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)
- Compact form – smaller than a standard business card (55x55 mm)
- Seamless integration with design software – logical placements and fixed distances
- Power Output Control – Switch power outputs On/Off remotely

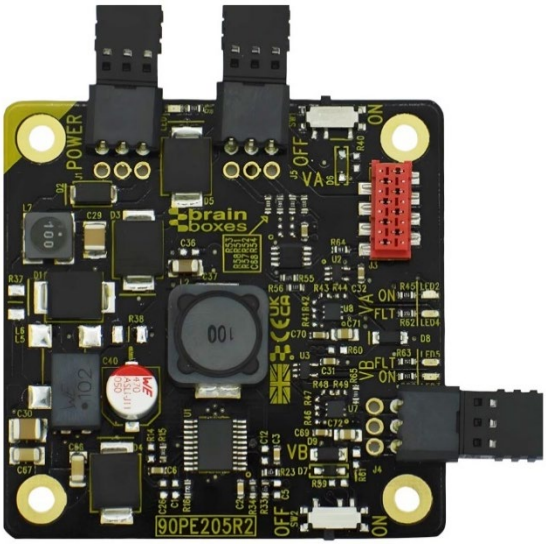

Figure 1 – PE-205 Embedded Power Supply Module

1.1 Functionality & Features

- Wide voltage input range: +5 to +30 VDC – Can be powered form 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

1.2 Specification

Table 1 – General Information

Input Voltage		+5 V to +30 VDC
Power Consumption		5 W Max: 1 A @ +5 VDC / 167 mA @ +30 VDC
Output Voltage		+3.3 VDC
Max Output Current		1.2 A (*see Table 15)*
Max Power Output		4 W
Industry, EMC & Immunity Compliance	**General**	CE, UKCA, RoHS, REACH, WEEE
	Safety	IEC/EN/BS 62368-1
	EMC	EN/BS 55032
		EN/BS 55035
	Flammability	UL-94 V0
	RoHS	2015/863/EU
		IEC/EN/BS 63000
	REACH	(EC)1907/2006
	Robustness	EN 60068-2-31
Operating Temperature		40 °C to +80 °C / -40 °F to +176 °F
Storage Temperature		40 °C to +80 °C / -40 °F to +176 °F
Product Dimensions		66.7 x 67.3 x 9.4 mm / 2.62 x 2.64 x 0.4 in

Product Weight	0.022 kg / 0.048 lbs
Packaged Dimensions	100 x 90 x 30 mm / 3.3 x 3.5 x 1.2 in
Packaged Weight	0.031 kg / 0.068 lbs
GTIN	837324005400

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
Power Input	FE	$-V_{IN}$	$+V_{IN}$					
+VA Power Output	FE	$+V_{IN}$	$-V_{IN}$	Pass-Through		Pass-Through	$-V_{OUT}$	$+VA_{OUT}$
+VB Power Output	FE	$-V_{OUT}$	$+VB_{OUT}$					
Digital Output Control	VA_{CTL}	$-V_{OUT}$	VB_{CTL}					

2 Ordering

Table 4 – Ordering Information

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

3 Changelog

Table 5 – Changelog

Date	Revision	Author	Approval	Notes
12/06/25	0.1	JM		First Draft
02/07/25	0.2	JM		Second Draft
22/07/25	0.3	JM		Third Draft
01/10/25	0.4	JM		Final Draft

Please check: https://www.brainboxes.com/product/pure-embedded/pe-205 for the most recent datasheet revision.

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7 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*).

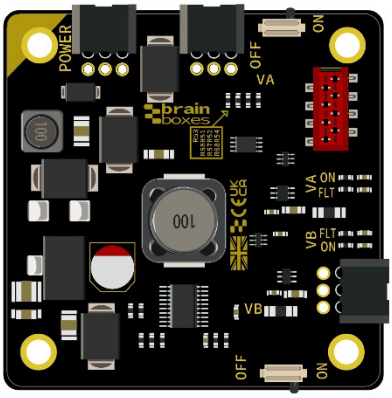

Figure 2 – PE-205

8 Design Guide

8.1 Device Markings

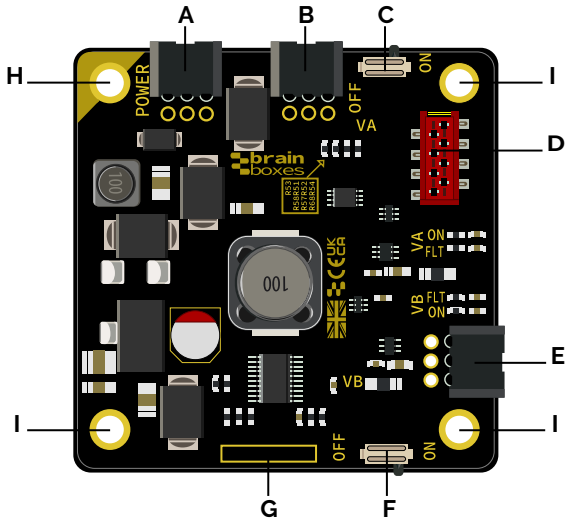

Figure 3 – PE-205_Front Annotated Features

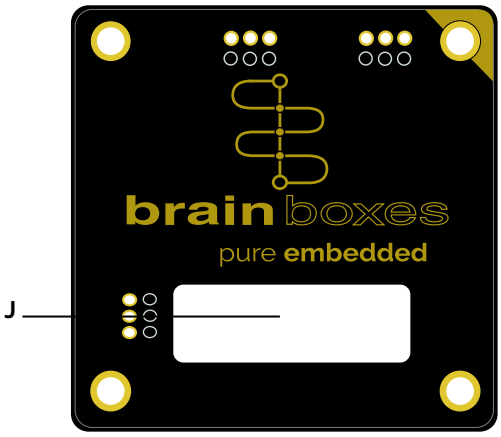

Figure 4 – PE-205_Rear Annotated Features

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

8.2 Connectors & Pinouts

8.2.1 A – VDC Power Input

Table 6 – VDC Power Input

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

8.2.2 B – Power Output Control

Table 7 – Digital Power Output Control

Pin	Function
1	$+VA_{CTL}$
2	$-V_{OUT}$ (Reference)
3	$+VB_{CTL}$

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 $-V_{out}$ reference and two control pins (VA_{CTL} and one for VB_{CTL}).

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 $-V_{out}$ Reference

8.2.3 D – VA Power Output

Table 8 – VA Power Output Pinouts

Pin	Function	
1	FE	Functional Earth
2	$+V_{IN}$	+5 to +30 VDC
3	$-V_{IN}$	GND / 0 V*
4	Passthrough	NC
5	$-V_{OUT}$	0 V*
6	Passthrough	NC
7	$-V_{OUT}$	0 V*
8	$+VA_{OUT}$	+3.3 V

*$-V_{IN}$ and $-V_{out}$ connected internally on the PE-205. For the product to perform to the stated specification, maintain separate power domains for $-V_{IN}$ and $-V_{OUT}$.

8.2.4 E – VB Power Output

Table 9 – VB Power Output Pinouts

Pin	Function	
1	FE	Functional Earth
2	-VOUT	0 V
3	+VBOUT	+3.3 V

8.3 Switches

8.3.1 VA & VB Power Output Logic Switches

Table 10 – VA & VB Power Output Logic Switches

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

8.4 LED's

8.4.1 Power Input

Table 11 – Power Input LED

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

8.4.2 VA & VB Power Output

Table 12 – VA & VB Power Output LED's

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

8.4.3 VA & VB Fault LED's

Table 13 – VA & VB Power Output Fault LED's

LED State	Function
Off	No Issues
On – Red	Power Fault

8.5 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.

8.6 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

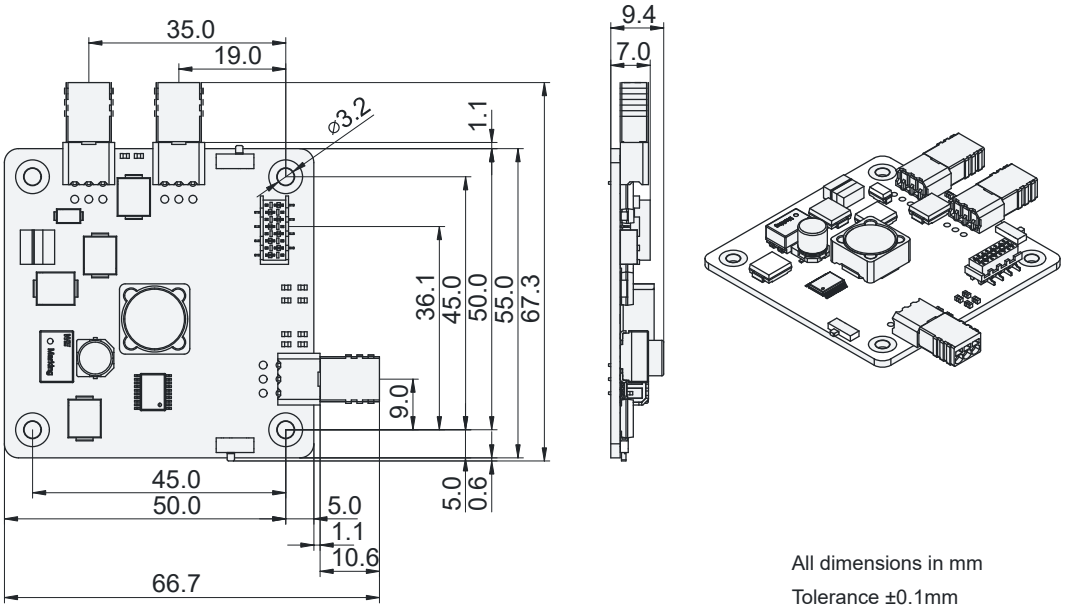

Figure 5 – PE-205 2D Dimensioned Drawing

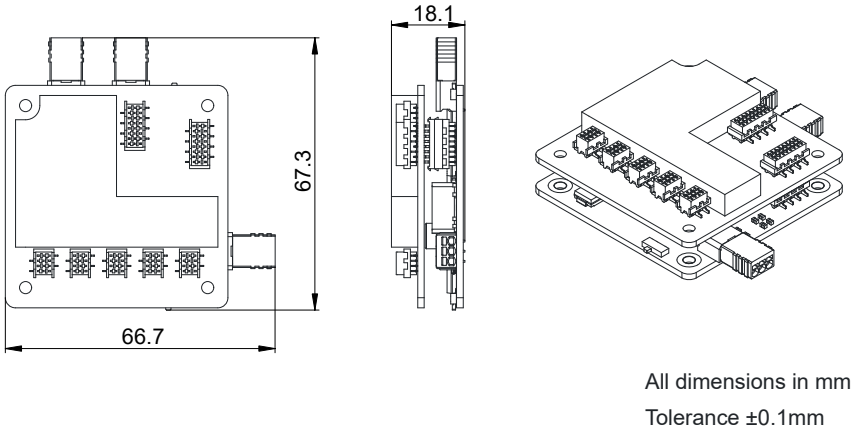

Figure 6 – PE-205 Modularly Stacked with PE-505

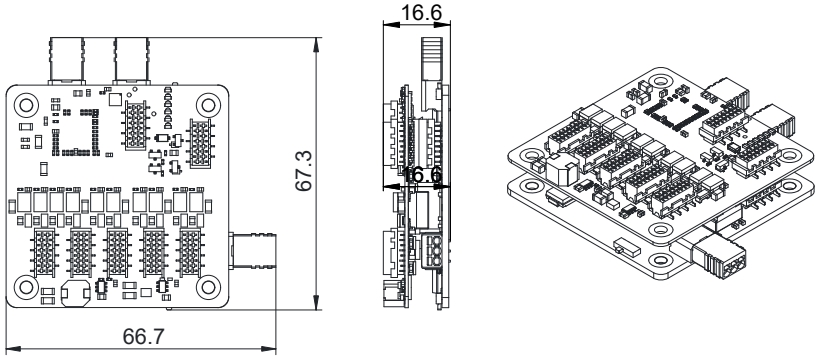

Figure 7 – PE-205 Modularly Stacked with PE-515

8.7 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)

9 Operation

9.1 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:

9.1.1 Power Input

Measure between the +V_{in} & -V_{IN} pins and verify supply voltage is present

9.1.2 VA Power Output

Measure between the +VA_{OUT} and -V_{OUT} pins and verify 3.3 V is present

9.1.3 VB Power Output

Measure between the +VB_{OUT} & -V_{OUT} pins and verify 3.3 V is present

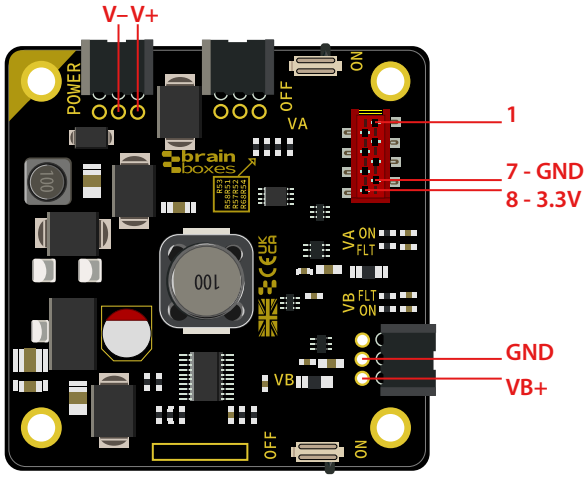

Figure 8 – PE-205 Power Input & Output Pinouts

9.2 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.

9.2.1 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.

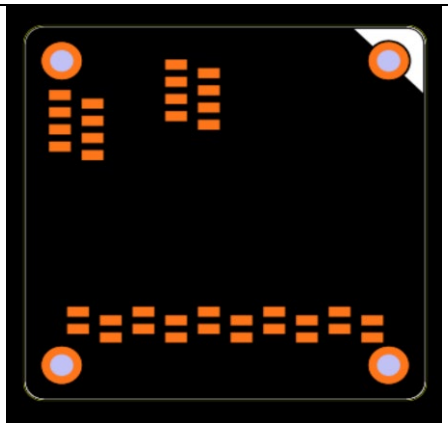

Figure 9 – PE-505 Modular Stacking Header Pad Location

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

9.2.2 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.

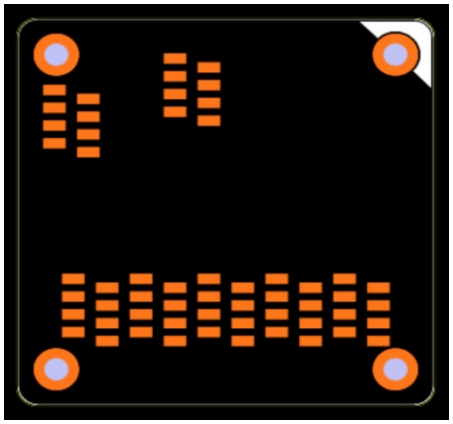

Figure 11 – PE-515 Modular Stacking Header Pad Location

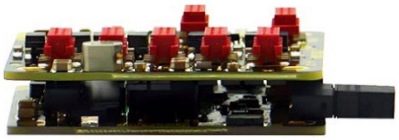

Figure 12 – PE-515 Modularly Stacked with PE-515

9.2.3 PE-508

The PE-508 does not support modular stacking.

10 Operating Conditions

10.1 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 14 – Absolute Maximum Ratings

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

10.2 Electrical Characteristics

Table 15 – 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	$+VA_{OUT}$	3.25	3.3	3.4	V	
VA Overload	I_{AMAX}		1		A	Overload Cut-off
VB Output	$+VB_{OUT}$	3.25	3.3	3.4	V	
VB Overload	I_{BMAX}		0.2		A	Overload Cut-off

11 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