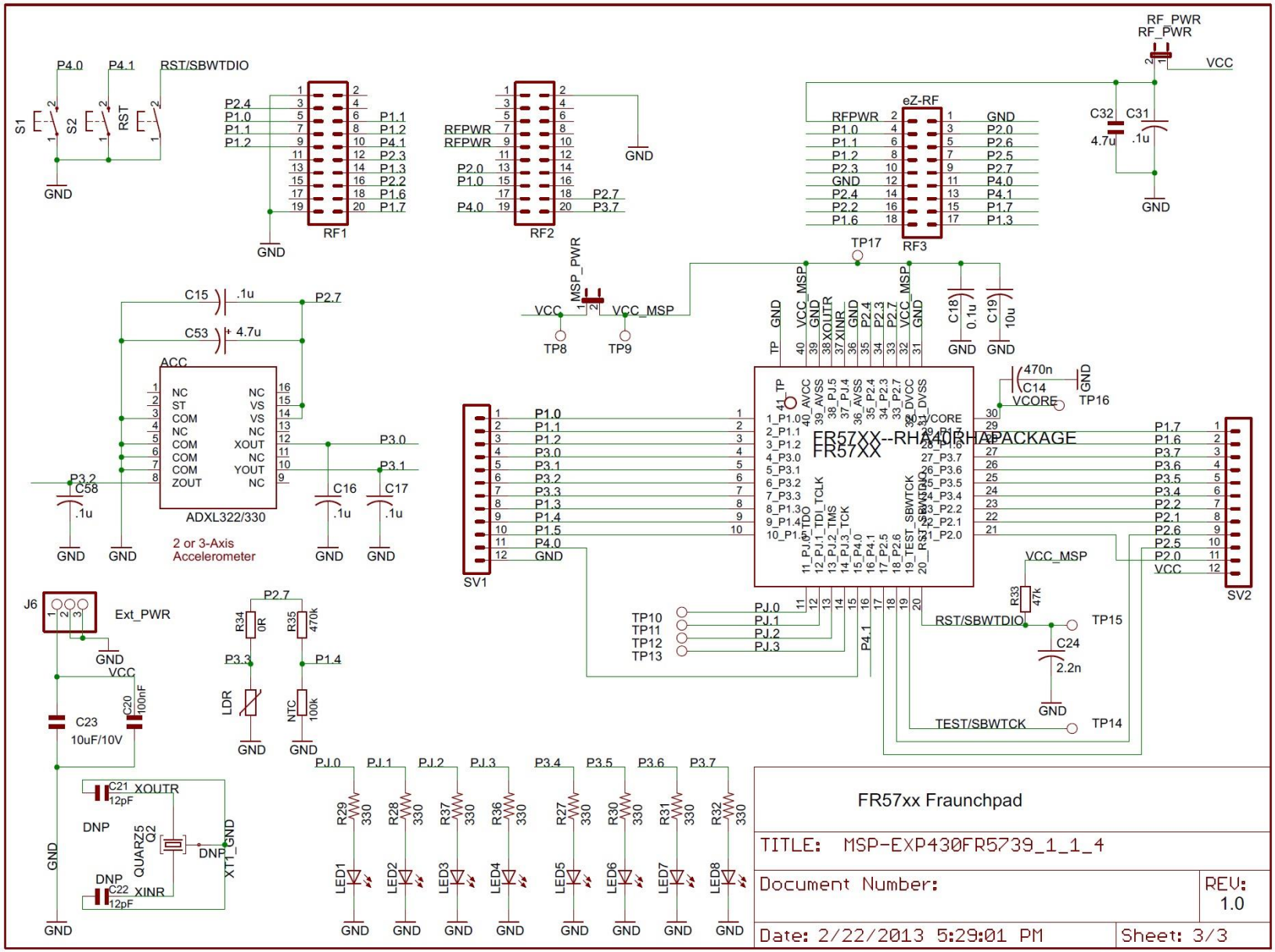
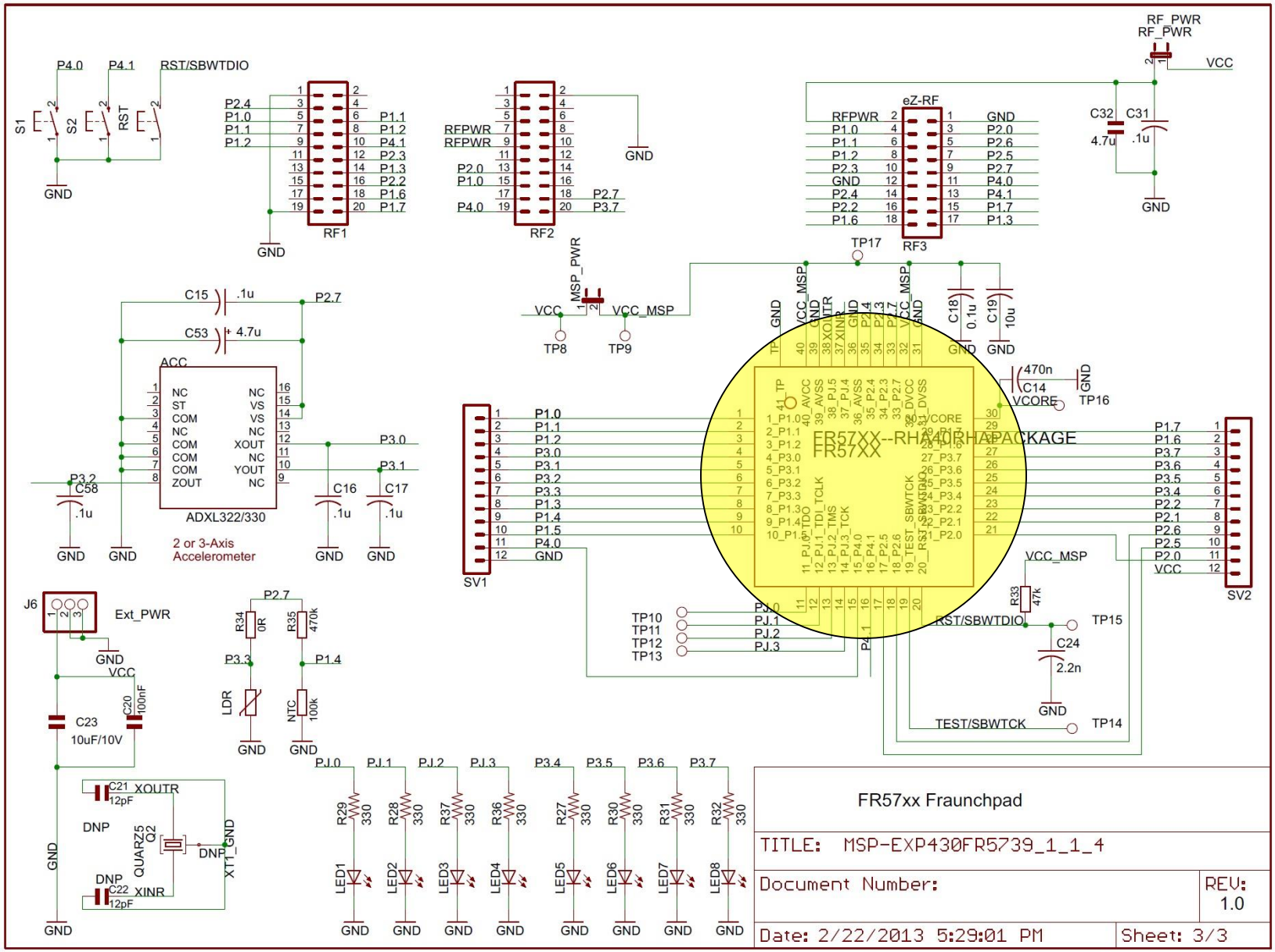
MSP430 Port Determinations

These lecture notes created by Mr. James B. (Jim) Carlson, NCSU

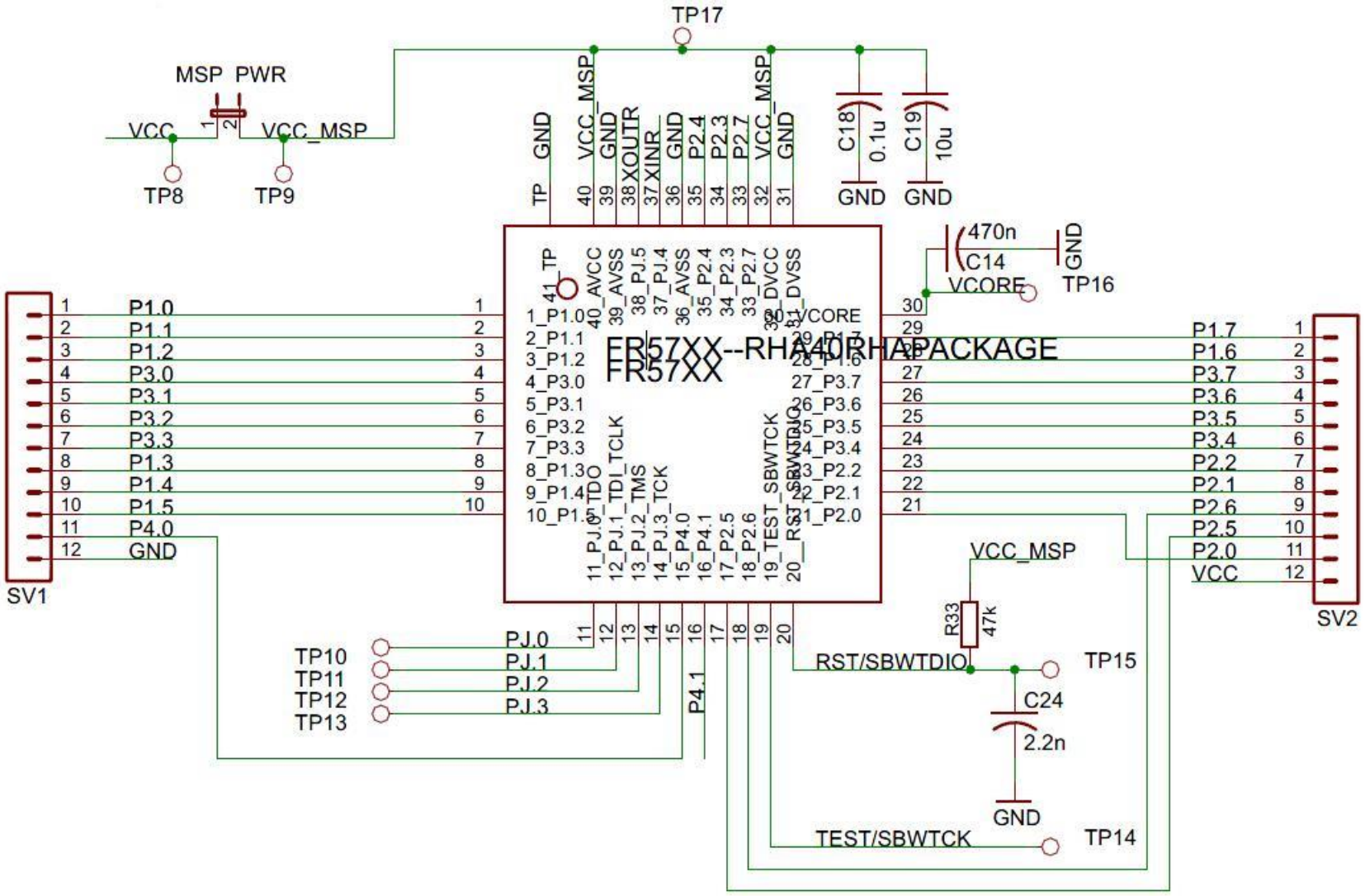
From MSP-EXP430FR5739_SCH



From MSP-EXP430FR5739_SCH



From MSP-EXP430FR5739_SCH



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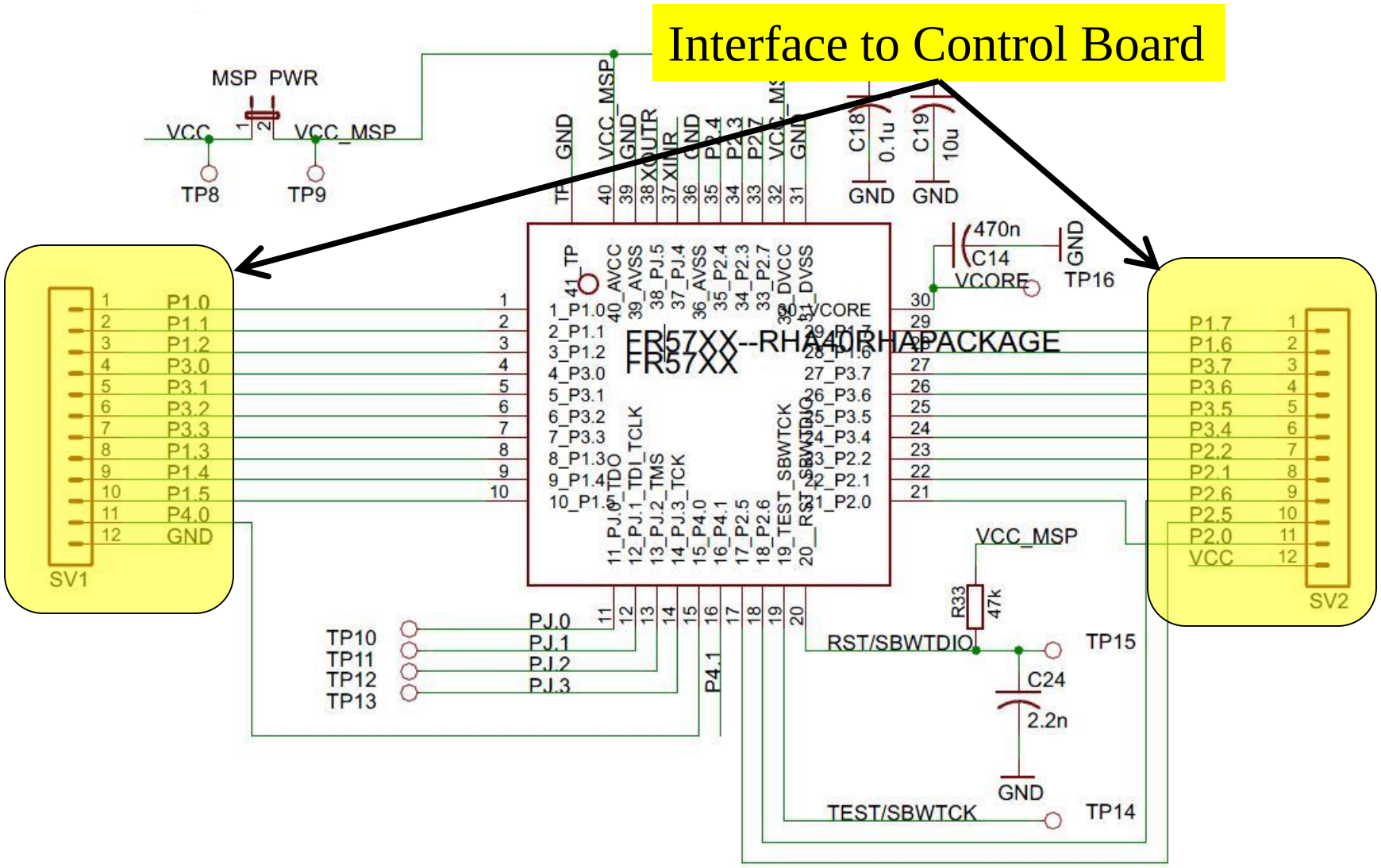
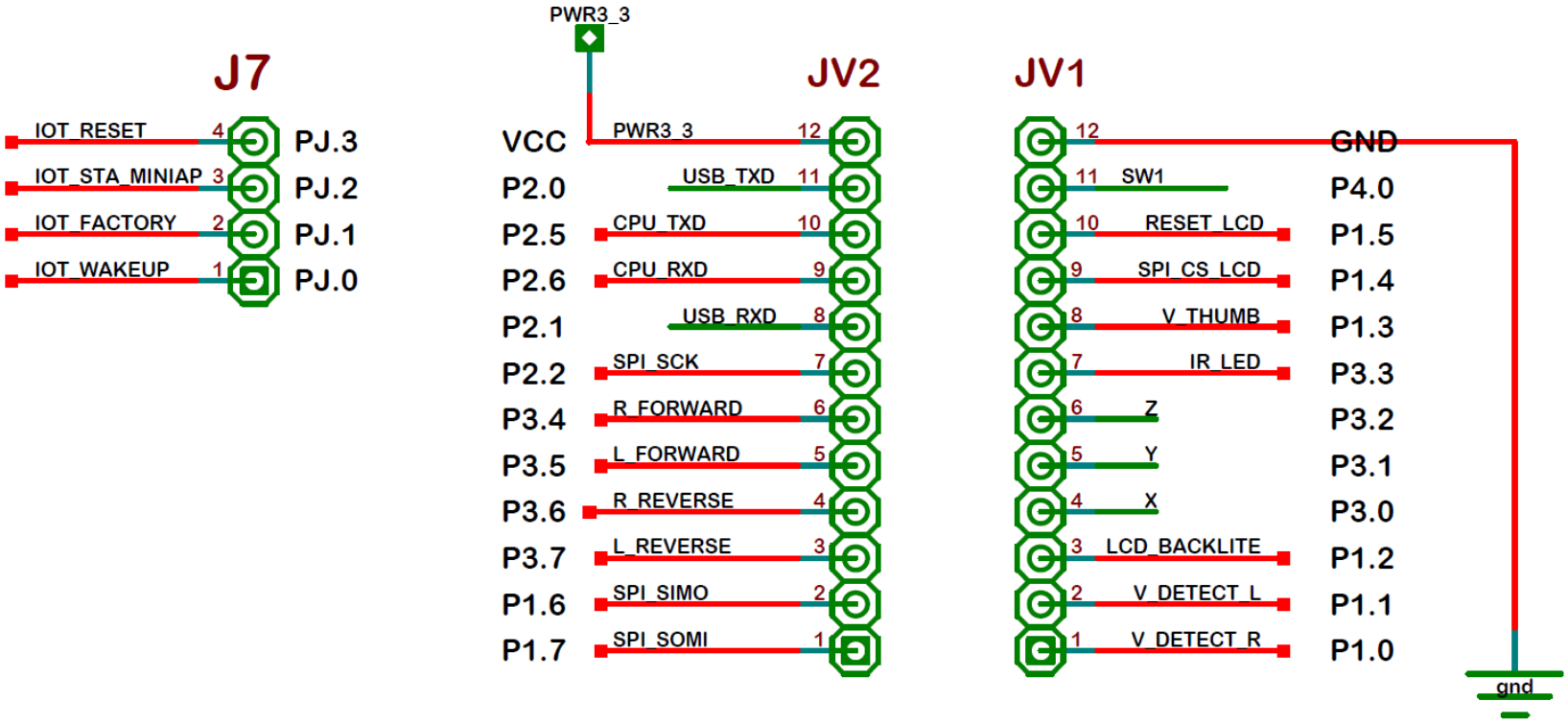


From SCH_FRAM_II

Interconnect



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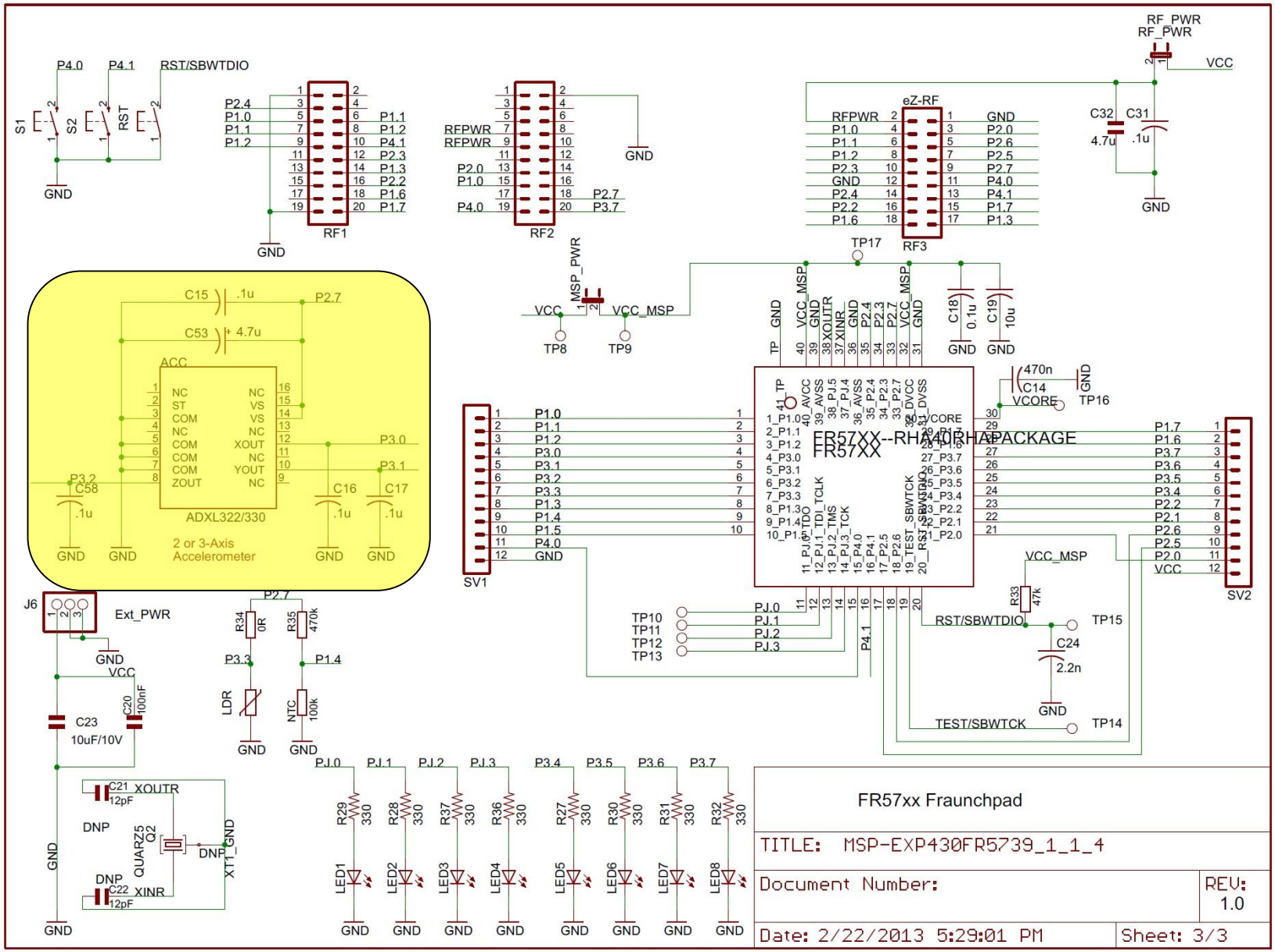

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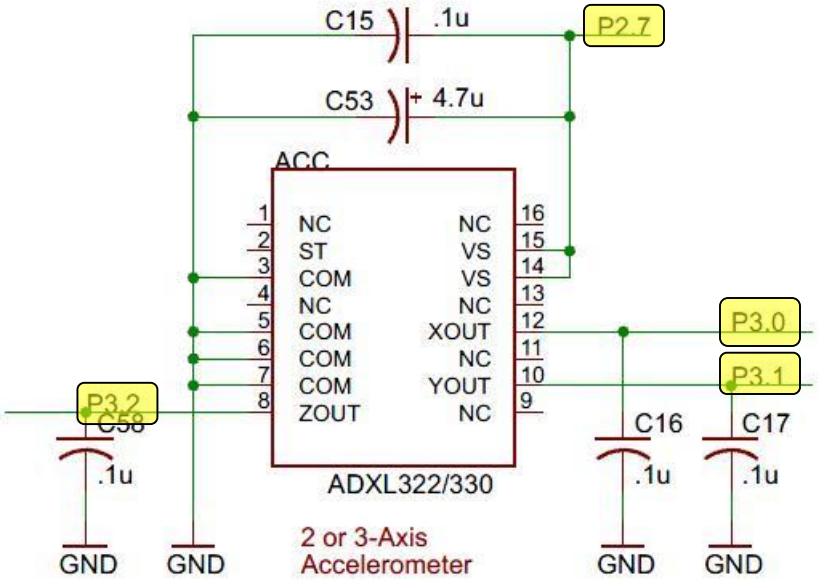
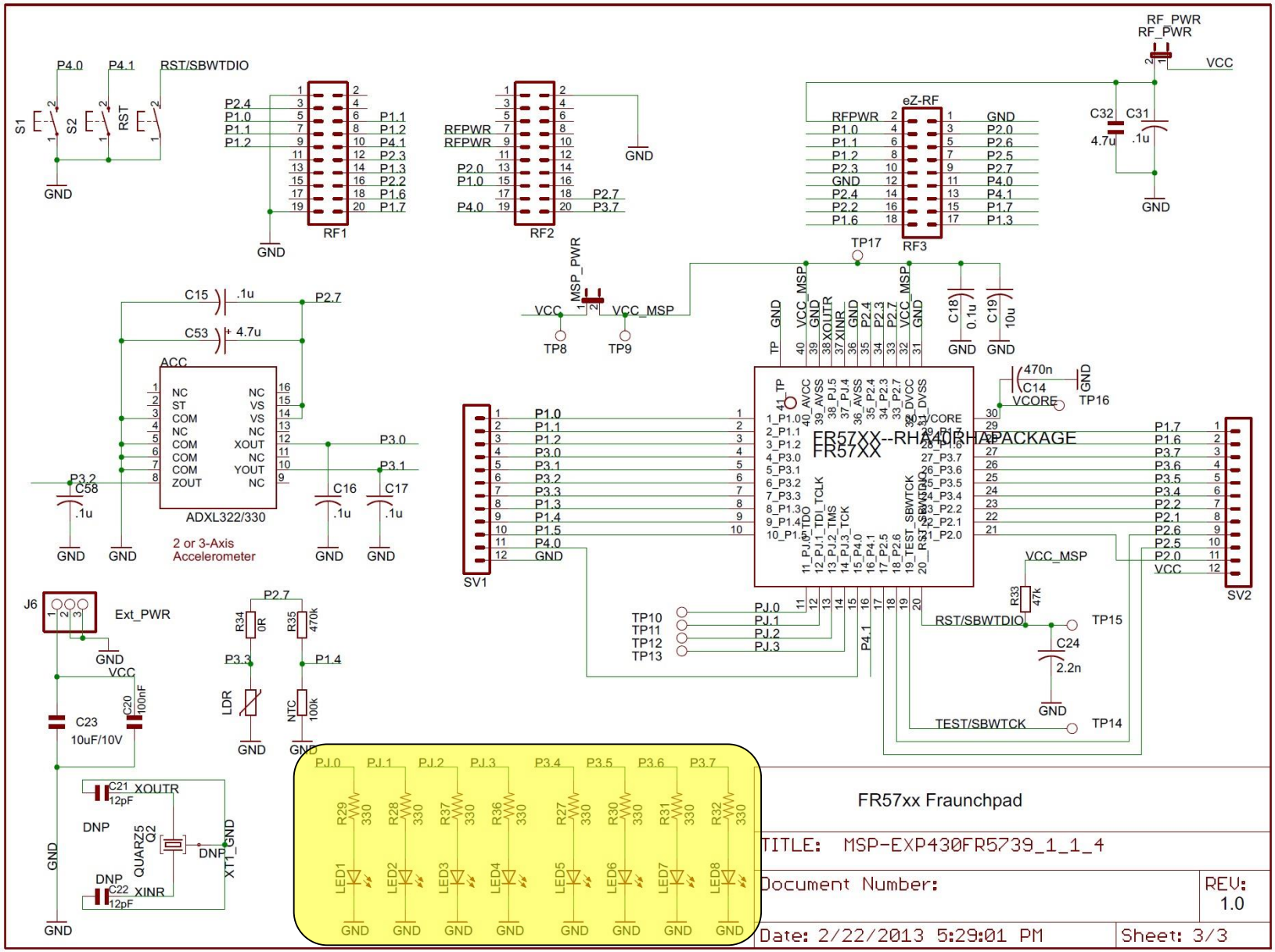
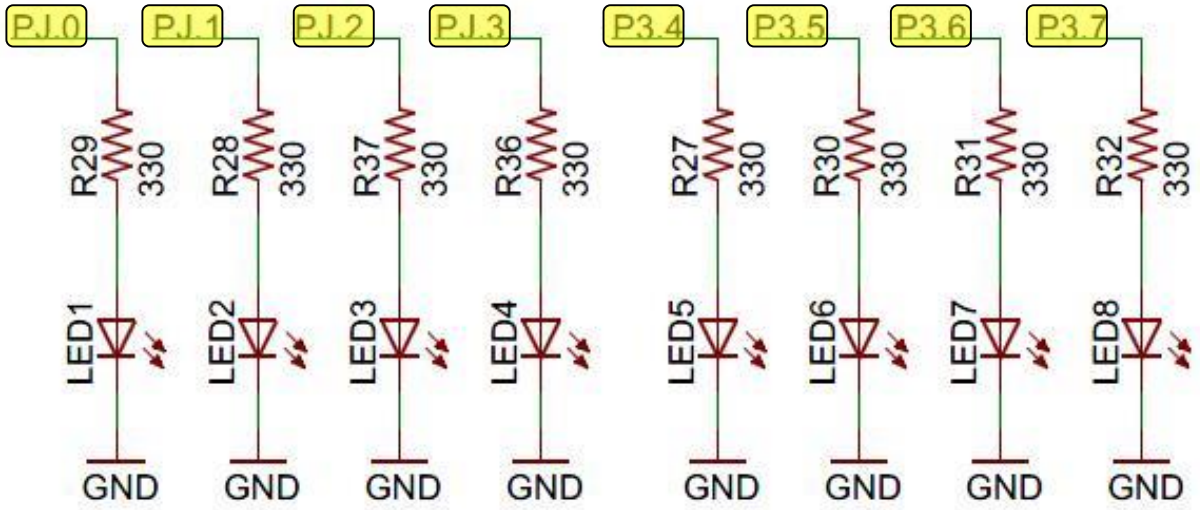


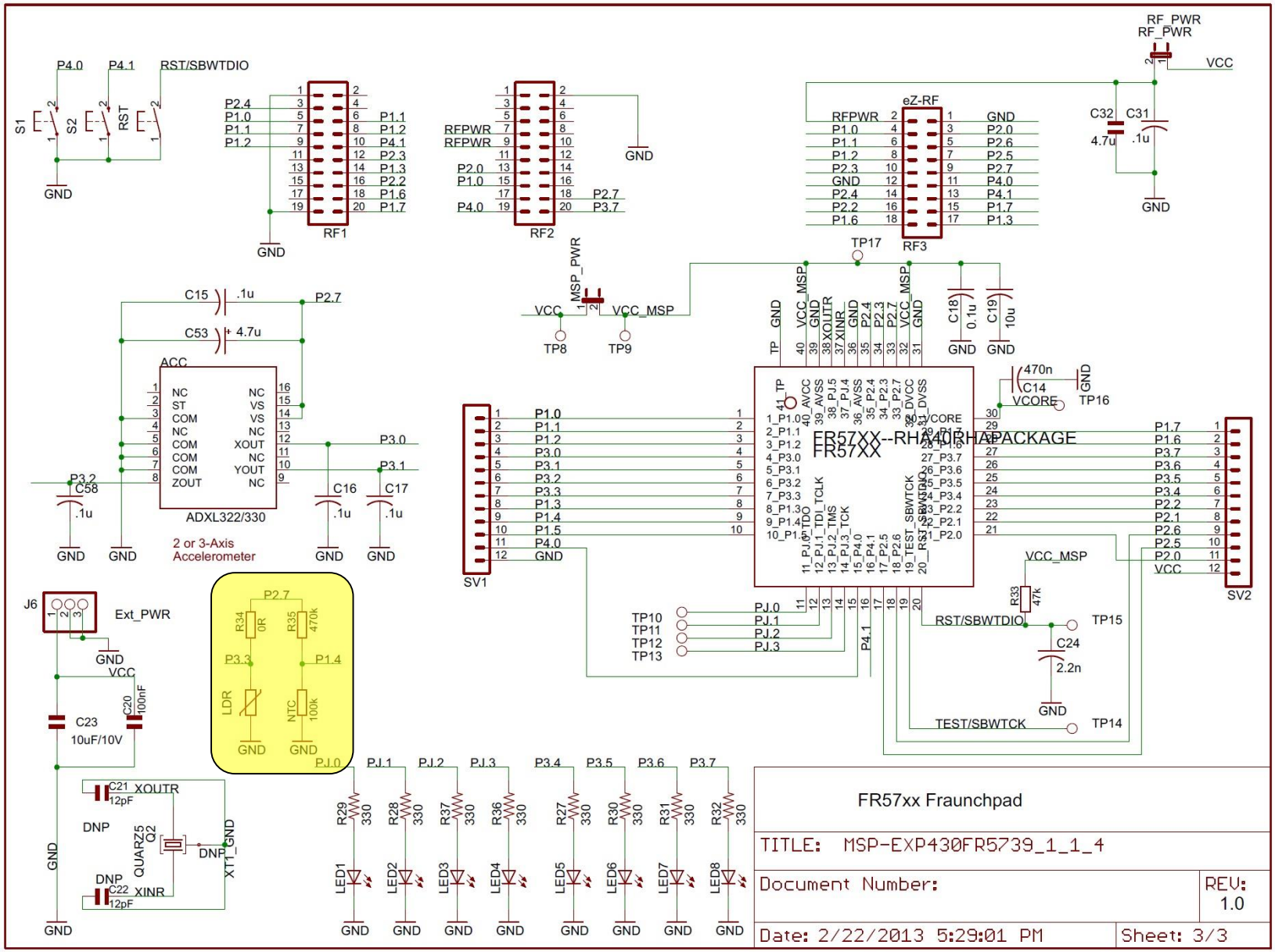
From MSP-EXP430FR5739_SCH



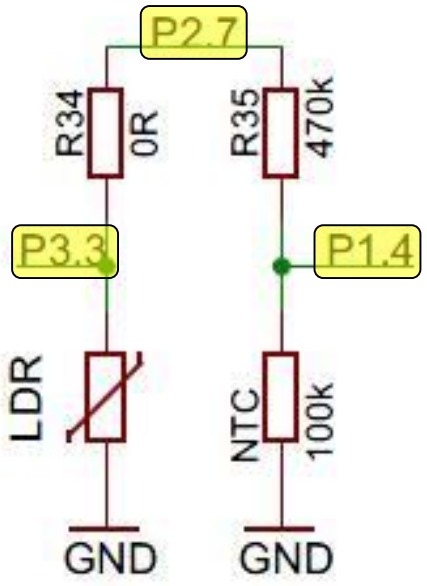
From MSP-EXP430FR5739_SCH



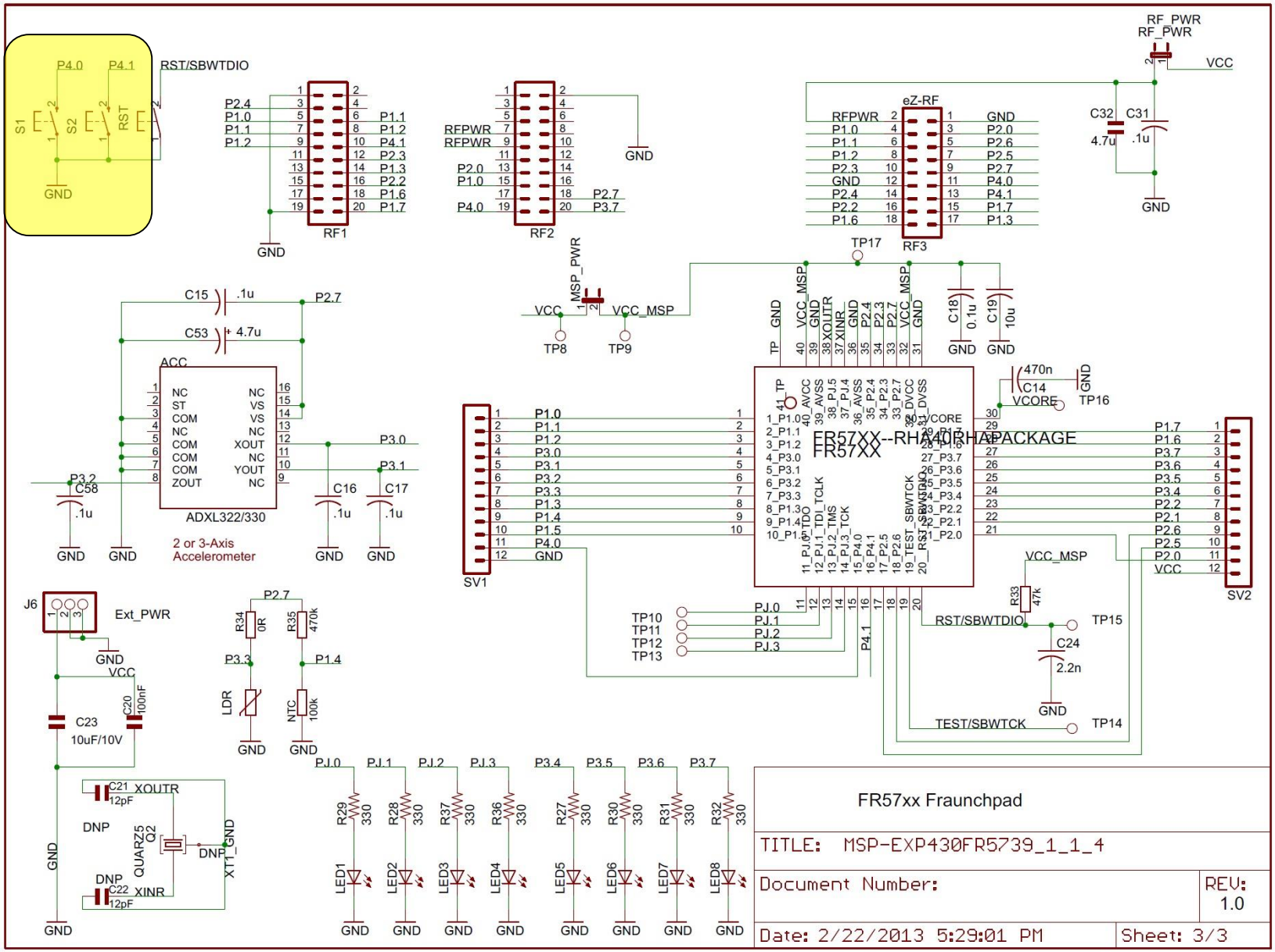
From MSP-EXP430FR5739_SCH



From MSP-EXP430FR5739_SCH



From MSP-EXP430FR5739_SCH



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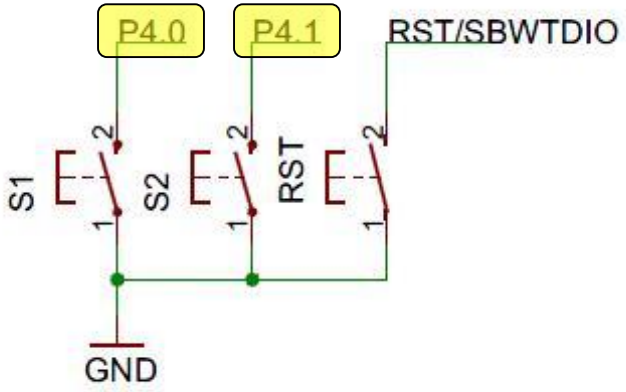
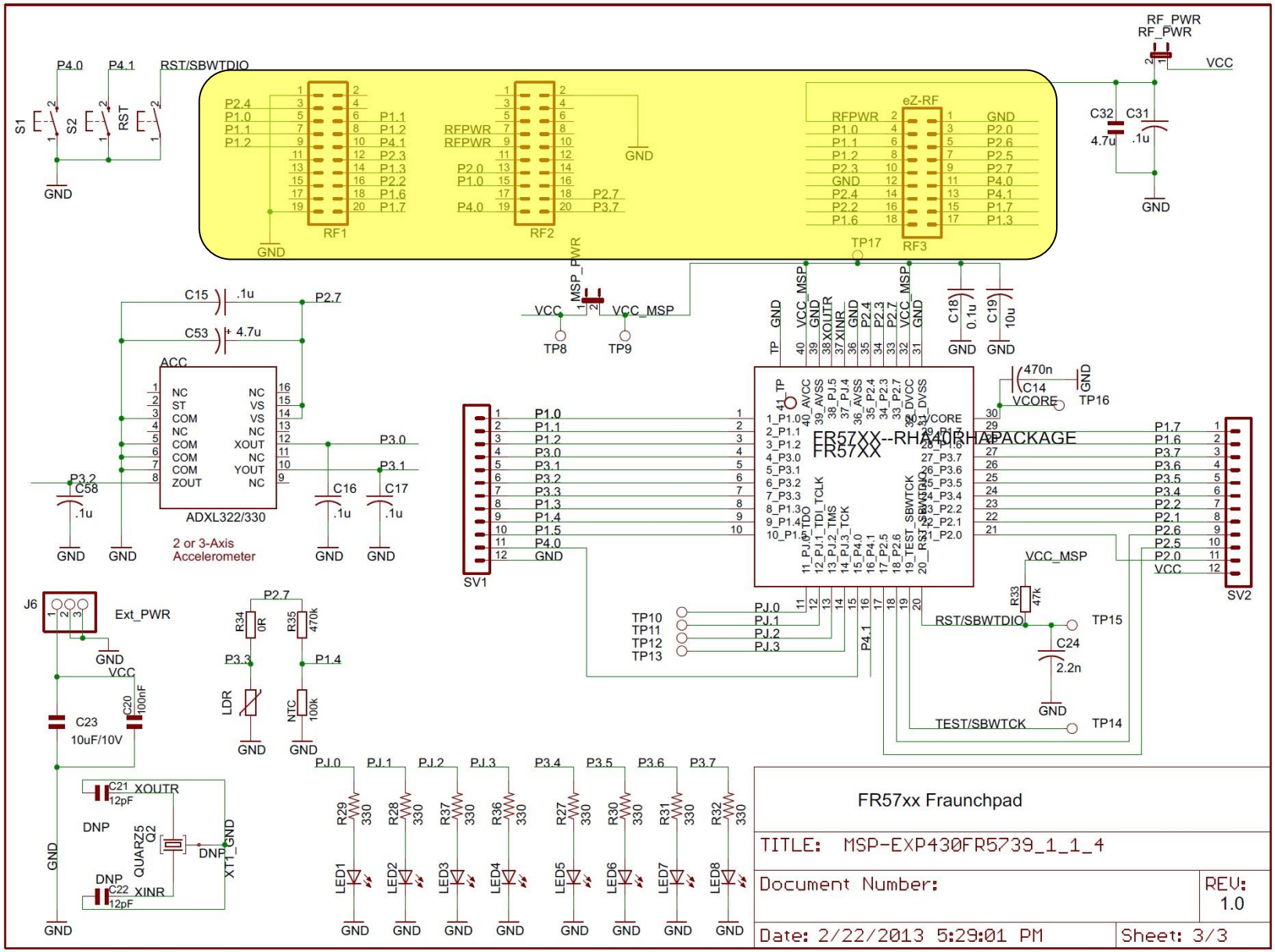
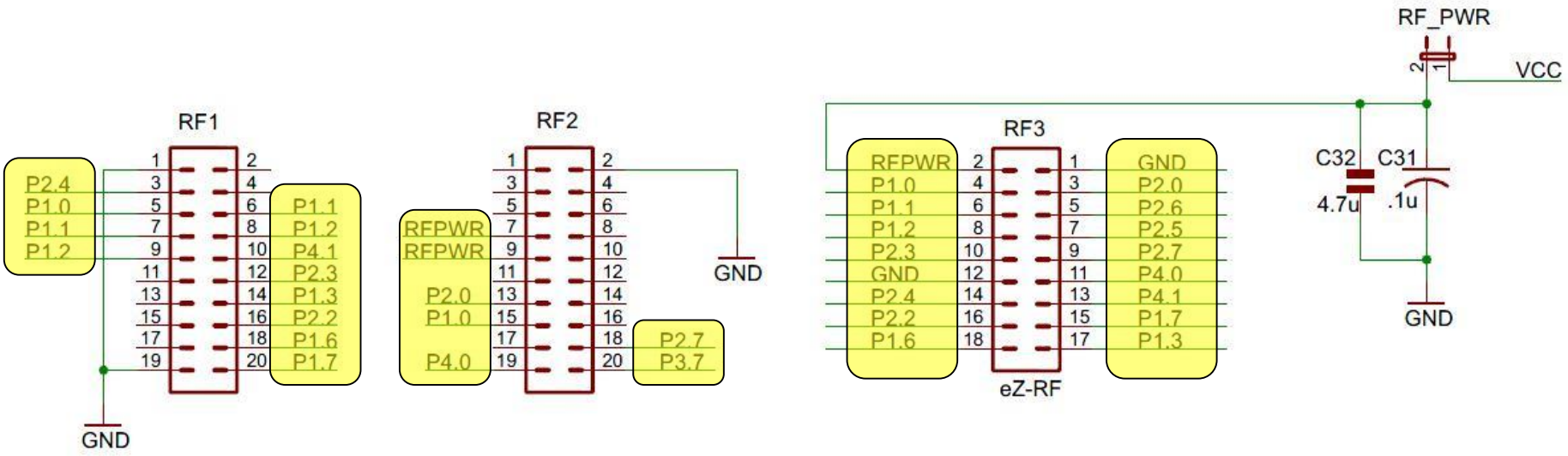


From MSP-EXP430FR5739_SCH



From MSP-EXP430FR5739_SCH



Start With a Spread Sheet

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP

Enter Ports and Pins

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0							
1	1							
1	2							
1	3							
1	4							
1	5							
1	6							
1	7							
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

Capture Schematic Names

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R						
1	1	V_DETECT_L						
1	2	LCD_BACKLITE						
1	3	V_THUMB						
1	4	SPI_CS_LCD						
1	5	RESET_LCD						
1	6	SPI_SIMO						
1	7	SPI_SOMI						
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

Identify GP I/O or Function

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R	Function					
1	1	V_DETECT_L	Function					
1	2	LCD_BACKLITE	GP I/O					
1	3	V_THUMB	Function					
1	4	SPI_CS_LCD	GP I/O					
1	5	RESET_LCD	GP I/O					
1	6	SPI_SIMO	Function					
1	7	SPI_SOMI	Function					
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

Direction for GP I/O and what function [Page 68 of Data Sheet]

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R	Function	ADC - A0				
1	1	V_DETECT_L	Function	ADC - A1				
1	2	LCD_BACKLITE	GP I/O	Output				
1	3	V_THUMB	Function	ADC - A3				
1	4	SPI_CS_LCD	GP I/O	Output				
1	5	RESET_LCD	GP I/O	Output				
1	6	SPI_SIMO	Function	UCB0SIMO/UCB0SDA				
1	7	SPI_SOMI	Function	UCB0SOMI/UCB0SCL				
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

From Data Sheet capture SEL bit values

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R	Function	ADC - A0	1	1		
1	1	V_DETECT_L	Function	ADC - A1	1	1		
1	2	LCD_BACKLITE	GP I/O	Output	0	0		
1	3	V_THUMB	Function	ADC - A3	1	1		
1	4	SPI_CS_LCD	GP I/O	Output	0	0		
1	5	RESET_LCD	GP I/O	Output	0	0		
1	6	SPI_SIMO	Function	UCB0SIMO/UCB0SDA	1	0		
1	7	SPI_SOMI	Function	UCB0SOMI/UCB0SCL	1	0		
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

What are the desired starting values

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R	Function	ADC - A0	1	1	0	
1	1	V_DETECT_L	Function	ADC - A1	1	1	0	
1	2	LCD_BACKLITE	GP I/O	Output	0	0	0	
1	3	V_THUMB	Function	ADC - A3	1	1	0	
1	4	SPI_CS_LCD	GP I/O	Output	0	0	1	
1	5	RESET_LCD	GP I/O	Output	0	0	0	
1	6	SPI_SIMO	Function	UCB0SIMO/UCB0SDA	1	0	0	
1	7	SPI_SOMI	Function	UCB0SOMI/UCB0SCL	1	0	0	
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

What Input signals require pull-ups / pull-downs

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Initial Value	Pull-UP
1	0	V_DETECT_R	Function	ADC - A0	1	1		
1	1	V_DETECT_L	Function	ADC - A1	1	1		
1	2	LCD_BACKLITE	GP I/O	Output	0	0	1	
1	3	V_THUMB	Function	ADC - A3	1	1		
1	4	SPI_CS_LCD	GP I/O	Output	0	0	1	
1	5	RESET_LCD	GP I/O	Output	0	0	0	
1	6	SPI_SIMO	Function	UCB0SIMO/UCB0SDA	1	0		
1	7	SPI_SOMI	Function	UCB0SOMI/UCB0SCL	1	0		1
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							
2	6							
2	7							
3	0							
3	1							
3	2							
3	3							
3	4							
3	5							
3	6							
3	7							
4	0							
4	1							
J	0							
J	1							
J	2							
J	3							

Repeat for all ports

Port	Pin	Signal Name	GP I/O or Function	Direction / Function	SEL1	SEL0	Out Value	Resistor
1	0	V_DETECT_R	Function / In Analog	ADC - A0	1	1	0	n/a
1	1	V_DETECT_L	Function / In Analog	ADC - A1	1	1	0	n/a
1	2	LCD_BACKLITE	GP I/O	Output	0	0	0	n/a
1	3	V_THUMB	Function / In Analog	ADC - A3	1	1	0	n/a
1	4	SPI_CS_LCD	GP I/O	Output	0	0	1	n/a
1	5	RESET_LCD	GP I/O	Output	0	0	0	n/a
1	6	SPI_SIMO	Function	UCB0SIMO/UCB0SDA	1	0	0	n/a
1	7	SPI_SOMI	Function / In Digital	UCB0SOMI/UCB0SCL	1	0	0	1
2	0	USB_TXD	Function / Out Digital	UCA0TXD/UCA0SIMO	1	0	0	n/a
2	1	USB_RXD	Function / In Digital	UCA0RXD/UCA0SOMI	1	0	0	0
2	2	SPI_SCK	Function / Out Digital	UCB0CLK	1	0	1	n/a
2	3	UNKNOWN	GP I/O	Input	0	0	0	0
2	4	UNKNOWN	GP I/O	Input	0	0	0	0
2	5	CPU_TXD	Function / Out Digital	UCA1TXD/UCA1SIMO	1	0	0	n/a
2	6	CPU_RXD	Function / In Digital	UCA1RXD/UCA1SOMI	1	0	0	0
2	7	UNKNOWN	GP I/O	Input	0	0	0	0
3	0	X	GP I/O	Input	0	0	0	0
3	1	Y	GP I/O	Input	0	0	0	0
3	2	Z	GP I/O	Input	0	0	0	0
3	3	IR_LED	GP I/O	Output	0	0	0	n/a
3	4	R_FORWARD	GP I/O	Output	0	0	0	n/a
3	5	L_FORWARD	GP I/O	Output	0	0	0	n/a
3	6	R_REVERSE	GP I/O	Output	0	0	0	n/a
3	7	L_REVERSE	GP I/O	Output	0	0	0	n/a
4	0	SW1	GP I/O	Input	0	0	1	1
4	1	SW2	GP I/O	Input	0	0	1	1
J	0	IOT_WAKEUP	GP I/O	Output	0	0	0	n/a
J	1	IOT_FACTORY	GP I/O	Output	0	0	0	n/a
J	2	IOT_STA_MINIAP	GP I/O	Output	0	0	0	n/a
J	3	IOT_RESET	GP I/O	Output	0	0	0	n/a

Configure Port 1

```
void Init_Port1(void){
// Configure Port 1 ---------------------------------------------------------------
// V_DETECT_R           (0x01) // Voltage from Right Detector
// V_DETECT_L           (0x02) // Voltage from Right Detector
// LCD_BACKLITE         (0x04) // Control Signal for LCD_BACKLITE
// V_THUMB              (0x08) // Voltage from Thumb Wheel
// SPI_CS_LCD           (0x10) // LCD Chip Select
// RESET_LCD            (0x20) // LCD Reset
// SIMO_B               (0x40) // SPI mode - slave in/master out of USCI_B0
// SOMI_B               (0x80) // SPI mode - slave out/master in of USCI_B0
//---------------------------------------------------------------------------------
  P1SEL0 = 0x00;               // P1 set as I/O
  P1SEL1 = 0x00;               // P1 set as I/O
  P1DIR = 0x00;                // Set P1 direction to input

  P1SEL0 |= V_DETECT_R;        // V_DETECT_R selected
  P1SEL1 |= V_DETECT_R;        // V_DETECT_R selected

  P1SEL0 |= V_DETECT_L;        // V_DETECT_L selected
  P1SEL1 |= V_DETECT_L;        // V_DETECT_L selected

  P1SEL0 &= ~LCD_BACKLITE;     // LCD_BACKLITE GPI/O selected
  P1SEL1 &= ~LCD_BACKLITE;     // LCD_BACKLITE GPI/O selected
  P1OUT |= LCD_BACKLITE;       // LCD_BACKLITE Port Pin set low
  P1DIR |= LCD_BACKLITE;       // Set LCD_BACKLITE direction to output

  P1SEL0 |= V_THUMB;           // V_THUMB selected
  P1SEL1 |= V_THUMB;           // V_THUMB selected

  P1SEL0 &= ~SPI_CS_LCD;       // SPI_CS_LCD GPI/O selected
  P1SEL1 &= ~SPI_CS_LCD;       // SPI_CS_LCD GPI/O selected
  P1OUT |= SPI_CS_LCD;         // SPI_CS_LCD Port Pin set high
  P1DIR |= SPI_CS_LCD;         // Set SPI_CS_LCD output direction

  P1SEL0 &= ~RESET_LCD;        // RESET_LCD GPI/O selected
  P1SEL1 &= ~ RESET_LCD;       // RESET_LCD GPI/O selected
  P1OUT &= ~ RESET_LCD;        // RESET_LCD Port Pin set low
  P1DIR |= RESET_LCD;          // Set RESET_LCD output direction

  P1SEL0 &= ~SIMO_B;           // SIMO_B selected
  P1SEL1 |= SIMO_B;            // SIMO_B selected
  P1DIR |= SIMO_B;             // SIMO_B set to Output
  P1SEL0 &= ~SOMI_B;           // SOMI_B is used on the LCD

  P1SEL1 |= SOMI_B;            // SOMI_B is used on the LCD
  P1OUT |= SOMI_B;             // SOMI_B Port Pin set for Pull-up
  P1DIR &= ~SOMI_B;            // SOMI_B set to Input
  P1REN |= SOMI_B;             // Enable pullup resistor
//---------------------------------------------------------------------------------
```

Configure Port J

```
void Init_PortJ(void){
//-------------------------------------------------------------------------------
// Port J Pins
// LED1                 (0x01) // LED 5
// LED2                 (0x02) // LED 6
// LED3                 (0x04) // LED 7
// LED4                 (0x08) // LED 8
// XINR                 (0x10) // XINR
// XOUTR                (0x20) // XOUTR
//-------------------------------------------------------------------------------
  PJSEL0 = 0x00;               // PJ set as I/0
  PJSEL1 = 0x00;               // PJ set as I/0
  PJDIR = 0x00;                // Set PJ direction to output

  PJSEL0 &= ~LED1;
  PJSEL1 &= ~LED1;
  PJOUT &= ~LED1;
  PJDIR |= LED1;               // Set PJ Pin 1 direction to output

  PJSEL0 &= ~LED2;
  PJSEL1 &= ~LED2;
  PJOUT &= ~LED2;
  PJDIR |= LED2;               // Set PJ Pin 2 direction to output

  PJSEL0 &= ~LED3;
  PJSEL1 &= ~LED3;
  PJOUT &= ~LED3;
  PJDIR |= LED3;               // Set PJ Pin 3 direction to output

  PJSEL0 &= ~LED4;
  PJSEL1 &= ~LED4;
  PJDIR |= LED4;               // Set P3 Pin 4 direction to output
  PJOUT &= ~LED4;

// XT1 Setup
//  PJSEL0 |= XINR;
//  PJSEL0 |= XOUTR;

//-------------------------------------------------------------------------------
}
```

Configure Port J

```
void Init_PortJ(void){
//------------------------------------------------------------------------------
// Port J Pins
// LED1                 (0x01) // LED 5
// LED2                 (0x02) // LED 6
// LED3                 (0x04) // LED 7
// LED4                 (0x08) // LED 8
// XINR                 (0x10) // XINR
// XOUTR                (0x20) // XOUTR
//------------------------------------------------------------------------------
  PJSEL0 = 0x00;               // PJ set as I/0
  PJSEL1 = 0x00;               // PJ set as I/0
  PJDIR = 0x00;                // Set PJ direction to output

  PJSEL0 &= ~LED1;
  PJSEL1 &= ~LED1;
  PJOUT &= ~LED1;
  PJDIR |= LED1;               // Set PJ Pin 1 direction to output

  PJSEL0 &= ~LED2;
  PJSEL1 &= ~LED2;
  PJOUT &= ~LED2;
  PJDIR |= LED2;               // Set PJ Pin 2 direction to output

  PJSEL0 &= ~LED3;
  PJSEL1 &= ~LED3;
  PJOUT &= ~LED3;
  PJDIR |= LED3;               // Set PJ Pin 3 direction to output

  PJSEL0 &= ~LED4;
  PJSEL1 &= ~LED4;
  PJDIR |= LED4;               // Set P3 Pin 4 direction to output
  PJOUT &= ~LED4;

// XT1 Setup
//   PJSEL0 |= XINR;
//   PJSEL0 |= XOUTR;

//------------------------------------------------------------------------------
}
```

What is Wrong?