

## PE-205 *Pure Embedded DC-DC Industrial Power Supply Module, 3.3 V, 4 W*

### 1 Overview

The perfect fit for any stable, future-proof system, even where space is limited

- DC-DC industrial power supply, 3.3 V, 4 W
- Supports modular stacking with [PE-5XX Range](#)
- Stability of design guaranteed compatibility until at least 2035 (Minimum 10 years)
- Seamless integration with design software – logical placements and fixed distances
- Power Output Control – Switch power outputs On/Off remotely

#### 1.1 Functionality & Features

- Wide voltage input range: +5 to +30 VDC – Can be powered from a variety of sources
- +3.3 VDC Controllable Outputs – Natively compatible with Brainboxes PE Range
- Reverse Polarity Protected
- Short Circuit Protection
- Extremely compact 55x55 mm board size
- 2D & 3D design resources available

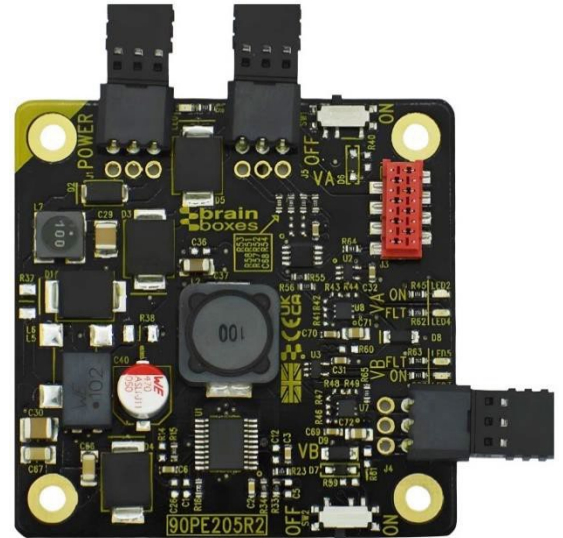


Figure 1 – PE-205 Embedded Power Supply Module

#### 1.2 Specification

Table 1 – General Information

|  |                                |  |
|--|--------------------------------|--|
| <b>Input Voltage</b>                           |                                | +5 V to +30 VDC                                  |
| <b>Power Consumption</b>                       |                                | 5 W Max: 1 A @ +5 VDC / 167 mA @ +30 VDC         |
| <b>Output Voltage</b>                          |                                | +3.3 VDC   |
| <b>Max Output Current</b>                      |                                | 1.2 A (see Table 15)                             |
| <b>Max Power Output</b>                        |                                | 4 W  |
| <b>Operating Temperature</b>                   |                                | 40 °C to +80 °C / -40 °F to +176 °F              |
| <b>Storage Temperature</b>                     |                                | 40 °C to +80 °C / -40 °F to +176 °F              |
| <b>Product Dimensions</b>                      |                                | 66.7 x 67.3 x 9.4 mm / 2.62 x 2.64 x 0.4 in      |
| <b>Product Weight</b>                          |                                | 0.022 kg / 0.048 lbs                             |
| <b>Packaged Dimensions</b>                     |                                | 100 x 90 x 30 mm / 3.3 x 3.5 x 1.2 in            |
| <b>Packaged Weight</b>                         |                                | 0.031 kg / 0.068 lbs                             |
| <b>Industry, EMC &amp; Immunity Compliance</b> | <b>General</b>                 | CE, UKCA, RoHS, REACH, WEEE                      |
|  | <b>GTIN</b>                    | 837324005400                                     |
|  | <b>HTS</b>                     | 8504.40.85.00                                    |
|  | <b>ECCN</b>                    | 5A991.b  |
|  | <b>Country of Origin (COO)</b> | Made in GB, United Kingdom of Great Britain & NI |
|  | <b>Safety</b>                  | IEC/EN/BS 62368-1                                |
|  | <b>EMC</b>                     | EN/BS 55032<br>EN/BS 55035                       |

|                   |                     |                 |
|-------------------|---------------------|-----------------|
|                   | <b>Flammability</b> | UL-94 V0        |
|                   | <b>RoHS</b>         | 2015/863/EU     |
|                   |                     | IEC/EN/BS 63000 |
|                   | <b>REACH</b>        | (EC)1907/2006   |
| <b>Robustness</b> | EN 60068-2-31       |                 |

### 1.3 Connectors

The PE-205 board contains three spring clip power connectors & one 8-way female IDC style connector for power input & output:

Table 2 – Male Header Compatibility

| Type  | Manufacturer    | Part Number |
|-------|-----------------|-------------|
| 3-pin | Phoenix Contact | 1778845     |
| 8-way | TE              | 338728-8    |

Table 3 – Connector Wiring Guide

| Connector/Pin                 | 1                 | 2                 | 3                  | 4            | 5 | 6            | 7                 | 8                  |
|-------------------------------|-------------------|-------------------|--------------------|--------------|---|--------------|-------------------|--------------------|
| <b>Power Input</b>            | FE                | -V <sub>IN</sub>  | +V <sub>IN</sub>   |              |   |              |                   |                    |
| <b>+VA Power Output</b>       | FE                | +V <sub>IN</sub>  | -V <sub>IN</sub>   | Pass-Through |   | Pass-Through | -V <sub>OUT</sub> | +VA <sub>OUT</sub> |
| <b>+VB Power Output</b>       | FE                | -V <sub>OUT</sub> | +VB <sub>OUT</sub> |              |   |              |                   |                    |
| <b>Digital Output Control</b> | VA <sub>CTL</sub> | -V <sub>OUT</sub> | VB <sub>CTL</sub>  |              |   |              |                   |                    |

## 2 Ordering

Table 4 – Ordering Information

| Product Code           | Description   |
|------------------------|---|
| <a href="#">PE-405</a> | Pure Embedded 10/100 5 Port Industrial Ethernet Eval Kit        |
| <a href="#">PE-505</a> | Pure Embedded 10/100 5 Port Industrial Ethernet Switch          |
| <a href="#">PE-508</a> | Pure Embedded 10/100 8 Port Industrial Ethernet Switch          |
| <a href="#">PE-415</a> | Pure Embedded Gigabit 5 Port Industrial Ethernet Evaluation Kit |
| <a href="#">PE-515</a> | Pure Embedded Gigabit 5 Port Industrial Ethernet Switch         |
| <a href="#">PE-205</a> | Pure Embedded DC-DC Industrial Power Supply Module, 3.3 V, 4 W  |

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## 6 PE-205 Pure Embedded DC-DC Industrial Power Supply Module

The PE-205 is a compact, industrial DC-DC power supply module offering a wide +5 to +30 VDC input range, with two 3.3 V outputs, designed to allow seamless integration with Brainboxes' Pure Embedded (PE) range of compact industrial switches, or any other low voltage device where space is a premium.

The PE-205 provides one +5 to +30 VDC input through a 3-pin connector, and two 3.3 V outputs, the first through a 3-pin connector & the second through an 8-way IDC style connector. The 8-way IDC connector enables modular stacking with select products from the PE range (*see Section 9.2 below for more details*).

The PE-205 also offers Digital Power Control, enabling remote control of the two 3.3 V power outputs. These operate using NPN/PNP logic and could be easily integrated with Brainboxes' Ethernet to Digital (ED) range (*see Section 8.2.2 for more details*).

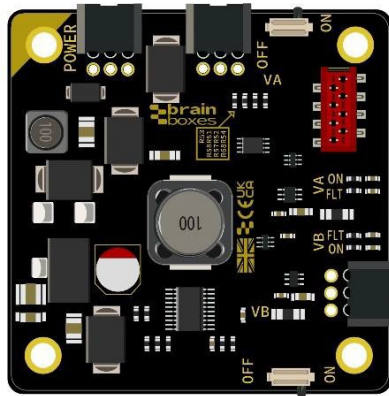


Figure 2 – PE-205

## 7 Design Guide

### 7.1 Device Markings

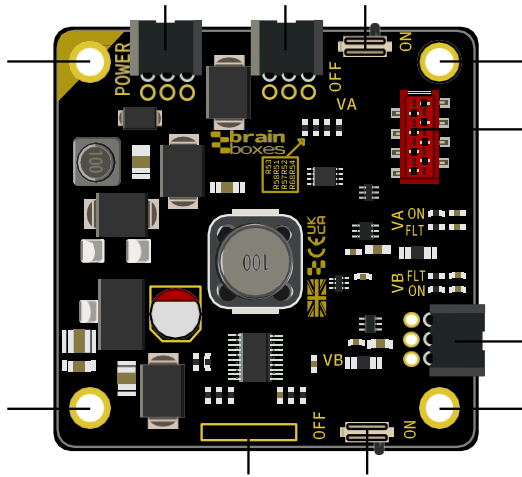


Figure 3 – PE-205\_Front Annotated Features

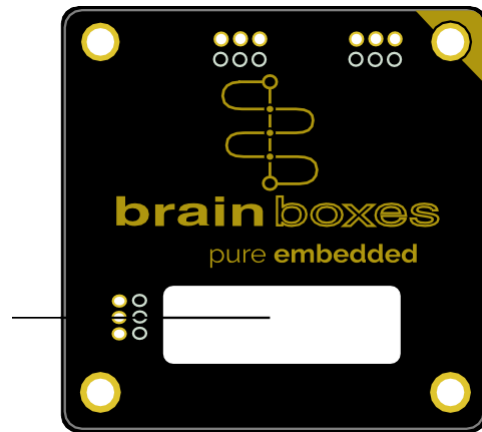


Figure 4 – PE-205\_Rear Annotated Features

- A +5 to +30 VDC Power Input
- B Power Output Control
- C VA Power Output Logic Switch
- D VA Power Output
- E VB Power Output
- F VB Power Output Logic Switch
- G PCB Revision
- H NC Mounting Hole
- I FE Mounting Holes

- J Serial Number Label

### 7.2 Connectors & Pinouts

#### 7.2.1 A – VDC Power Input

Table 5 – VDC Power Input

| Pin | Function  |                  |
|-----|-----------|------------------|
| 1   | FE        | Functional Earth |
| 2   | $-V_{IN}$ | GND / 0 V        |
| 3   | $+V_{IN}$ | +5 to +30 VDC    |

#### 7.2.2 B – Power Output Control

Table 6 – Digital Power Output Control

| Pin | Function               |
|-----|------------------------|
| 1   | $+V_{ACTL}$            |
| 2   | $-V_{OUT}$ (Reference) |
| 3   | $+V_{BCTL}$            |

The PE-205's +VA & +VB power outputs can both be digitally controlled through the Digital Power Control connector (see 'B' on Figure 3). The connector has a -V<sub>out</sub> reference and two control pins (VA<sub>CTL</sub> and one for VB<sub>CTL</sub>).

In addition to the Digital Power Control connector, each power supply also has a physical On/Off switch (see 'C' & 'F' on Figure 3), which are used to define the operational behaviour of the power outputs. Both the VA & VB power outputs behave using NPN/PNP style logic, and will either deliver power when idle, or require driving High (PNP) or pulling Low (NPN) to deliver power (see Table 10).

The logic levels for the Digital Power Control VA & VB pins are as follows:

- Logic Level 0 = 0 V to +1 VDC
- Logic Level 1 = +5 V to +30 VDC

All Voltages are given in respect to the -V<sub>out</sub> Reference

### 7.2.3 D – VA Power Output

Table 7 – VA Power Output Pinouts

| Pin | Function           |                  |
|-----|--------------------|------------------|
| 1   | FE                 | Functional Earth |
| 2   | +V <sub>IN</sub>   | +5 to +30 VDC    |
| 3   | -V <sub>IN</sub>   | GND / 0 V*       |
| 4   | Passthrough        | NC               |
| 5   | -V <sub>OUT</sub>  | 0 V*             |
| 6   | Passthrough        | NC               |
| 7   | -V <sub>OUT</sub>  | 0 V*             |
| 8   | +VA <sub>OUT</sub> | +3.3 V           |

\*-V<sub>IN</sub> and -V<sub>out</sub> connected internally on the PE-205. For the product to perform to the stated specification, maintain separate power domains for -V<sub>IN</sub> and -V<sub>OUT</sub>.

### 7.2.4 E – VB Power Output

Table 8 – VB Power Output Pinouts

| Pin | Function           |                  |
|-----|--------------------|------------------|
| 1   | FE                 | Functional Earth |
| 2   | -V <sub>OUT</sub>  | 0 V              |
| 3   | +VB <sub>OUT</sub> | +3.3 V           |

## 7.3 Switches

### 7.3.1 VA & VB Power Output Logic Switches

Table 9 – VA & VB Power Output Logic Switches

| Position | Function         |     |
|----------|------------------|-----|
| On       | On – Idle        | NPN |
|          | Off – Pulled Low |     |
| Off      | On – Driven High | PNP |
|          | Off – Idle       |     |

## 7.4 LED's

### 7.4.1 Power Input

*Table 10 – Power Input LED*

| LED State  | Function            |
|------------|---------------------|
| Off        | No Power            |
| On – Green | Powered – Device OK |

### 7.4.2 VA & VB Power Output

*Table 11 – VA & VB Power Output LED's*

| LED State  | Function                |
|------------|-------------------------|
| Off        | Power Delivery Disabled |
| On – Green | Power Delivery Enabled  |

### 7.4.3 VA & VB Fault LED's

*Table 12 – VA & VB Power Output Fault LED's*

| LED State | Function    |
|-----------|-------------|
| Off       | No Issues   |
| On – Red  | Power Fault |

## 7.5 Mounting Holes

The PE-205 has 4 x M3 mounting holes, with each being connected to Functional Earth (FE). The top-left mounting hole (indicated by the yellow corner on the PCB) is floating to maintain  $-V_{out}$  as a separate power domain while stacked. The remaining 3 mounting holes are connected to Functional Earth.

If the device does not share a common ground with the rest of the system, it is recommended to use a non-conductive standoff or isolated mounting point.

## 7.6 Mechanical Outline & 3D Step Model

A scale drawing is available in this document on Page 9, while a 3D Step model is available on our website at the following link: <https://www.brainboxes.com/product/pure-embedded/pe-205#3d-model>

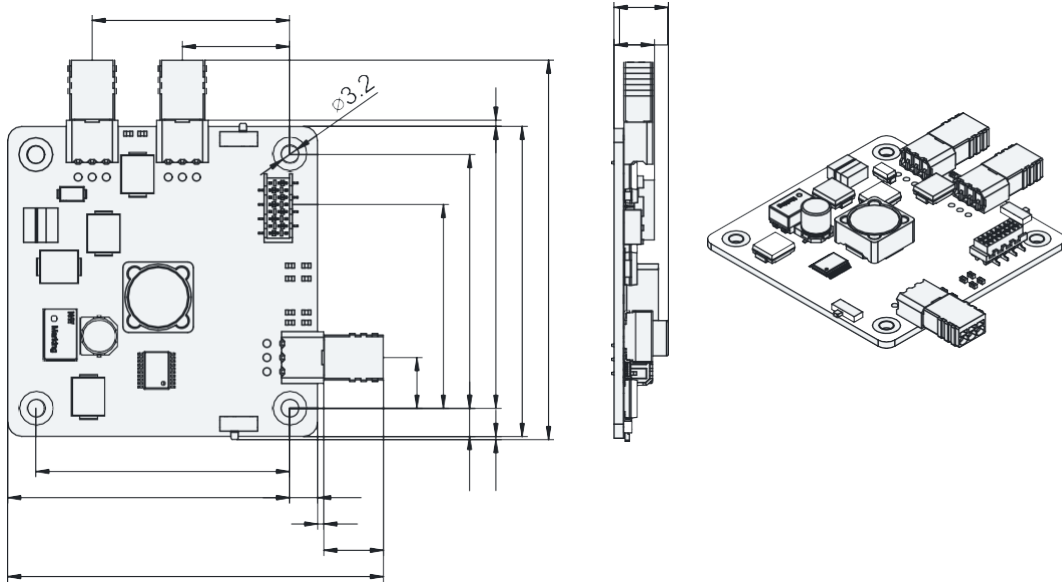


Figure 5 – PE-205 2D Dimensioned Drawing

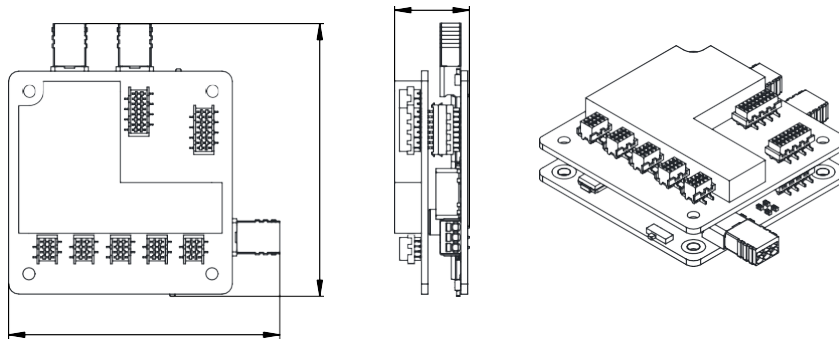


Figure 6 – PE-205 Modularly Stacked with PE-505

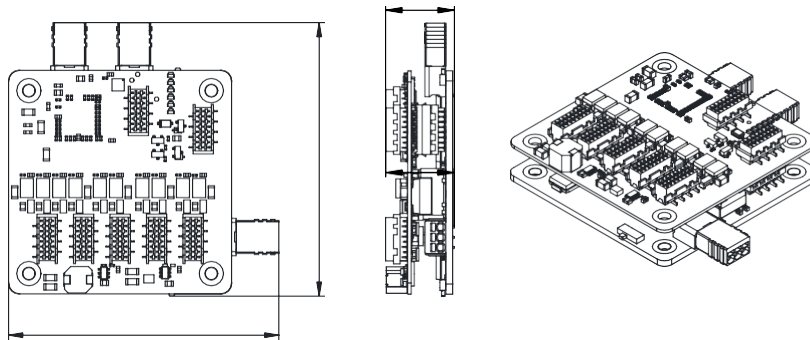


Figure 7 – PE-205 Modularly Stacked with PE-515

## 7.7 Recommended Footprint

For applications where the module is frequently inserted and removed a through-hole mating connector is recommended. Avoid placing components within the 55 x 55 square occupied by the PE-205 where possible. Where not possible, ensure that the 'Keepout' zone given in the 3D Model of the Design Kit is strictly adhered to. Failure to do so has the potential to cause issues with future compatibility.

The device should be given 20 mm of clearance from the mating surface.

Alternatively, an 8-way IDC style header (as detailed in Section 1.3 above) can be used for the VA power header, with the following centre coordinates: (2,35.5)

The 4x M3 mounting holes are located at: (0,0), (45,0), (0,45 – NC) & (45,45)

## 8 Operation

### 8.1 Verifying Power Output

The PE-205 accepts a wide input voltage (see 'A' on Figure 3) and provides two 3.3 V outputs (see 'D' & 'E' on Figure 3).

If an issue develops and your PE-205 isn't distributing power to external devices correctly, measuring the voltage input and outputs may identify the problem. Using a Digital Multi Meter (DMM), verify that a voltage is present between the following pins:

#### 8.1.1 Power Input

Measure between the +V<sub>IN</sub> & -V<sub>IN</sub> pins and verify supply voltage is present

#### 8.1.2 VA Power Output

Measure between the +V<sub>AOUT</sub> and -V<sub>OUT</sub> pins and verify 3.3 V is present

#### 8.1.3 VB Power Output

Measure between the +V<sub>BOUT</sub> & -V<sub>OUT</sub> pins and verify 3.3 V is present

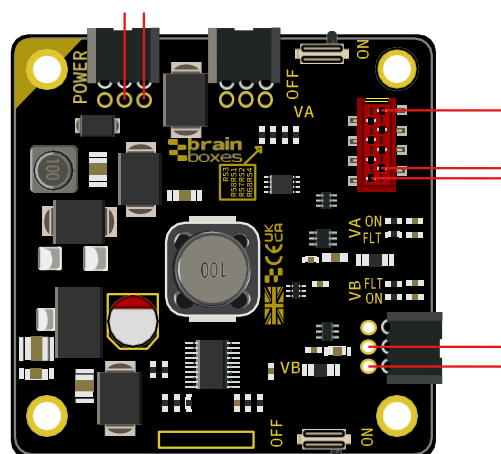


Figure 8 – PE-205 Power Input & Output Pinouts

## 8.2 PE Range Modular Stacking

The PE-205's design allows for native modular stacking with the PE-505 & PE-515 network switches. Using the VA Power Output header (see 'D' on Figure 4), a board-to-board connection can be made to deliver power to the PE-505 & PE-515.

### 8.2.1 PE-505

The PE-505 has a footprint on the rear of the PCB, intended for a female 8-way IDC style connector (**TE: 338728-8**). If desired, once fitted to the board, the PE-505 can be modularly stacked with the PE-205.

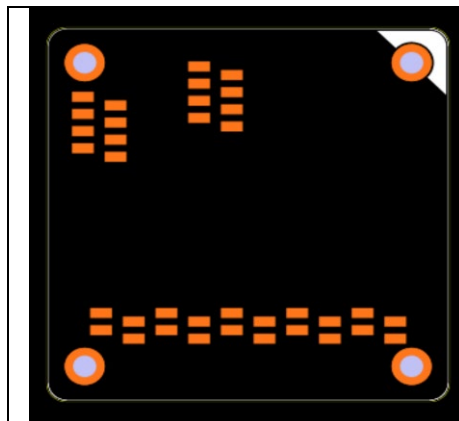


Figure 9 – PE-505 Modular Stacking Header Pad Location



Figure 10 – PE-505 Modularly Stacked with PE-205

### 8.2.2 PE-515

The PE-515 is manufactured with a female 8-way IDC style connector (**TE: 338728-8**), fitted to the rear of the PCB. This allows for direct out of the box modular stacking with the PE-205.

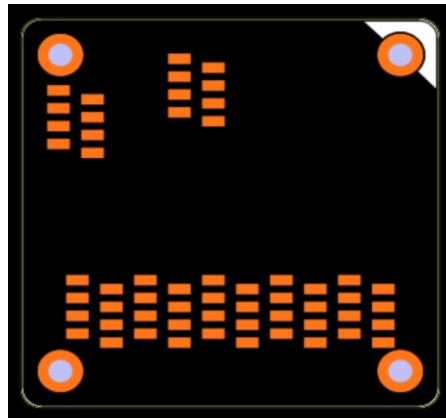


Figure 11 – PE-515 Modular Stacking Header Pad Location

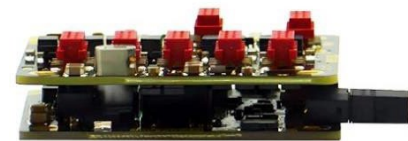


Figure 12 – PE-515 Modularly Stacked with PE-515

### 8.2.3 PE-508

The PE-508 does not support modular stacking.

## 9 Operating Conditions

### 9.1 Absolute Maximum Ratings

Stresses exceeding absolute maximum ratings may cause permanent damage. Functional performance and device reliability are not guaranteed under these conditions. All voltages are specified with respect to GND.

Table 13 – Absolute Maximum Ratings

| Parameter                     | Max        | Unit | Notes |
|-------------------------------|------------|------|-------|
| Supply Voltage                | 34         | V    | -     |
| IO Voltages                   | 30         | V    | -     |
| Ambient Operating Temperature | -40 to +85 | °C   | -     |

### 9.2 Electrical Characteristics

Table 14 – Typical Electrical Characteristics

| Parameter        | Symbol      | Min  | Typical  | Max  | Unit | Notes            |
|------------------|-------------|------|----------|------|------|------------------|
| DC Input Voltage | $V_{IN}$    | 5    |          | 30   | V    |                  |
| DC Current       | $I_{IN}$    |      |          | 1    | A    | $V_{IN}$ @5 V    |
|                  |             |      |          | 0.4  | A    | $V_{IN}$ @12 V   |
|                  |             |      |          | 0.15 | A    | $V_{IN}$ @30 V   |
| CTL High         |             | 5    | $V_{IN}$ | 30   | V    |                  |
| CTL Low          |             | 0    | 0        | 1    | V    |                  |
| VA Output        | $+V_{AOUT}$ | 3.25 | 3.3      | 3.4  | V    |                  |
| VA Overload      | $I_{AMAX}$  |      | 1        |      | A    | Overload Cut-off |
| VB Output        | $+V_{BOUT}$ | 3.25 | 3.3      | 3.4  | V    |                  |
| VB Overload      | $I_{BMAX}$  |      | 0.2      |      | A    | Overload Cut-off |

## 10 Stability of Design Guarantee

Brainboxes guarantees that all our off-the-shelf embedded board products will remain available for a minimum of 10 years from the initial launch date. Our Change Control Policy, along with other regulatory documents, can be found here: <https://www.brainboxes.com/regulatory-declarations>