User Manual

Keypad Module

*Designed and Implemented
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1. **Introduction to Keypad Module**

This Arduino compatible keypad module can also be connected to any microcontroller using only 1 digital pin. A brief tutorial on interfacing this keypad module can be found in the video tutorial. The users can connect any keypad up to 4 rows by 4 columns matrix keypad. The keypad matrix transmits 8-bit data (ASCII value of the button pressed on keypad) serially using standard UART communication protocol. A 7 segment display is also provided in the keypad module which shows the number of the keypad button pressed.
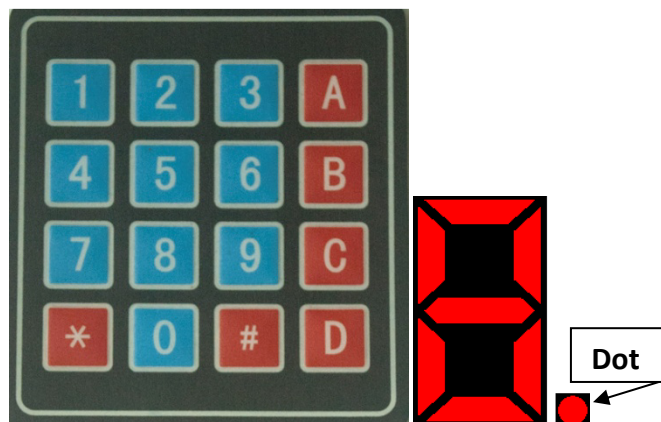
Key Features:

1.1 Module's components:
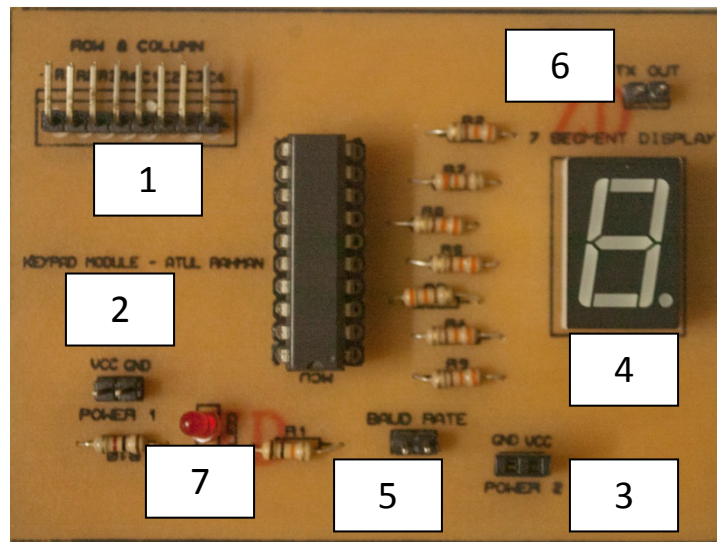
1) Row & Column
2) Power-1 (Vcc and Gnd)
3) Power-2 (Vcc and Gnd)
4) Common Anode 7 segment Display
5) Baud rate selection
6) Tx out (Data out)
7) LED

1.2 Description of the Features:

1) **Row & Column:** A matrix keypad up to 4 rows and 4 columns can be connected through this male L shaped connector. Numbering of the rows and columns is provided on the top silk layer of the PCB board.

2) **Power-1 (Vcc and Gnd):** Power should be supplied to the keypad module using these two pins, Vcc and Gnd. Recommended voltage that should be provided is around 4-6 votls.

3) **Power-2 (Vcc and Gnd):** These male connectors also serve the same purpose as that of Power-1. *Any one of the power connectors (Power-1 or Power-2) can be used or both (Power-1 and Power-2) can be used*.

4) **Common Anode 7 segment Display:** This display shows the number of the keypad buttons pressed.
   ➢ For a 4 row by 4 column matrix keypad buttons, the decimal numbers and alphabets that are shown on the 7-segment display are stated on the table below:

Keypad Button pressed	Character shown on 7 segment display	Dot (DP)
1	0	OFF
4	1	OFF
7	2	OFF
*	3	OFF
2	4	OFF
5	5	OFF
8	6	OFF
0	7	OFF
3	8	OFF
6	9	OFF
9	A	ON
#	b	ON
A	C	ON
B	d	ON
C	E	ON
D	F	ON

Table 1: Character Display scheme for 4*4 matrix keypad in 7 Segment Display

➢ For a 4 row by 3 column matrix keypad buttons, the decimal numbers and alphabets that are shown on the 7-segment display are stated on the table below:


Keypad Button pressed	Character shown on 7 segment display	Dot (DP)
1	0	OFF
4	1	OFF
7	2	OFF
*	3	OFF
2	4	OFF
5	5	OFF
8	6	OFF
0	7	OFF
3	8	OFF
6	9	OFF
9	A	ON
#	b	ON

Table 2: Character Display scheme for 4*3 matrix keypad in 7 Segment Display

5) **Baud rate selection:** Users can control communication baud rate of the keypad module. Keypad module can send data out at a baud rate of 9600 bits per second or at baud rate of 1200 bits per second. The communication protocol is UART (Universal Asynchronous Receive and Transmit).

➢ If the jumper is placed and the two pins are shorted then the baud rate of 1200 bits per second is selected.

➢ If the jumper is not placed and the two pins are not shorted (default state) then the baud rate of 9600 bits per second is selected

➢ **To select a baud rate, connection must be given before providing power to the keypad module**

6) **Tx out (Data out):** There are two data out pins which are shorted internally. Both of the pins can be used or any one pin out of these two pins can be used. The data out pin transmits the 8-bit data which is the ASCII value of the keypad button pressed. The ASCII characters and corresponding string characters are shown in the table below:
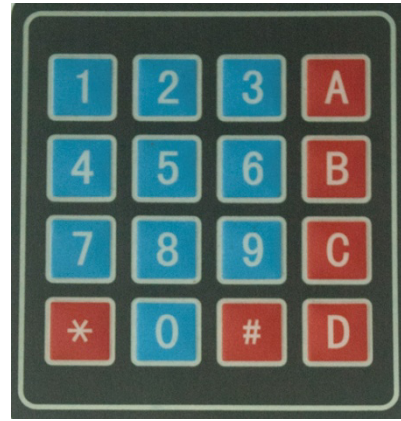
Keypad Button pressed	8-bit data transmitted from keypad module (hexadecimal)	Corresponding string character
1	0x31	1
4	0x34	4
7	0x37	7
*	0x2A	*
2	0x32	2
5	0x35	5
8	0x38	8
0	0x30	0
3	0x33	3
6	0x36	6
9	0x39	9
#	0x23	#
A	0x41	A
B	0x42	B
C	0x43	C
D	0x44	D

Table 3: 8-bit data transmitted from keypad module for 4*4 matrix keypad

7) **LED:** This LED turns on when power is provided to the keypad module.