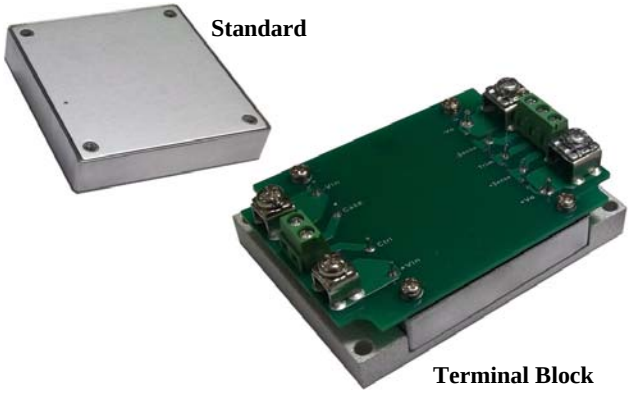
Wall Industries, Inc.

**DATASHEET**
**Rev. E**

# DCHBW75 SERIES

**4:1 Ultra Wide Input Voltage Ranges**
**Up to 76.8 Watts, Single Outputs**
**Industry Standard Half-Brick Footprint**
**DC/DC Power Converters**




## APPLICATIONS

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

## OPTIONS

- Pin Length
- Heatsinks
- Thru-Hole Inserts
- Negative Logic Remote On/Off
- Terminal Block
- Terminal Block with EMC Filter

## FEATURES

- Railway Applications
- Soft-Start
- RoHS Compliant
- 4:1 Ultra Wide Input Voltage Ranges
- Up to 76.8 Watts Output Power
- Single Outputs Ranging from 3.3VDC to 48VDC
- Output Current up to 20A
- Under Voltage Lockout
- Six-Sided Shielding
- High Efficiency up to 90%
- No Minimum Load Requirements
- Adjustable Output Voltage
- Industry Standard Half-Brick Footprint
- Remote On/Off Control
- Threaded Inserts and Thru-Hole Inserts Available
- Short Circuit, Over Voltage, Over Current, and Over Temperature Protection
- UL60950-1, EN60950-1, IEC60950-1, & EN50155 Safety Approvals (Approvals Pending for 110VDC Input Models)

## DESCRIPTION

The DCHBW75 series of DC/DC power converters provides up to 76.8 Watts of output power in an industry standard half-brick package and footprint. This series consists of single output models ranging from 3.3VDC to 48VDC with 4:1 ultra wide input voltage ranges of 9~36VDC, 18~75VDC and 43~160VDC. Some features include high efficiency up to 90%, adjustable output voltage, positive remote on/off control, and under voltage lockout. These converters also have short circuit, over voltage, over current, and over temperature protection. The DCHBW75 series is RoHS compliant and has UL60950-1, EN60950-1, IEC60950-1, and EN50155 safety approvals (safety approvals pending for 110VDC input models). Several different options are available for this series including negative remote on/off, terminal block, pin length, heatsinks, and thru-hole inserts. Please call factory for more details.

## SPECIFICATIONS: DCHBW75 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** | | | | | | |
| Input Voltage Range | | 24VDC nominal input models | 9 | 24 | 36 | VDC |
| | | 48VDC nominal input models | 18 | 48 | 75 | |
| | | 110VDC nominal input models | 43 | 110 | 160 | |
| Start-up Voltage | | 24VDC nominal input models | | | 9 | VDC |
| | | 48VDC nominal input models | | | 18 | |
| | | 110VDC nominal input models | | | 43 | |
| Shutdown Voltage | | 24VDC nominal input models | | 7.5 | | VDC |
| | | 48VDC nominal input models | | 16 | | |
| | | 110VDC nominal input models | | 36 | | |
| Input Surge Voltage (100ms) | | 24VDC nominal input models | | | 50 | VDC |
| | | 48VDC nominal input models | | | 100 | |
| | | 110VDC nominal input models | | | 185 | |
| Input Current | | No Load | See Table | | | |
| Input Filter *(See Note 13)* | | | Pi Type | | | |
| Input Reverse Protection *(See Note 15)* | | | Parallel diode | | | |
| **OUTPUT SPECIFICATIONS** | | | | | | |
| Output Voltage | | | See Table | | | |
| Line Regulation | | Low line to high line at full load | -0.1 | | +0.1 | % |
| Load Regulation | | No load to full load | -0.1 | | +0.1 | % |
| Voltage Accuracy | | Full load an nominal Vin | -1 | | +1 | % |
| Voltage Adjustability *(See Note 7)* | | | -20 | | +10 | % |
| Output Power | | | See Table | | | |
| Output Current | | | See Table | | | |
| Minimum Load | | | 0 | | | % |
| Ripple & Noise (peak to peak) | | 20MHz Bandwidth | See Table | | | |
| Transient Response Recovery Time | | 25% load step change | | 200 | | µs |
| Start-Up Time | 110VDC Input Models | Nominal input and constant resistive load<br>Power Up or Remote On/Off | | 60 | | ms |
| | Others | | | 25 | | ms |
| Remote Sense *(See Note 8)* | | | | 10 | | % Vo |
| Temperature Coefficient | | | -0.02 | | +0.02 | %/°C |
| **PROTECTION** | | | | | | |
| Over Voltage Protection Threshold | | Hiccup | 115 | | 130 | % Vo |
| Over Current Protection Threshold | | 110VDC nominal input models | | | 150 | % Io |
| | | Others | 110 | | 140 | |
| Short Circuit Protection | | | Hiccup, automatic recovery | | | |
| Over Temperature Protection | | | | | +115 | °C |
| **REMOTE ON/OFF CONTROL *(See Note 6)*** | | | | | | |
| Positive Logic (standard) | DC/DC ON | | Open or 3V < Vr < 12V | | | |
| | DC/DC OFF | | Short or 0V < Vr < 1.2V | | | |
| Negative Logic (optional) | DC/DC ON | | Short or 0V < Vr < 1.2V | | | |
| | DC/DC OFF | | Open or 3V < Vr < 12V | | | |
| Input Current of Remote Control Pin | | Nominal Vin | -0.5 | | 1 | mA |
| Remote Off State Input Current | | Nominal Vin | | 3 | | mA |

## SPECIFICATIONS: DCHBW75 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 |
|---|---|---|---|---|---|---|---|
| **GENERAL SPECIFICATIONS** | | | | | | | |
| Efficiency | | Nominal input voltage and full load | | See Table | | | |
| Switching Frequency | | | | 270 | 300 | 330 | KHz |
| Isolation Voltage | 110VDC Input Models | 1 minute (reinforced insulation) | Input to Output | 4242 | | | VDC |
| | | | Input (Output) to Case | 2121 | | | |
| | Others | 1 minute (basic insulation) | Input to Output | 2250 | | | VDC |
| | | | Input (Output) to Case | 1600 | | | |
| Isolation Resistance | | | | 1 | | | GΩ |
| Isolation Capacitance | | | | | | 2500 | pF |
| Maximum Capacitive Load | | Minimum input and constant resistive load | | See Table | | | |
| **ENVIRONMENTAL SPECIFICATIONS** | | | | | | | |
| Operating Case Temperature Range | | Base-plate | | -40 | | +105 | °C |
| | | Terminal Block type | | -40 | | +105 | |
| Storage Temperature | | Standard | | -55 | | +125 | °C |
| | | Terminal Block type | | -40 | | +105 | |
| Relative Humidity | | | | 5 | | 95 | % RH |
| Thermal Shock | | | | EN61373, MIL-STD-810F | | | |
| Vibration | | | | EN61373, MIL-STD-810F | | | |
| Thermal Impedance *(See Note 9)* | | Standard | | | 6.7 | | °C/Watt |
| | | With 0.24" Heatsink | | | 5.4 | | |
| | | With 0.45" Heatsink | | | 4.7 | | |
| MTBF *(See Note 1)* | | BELLCORE TR-NWT-000332 | | 1,010,000 hours | | | |
| | | MIL-HDBK-217F | | 74,160 hours | | | |
| **PHYSICAL SPECIFICATIONS** | | | | | | | |
| Weight | | Standard | | 3.42oz (97g) | | | |
| | | Terminal Block ("T" suffix) | | 7.05oz (200g) | | | |
| | | Terminal Block with EMC Filter ("TF" suffix) | | 8.47oz (240g) | | | |
| Dimensions (L x W x H) | | Standard | | 2.4x2.28x0.5 inches (61x57.9x12.7 mm) | | | |
| | | Terminal Block ("T" suffix) | | 3.35x2.4x1.1 inches (85x61x28 mm) | | | |
| | | Terminal Block with EMC Filter ("TF" suffix) | | 3.35x2.4x1.27 inches (85x61x32.3 mm) | | | |
| Case Material | | 24VDC and 48VDC nominal input models | | Metal | | | |
| | | 110VDC nominal input voltage models | | Aluminum base-plate with plastic case | | | |
| Base Material | | 24VDC and 48VDC nominal input models | | FR4 PCB | | | |
| Potting Material | | | | Silicon (UL94-V0) | | | |
| Shielding | | 24VDC and 48VDC nominal input models | | Six-sided | | | |
| **SAFETY & EMC CHARACTERISTICS** | | | | | | | |
| Safety Approvals | | IEC60950-1, UL60950-1, EN60950-1, EN50155 (pending for 110VDC nominal input models) | | | | | |
| EMI *(See Note 11)* | Standard | EN55011, EN55022 | | | | | Class A |
| | TF Option | EN55011, EN55022 | | | | | Class A |
| ESD | | EN61000-4-2 | Air | ±8KV | | | Perf. Criteria A |
| | | | Contact | ±6KV | | | |
| Radiated Immunity | | EN61000-4-3 | | 20 V/m | | | Perf. Criteria A |
| Fast Transient *(See Note 11)* | | EN61000-4-4 | | ±2KV | | | Perf. Criteria A |
| Surge *(See Note 11)* | | EN61000-4-5 | EN55024 | ±1KV | | | Perf. Criteria A |
| | | | EN50155 | ±2KV | | | Perf. Criteria A |
| Conducted Immunity | | EN61000-4-6 | | 10 Vrms | | | Perf. Criteria A |

## MODEL SELECTION TABLE

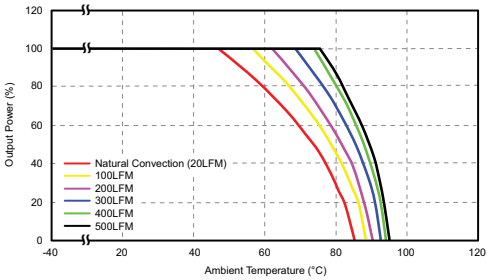
| Model Number | Input Voltage | Output Voltage | Output Current | | No Load [2] Input Current | Ripple & Noise [3] [4] | Output Power | Maximum Capacitive Load [5] | Efficiency [3] |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min. load | Full load | | | | | |
| DCHBW75-24S3.3 | 24 VDC (9 – 36 VDC) | 3.3VDC | 0mA | 20A | 85mA | 75mVp-p | 66W | 60600µF | 87% |
| DCHBW75-24S05 | | 5 VDC | 0mA | 15A | 120mA | 75mVp-p | 75W | 30000µF | 88% |
| DCHBW75-24S12 | | 12 VDC | 0mA | 6.3A | 185mA | 100mVp-p | 75.6W | 5250µF | 88% |
| DCHBW75-24S15 | | 15 VDC | 0mA | 5A | 185mA | 100mVp-p | 75W | 3330µF | 88% |
| DCHBW75-24S24 | | 24 VDC | 0mA | 3.2A | 85mA | 200mVp-p | 76.8W | 1330µF | 87% |
| DCHBW75-24S28 | | 28 VDC | 0mA | 2.7A | 85mA | 200mVp-p | 75.6W | 960µF | 87% |
| DCHBW75-24S48 | | 48 VDC | 0mA | 1.6A | 85mA | 300mVp-p | 76.8W | 330µF | 87% |
| DCHBW75-48S3.3 | 48 VDC (18 – 75 VDC) | 3.3VDC | 0mA | 20A | 60mA | 75mVp-p | 66W | 60600µF | 88% |
| DCHBW75-48S05 | | 5 VDC | 0mA | 15A | 60mA | 75mVp-p | 75W | 30000µF | 90% |
| DCHBW75-48S12 | | 12 VDC | 0mA | 6.3A | 90mA | 100mVp-p | 75.6W | 5250µF | 90% |
| DCHBW75-48S15 | | 15 VDC | 0mA | 5A | 50mA | 100mVp-p | 75W | 3330µF | 89% |
| DCHBW75-48S24 | | 24 VDC | 0mA | 3.2A | 50mA | 200mVp-p | 76.8W | 1330µF | 88% |
| DCHBW75-48S28 | | 28 VDC | 0mA | 2.7A | 50mA | 200mVp-p | 75.6W | 960µF | 88% |
| DCHBW75-48S48 | | 48 VDC | 0mA | 1.6A | 50mA | 300mVp-p | 76.8W | 330µF | 87% |
| DCHBW75-110S3.3 | 110 VDC (43 – 160 VDC) | 3.3VDC | 0mA | 20A | 25mA | 75mVp-p | 66W | 60600µF | 89% |
| DCHBW75-110S05 | | 5 VDC | 0mA | 15A | 25mA | 75mVp-p | 75W | 30000µF | 91% |
| DCHBW75-110S12 | | 12 VDC | 0mA | 6.3A | 40mA | 100mVp-p | 75.6W | 5250µF | 91% |
| DCHBW75-110S15 | | 15 VDC | 0mA | 5A | 40mA | 100mVp-p | 75W | 3330µF | 91% |
| DCHBW75-110S24 | | 24 VDC | 0mA | 3.2A | 25mA | 200mVp-p | 76.8W | 1330µF | 90% |
| DCHBW75-110S28 | | 28 VDC | 0mA | 2.7A | 25mA | 200mVp-p | 75.6W | 960µF | 90% |
| DCHBW75-110S48 | | 48 VDC | 0mA | 1.6A | 25mA | 300mVp-p | 76.8W | 330µF | 90% |

## NOTES

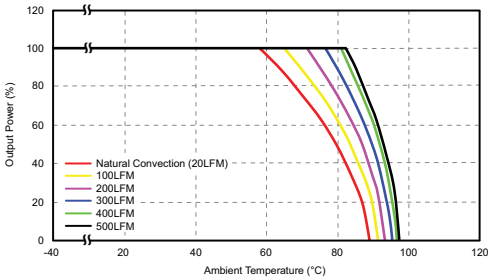
1. BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.
   MIL-HDBK-217F Notice2 @Ta=25°C, Full load (Ground, Benign, controlled environment).
2. Typical value at nominal input voltage and no load.
3. Typical value at nominal input voltage and full load.
4. The ripple and noise of 48VDC output voltage models is measured with a 2.2µF/100V X7R 1812 MLCC;
   The ripple and noise of all other output voltages is measured with a 4.7µF/50V X7R 1812 MLCC.
5. Test by minimum input and constant resistive load.
6. The CTRL pin voltage is referenced to –INPUT. To order negative logic remote on/off control add the suffix "R" to the model number.
7. Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting a single resistor between TRIM and +SENSE pins for trim up or between TRIM and -SENSE pins for trim down. To calculate the value of the resistor $R_U$ and $R_D$ for a particular output voltage see page 5.
8. Maximum output deviation is +10% inclusive of remote sense and trim. If remote sense is not being used the +SENSE should be connected to its corresponding +OUTPUT and likewise the -SENSE should be connected to its corresponding -OUTPUT.
9. (1) Thermal test conditions for vertical direction are by natural convection (20LFM).
   (2) Heat sink is optional. See the "Product Options" table on page 6 for suffix options.
10. The DCHBW75 series can only meet EN55022 Class A or Class B with external components added. Please contact factory for more information.
11. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. For 24 & 48VDC nominal input models, we recommend connecting one aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF /100V, ESR 48mΩ) in parallel. For 110VDC nominal input models, we recommend connecting three aluminum electrolytic capacitors (Ruby-con BXF series, 100µF / 250V) in parallel.
12. CASE GROUNDING: EMI can be reduced when you connect the four screw bolts to the shield plane.
13. An external input capacitor is recommended for 24VDC nominal input models. We suggest 4.7µF/50V X7R MLCC or Nippon chemi-con KY series, 68µF/100V, ESR 110mΩ or better capacitor. For terminal block versions, the capacitor is included as standard and an external capacitor is not necessary.
14. This series comes with several different options: negative remote on/off control, heatsinks, pin length, thru-hole inserts, and terminal blocks. See the "Product Options" table on page 6 for more ordering information.
15. **CAUTION:** This power converter is not internally fused. An input line fuse must always be used.

## DERATING CURVES

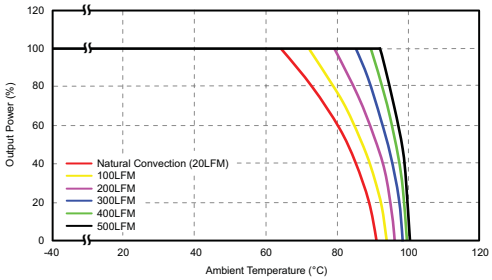
DCHBW75-48S05 Derating Curve




DCHBW75-48S05 Derating Curve
With 0.24" Height Heatsink (See Note 9)

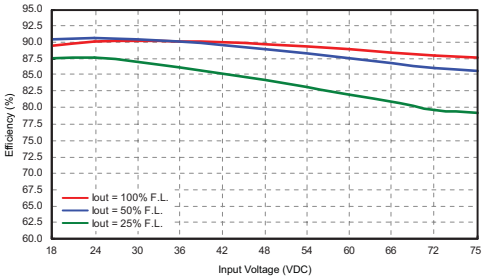



DCHBW75-48S05 Derating Curve
With 0.45" Height Heatsink (See Note 9)

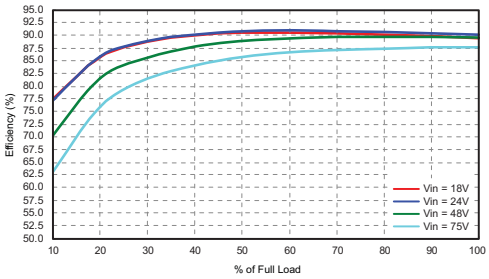



## EFFICIENCY GRAPHS

DCHBW75-48S05 Efficiency vs Input Voltage



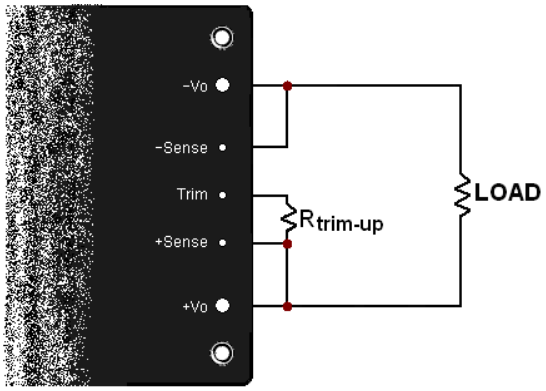

DCHBW75-48S05 Efficiency vs Output Load



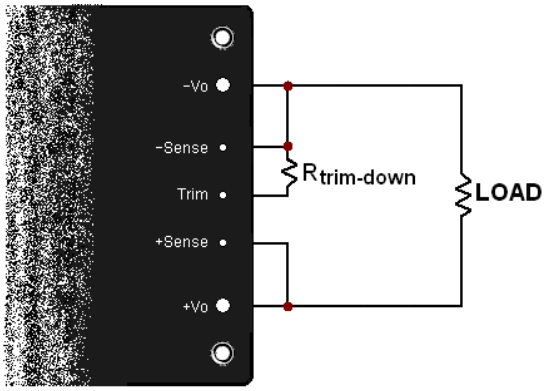

## OUTPUT VOLTAGE ADJUSTMENT

Output is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting an external resistor between the TRIM pin and either the +SENSE or -SENSE pins. With an external resistor between the TRIM and -SENSE pin, the output voltage set decreases. With an external between the TRIM and -SENSE pin, the output voltage set point increases. Maximum output deviation is +10% inclusive of remote sense. The value of the external resistor can be obtained by the equations below. The external TRIM resistor needs to be at least 1/8W resistor.

$$R_U = \left( \frac{V_{OUT}(100+\Delta\%)}{1.225\Delta\%} - \frac{(100+2\Delta\%)}{\Delta\%} \right) K\Omega \qquad R_D = \left( \frac{100}{\Delta\%} - 2 \right) K\Omega$$




TRIM UP

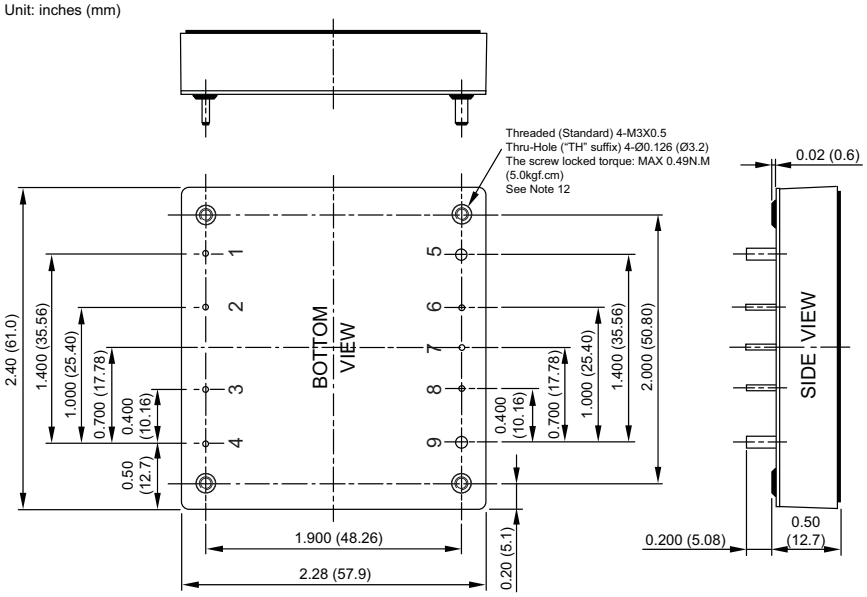



TRIM DOWN

## MECHANICAL DRAWING

### METAL CASE (24VDC & 48VDC Nominal Input Models)

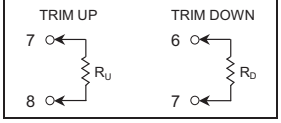
Unit: inches (mm)




| PIN CONNECTIONS | | |
|---|---|---|
| PIN | DEFINE | DIAMETER |
| 1 | - INPUT | 0.04 in. |
| 2 | CASE | 0.04 in. |
| 3 | CTRL | 0.04 in. |
| 4 | + INPUT | 0.04 in. |
| 5 | - OUTPUT | 0.08 in. |
| 6 | - SENSE | 0.04 in. |
| 7 | TRIM | 0.04 in. |
| 8 | + SENSE | 0.04 in. |
| 9 | + OUTPUT | 0.08 in. |

**EXTERNAL OUTPUT TRIMMING**

Output can be externally trimmed by using the method shown below.

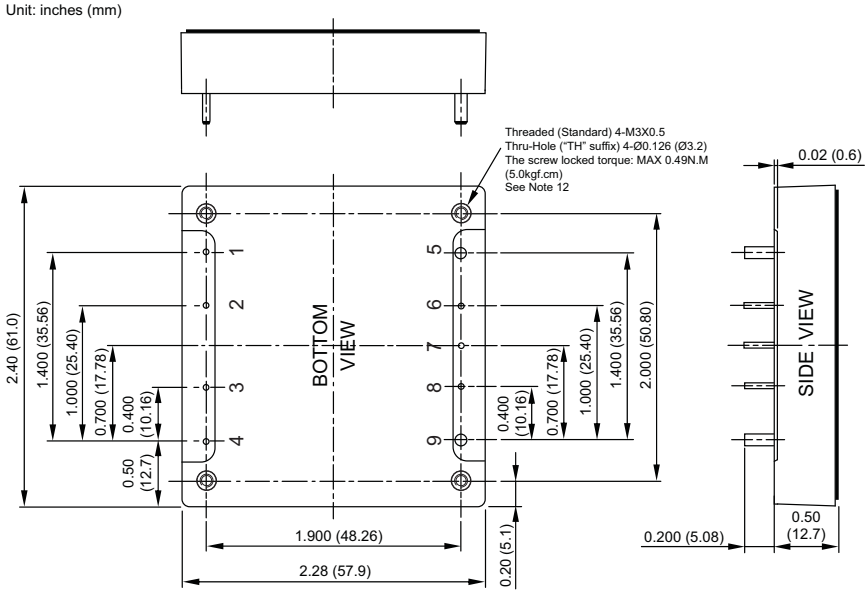



**NOTES**

1. Tolerance: x.xx±0.02 (x.x±0.5)
   x.xxx±0.01 (x.xx±0.25)
2. Pin Pitch Tolerance: ±0.01 (±0.25)
3. Pin Dimension Tolerance: ±0.004 (±0.1)

### PLASTIC CASE (110VDC Nominal Input Models)

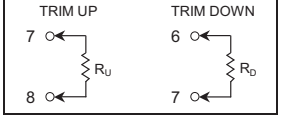
Unit: inches (mm)




| PIN CONNECTIONS | | |
|---|---|---|
| PIN | DEFINE | DIAMETER |
| 1 | - INPUT | 0.04 in. |
| 2 | CASE | 0.04 in. |
| 3 | CTRL | 0.04 in. |
| 4 | + INPUT | 0.04 in. |
| 5 | - OUTPUT | 0.08 in. |
| 6 | - SENSE | 0.04 in. |
| 7 | TRIM | 0.04 in. |
| 8 | + SENSE | 0.04 in. |
| 9 | + OUTPUT | 0.08 in. |

**EXTERNAL OUTPUT TRIMMING**

Output can be externally trimmed by using the method shown below.




**NOTES**

1. Tolerance: x.xx±0.02 (x.x±0.5)
   x.xxx±0.01 (x.xx±0.25)
2. Pin Pitch Tolerance: ±0.01 (±0.25)
3. Pin Dimension Tolerance: ±0.004 (±0.1)

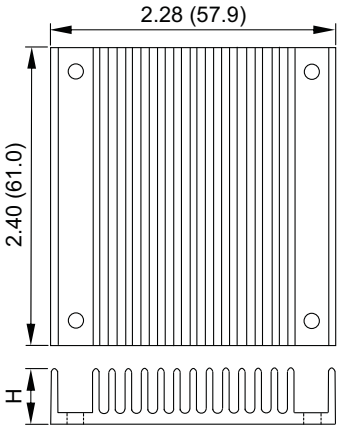
| Product Options | | Suffix | Product Options | | Suffix |
|---|---|---|---|---|---|
| Negative Remote ON/OFF Logic | 0.200" pin length | R | Heatsink [1] | H = 0.45" Vertical | H |
| | 0.145" pin length | RL | | H = 0.24" Horizontal | H1 |
| Positive Remote ON/OFF Logic | 0.200" pin length | None | | H = 0.24" Vertical | H2 |
| | 0.145" pin length | S | | H = 0.45" Horizontal | H3 |
| Thru-Hole Inserts (No Thread) [1] | Ø0.126 thru-hole (no thread) inserts | TH | Terminal Block [2][3] | Wall Mounted | T |
| | | | | Wall Mounted with EMC Filter [3] | TF |

**NOTES**

1. Models with thru-hole inserts cannot be equipped with a heatsink.
2. Terminal block models have 0.200" pin lengths. 0.145" pin lengths are not available for terminal block models.
3. EMI filter meets EN55011, EN55022 Class A.

## HEATSINK OPTIONS

### Vertical Fin Orientation (Suffixes "H", "H2")



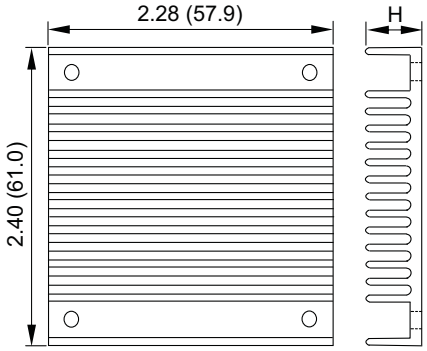

Unit: inches (mm)

Heatsink Options

H = 0.24 inches ("H2" suffix)

H = 0.45 inches ("H" suffix)

### Horizontal Fin Orientation (Suffixes "H1", "H3")




Unit: inches (mm)

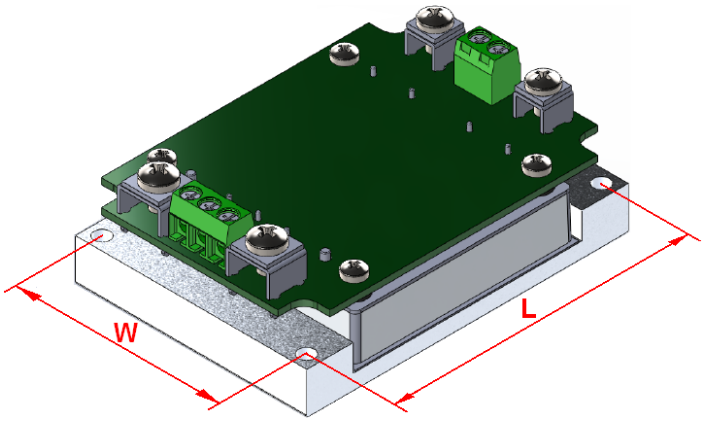
Heatsink Options

H = 0.24 inches ("H1" suffix)

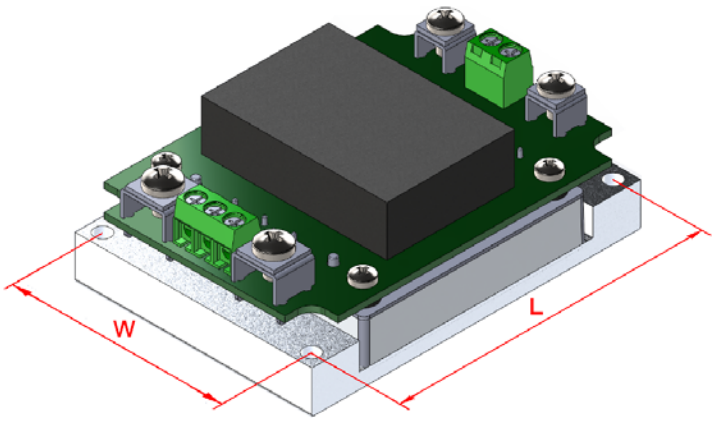
H = 0.45 inches ("H3" suffix)

## TERMINAL BLOCK OPTIONS

### Wall Mounted without EMC Filter (Suffix "T")




### Wall Mounted with EMC Filter (Suffix "TF")




| Terminal Block Type | T | TF |
|---|---|---|
| Weight | 7.05oz (200g) | 8.47oz (240g) |
| Dimensions | 3.35 x 2.40 x 1.10 inches (85.0 x 61.0 x 28.0 mm) | 3.35 x 2.40 x 1.27 inches (85.0 x 61.0 x 32.3 mm) |
| Thru-Hole Inserts (WxL) | 2.126 x 3.071 inches (54.00 x 78.00 mm) | 2.126 x 3.071 inches (54.00 x 78.00 mm) |

**NOTES**

1. Terminal block models have 0.200" pin lengths. 0.145" pin lengths are not available for terminal block models.
2. Models with EMC filter (suffix "TF") meet EN55011, EN55022 Class A.

## MODEL NUMBER SETUP

| DCHBW | 75 | - | 48 | S | 05 |
|---|---|---|---|---|---|
| **Series Name** | **Output Power** | | **Input Voltage** | **Single Output** | **Output Voltage** |
| | **75:** 75 Watts | | **24:** 9~36 VDC<br>**48:** 18~75 VDC<br>**110:** 43~160 VDC | **S:** single | **3.3:** 3.3 VDC<br>**05:** 5 VDC<br>**12:** 12 VDC<br>**15:** 15 VDC<br>**24:** 24 VDC<br>**28:** 28 VDC<br>**48:** 48 VDC |

| R | TH | H | TF |
|---|---|---|---|
| **Remote On/Off & Pin Length** | **Thru-Hole Inserts** (1) | **Heatsink** (1) | **Terminal Block** (2) |
| **None:** positive Logic, 0.200" pin length<br>**S:** positive Logic, 0.145" pin length<br>**R:** negative Logic, 0.200" pin length<br>**RL:** negative Logic, 0.145" pin length | **None:** threaded inserts<br>**TH:** Ø0.126 thru-hole inserts (1) | **None:** no heatsink<br>**H:** 0.45" vertical<br>**H1:** 0.24" horizontal<br>**H2:** 0.24" vertical<br>**H3:** 0.45" horizontal | **None:** no terminal block<br>**T:** wall mounted<br>**TF:** wall mounted with EMC filter (3) |

**NOTES**

1. Models with thru-hole inserts cannot be equipped with a heatsink.
2. Terminal block models have 0.200" pin lengths. 0.145" pin lengths are not available for terminal block models.
3. Models with EMC filter (suffix "TF") meet EN55011, EN55022 Class A.

## 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 ISO9001-2008 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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