

Keypad Kit

With this kit you can create custom keypads with up to 54 buttons and/or 3 rotary encoders. The keypad is organised as 6 rows of 8 buttons and 1 row of 6 buttons. The rotary encoders share the position of switch so for each rotary encoder that is fitted, the switch in that position can not be used. The board accepts EC12E style rotary encoders that do not have an integrated push switch. EC12E rotary encoders are commonly available. The board also accepts standard through-hole 6mm x 6mm tactile switches which are also commonly available in a range of styles.

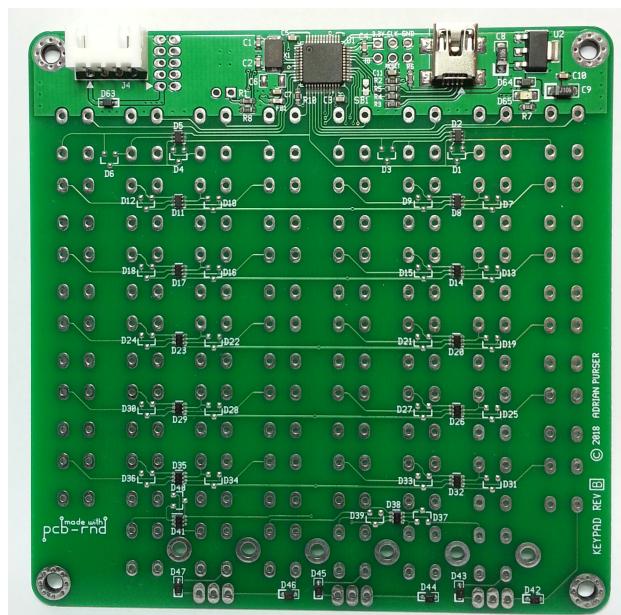
This kit has two types of interface, serial and USB, either of which can be used independently. The serial port is a uart operating at a baud rate of 115200. The USB interface appears as a standard USB HID Keyboard. Either interface can be used to power the board.

This board is a DIY kit. It is partly assembled with most components already fitted with the exception of the buttons and rotary encoders.

You will receive the board as pictured.

Features

- Up to 54 6mm x 6mm buttons can be fitted in any arrangement.
- Up to 3 standard EC12E rotary encoders can be fitted (each encoder uses a button slot).
- Dual Interfaces, UART and USB HID Keyboard (USB Mini-B connector).
- Either interface can be used to power the unit.
- SWD pins available should you wish to write custom software.
- Expansion header with SPI interface (For future use or available to custom software).



(Rev B board)

Specification

- **Dimensions:** 100mm x 100mm
- **Serial Interface:** UART 15200baud, +3.3V logic level. +3.3V Power input.
- **USB Interface:** Mini-B connector. HID Keyboard device. +5V Power input
- **Keypad Buttons:** 6mm x 6mm tactile switch.
- **Rotary Encoders:** EC12E style (no push switch)

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Keypad Kit

Revision History

Revision	Description	Date
1.0	• Keypad Kit (Board Rev B) Datasheet – Formal Release	October 20, 2018



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Keypad Kit

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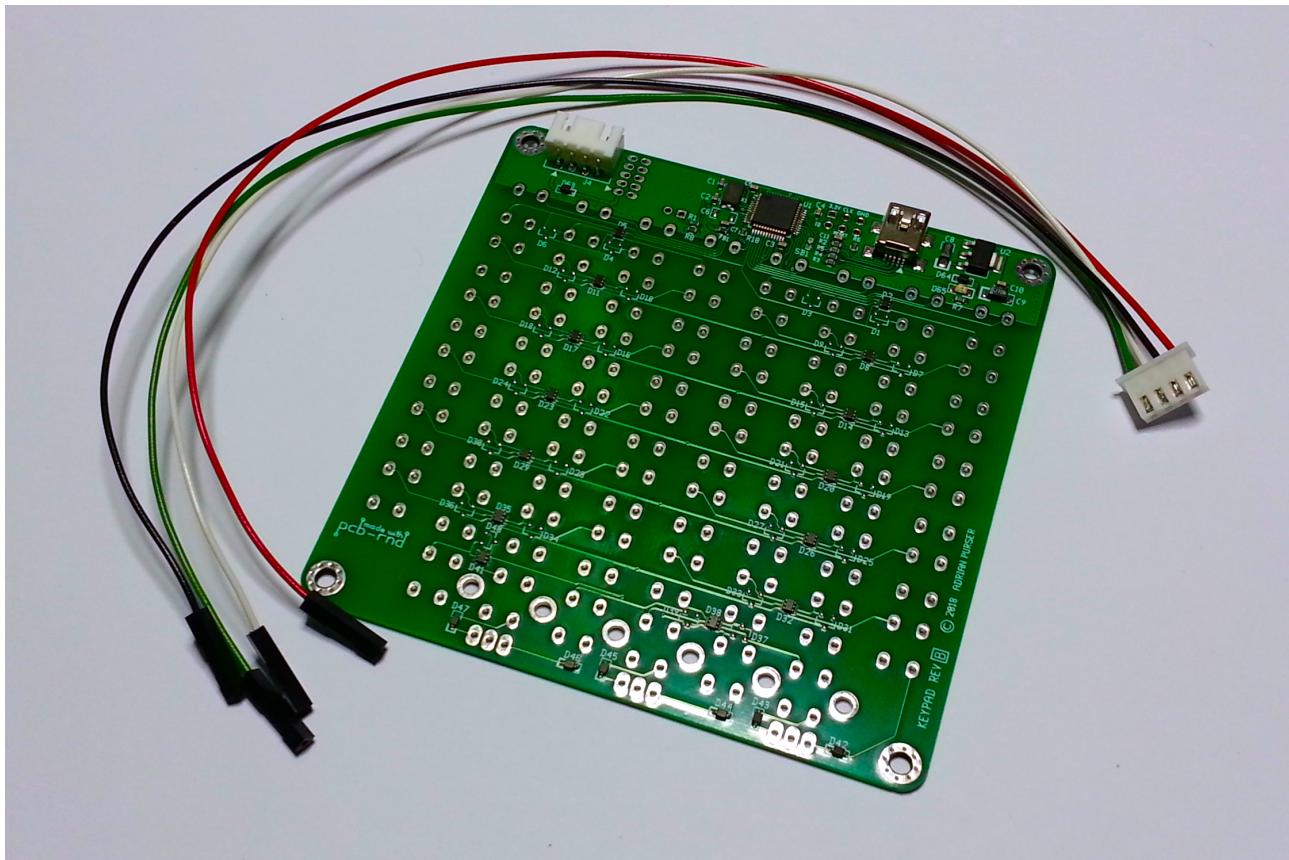
Keypad Kit

Kit Contents

The keypad kit contains -

- **Keypad circuit board.** This is supplied assembled with the exception of the buttons and rotary encoders which are intended to be configured by the end user to their own specific requirements.
- **4-way serial interface cable.** This cable comprises a 4-way JST connector on one end and four dupont style 1-way connectors on the end of each wire. This allows the keypad to be easily connected to a development board such as an Arduino (3.3V version), Raspberry Pi or one of the many ARM development boards that are very common.

Buttons and/or rotary encoders are not included in the standard kit but may be offered as an optional extra.



Keypad Kit

Buttons & Rotary Encoders

Buttons

The board accepts up to 54 buttons. The buttons are 6mm x 6mm tactile switches. These switches are commonly available from a variety of sources and come in a number of different styles. The layout of the keypad has been designed to allow 8mm key-caps to be used with a sufficient amount of spacing between buttons.

Buttons can be arranged in any combination to suit your application.



(Various styles of 6mm x 6mm switches)

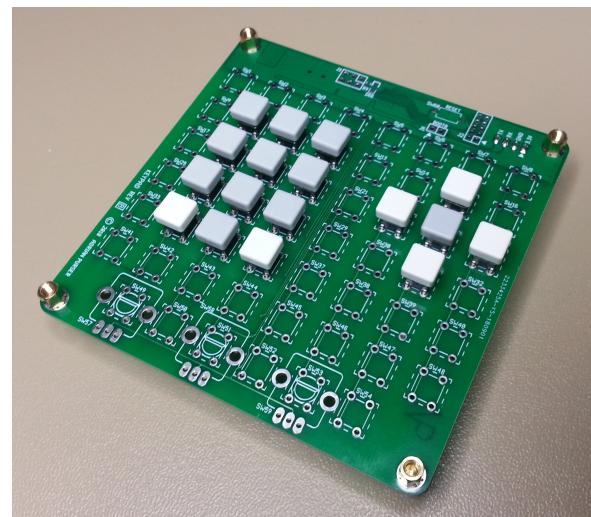
Rotary Encoders

Up to 3 EC12E style rotary encoders can be fitted. Each encoder shares the position of one of the buttons so if all 3 encoders are fitted then the maximum number of buttons would be 51. Encoders that have push switches on the shaft are not compatible with this board due to the lack of pads for the switch contacts.



(Various styles of EC12E rotary encoders)

Example Layouts



(Example of various types of buttons and rotary encoders)

Keypad Kit

Serial (UART) Interface

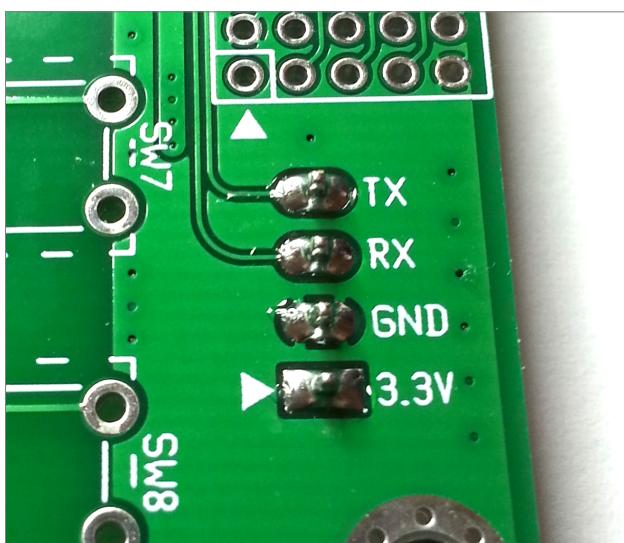
The serial interface uses a 4-pin JST connector. The board can be powered from the serial interface by supplying +3.3V DC. The serial signal pins RX and TX support 3.3V logic levels.

Baud Rate	115200
Parity	None
Data Bits	8
Stop Bits	1

Pinout

(Important Note: On revision B boards, due to a mistake during PCB design, the pin numbering of the serial connector (J4) is transposed when compared to the manufacturers pin numbering. Please follow the pin labels on the PCB silk screen, which are correct, when making your own cable assemblies.)

Pin	Function	Wire Colour
1	+3.3V DC IN	Red
2	GND	Black
3	RX	White
4	TX	Green



Data Format

Each event from the keypad is sent in a single byte. The 3 types of events are button press, button release and rotary encoder. The format of the data byte is shown in the following table. The value in bits 0 to 5 is specific to the event type.

7	6	5	4	3	2	1	0	Event Type
0	0							Button Release
1	0							Button Press
0	1						D	Rotary Encoder
1	1							(Reserved)

Button Events

The lower 6 bits of the data value contains the button number between 1 and 55. The button number matches the switch number printed on the silk-screen on the board. For example, SW1 is button number 1. The keypad reports button press and release events but there are no key repeat events.

Each button on the keypad has its own diode to eliminate ghosting. When using the serial port, each button press or release will send an event regardless of how many other buttons are pressed at that time.

Rotary Encoder Events

Bit 0 indicates the direction that the encoder is rotating. Bits 5..1 contain the encoder ID.

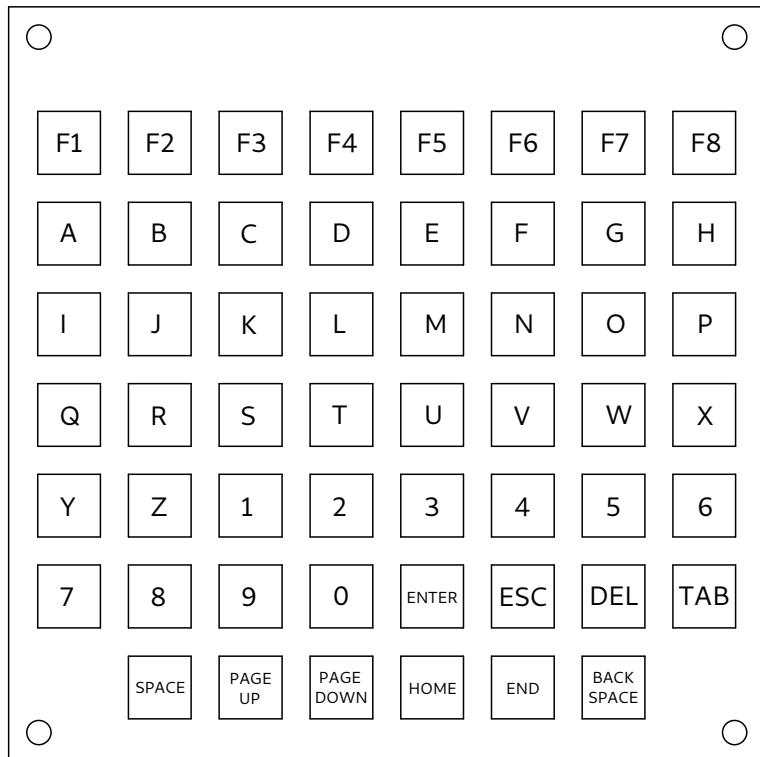
Raw Event	Value (Bits 5..0)	Function
64 (0x40)	0	Rotary Encoder 1 - CCW
65 (0x41)	1	Rotary Encoder 1 - CW
66 (0x42)	2	Rotary Encoder 2 - CCW
67 (0x43)	3	Rotary Encoder 2 - CW
68 (0x44)	4	Rotary Encoder 3 - CCW
69 (0x45)	5	Rotary Encoder 3 - CW

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USB HID Keyboard Interfaces

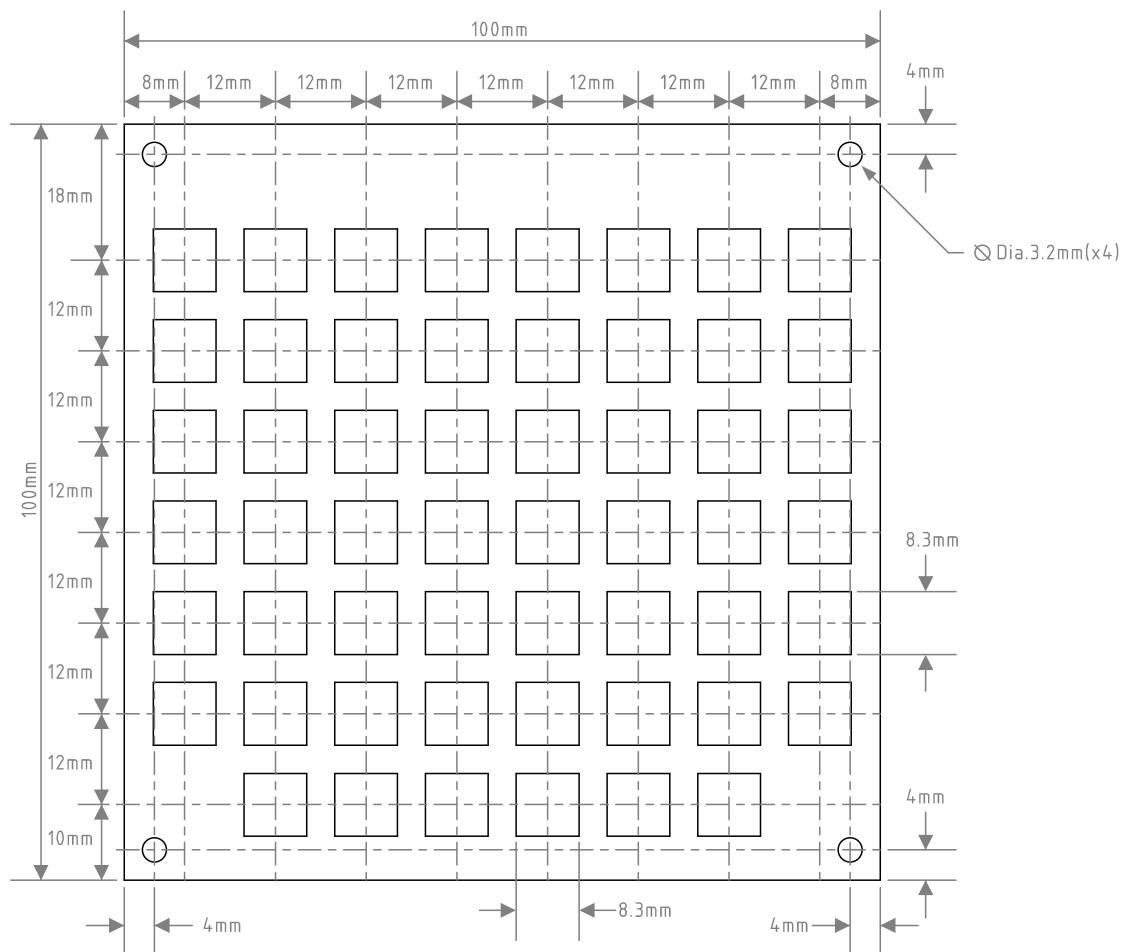
The keypad will appear as a standard HID Keyboard. The diagram on the right shows the key mapping. This key mapping is currently hard coded and can not be changed. A maximum of 6 keys can be pressed at any one time.

The USB interface can be used to power the keypad.



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Suggested Front Panel Cutout

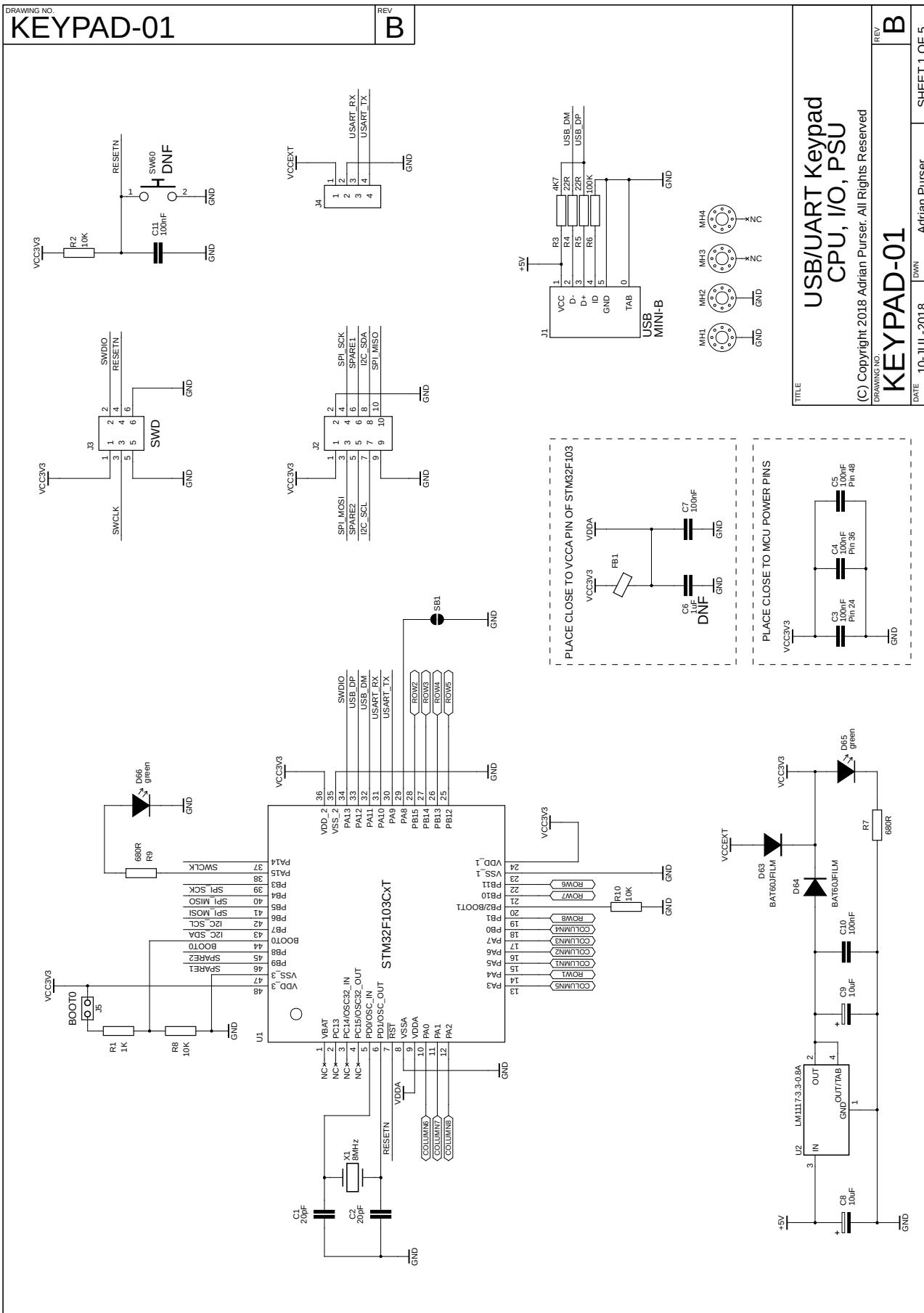


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Schematics

1. CPU, IO & Power Supply
2. Key Matrix Rows 1 & 2
3. Key Matrix Rows 3 & 4
4. Key Matrix Rows 5 & 6
5. Key Matrix Row 7. Rotary Encoders

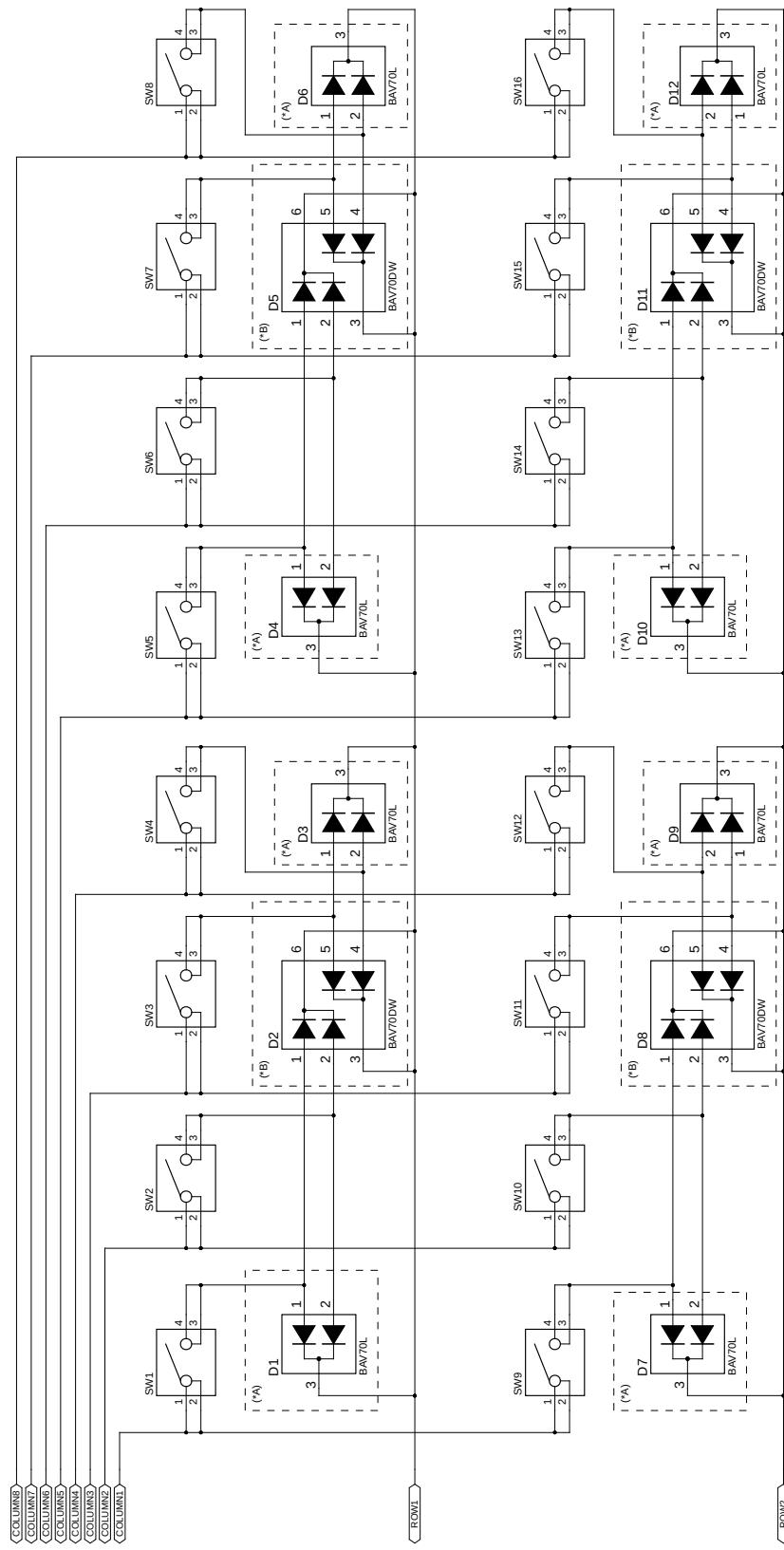
Keypad Kit



Keypad Kit

DRAWING NO.
KEYPAD-02

REV
B



*A/B: Fit either components marked *A or *B but not both together.

USB/UART Keypad Key Matrix - Rows 1 & 2
 (C) Copyright 2018 Adrian Purser. All Rights Reserved
 DRAWING NO.
KEYPAD-02

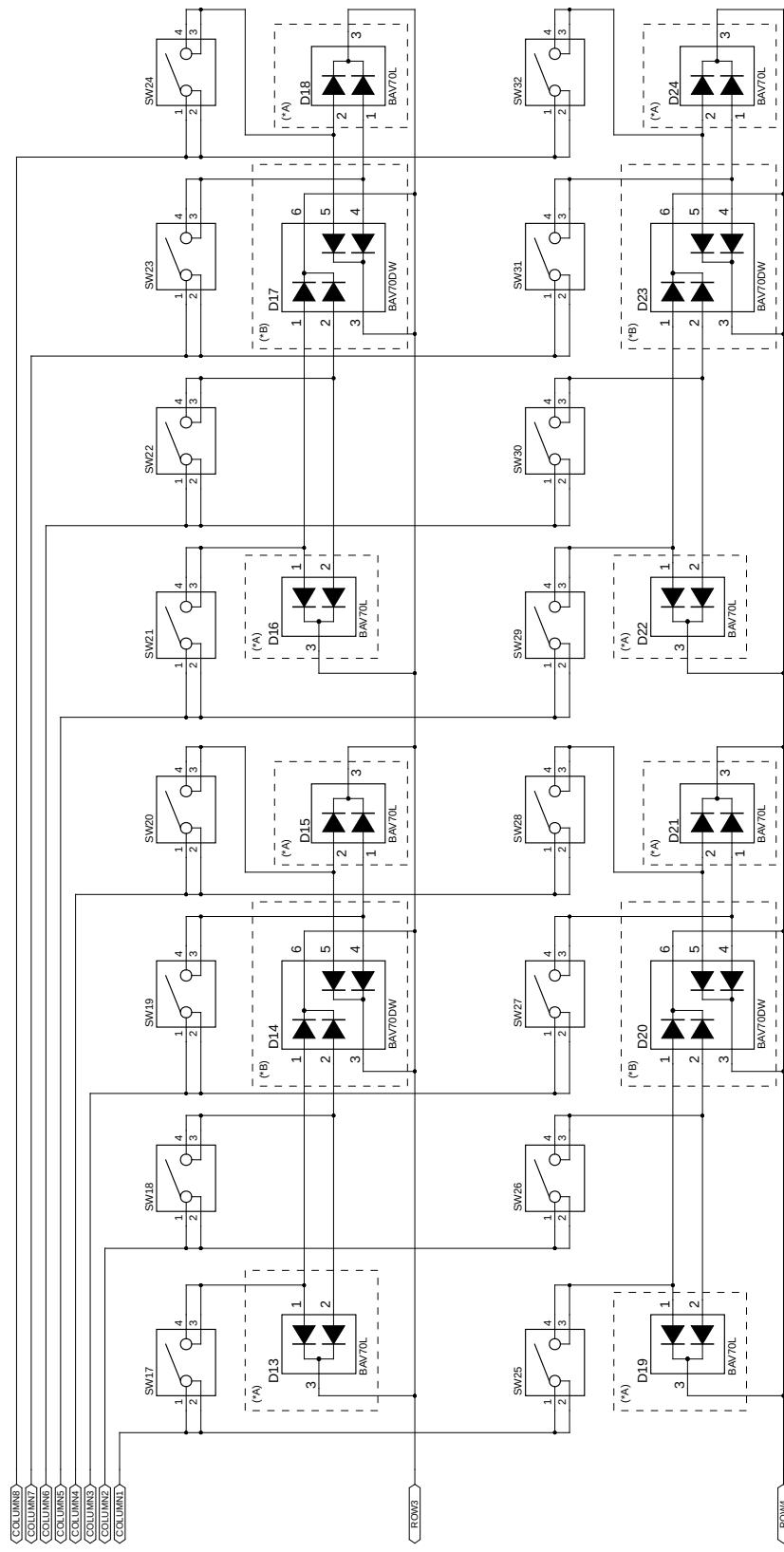
REV
B

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Keypad Kit

DRAWING NO.
KEYPAD-03

REV
B



*A/B: Fit either components marked *A or *B but not both together.

USB/UART Keypad Key Matrix - Rows 3 & 4
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 DRAWING NO.
KEYPAD-03

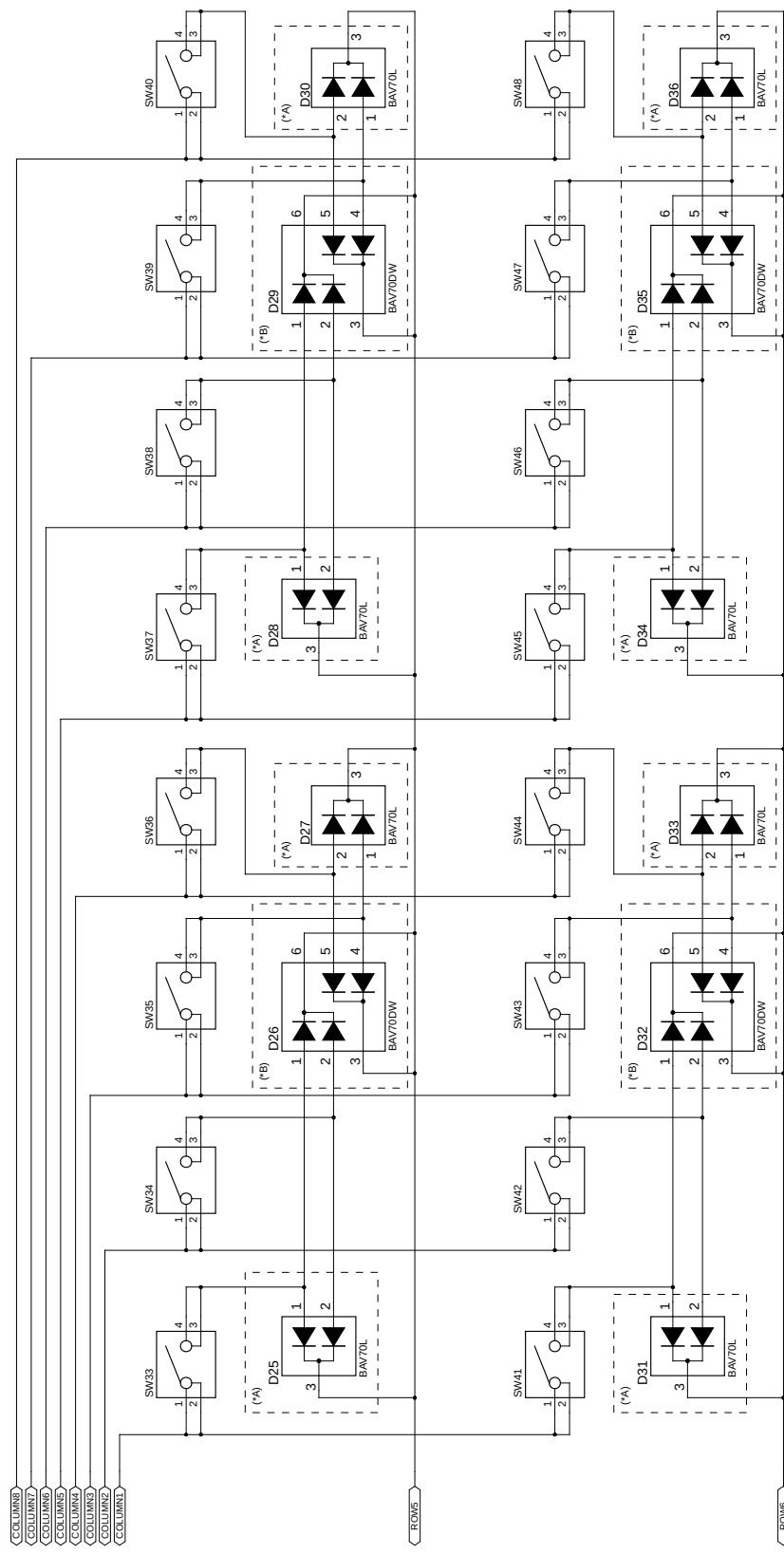
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B

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Keypad Kit

DRAWING NO.
KEYPAD-04

REV
B



*A/B: Fit either components marked *A or *B but not both together.

TITLE: **USB/UART Keypad Key Matrix - Rows 5 & 6**
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 DRAWING NO.:
KEYPAD-04

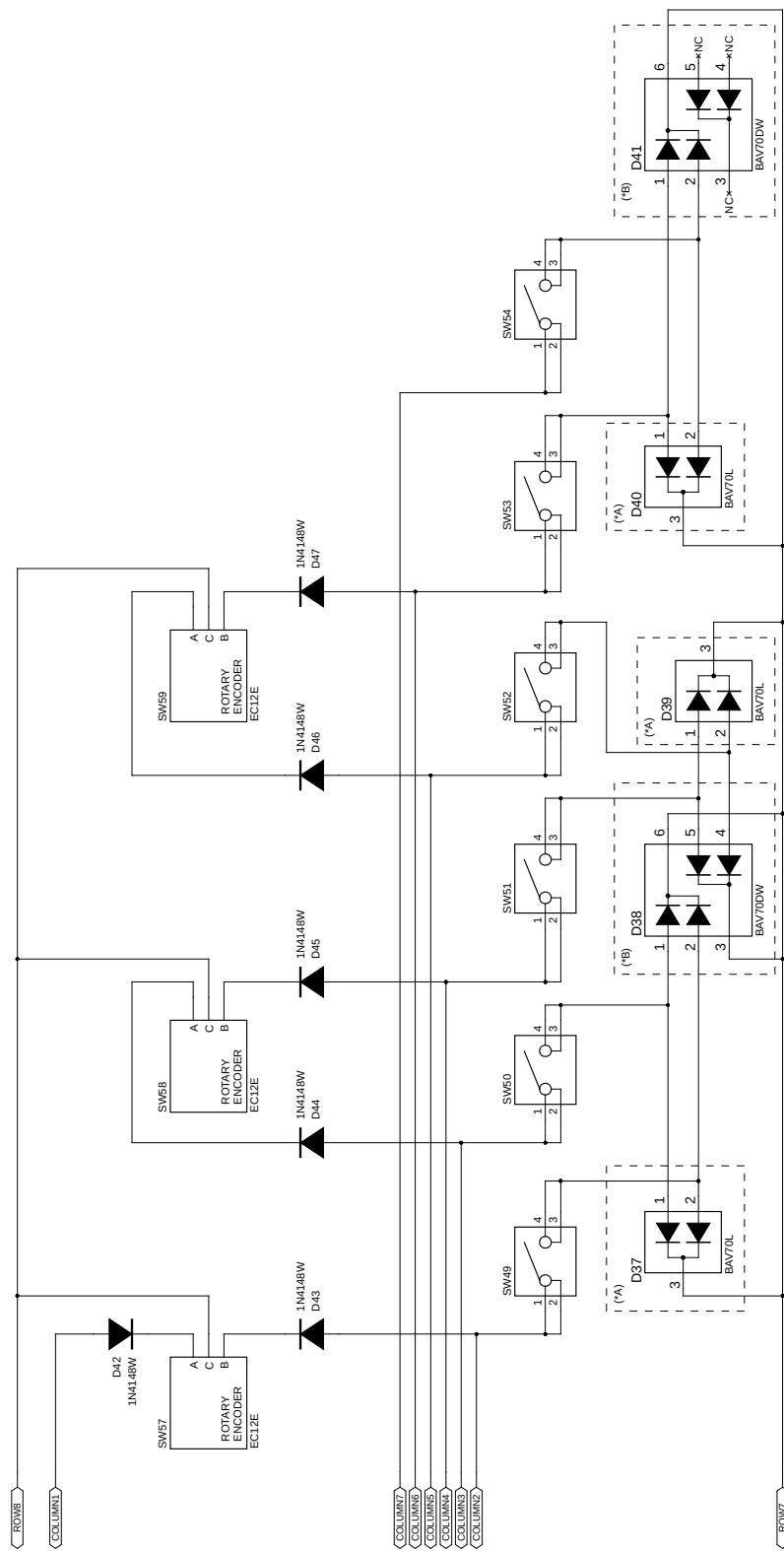
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Keypad Kit

DRAWING NO.
KEYPAD-05

REV
B



*A/B: Fit either components marked *A or *B but not both together.

USB/UART Keypad Key Matrix Row 7 & Rotary Encoders	
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DRAWING NO. KEYPAD-05	REV B
DATE 11-AUG-2018	DRAWN Adrian Purser
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