



## SERIES: VFK600-DIN | DESCRIPTION: DC-DC CONVERTER

### FEATURES

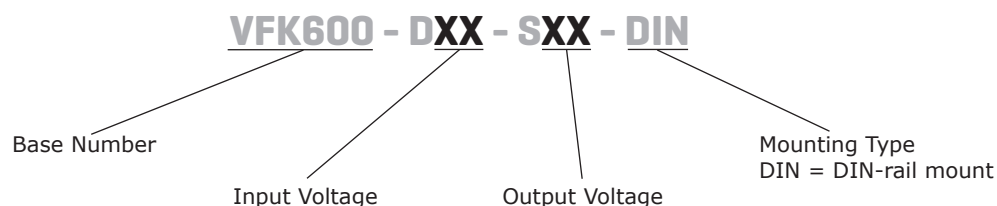
- up to 700 W isolated output
- rugged metal enclosure with integrated heat sink
- 2:1 input range (18~36 Vdc, 36~75 Vdc)
- single output from 12~48 Vdc
- 1,500 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- N+1 current sharing
- efficiency up to 92%
- 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>typ<br>(%) |
|--------------------|------------------------------------|----------------------------|---------------------------------|-------------------------------|----------------------------------------------------|--------------------------|
| VFK600-D24-S12-DIN | 18 ~ 36                            | 12                         | 50                              | 600                           | 120                                                | 89                       |
| VFK600-D24-S24-DIN | 18 ~ 36                            | 24                         | 25                              | 600                           | 240                                                | 91                       |
| VFK600-D24-S28-DIN | 18 ~ 36                            | 28                         | 21.5                            | 600                           | 280                                                | 90                       |
| VFK600-D24-S32-DIN | 18 ~ 36                            | 32                         | 19                              | 608                           | 320                                                | 91                       |
| VFK600-D24-S48-DIN | 18 ~ 36                            | 48                         | 12.5                            | 600                           | 480                                                | 92                       |
| VFK600-D48-S12-DIN | 36 ~ 75                            | 12                         | 50                              | 600                           | 120                                                | 90                       |
| VFK600-D48-S24-DIN | 36 ~ 75                            | 24                         | 25                              | 600                           | 240                                                | 91                       |
| VFK600-D48-S28-DIN | 36 ~ 75                            | 28                         | 25                              | 700                           | 280                                                | 91                       |
| VFK600-D48-S32-DIN | 36 ~ 75                            | 32                         | 19                              | 608                           | 320                                                | 92                       |
| VFK600-D48-S48-DIN | 36 ~ 75                            | 48                         | 12.5                            | 600                           | 480                                                | 92                       |

Notes: 1. Ripple and noise are measured at full load, 20 MHz BW with 10µF tantalum capacitor and 1µF ceramic capacitor across output

### PART NUMBER KEY



## INPUT

| parameter               | conditions/description                                                            |                                         | min | typ  | max | units |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------|-----|------|-----|-------|
| operating input voltage | 24 Vdc input models                                                               |                                         | 18  | 24   | 36  | Vdc   |
|                         | 48 Vdc input models                                                               |                                         | 36  | 48   | 75  | Vdc   |
| input current           | 24 Vdc input models, Vin = 18 Vdc, full load                                      |                                         |     | 37.7 |     | A     |
|                         | 48 Vdc input models, Vin = 36 Vdc, full load                                      |                                         |     | 21.7 |     | A     |
| under voltage shutdown  | 24 Vdc input                                                                      | power up                                | 16  | 17   | 18  | Vdc   |
|                         |                                                                                   | power down                              | 15  | 16   | 17  | Vdc   |
|                         | 48 Vdc input                                                                      | power up                                | 34  | 35   | 36  | Vdc   |
|                         |                                                                                   | power down                              | 32  | 33   | 34  | Vdc   |
| over voltage shutdown   | 24 Vdc input                                                                      | power up                                |     | 38   |     | Vdc   |
|                         |                                                                                   | power down                              |     | 40   |     | Vdc   |
|                         | 48 Vdc input                                                                      | power up                                |     | 77   |     | Vdc   |
|                         |                                                                                   | power down                              |     | 80   |     | Vdc   |
| CTRL <sup>1</sup>       | positive logic                                                                    | models ON (3.5~7.5 Vdc or open circuit) |     |      |     |       |
|                         |                                                                                   | models OFF (0~0.7 Vdc)                  |     |      |     |       |
| input fuse              | 60 A time delay fuse for 24 Vin models,<br>30 A time delay fuse for 48 Vin models |                                         |     |      |     |       |
| filter                  | pi filter                                                                         |                                         |     |      |     |       |

Note: 1. Open collector refer to -Vin.

## OUTPUT

| parameter               | conditions/description               | min | typ   | max    | units |
|-------------------------|--------------------------------------|-----|-------|--------|-------|
| maximum capacitive load | 12 V output models                   | 470 |       | 10,000 | μF    |
|                         | 24~48 V output models                | 470 |       | 5,000  | μF    |
| line regulation         | measured from low line to high line  |     |       | ±0.2   | %     |
| load regulation         | measured from zero load to full load |     |       | ±0.5   | %     |
| voltage accuracy        |                                      |     |       | ±1.5   | %     |
| load share accuracy     | 50~100% load                         |     | ±10   |        | %     |
| adjustability           |                                      | 60  |       | 110    | %     |
| switching frequency     | 48 V input, 12/28/32 V output models |     | 300   |        | kHz   |
|                         | all other models                     |     | 250   |        | kHz   |
| transient response      | 25% step load change                 |     |       | 500    | μs    |
| temperature coefficient |                                      |     | ±0.03 |        | %/°C  |

## PROTECTIONS

| parameter                   | conditions/description   | min | typ | max | units |
|-----------------------------|--------------------------|-----|-----|-----|-------|
| short circuit protection    | continuous               |     |     |     |       |
| over current protection     | % nominal output current | 110 |     | 150 | %     |
| over voltage protection     | %Vo                      | 115 |     | 140 | %     |
| over temperature protection | shutdown                 |     | 110 |     | °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 curves    | -40 |     | 85  | °C    |
| storage temperature   |                        | -55 |     | 105 | °C    |

## MECHANICAL

| parameter     | conditions/description                       | min | typ  | max | units |
|---------------|----------------------------------------------|-----|------|-----|-------|
| dimensions    | 7.83 x 5.00 x 2.11 (199.0 x 127.0 x 53.6 mm) |     |      |     | inch  |
| case material | steel and aluminum extrusion                 |     |      |     |       |
| weight        |                                              |     | 1.53 |     | kg    |

## MECHANICAL DRAWING

units: mm[inch]

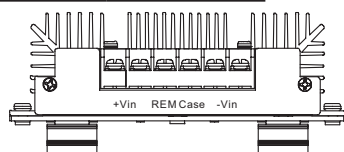
tolerance: X.XX =  $\pm 0.02$  [ $\pm 0.5$ ]X.XXX =  $\pm 0.010$  [ $\pm 0.25$ ]

wire range: 22~12 AWG

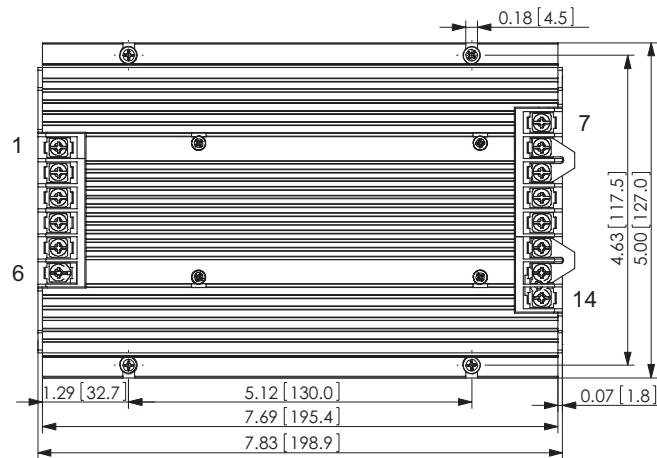
screw size: #6-32

mounts to TS35 rails

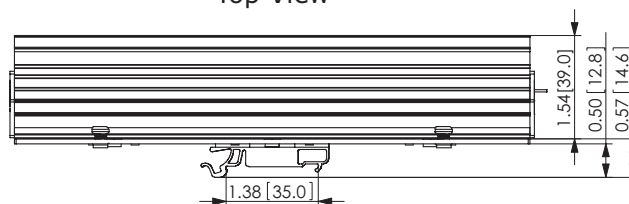
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1, 2            | +Vin     |
| 3               | REM      |
| 4               | case     |
| 5, 6            | -Vin     |
| 7, 8            | +Vo      |
| 9               | +S       |
| 10              | PC       |
| 11              | Trim     |
| 12              | -S       |
| 13, 14          | -Vo      |



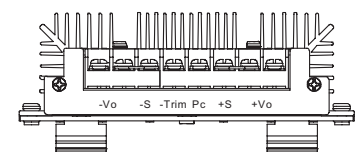
2 - DIN RAIL CLIP  
Front View



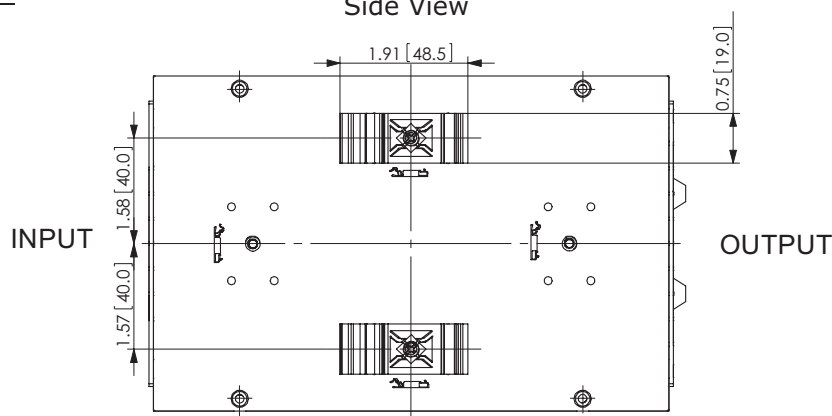
Top View



Side View



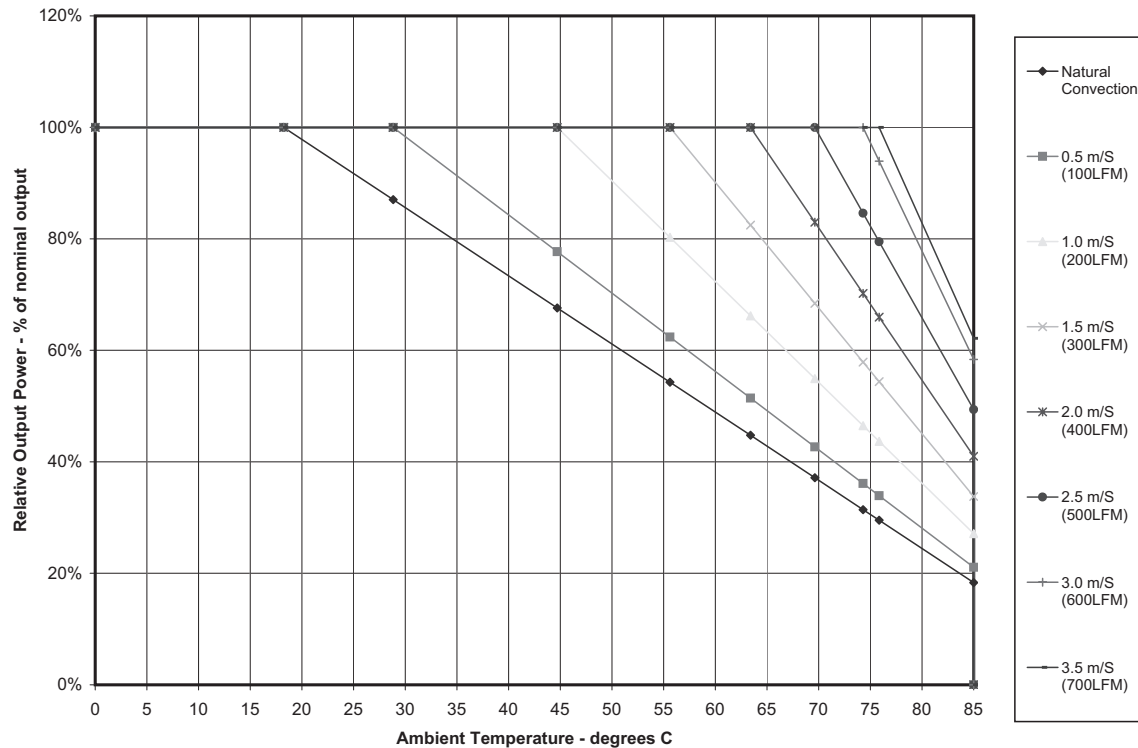
Back View



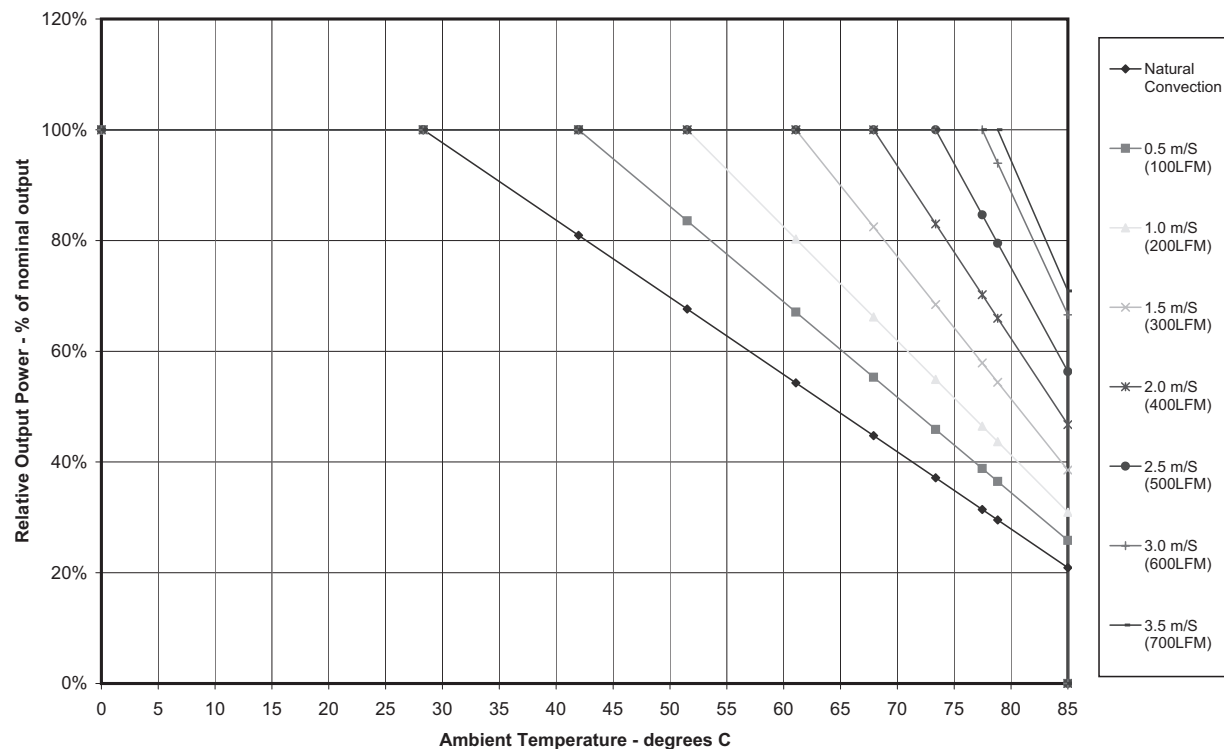
Bottom View

## DERATING CURVES

VFK600-DIN Power Derating Curves At Nominal Input  
(Includes 24 V input, 12/24/28 V output models and VFK600-D48-S12-DIN)



VFK600-DIN Power Derating Curves At Nominal Input  
(Includes 24 V input, 32/48 V output models and 48 V input, 24/28/32/48 V output models)



TEST CONFIGURATION

Figure 1

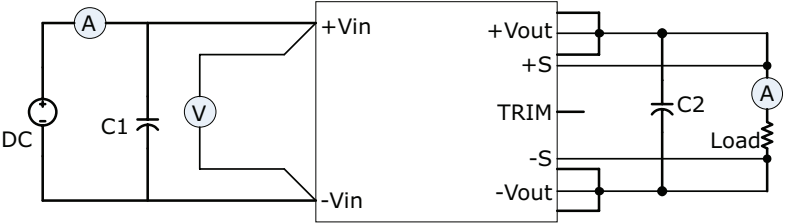


Table 1

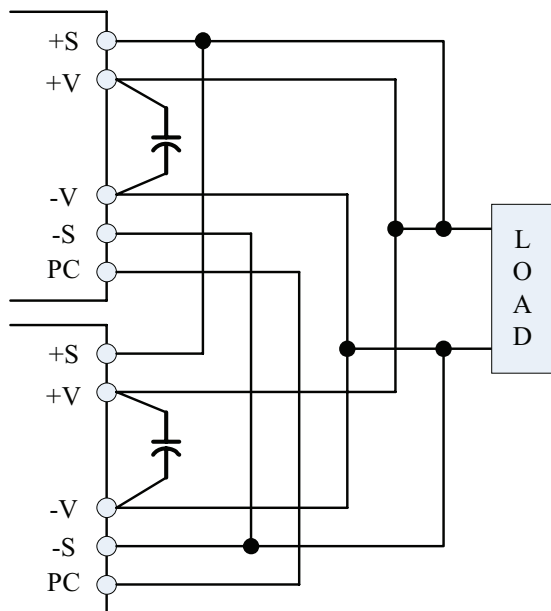
| Recommended External components |                   |
|---------------------------------|-------------------|
| C1                              | 220 $\mu$ F/100 V |
| C2                              | 470 $\mu$ F/100 V |

## APPLICATION NOTES

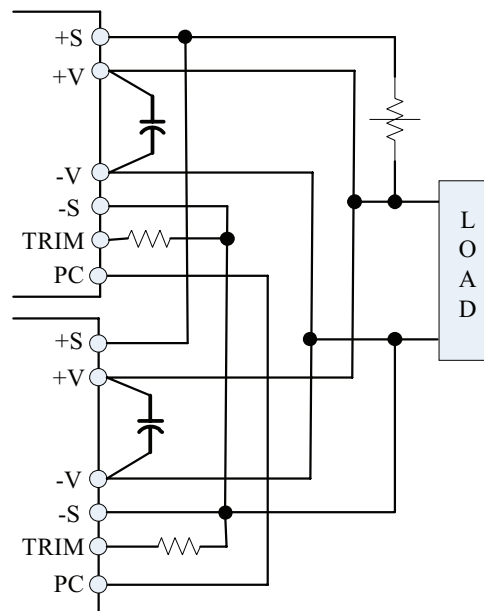
### 1. Parallel Operation

The VFK600-DIN series are designed for parallel operation. When in parallel the load current can be shared equally between the two modules by connecting their PC pins. The VFK600-DIN can be setup in two different modes to achieve parallel operation. The standard parallel operation is suitable when load cannot be handled by a single unit, whereas the N+1 redundant operation is suitable for loads when backup power is required.

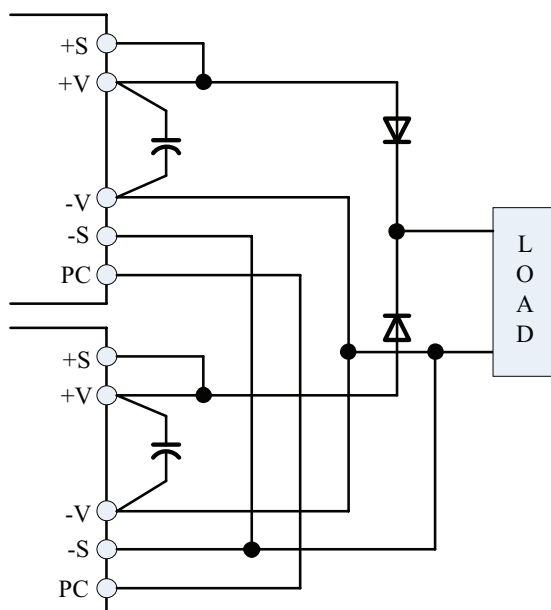
### STANDARD PARALLEL CONNECTION



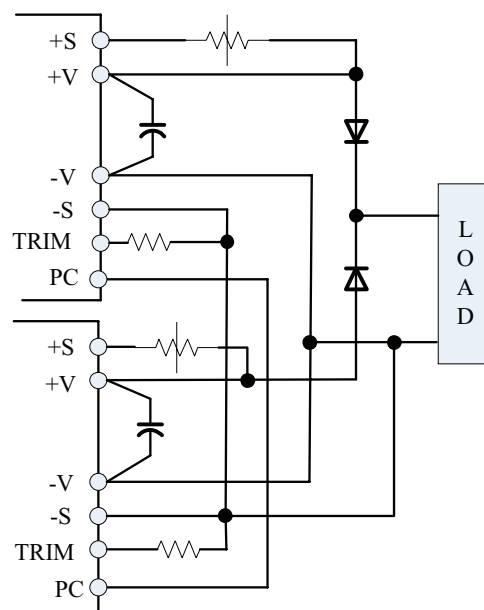
### PARALLEL CONNECTION WITH PROGRAMMED AND ADJUSTABLE OUTPUT



### N+1 REDUNDANT CONNECTION



### N+1 REDUNDANT CONNECTION WITH PROGRAMMED OUTPUT AND ADJUSTABLE OUTPUT VOLTAGE



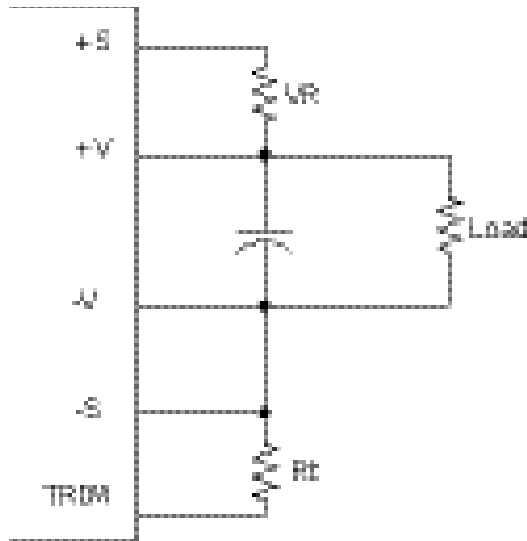
## APPLICATION NOTES (CONTINUED)

### 2. Output Voltage Trimming

Leave open if not used.

**Figure 2**

External Resistors



#### Trim-Up/Trim-Down Formulas

$$V_f = \frac{1.24 \times \left( \frac{R_t \times 33}{R_t + 33} \right)}{7.68 + \left( \frac{R_t \times 33}{R_t + 33} \right)}$$

$$V_{out} = (V_o + V_R) \times V_f$$

Note:  $R_t = 6.8 \text{ K}\Omega$

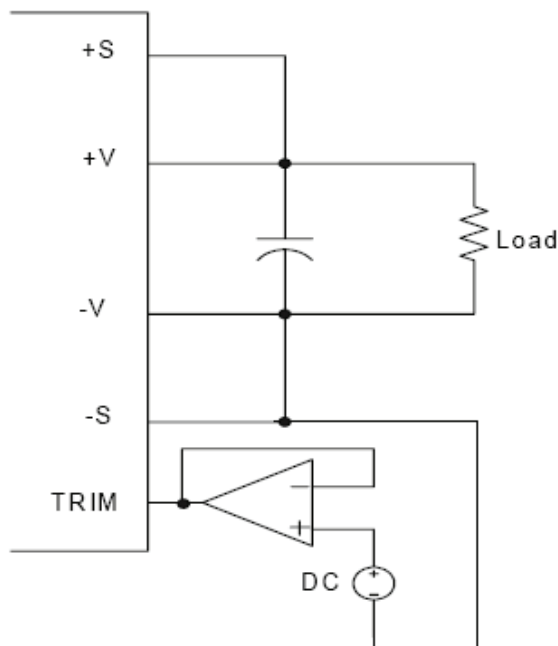
$V_o$  is the nominal output voltage

$V_{out}$  is the desired output voltage (up or down)

$V_R$  is the trim resistor in  $\text{K}\Omega$

**Figure 3**

External DC Voltage



#### Trim-Up/Trim-Down Formulas

$$V_{out} = V_T \times V_o$$

Note:  $V_T$  is the trim terminal voltage

$V_o$  is the nominal output voltage

$V_{out}$  is the desired output voltage (up or down)

## REVISION HISTORY

| rev. | description            | date       |
|------|------------------------|------------|
| 1.0  | initial release        | 12/17/2013 |
| 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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