

## **Wall Industries, Inc.**

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# **CV SERIES**

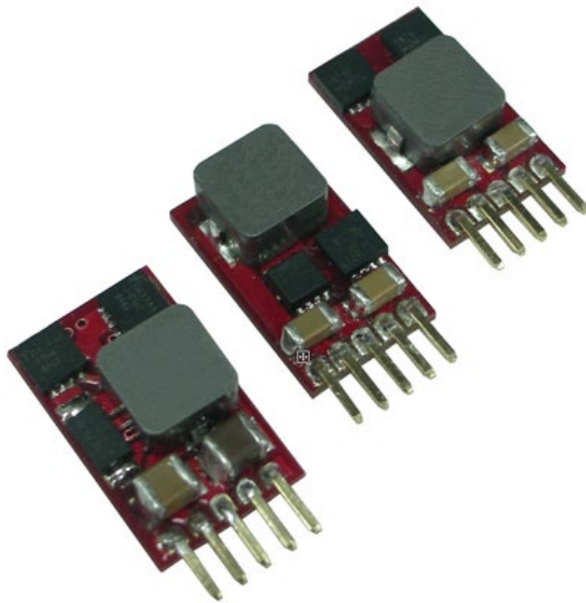
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**1.8 to 45 Watts**  
**2.5-5.5VDC, 4.5-14VDC, 10-30VDC Input Ranges**  
**Adjustable Output Voltage**  
**Negative and Positive Output Applications**  
**Non-Isolated DC/DC Converters**

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### **FEATURES**

- Output Current up to 3A
- 1.8 to 45 Watts Output Power Range
- Adjustable Output Voltage
- High Efficiency - 95% at 12VDC and Full Load
- SIP Open Frame Packages
- Small Size and Profile
- Fixed Switching Frequency
- Remote On/Off
- Short Circuit, Over Current, and Over Temperature Protection
- Positive & Negative Output Applications
- Compliant to RoHS EU Directive 2011/65/EU
- UL60950-1, EN60950-1, and IEC60950-1 Safety Approvals
- Vertical Mounting and Horizontal Mounting Types Available



### **APPLICATIONS**

- Wireless Networks
- Telecom / Datacom
- Industry Control Systems
- Semiconductor Equipment
- Distributed Power Architectures

### **DESCRIPTION**

The CV series consists of non-isolated DC/DC converters that can deliver up to 3A of output current in a small open frame package. This series features remote on/off, adjustable output voltage, and efficiency up to 95%. These converters are protected against over current, over temperature, and short circuit conditions. The CV series is RoHS compliant and has UL60950-1, EN60950-1, and IEC60950-1 safety approvals. This series also has positive and negative output applications as well as vertical (standard) and horizontal ("A" suffix) SIP mounting options.

**SPECIFICATIONS: CV SERIES**

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.  
We reserve the right to change specifications based on technological advances.

| SPECIFICATION                                |                                | TEST CONDITIONS                                                                                                |                                                        | Min                                            | Typ | Max  | Unit  |  |
|----------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------|-----|------|-------|--|
| INPUT SPECIFICATIONS                         |                                |                                                                                                                |                                                        |                                                |     |      |       |  |
| Operating Input Voltage Range <sup>(3)</sup> |                                | Positive Output Application                                                                                    |                                                        |                                                |     |      |       |  |
|                                              |                                | CV5S2.5-3000 (Vin>Vo+0.5V)                                                                                     | 05Vin(nom), 0.6 ~ 3.3Vout                              | 2.5                                            |     | 5.5  | VDC   |  |
|                                              |                                | CV12S3.3-3000 (Vin>Vo+2.0V)                                                                                    | 12Vin(nom), 0.59 ~ 6.0Vout                             | 4.5                                            |     | 14   |       |  |
|                                              |                                | CV24S5-3000 (Vin>Vo+3.0V)                                                                                      | 24Vin(nom), 3.0 ~ 6.0Vout                              | 10                                             |     | 30   |       |  |
|                                              |                                | CV24S12-3000 (Vin>Vo+3.0V)                                                                                     | 24Vin(nom), 5.0 ~ 15Vout                               | 10                                             |     | 30   |       |  |
|                                              |                                | Negative Output Application                                                                                    |                                                        |                                                |     |      |       |  |
|                                              |                                | CV12S3.3-3000 (Vin <sub>max</sub> =14- Vo )                                                                    | 12Vin(nom), -0.59 ~ -6.0Vout                           | 4.7                                            |     | 13   | VDC   |  |
|                                              |                                | CV24S5-3000 (Vin <sub>max</sub> =30- Vo )                                                                      | 12Vin(nom), -3.0 ~ -6.0Vout                            | 10                                             |     | 27   |       |  |
|                                              |                                | CV24S12-3000 (Vin <sub>max</sub> =30- Vo )                                                                     | 12Vin(nom), -5.0 ~ -15Vout                             | 10                                             |     | 25   |       |  |
| No Load Input Current                        |                                |                                                                                                                |                                                        | See Table                                      |     |      |       |  |
| Maximum Input Current                        |                                | CV5S2.5-3000                                                                                                   | Vin=Vin(min); Io=Io(max)                               |                                                |     | 3.0  | A     |  |
|                                              |                                | CV12S3.3-3000                                                                                                  |                                                        |                                                |     | 2.6  |       |  |
|                                              |                                | CV24S5-3000                                                                                                    |                                                        |                                                |     | 2.2  |       |  |
|                                              |                                | CV24S12-3000                                                                                                   |                                                        |                                                |     | 3.0  |       |  |
| Input Reflected Ripple Current               |                                | An external $\pi$ filter is recommended at the input of the module in order to minimize input reflected ripple |                                                        |                                                | 30  |      | mAp-p |  |
| Input Filter                                 |                                |                                                                                                                |                                                        | C type                                         |     |      |       |  |
| Remote On/Off (Positive Logic)               |                                | CV5S2.5-3000                                                                                                   | The On/Off control pin voltage is referenced to ground | ON = Open or Vin (max)<br>OFF = 0V < Vr < 0.3V |     |      |       |  |
|                                              |                                | Others                                                                                                         |                                                        | ON = 1V < Vr < 12V<br>OFF = 0V < Vr < 0.3V     |     |      |       |  |
| OUTPUT SPECIFICATIONS                        |                                |                                                                                                                |                                                        |                                                |     |      |       |  |
| Voltage Adjustability <sup>(1)</sup>         |                                | See Figure 2                                                                                                   |                                                        | See Table                                      |     |      |       |  |
| Voltage Accuracy                             |                                |                                                                                                                |                                                        | -2.0                                           |     | +2.0 | %     |  |
| Line Regulation                              |                                | Vo ≥ 2.5VDC                                                                                                    |                                                        |                                                | 0.2 |      | %     |  |
|                                              |                                | Vo < 2.5VDC                                                                                                    |                                                        |                                                | 5   |      | mV    |  |
| Load Regulation                              |                                | Vo ≥ 2.5VDC                                                                                                    |                                                        | 0% to 100% of full load                        | 0.8 |      | %     |  |
|                                              |                                | Vo < 2.5VDC                                                                                                    |                                                        |                                                | 20  |      | mV    |  |
|                                              |                                | Vo ≥ 2.5VDC                                                                                                    |                                                        | 10% to 90% of full load                        | 0.6 |      | %     |  |
|                                              |                                | Vo < 2.5VDC                                                                                                    |                                                        |                                                | 15  |      | mV    |  |
| Output Power                                 |                                |                                                                                                                |                                                        | 1.8 ~ 45 Watts                                 |     |      |       |  |
| Output Current                               |                                |                                                                                                                |                                                        | See Table                                      |     |      |       |  |
| Ripple & Noise (20MHz BW)                    |                                | Positive Output Application                                                                                    |                                                        |                                                |     |      |       |  |
|                                              |                                | CV5S2.5-3000                                                                                                   |                                                        |                                                | 30  | 55   | mVp-p |  |
|                                              |                                | CV12S3.3-3000                                                                                                  |                                                        |                                                | 60  | 85   |       |  |
|                                              |                                | CV24S5-3000                                                                                                    | With 2.2μF MLCC                                        |                                                | 75  | 100  |       |  |
|                                              |                                | CV24S12-3000                                                                                                   | With 2.2μF MLCC                                        |                                                | 150 | 200  |       |  |
|                                              |                                | Negative Output Application (See figure 1)                                                                     |                                                        |                                                |     |      |       |  |
|                                              |                                | CV12S3.3-3000                                                                                                  |                                                        |                                                | 60  | 85   | mVp-p |  |
|                                              |                                | CV24S5-3000                                                                                                    | With C1=10μF/50V 1206 X5R MLCC                         |                                                | 75  | 100  |       |  |
| CV24S12-3000                                 | With C2=10μF/25V 1206 X5R MLCC |                                                                                                                | 150                                                    | 200                                            |     |      |       |  |
| Output Voltage Overshoot -Startup            |                                |                                                                                                                |                                                        |                                                |     | 1    | %     |  |
| Maximum Capacitive Load                      |                                |                                                                                                                |                                                        | See Table                                      |     |      |       |  |
| Rise Time                                    |                                | CV5S2.5-3000                                                                                                   | Time for Vo to rise from 10% to 90% Vo                 |                                                |     | 6    | ms    |  |
|                                              |                                | CV12S3.3-3000                                                                                                  |                                                        |                                                |     | 6    |       |  |
|                                              |                                | CV24S5-3000                                                                                                    |                                                        |                                                |     | 10   |       |  |
|                                              |                                | CV24S12-3000                                                                                                   |                                                        |                                                |     | 10   |       |  |
| Dynamic Load Response                        | Peak Deviation                 | CV24S12-3000                                                                                                   | 50% load step change                                   |                                                | 150 |      | mV    |  |
|                                              |                                | Others                                                                                                         |                                                        |                                                | 250 |      |       |  |
|                                              | Recovery Time                  | All models                                                                                                     |                                                        |                                                | 120 |      | μs    |  |
| Temperature Coefficient (max)                |                                |                                                                                                                |                                                        | -1                                             |     | +1   | %/°C  |  |
| PROTECTION                                   |                                |                                                                                                                |                                                        |                                                |     |      |       |  |
| Short Circuit Protection                     |                                |                                                                                                                |                                                        | continuous, automatic recovery                 |     |      |       |  |
| Over Load Protection                         |                                | CV5S2.5-3000                                                                                                   | % of rated Iout; hiccup mode                           |                                                | 280 |      | %     |  |
|                                              |                                | Others                                                                                                         |                                                        |                                                | 220 |      |       |  |
| Over Temperature Protection                  |                                | Internal IC Junction                                                                                           |                                                        |                                                | 150 |      | °C    |  |

## SPECIFICATIONS: CV SERIES

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| SPECIFICATION                | TEST CONDITIONS                                                                                                       | Min                                                                                                 | Typ        | Max        | Unit |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|------------|------|
| GENERAL SPECIFICATIONS       |                                                                                                                       |                                                                                                     |            |            |      |
| Efficiency                   | Nominal input voltage and full load                                                                                   | See Table                                                                                           |            |            |      |
| Switching Frequency          | CV5S2.5-3000 & CV12S3.3-3000<br>CV24S5-3000 & CV24S12-3000                                                            | 540<br>270                                                                                          | 600<br>300 | 660<br>330 | KHz  |
| Isolation Voltage            |                                                                                                                       | none                                                                                                |            |            |      |
| ENVIRONMENTAL SPECIFICATIONS |                                                                                                                       |                                                                                                     |            |            |      |
| Operating Temperature        | See derating curves                                                                                                   | -40                                                                                                 |            | +85        | °C   |
| Storage Temperature          |                                                                                                                       | -55                                                                                                 |            | +125       | °C   |
| Thermal Shock                |                                                                                                                       | MIL-STD-810F                                                                                        |            |            |      |
| MTBF                         | BELLCORE TR-NWT-000332 Case 1: 50% Stress, Ta=40°C<br>MIL-HDBK-217F Ta=25°C, full load, (G/B, controlled environment) | 6,250,000 hours<br>1,638,000 hours                                                                  |            |            |      |
| PHYSICAL SPECIFICATIONS      |                                                                                                                       |                                                                                                     |            |            |      |
| Case Material                |                                                                                                                       | Open frame                                                                                          |            |            |      |
| Potting Material             |                                                                                                                       | none                                                                                                |            |            |      |
| Weight                       | CV5S2.5-3000 & CV12S3.3-3000<br>CV24S5-3000 & CV24S12-3000                                                            | 0.06oz (1.7g)<br>0.074oz (2.1g)                                                                     |            |            |      |
| Dimensions (L x W x H)       | CV5S2.5-3000 & CV12S3.3-3000<br>CV24S5-3000 & CV24S12-3000                                                            | 0.37 x 0.24 x 0.61 inches (9.4 x 6.0 x 15.5 mm)<br>0.41 x 0.24 x 0.65 inches (10.4 x 6.0 x 16.5 mm) |            |            |      |
| SAFETY                       |                                                                                                                       |                                                                                                     |            |            |      |
| Safety Approvals             |                                                                                                                       | IEC60950-1, UL60950-1 <sup>(5)</sup> , EN60950-1                                                    |            |            |      |

## MODEL SELECTION TABLE

### POSITIVE OUTPUT APPLICATION

| Model Number  | Input Range  | Output Voltage <sup>(1)</sup> | Output Current | Maximum Input Current | No Load Input Current | Output Power | Efficiency  | Max Capacitive Load |          |
|---------------|--------------|-------------------------------|----------------|-----------------------|-----------------------|--------------|-------------|---------------------|----------|
|               |              |                               |                |                       |                       |              |             | ESR≥1mΩ             | ESR≥10mΩ |
| CV5S2.5-3000  | 2.5 ~ 5.5VDC | 0.6 ~ 3.3 VDC                 | 3A             | 3.0A                  | 20mA                  | 1.8W ~ 9.9W  | 95% @ 2.5Vo | 1000μF              | 3000μF   |
| CV12S3.3-3000 | 4.5 ~ 14VDC  | 0.59 ~ 6 VDC                  | 3A             | 2.6A                  | 25mA                  | 1.77W ~ 18W  | 93% @ 3.3Vo | 1000μF              | 3000μF   |
| CV24S5-3000   | 10 ~ 30VDC   | 3 ~ 6 VDC                     | 3A             | 2.2A                  | 25mA                  | 9W ~ 18W     | 91% @ 5.0Vo | 1000μF              | 3000μF   |
| CV24S12-3000  | 10 ~ 30VDC   | 5 ~ 15 VDC                    | 3A             | 3.0A                  | 30mA                  | 15W ~ 45W    | 95% @ 12Vo  | 500μF               | 1200μF   |

### NEGATIVE OUTPUT APPLICATION

| Model Number  | Input Range | Output Voltage | Output Current <sup>(2)</sup> | Maximum Input Current | No Load Input Current | Output Power | Efficiency  | Max Capacitive Load |
|---------------|-------------|----------------|-------------------------------|-----------------------|-----------------------|--------------|-------------|---------------------|
| CV12S3.3-3000 | 4.7 ~ 13VDC | -0.59 ~ -6 VDC | 2.2A                          | 2.6A                  | 35mA                  | 1.3W ~ 13.2W | 90% @ 3.3Vo | 780μF               |
| CV24S5-3000   | 10 ~ 27VDC  | -3 ~ -6 VDC    | 2.2A                          | 2.2A                  | 35mA                  | 6.6W ~ 13.2W | 90% @ 5.0Vo | 2200μF              |
| CV24S12-3000  | 10 ~ 25VDC  | -5 ~ -15 VDC   | 1.2A                          | 3.0A                  | 60mA                  | 6W ~ 18W     | 91% @ 12Vo  | 580μF               |

## NOTES

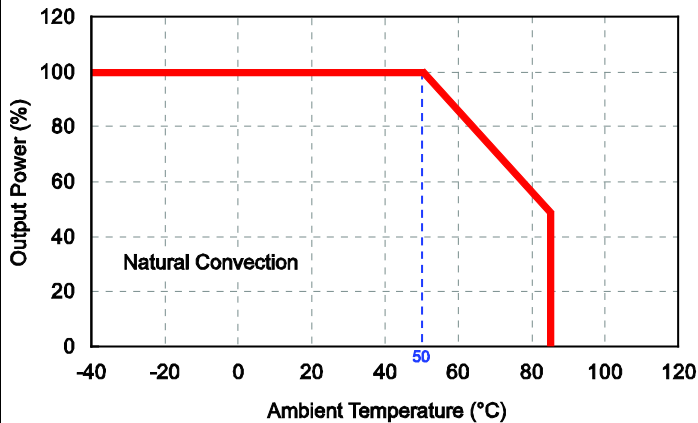
- Output voltage programmable from 0.6V to 3.3V, 0.59V to 6.0V, 3.0V to 6.0V, and 5.0V to 15V by connecting a single resistor between the TRIM and GND pins of the module. To calculate the value of the resistor ( $R_{trim}$ ) for a particular output voltage ( $V_o$ ), use the equations shown in **Table 1**.
- CV12S3.3-3000: When using negative output application,  $|V_o|$  trim up > 3.3V and the output current is 1.5A max.
- CV12S3.3-3000: When  $V_{o, set} < 0.9VDC$  the input voltage range is 4.5 ~ 9 VDC.
- Both vertical mounting and horizontal mounting SIP types are available. Add the suffix "A" to the model number for horizontal mounting SIP type.
- This product is Listed to applicable standards and requirements by UL.
- CAUTION:** This power module is not internally fused. An input line fuse must always be used.

\*Due to advances in technology, specifications are subject to change without notice.

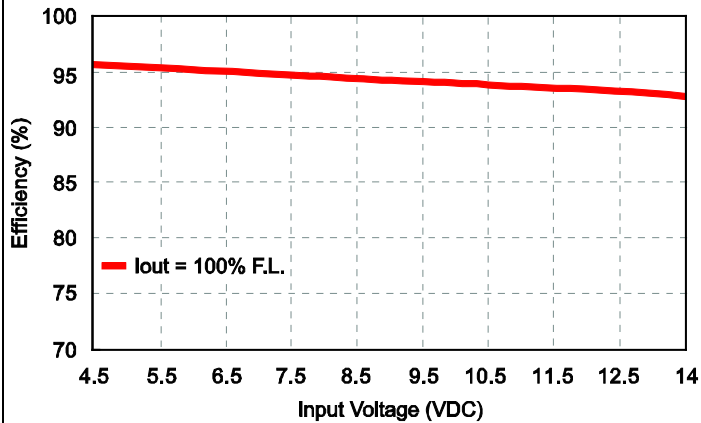
## CHARACTERISTIC CURVES

### POSITIVE OUTPUT APPLICATION

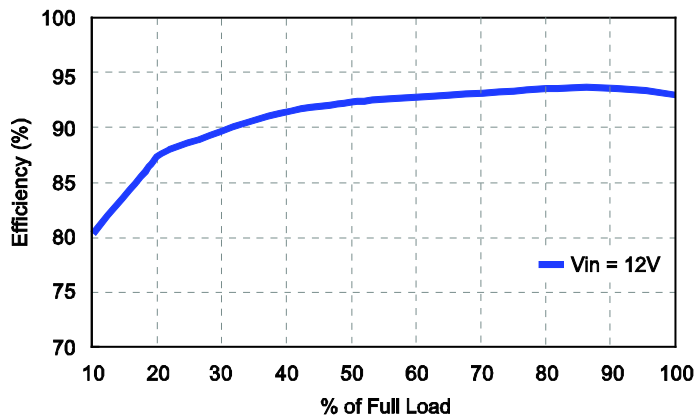
CV12S3.3-3000 Derating Curve



CV12S3.3-3000 Efficiency vs Input Voltage

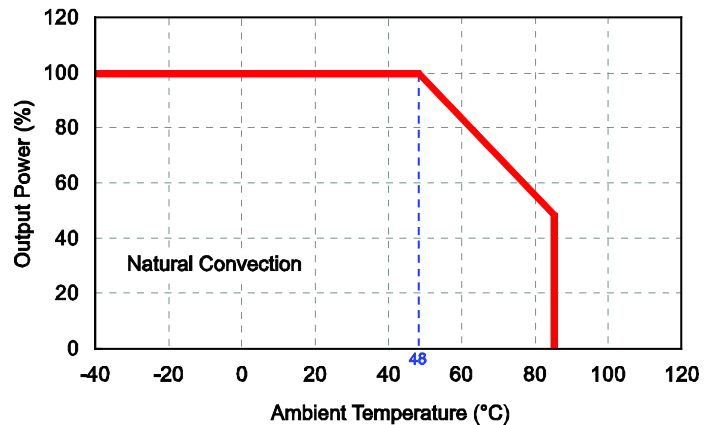


CV12S3.3-3000 Efficiency vs Output Load

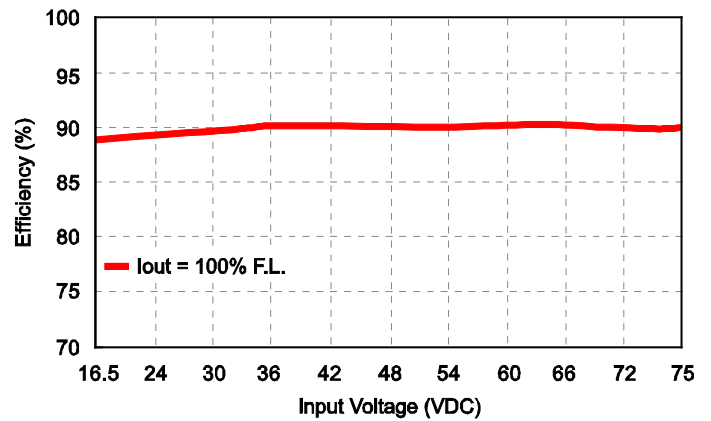


### NEGATIVE OUTPUT APPLICATION

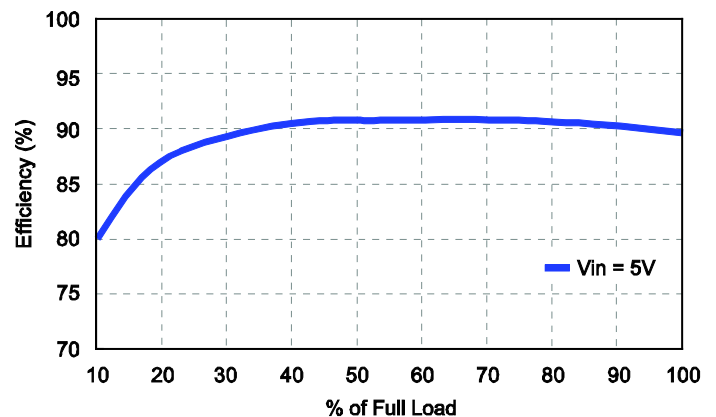
CV12S3.3-3000 Derating Curve



CV12S3.3-3000 Efficiency vs Input Voltage



CV12S3.3-3000 Efficiency vs Output Load

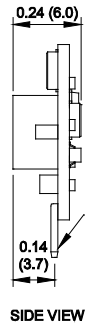
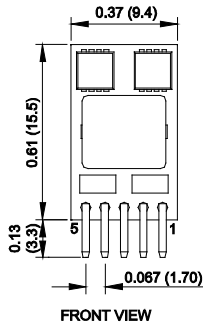


## MECHANICAL DRAWINGS

### VERTICAL MOUNTING SIP TYPE (Standard)

#### CV5S2.5-3000

Unit: Inches (mm)



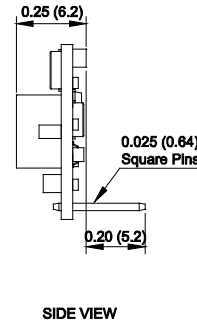
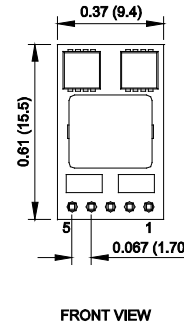
| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

### HORIZONTAL MOUNTING SIP TYPE ("A" Suffix)

#### CV5S2.5-3000A

Unit: Inches (mm)

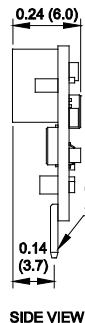
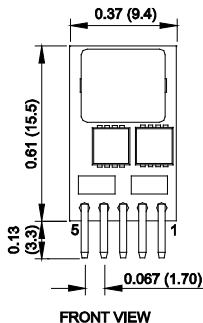


| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

#### CV12S3.3-3000

Unit: Inches (mm)

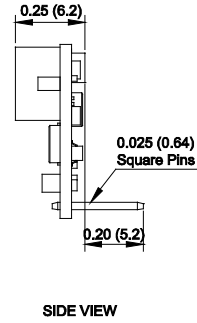
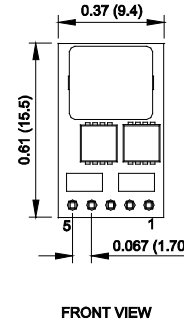


| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

#### CV12S3.3-3000A

Unit: Inches (mm)

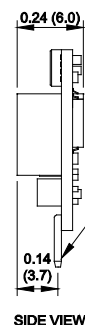
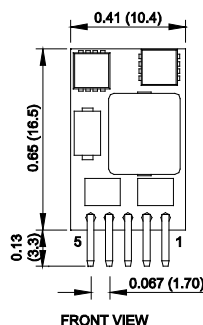


| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

#### CV24S5-3000 & CV24S12-3000

Unit: Inches (mm)

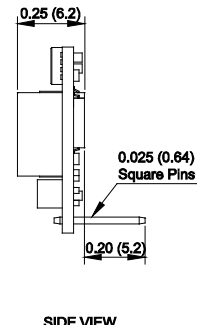
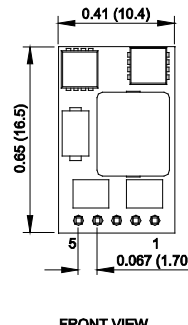


| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

#### CV24S5-3000A & CV24S12-3000A

Unit: Inches (mm)



| PIN CONNECTIONS |                 |                 |
|-----------------|-----------------|-----------------|
| Pin             | Positive Output | Negative Output |
| 1               | Ctrl            | Ctrl            |
| 2               | +Vin            | +Vin            |
| 3               | GND             | -Vout           |
| 4               | +Vout           | GND             |
| 5               | Trim            | Trim            |

Tolerance:  $X.XX \pm 0.02$  ( $X.X \pm 0.5$ )  
 $X.XXX \pm 0.01$  ( $X.XX \pm 0.25$ )  
 Pin Pitch Tolerance:  $\pm 0.01$  ( $\pm 0.25$ )  
 Pin Dimension Tolerance:  $\pm 0.004$  ( $\pm 0.1$ )

## NEGATIVE OUTPUT APPLICATION

C1 and C2 are required and should be connected as close as possible to the converter pins

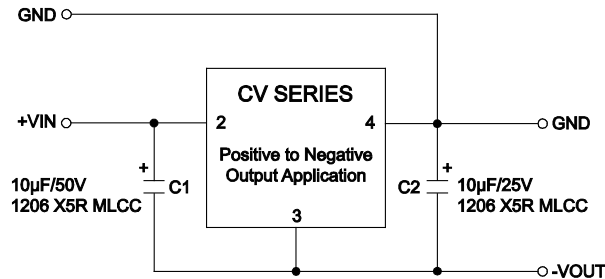


Figure 1

## TRIM APPLICATION

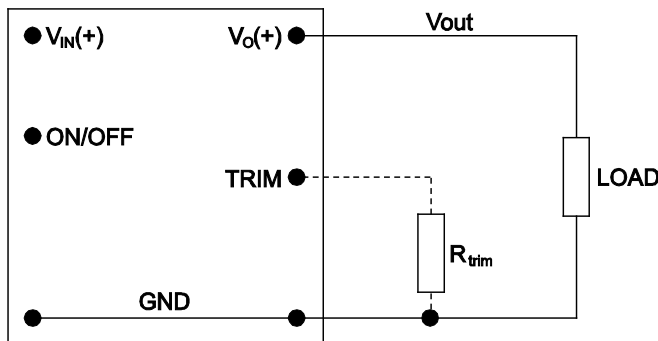


Figure 2

| Model Name    | R <sub>trim_up</sub> (KΩ)      |
|---------------|--------------------------------|
| CV5S2.5-3000  | $\frac{1.2}{V_o - 0.6} - 0.01$ |
| CV12S3.3-3000 | $\frac{1.18}{V_o - 0.59}$      |
| CV24S5-3000   | $\frac{11.2}{V_o - 3}$         |
| CV24S12-3000  | $\frac{8.4}{V_o - 5}$          |

Table 1

## COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

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