          |
| VHK75W-Q48-S3R3 | NC               | 47 $\mu$ F/100 V | 47 $\mu$ F/100 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q48-S5   | NC               | 47 $\mu$ F/100 V | 47 $\mu$ F/100 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q48-S12  | NC               | 47 $\mu$ F/100 V | 47 $\mu$ F/100 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q48-S15  | NC               | 47 $\mu$ F/100 V | 47 $\mu$ F/100 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q48-S24  | NC               | 47 $\mu$ F/100 V | 47 $\mu$ F/100 V | 2200 pF/2 kV    | NC               | NC               | Short    | 3.4 $\mu$ H |
| VHK75W-Q48-S48  | 56 $\mu$ F/100 V | 39 $\mu$ F/100 V | NC               | NC              | 1000 pF/2 kV     | 470 pF/2 kV      | 0.223 mH | NC          |

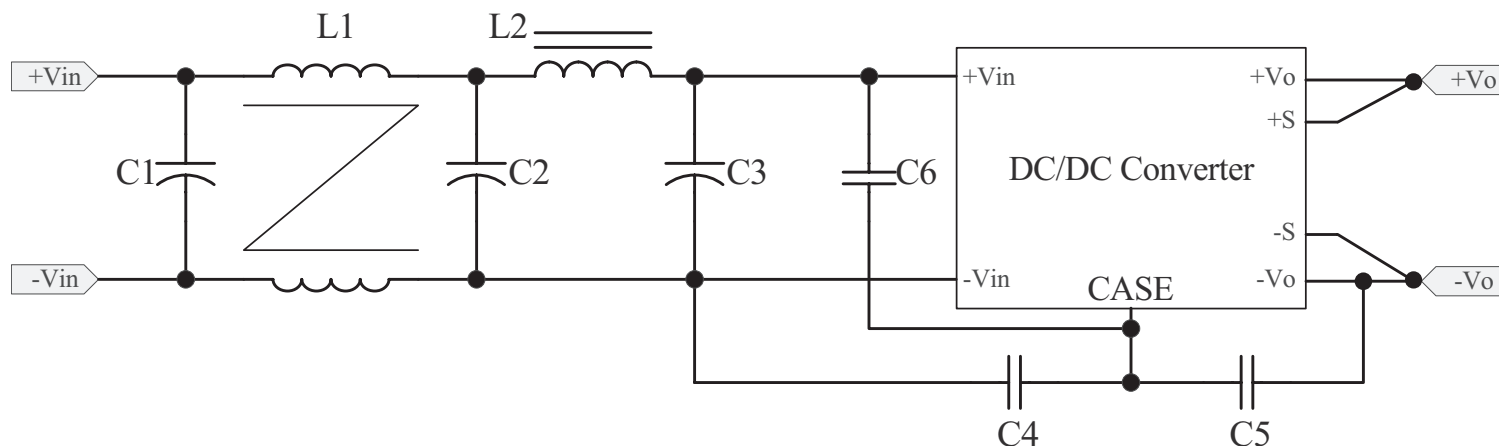
Note: 1. Aluminum capacitors.  
2. Ceramic capacitors.

## EMC RECOMMENDED CIRCUITS (CONTINUED)

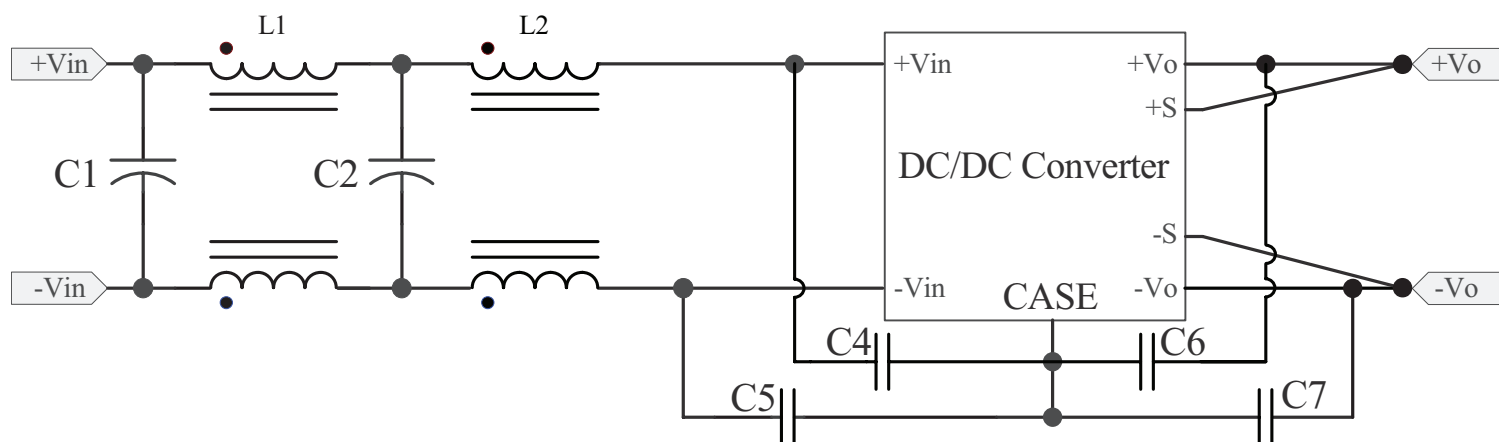
### EN55022 CLASS B

**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)

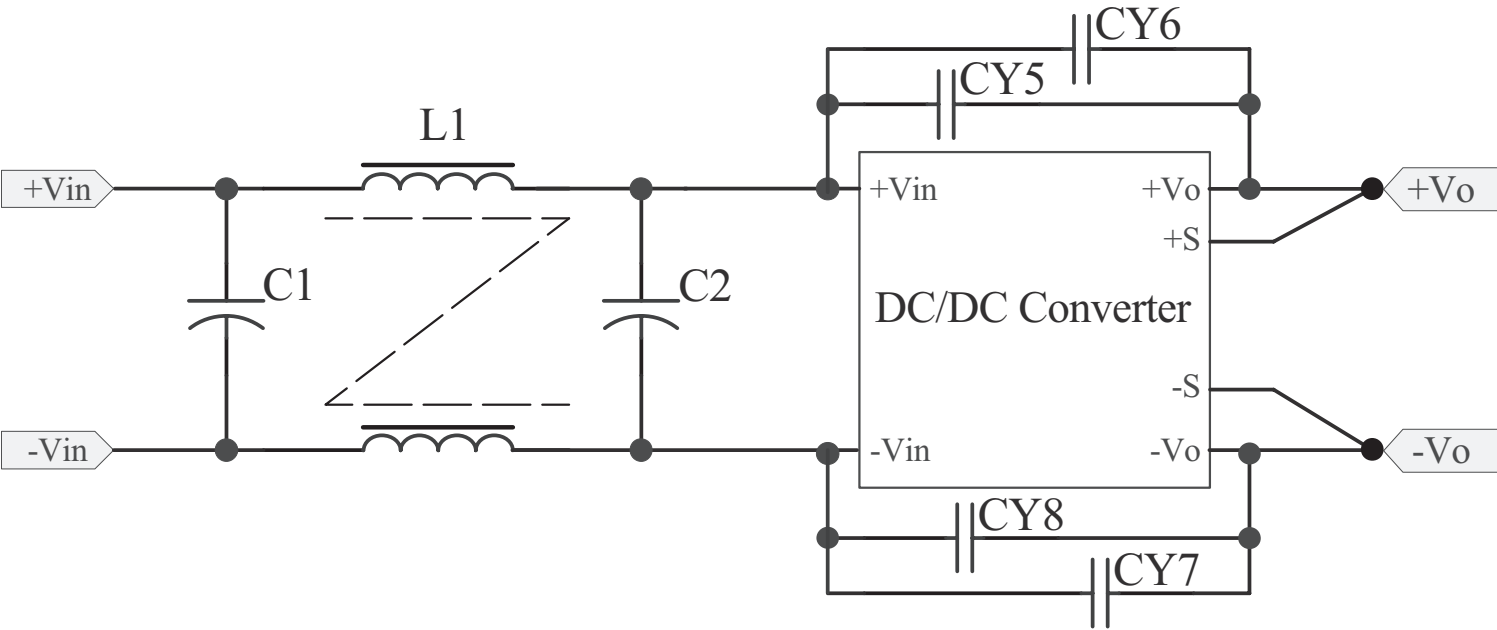


Table 4  
Class B Recommended Components  
(for all 48 V output models)

| 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.

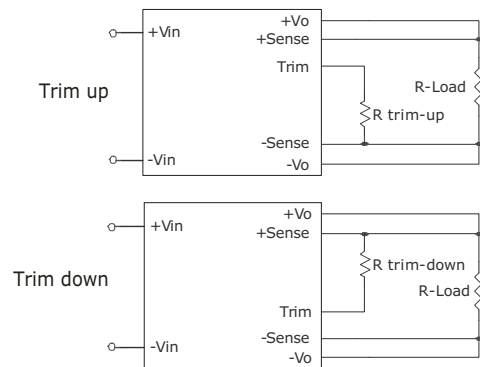
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 7**

Application Circuit for Trim pin



### Formula for Trim Resistor

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

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

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 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

| rev. | description            | date       |
|------|------------------------|------------|
| 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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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.