Keypad Interfacing with MSP430

Praveen Kumar Yadav

September 22, 2025

1 Introduction

This report presents the implementation of a 4x4 keypad interfaced with the MSP430 microcontroller. The program initializes GPIO pins for keypad rows and columns, configures pull-up resistors, and scans for key presses. A schematic of the circuit is attached for reference.

2 Schematic

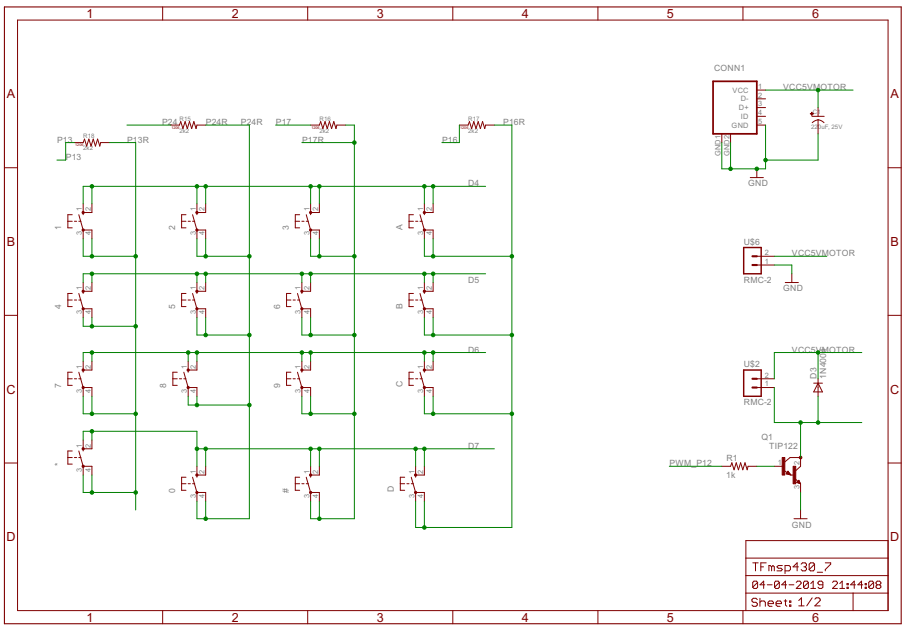

Figure 1: Keypad Interfacing Circuit with MSP430

3 Source Code

```c
#include <msp430.h>

void key();

/* Function to initialize keypad GPIO pins */
void key()
{
    P1DIR |= BIT0;

    P1DIR |= (BIT6|BIT7|BIT3);    // P1.6, P1.7, P1.3 as output
    P2DIR |= BIT4;                // P2.4 as output

    P2DIR &= ~(BIT5|BIT6);        // P2.5, P2.6 as input
    P3DIR &= ~(BIT1|BIT2);        // P3.1, P3.2 as input
    P2REN |= (BIT5|BIT6);         // enable P2.5, P2.6 pull-up/
       down
    P3REN |= (BIT1|BIT2);         // enable P3.1, P3.2 pull-up/
       down
    P2OUT |= (BIT5|BIT6);         // pull-up
    P3OUT |= (BIT1|BIT2);         // pull-up
}

int main(void)
{
    WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
    PM5CTL0 &= ~LOCKLPM5;

    key(); // Initialize keypad

    while(1)
    {
        P1OUT &= ~BIT3;
        P2OUT |= BIT4;
        P1OUT |= BIT7;
        P1OUT |= BIT6;

        if(!(P3IN & BIT2))    // D4 key pressed
        {
            P1OUT ^= BIT0;           // Toggle LED
            __delay_cycles(100000); // Debounce delay
            key();                   // Re-initialize keypad
        }
    }
}
```

Listing 1: MSP430 Keypad Interfacing Code

4 Working Principle

- Rows and columns of the keypad are connected to MSP430 GPIO pins.
- Internal pull-up resistors keep inputs high when no key is pressed.
- The microcontroller drives row lines low one at a time and checks the column inputs to detect which key is pressed.
- When key `D4` is pressed, the LED connected to P1.0 toggles.

5 Conclusion

The above implementation demonstrates a simple keypad scanning method using GPIO configurations on the MSP430. It can be extended to read all keys, debounce inputs, and interface with LCD or other peripherals.