DESCRIPTION DOCUMENT FOR RPi 4-IN 4-OUT BAORD
HARDWARE REVISION 0.1

Department	Name	Signature	Date
Author			
Reviewer			
Approver			

Revision History

Rev	Description of Change	Effective Date
A	Initial Release	

ABSTRACT:

This document is a detailed product description that describes the effective features of the product. It includes a functional hardware description of the product with its internal block diagram and product images.
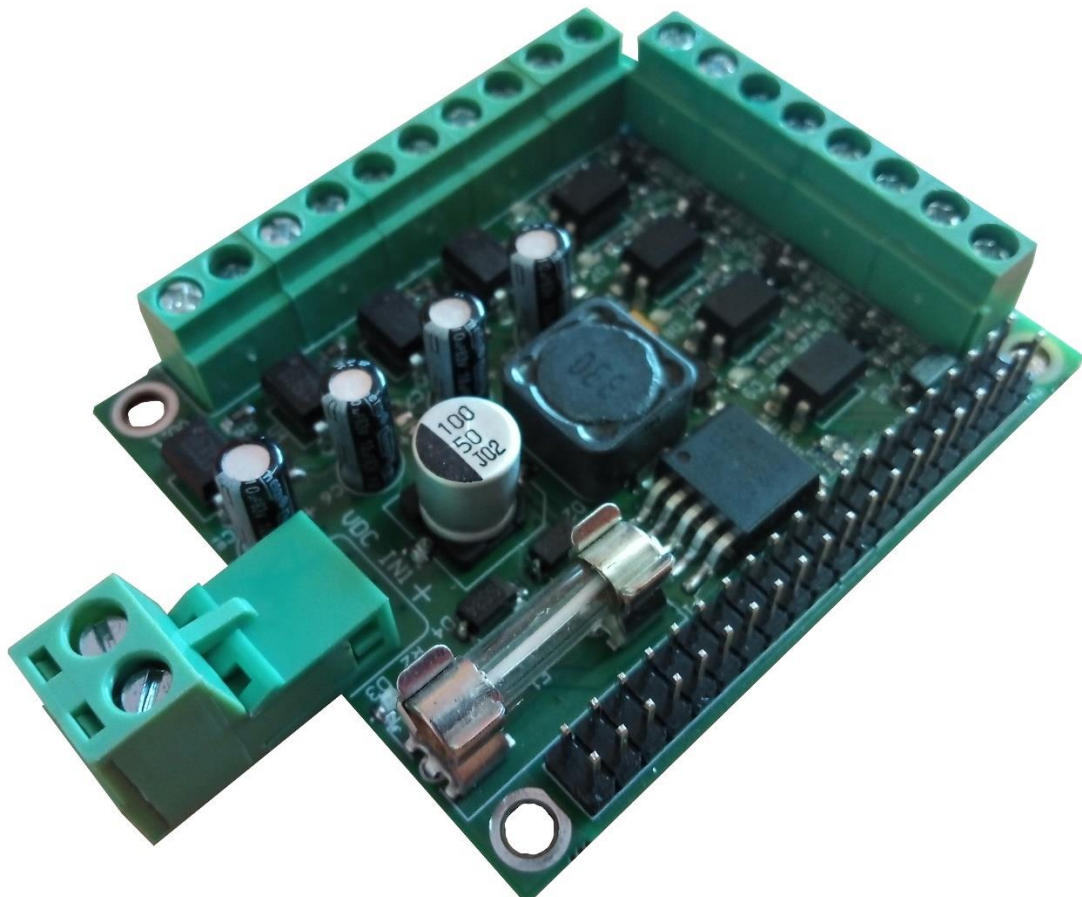
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	DOCUMENT #: IA002
ARMtronix	DOCUMENT REV: A
DOCUMENT NAME: DESIGN DESCRIPTION, RPi 4IN 4OUT BOARD.	

1. ABBREVIATIONS

Term	Description
DC	Direct Current
DGND	Digital Ground (DC)
GPIO	General Purpose Input Output
RPi	Raspberry Pi
MCU	Microcontroller Unit
PCB	Printed Circuit Board

2. REFERENCES

Company Website link	https://www.armtronix.net
Github Weblink	https://github.com/armtronix/Pi-Power-Supply-Isolated-GPIO-Board
Intructable's Weblink	https://www.instructables.com/id/Raspberry-Pi-Isolated-GPIO-Board-With-12-24VDC-to-/
Youtube Weblink	https://www.youtube.com/watch?v=O_O8Zq3A6D4

3. PURPOSE

The purpose of this document is to outline the design description for the RPi 4IN 4OUT BOARD. It provides a highlevel summary of the product.

4. SCOPE

This document describes system architecture which includes Buck converter, Isolated Inputs and Isolated Outputs.

5. SAFETY AND WARNING

If you are working with DC power or batteries, please take necessary precautions. Do not short the positive and negative terminals of the power supply, as it may damage the Hardware and may create hazardous to your health. Do not bring AC power in contact with this board, which will damage the hardware and may create hazardous to your health. Please consider disconnecting power supply from the board if you would like to make any changes in connections. Working without safety towards hardware is not advisable.

Fire Hazard: Making wrong connections, drawing more than rated power, contact with water or other conducting material, and other types of misuse/overuse/malfunction can all cause overheating and risk starting a fire. Test your circuit and the environment in which it is deployed thoroughly before leaving it switched on and unsupervised. Always follow all fire safety precautions.

6. PRODUCT FEATURES

- Operates with standard DC power 12V DC - 24V DC.
- On board 24V to 5V converter to power on pi directly.
- Stack-up or FRC compatible for Raspberry Pi.
- Isolated Digital Inputs – 4
- Isolated Digital Outputs – 4
- Four Input and Four Output Terminal Blocks.
- One Common Ground Terminal Block for sensor Ground connection.

7. PRODUCT DESCRIPTION

a. PHYSICAL DESCRIPTION

- ➢ Buck converter
- ➢ Isolated Digital Inputs
- ➢ Isolated Digital Outputs

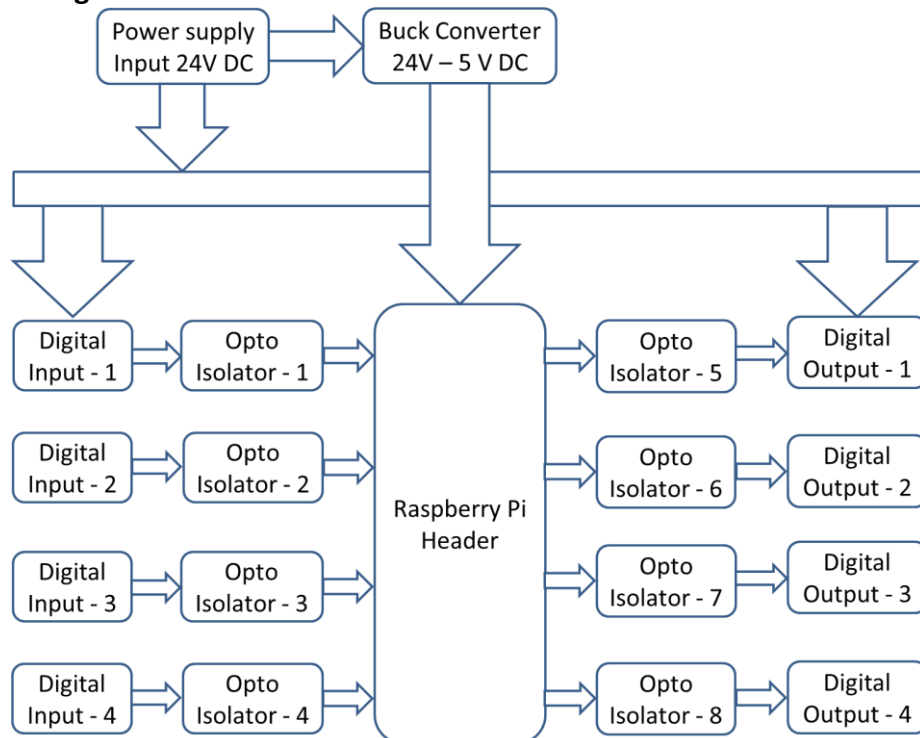### b. FUNCTIONAL DESCRIPTION

Block Diagram

Figure 1: Block Diagram

8. SYSTEM OVERVIEW

1. Buck Converter

The DC-DC converter on board is used to regulate voltage from 24 V DC to 5 V DC to supply power to Raspberry-Pi.

The main power input 24V supply is also used to provide limited power to isolated outputs.

2. Isolated Digital Inputs – 4 Numbers

There are four number of optically isolated inputs given accessible to user to monitor sensors or read any digital inputs with voltage level between 12V DC – 24V DC. The optical isolation is used to protect the hardware from any electrical hazardous at/from external interfaces to the board like sensor push buttons or any other respective inputs.

3. Isolated Digital outputs – 4 Numbers

There are four number of optically isolated outputs given accessible to user to control low power consumption loads with voltage level between 12V DC – 24V DC. The optical isolation is used to protect the hardware from any electrical hazardous at/from external interfaces to the board like solenoids, relays or any other respective outputs.

9. TECHNICAL SPECIFICATION

a. ELECTRICAL SPECIFICATION

Input Specifications				
Description	**Min**	**Typ**	**Max**	**Unit**
Voltage DC	3.3	5	5.5	Volts
Current DC (Standby)	-	10	-	uAmps

Isolated Outputs Specifications (Maximum)				
Description	**Min**	**Typ**	**Max**	**Unit**
Voltage DC	-	-	24	Volts
Current DC	-	-	0.3	Amps
Power DC	-	-	0.72	Watts

Isolated Inputs Specifications (Maximum)				
Description	**Min**	**Typ**	**Max**	**Unit**
Voltage DC	-	-	24	Volts
Current DC	-	-	0.03	Amps

b. MECHANICAL SPECIFICATION

- Mechanical Dimensions of PCB are 65 x 56 x 12 mm (Length x Width x Height)
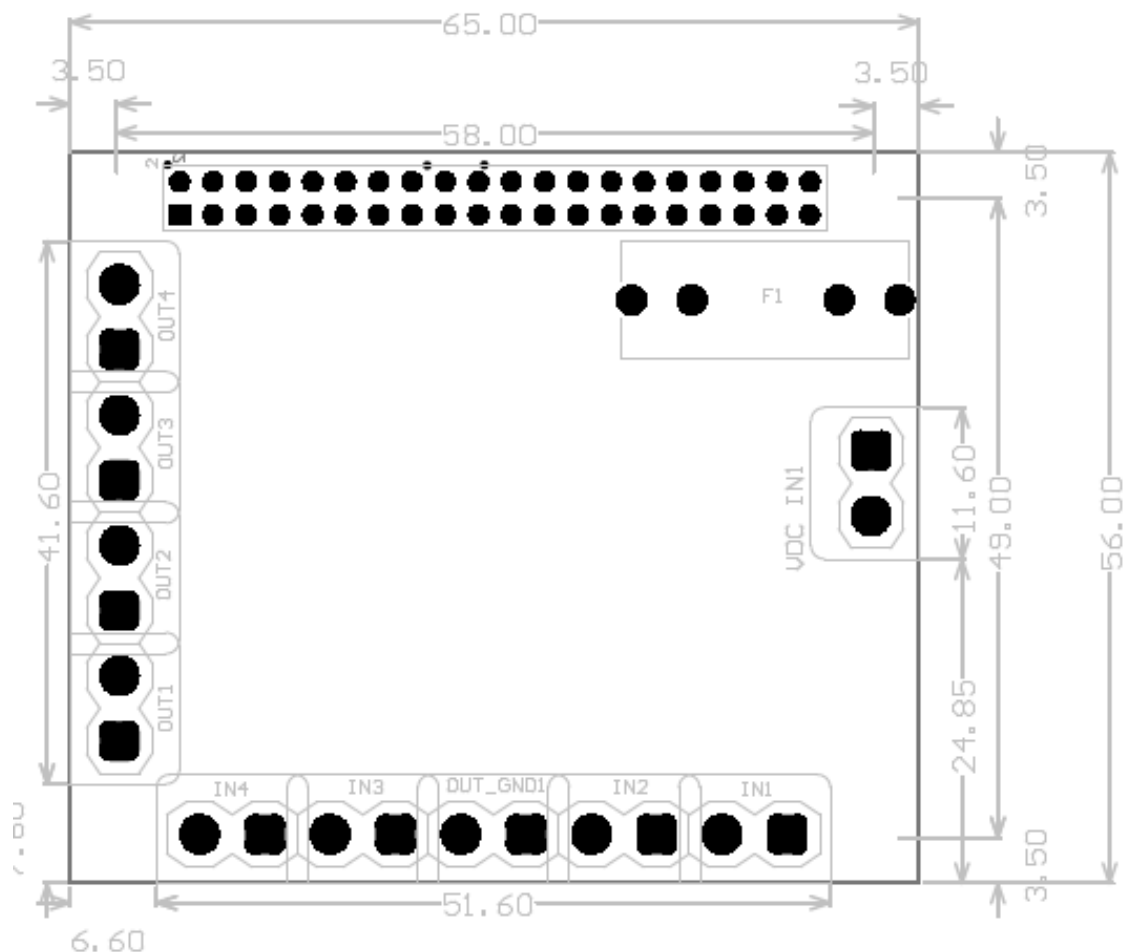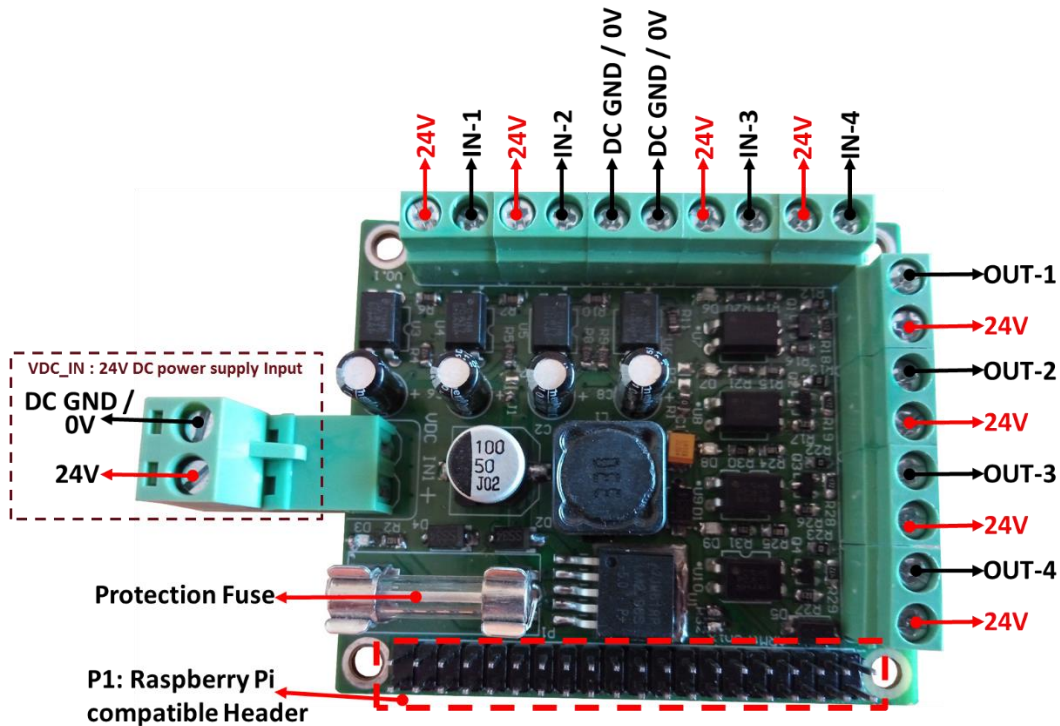- For more details on dimension of the board shown in figure 2.

Figure 2: Board Dimensions

10. ELECTRICAL CONNECTIONS

IN-x : Is input to board from device like sensors and others

OUT-x : Is Output from board to device like DC 24V lamps and others

Figure 3: Header Details

Description of Headers shown in Figure 3:

1. VDC_IN   24 V DC power Input supply connector to board.
2. P1   Raspberry Pi Compatible header.
3. IN-1   Digital Input -1
4. IN-1   Digital Input -2
5. IN-1   Digital Input -3
6. IN-1   Digital Input -4
7. OUT-1   Digital Output -1
8. OUT-2   Digital Output -2
9. OUT-3   Digital Output -3
10. OUT-4   Digital Output -4
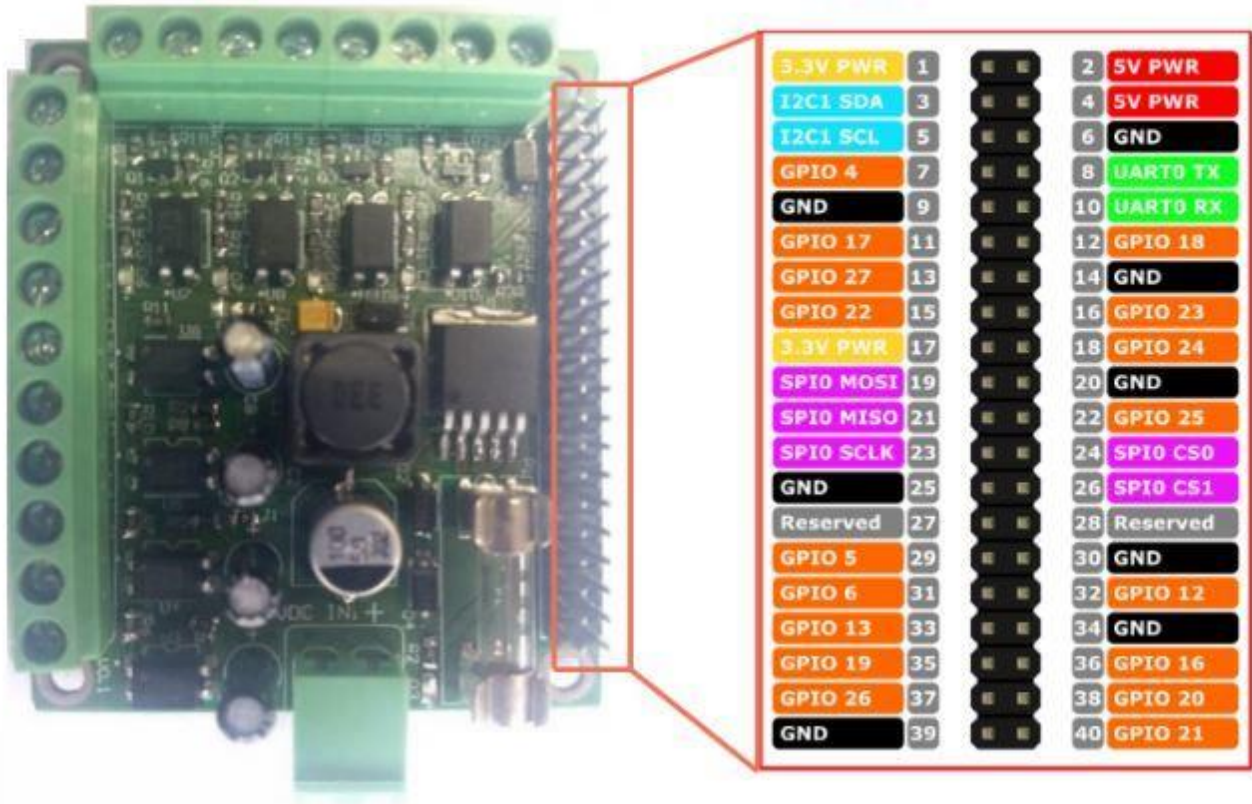
Image shows P1 header and GPIO Pinout
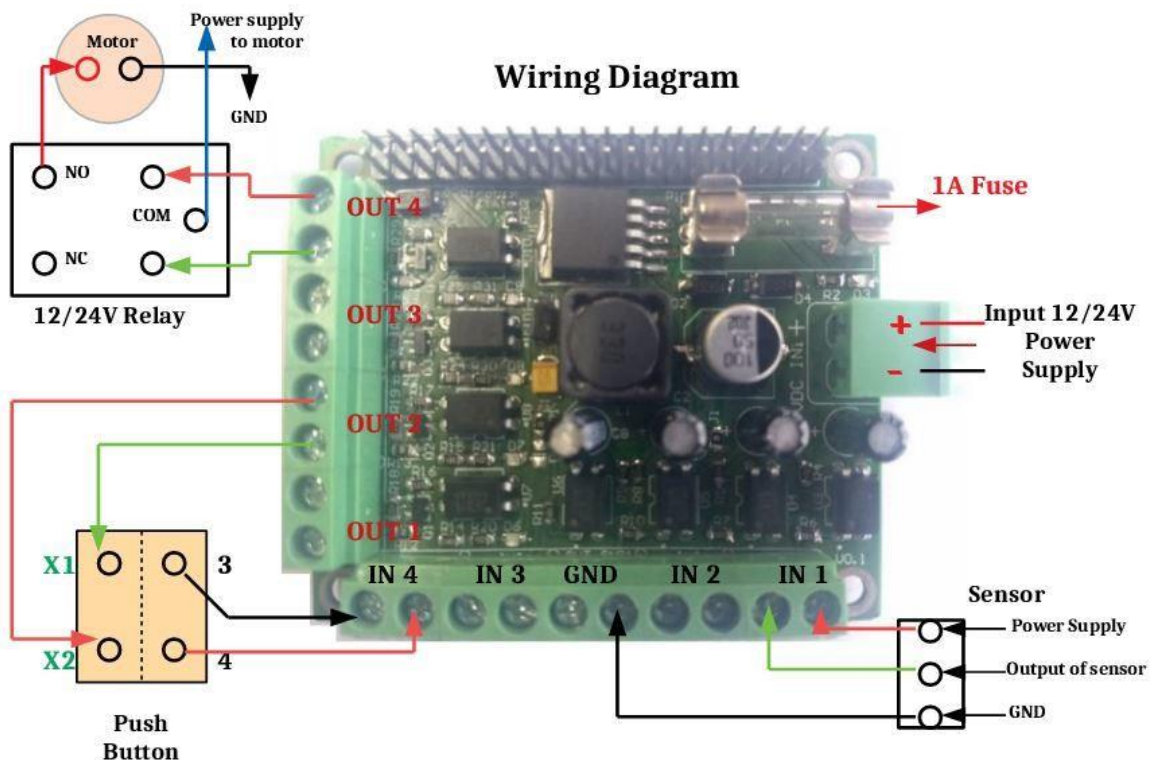

Figure 4: Header Pin number references

Figure 5: Example Application Diagram

a. HEADER PIN CONFIGURATION

i. HEADER VDC_IN

Header Pin	Pin Name
1	DC GND / 0V
2	24V

Table 1: DC Input power supply Connector

ii. DIGITAL INPUTS

Description	Pin Name	RPi Header Pin #
IN-1	GPIO26	37
IN-2	GPIO19	35
IN-3	GPIO13	33
IN-4	GPIO6	31

Table 2: Digital Inputs GPIO Configuration

iii. DIGITAL OUTPUTS

Description	Pin Name	RPi Header Pin #
OUT-1	GPIO22	15
OUT-2	GPIO27	13
OUT-3	GPIO17	11
OUT-4	GPIO4	7

Table 3: Digital Outputs GPIO Configuration

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