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# X-TWR-K80F150M

Revisions			
Rev	Description	Date	Approved
	Initial Design	19-Sep-14	David Connelly
	Feedbacks implemented	25-Sep-14	David Connelly
	Feedbacks implemented	13-Oct-14	David Connelly
	-Agile Marketing Part. No. Changed. -J51 replaced by 0ohm Resistor -SW3, SW4 Changed to Sealed switches.	14-Oct-14	David Connelly
X1	-J8-ASSY OPT changed to DNP -R331 0ohm DNP Added for U3-Power -0ohm RES added for VDD, VDDIO of U29,U30 -TMR0,1 on Elev.connector mapped to PTB0,1 -I2S Port Mapping updated to only Port A -General TWRPI Replaced by TouchPad TWRPI -J15 replaced by Cut-trace (SH9) -LEDs remapped to PTDX to ease SW design -J35-FLEXIO Signal sequence updated. -Ports remapped for lightly used pins.	29-Oct-14	David Connelly
	-SW1 changed from RA to Vertical Mount -J58 changed from "HDRIX12" to "HDRIX10". -PTB16, PTB17 mapping option to Primary elevator connector - UART0 by providing R340, R341 (DNP) -Agile CoreNo.changed from 28503 to 28608 -MPN changed to "X-TWR-K80F150M-S"  -A070 Publish in Agile (28608,Prototype)	30-Oct-14	David Connelly
X2	-Port PTD11 replaced by PTA21 for SW4 -R149, R153 Value updated	4-Nov-14	David Connelly
X3	Block Diagram updated & R54 value changed to 95.3 ohms	14-Nov-14	David Connelly
X4	SMT Test Point Removed	17-Nov-14	David Connelly
A	Prototype Release	18-Nov-14	David Connelly
A1	Updated text in the System Power Section	19-Dec-14	David Connelly
B	Changed Socket to FBGA Added 10k Pull up resistors to SW2 and SW3 Changed Ref Des on SW1 and SW3 Reorder Ref Des on D1-D3 Changed connectivity for SDRAM DQM signals Removed -S from all Titles	20-May-15	
B1	DNP C11	01-Sep-15	

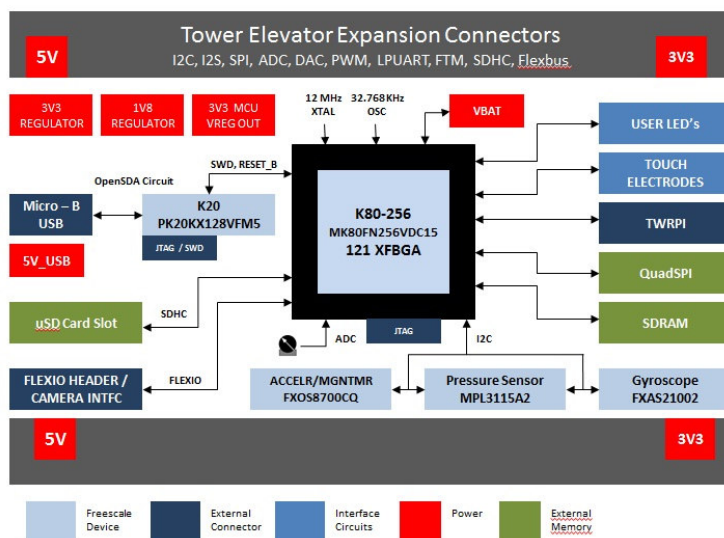
		<b>Microcontroller Product Group</b> 6501 William Cannon Drive West Austin, TX 78755-8598	
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ICAP Classification: FCP:		FLUQ: X PUB:	
Designer: Denesh Kumar	Drawing Title: <b>X-TWR-K80F150M</b>		
Drawn by: Denesh Kumar	Page Title: <b>TABLE OF CONTENT</b>		
Approved: David Connelly	Size C	Document Number SCH-28608 PDF: SFP-28608	Rev B1
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wise Specified:  
are in ohms  
All capacitors are in uF  
All voltages are DC

- Interrupted lines coded with the same letter or letter combinations are electrically connected.
- Device type number is for reference only. The number varies with the manufacturer.
- Special signal usage:  
\_B Denotes - Active-Low Signal  
<-> or [] Denotes - Vectored Signals
- Interpret diagram in accordance with American National Standards Institute specifications, current revision, with the exception of logic block symbology.

## Block Diagram



## Power & Ground Nets

NET	VOLTAGE	DESCRIPTION
P5V_SDA	5V	Power input from Open SDA USB connector
P5V_TRG_SDA	5V	Output of USB power switch controlled by the VTRG_EN signal from the OpenSDA and the ELE_PS_SENSE signal from the TWR elevator connectors. Goes to regulator input select header.
USB0_VBUS	5V	USB power from primary elevator Pin A57.
P3V3_VOUT	3.3V	VDD power from K80 MCU's internal regulator.
SDA_VOUT33	3.3V	Output of OpenSDA's K20 internal regulator to power OpenSDA's circuitry
P5V_ELEV	5V	Power to the elevator boards (or) from Tower System based on selection
P3V3_REG	3.3V	Output of 3.3V regulator or from the Elevator connectors.
3V3_BRD	3.3V	Output from the Elevator connector (or) from internal regulator U503 (or) from MCU's internal regulator, based on the selection header position (refer power section)
P1V8	1.8V	Output of the 1.8V regulator.
P1V8_REGIN	3.3V/3.7V/5V	Input to the 1.8V regulator.
V_BRD	1.8/3.3V	Output of 1.8V or 3.3V regulators(3V3_BRD) as selected by the board voltage select header.
5V0_K80_USB	5V	Power to K80 MCU USB for Host Mode.
5V0_VIN	5V	Power into the on board voltage regulators. Selectable from open SDA's P5V_SDA (or) P5V_TRG_SDA (or) P5V_ELEV (or) 5V0_K80_USB based on the 5V Input selection header position (refer power section)
5V0_VREGIN	5V	Power into the on board voltage regulators.
5V0_VREGIN_K80	5V	Power into the K80 MCU internal regulator. It is typically derived from the 5V0_VIN (or) the elevator USB0_VBUS pin.
VBAT	1.8/3.3V	Voltage to the battery input of the MCU. The value depends on whether the board is powered and at what value and the setting of the shunt that selects the source of the battery voltage.
P3V7_BAT	3.7V	Power from Li-Ion Battery
BAT_OUT	3.7-4.2V	Lithium Ion Battery Charger Output
VCC_SIM	1.8-3.3V	Power to the EMVSIM card Slot controlled by EMVSIM1_VCCEN from MCU
VDDIO_E	1.8-3.3V	IO Power to the port E of K80 MCU, independent of VDD
MCU_PWR	1.8-3.3V	MCU digital power. Filtered from V_BRD
MCU_VDD	1.8-3.3V	MCU digital power input after current measurement jumper
VDDA	1.8-3.3V	VDDA power for MCU and analog circuits. Filtered from MCU_PWR.
VREFH	3.3V	Upper reference voltage for ADC on the MCU. Filtered from VDDA.
VREFL	0V	Lower reference voltage for ADC on the MCU. Filtered from VSSA.
VSSA	0V	VSSA power for MCU and analog circuits. Filtered from GND.
GND	0V	Digital and Analog Ground.



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Drawing Title: <b>X-TWR-K80F150M</b>			
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# SYSTEM POWER

## 3V3\_BRD Power Selection:

Default : Short 1-3: Use regulator U18 for 3.3V board power  
 Optional: Short 1-2: Use output of K80 Inbuilt Regulator for 3.3V board power (5V needed on VREGIN)

## 1.8V Regulator Power Input Selection:

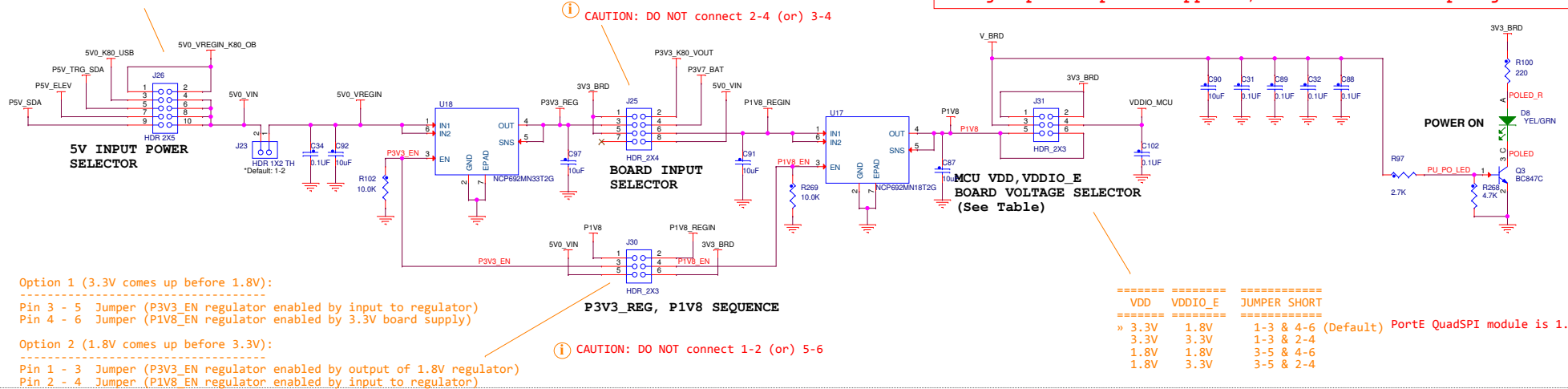
Default : Short 5-6: from 3V3 Board Power  
 Optional: Short 4-6: from Li-Ion Battery Domain P3V7\_BAT  
 Optional: Short 6-8: from 5V Input 5V0\_VIN directly

Note that not all functions of the board will operate at 1.8V. Also, please check that tower boards used with this board have the correct I/O voltages when this board is set to 1.8V.

## 5V system Power Input Selection:

Optional: 7-8: Power from PSV\_ELEV input  
 Optional: 9-10: Raw 5V input From USB OpenSDA  
 >>Default: 5-6: Regulated 5V output from OpenSDA 5V input  
 Optional: 3-4: Raw 5V input from K80 on board USB port

**V\_BRD is required to power up prior to VDDIO\_MCU if using separate power supplies, otherwise can ramp together**



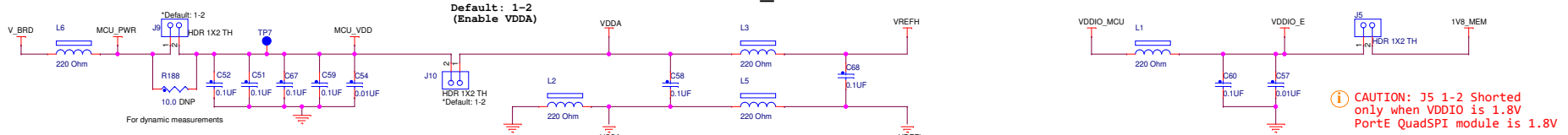
### Option 1 (3.3V comes up before 1.8V):

Pin 3 - 5 Jumper (P3V3\_EN regulator enabled by input to regulator)  
 Pin 4 - 6 Jumper (P1V8\_EN regulator enabled by 3.3V board supply)

### Option 2 (1.8V comes up before 3.3V):

Pin 1 - 3 Jumper (P3V3\_EN regulator enabled by output of 1.8V regulator)  
 Pin 2 - 4 Jumper (P1V8\_EN regulator enabled by input to regulator)

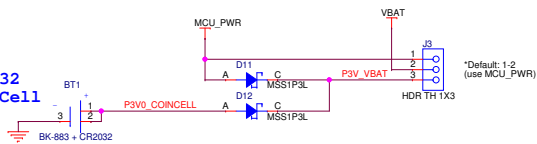
## PWR\_MCU



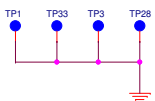
### CAD NOTE:

Place this circuitry near the processor

2016/25/32  
 3V Coin Cell



## GND LOOP TEST LOOPS

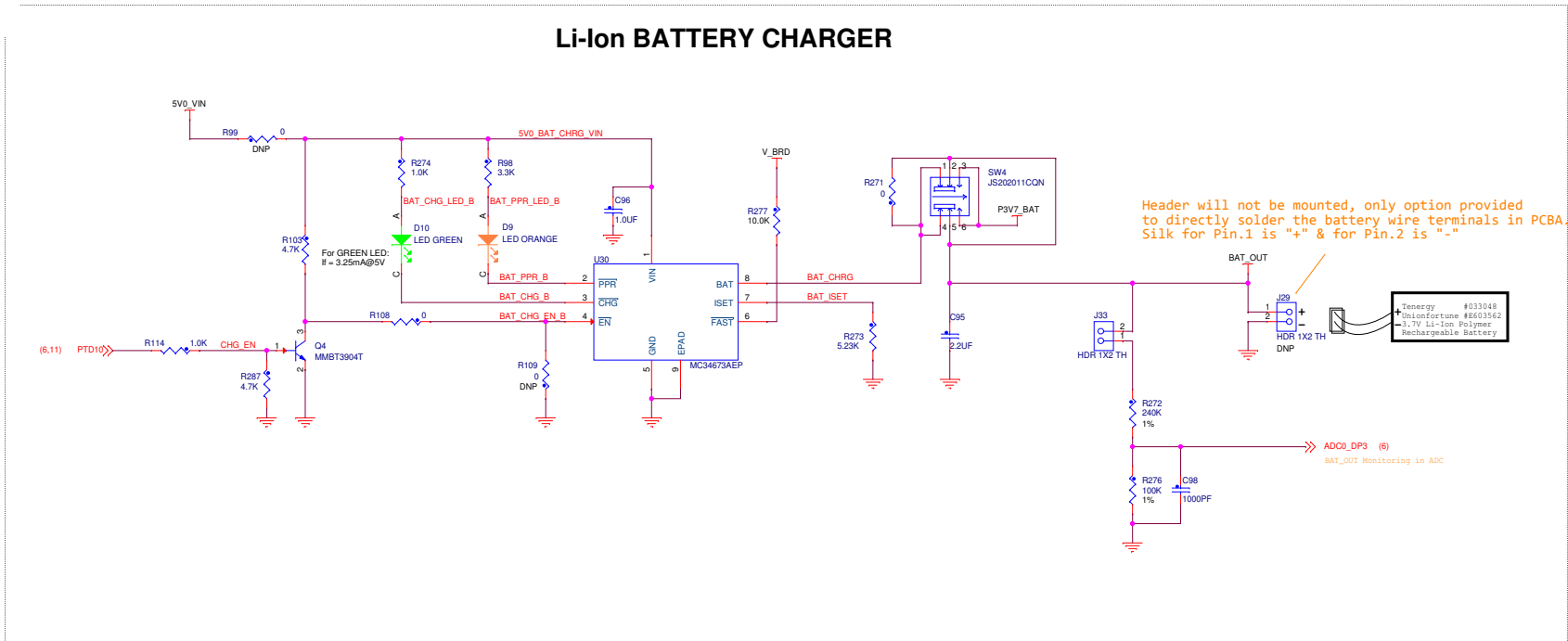


CAD NOTE:  
 Place ground test loops in the four corners away from sensitive signals that might short with scope probe alligator clips

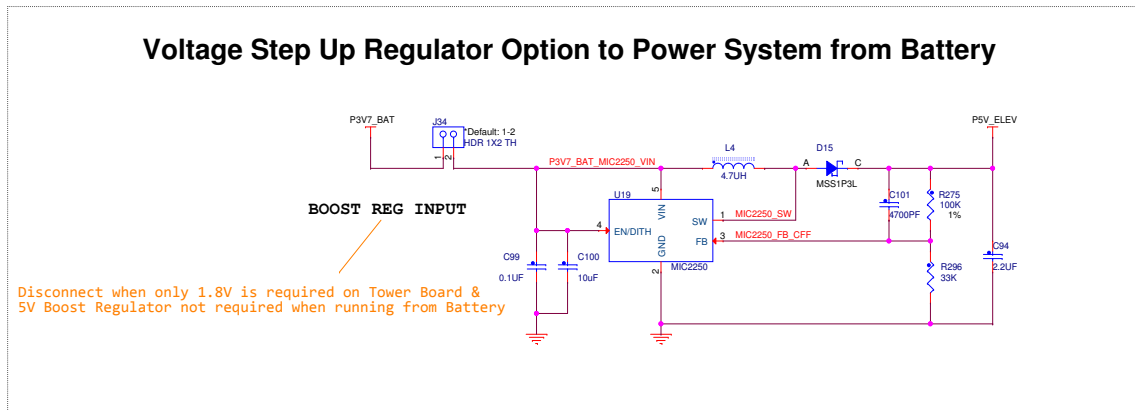




# Li-Ion BATTERY CHARGER



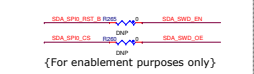
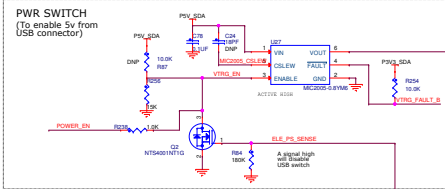
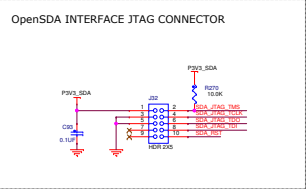
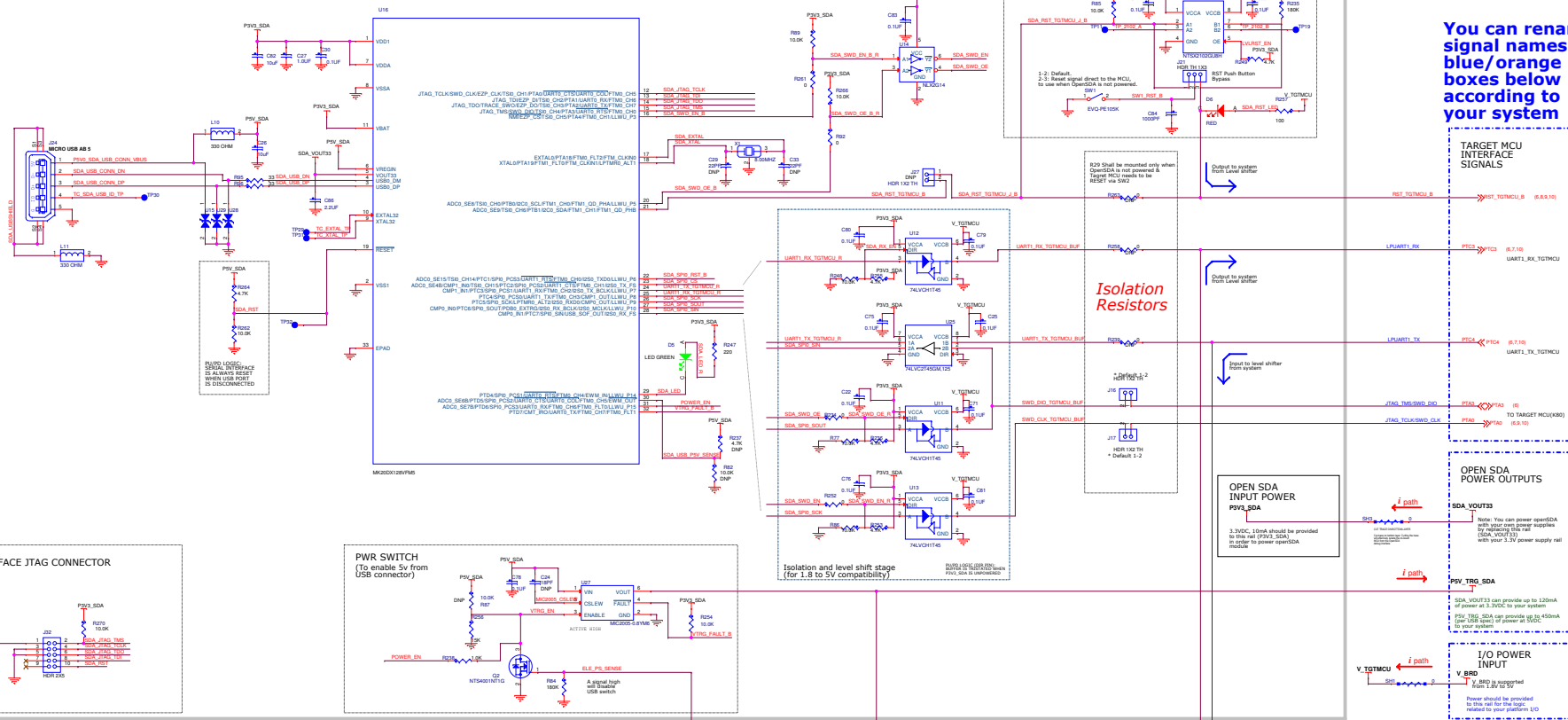
## Voltage Step Up Regulator Option to Power System from Battery



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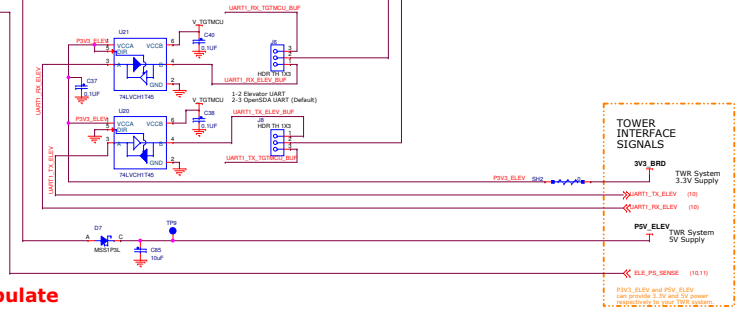
# NXP iSDA Interface

You can rename signal names in blue/orange boxes below according to your system

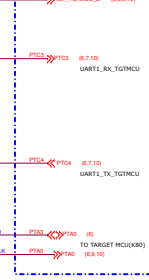


## OPTIONAL TOWER SPECIFIC INTERFACING CIRCUITRY

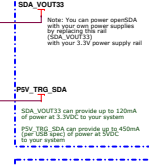
You can entirely remove the contents in this box when interfacing openSDA in a non-Tower system.  
If that is the case, please populate all isolation resistors



### TARGET MCU INTERFACE SIGNALS



### OPEN SDA POWER OUTPUTS

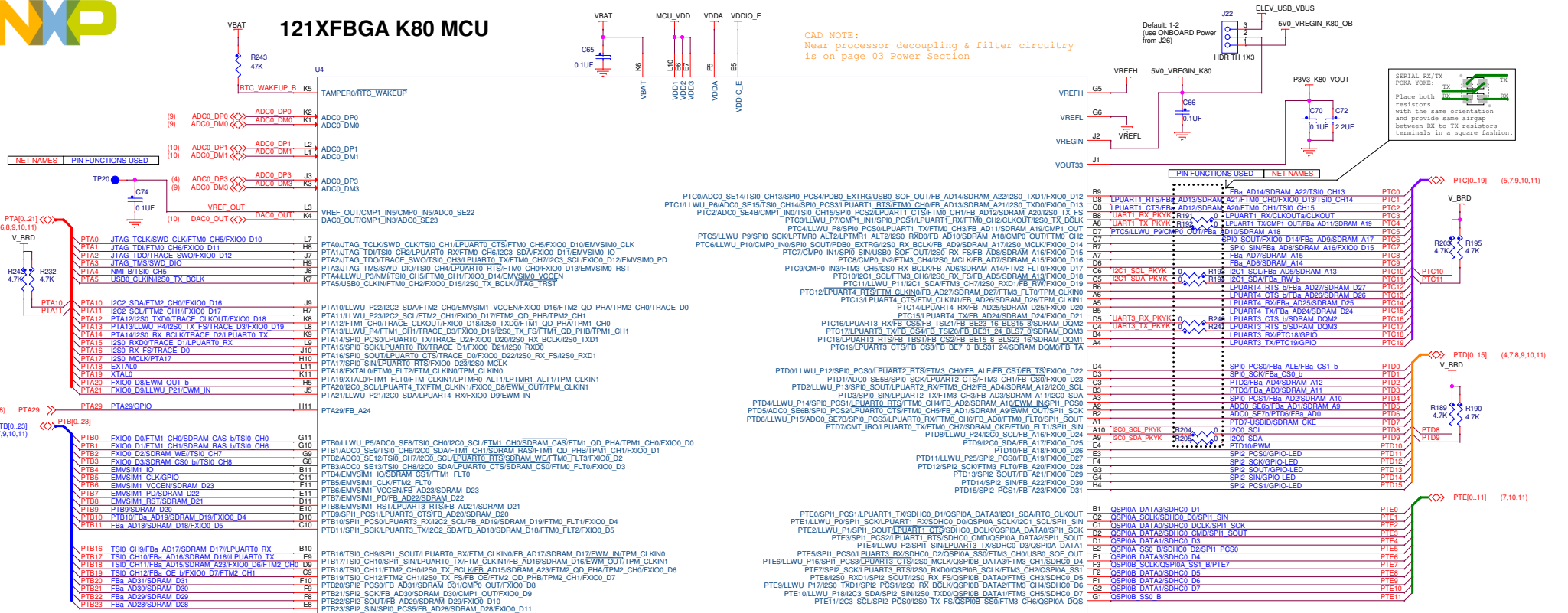


### I/O POWER INPUT

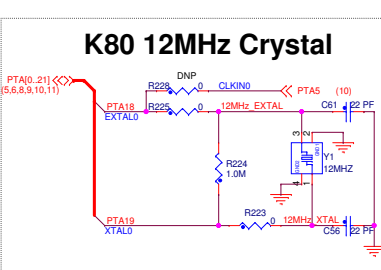




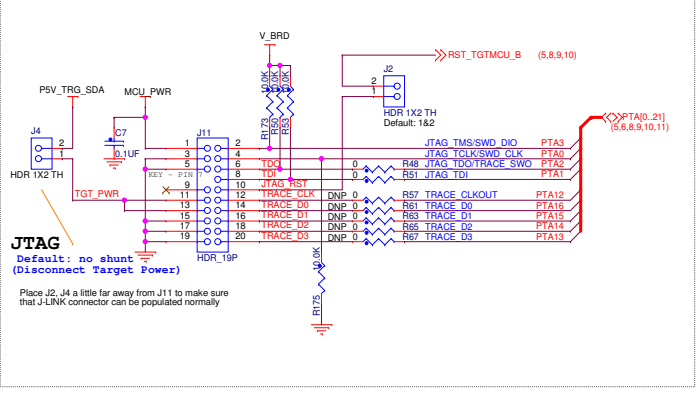
# 121XFBGA K80 MCU



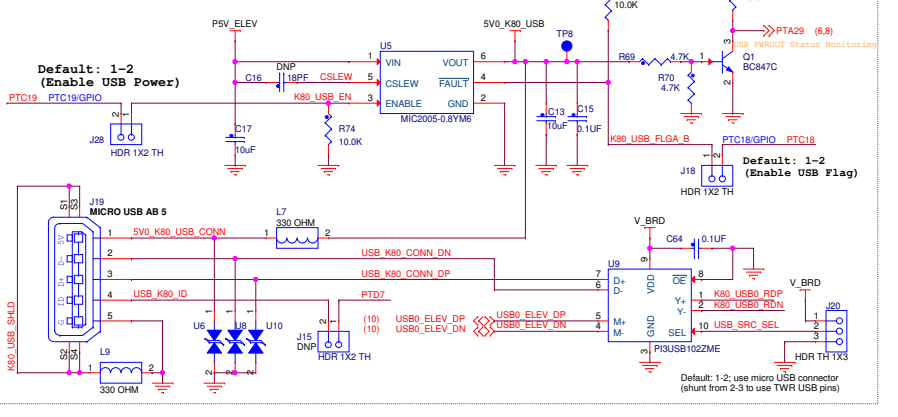
## K81 TAMPER HEADER



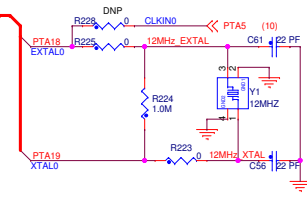
## K80-CORTEX JTAG SECTION



## K80 USB FS Protocol (Host, Device, OTG)



## K80 12MHz Crystal



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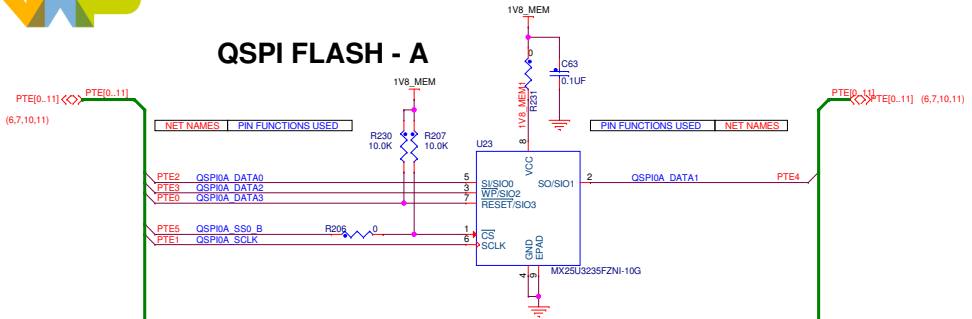
**MK06FN256VDC15(121XFBGA) SKT ASSY**

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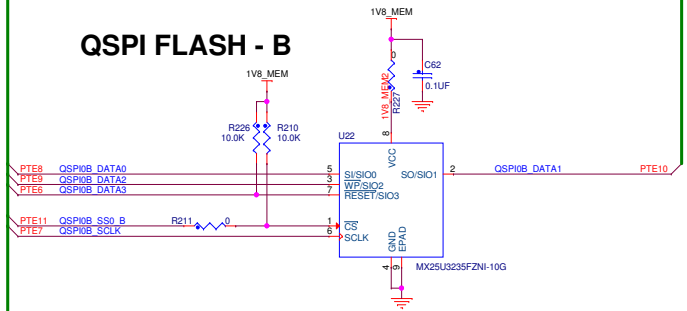
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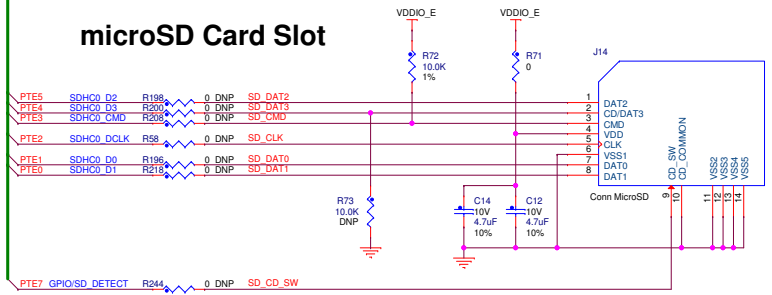
### QSPI FLASH - A



### QSPI FLASH - B

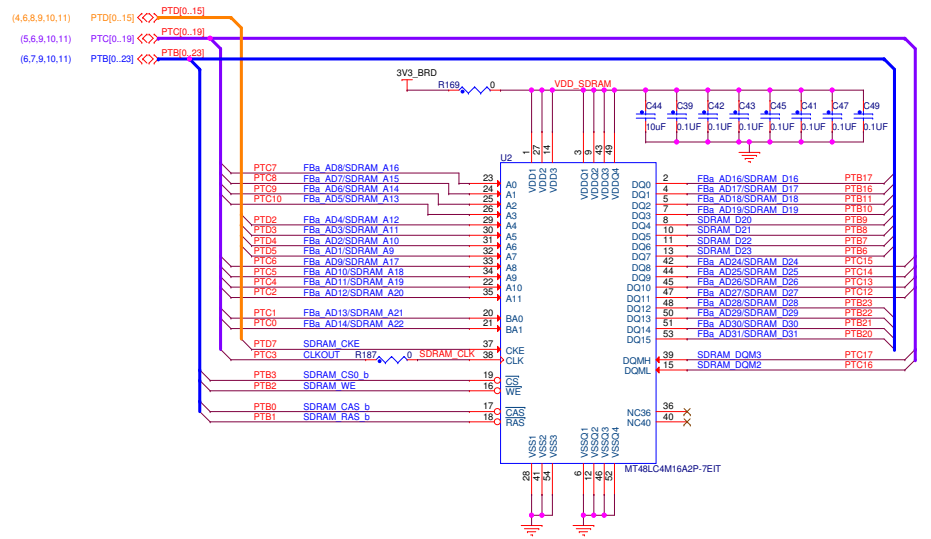


### microSD Card Slot

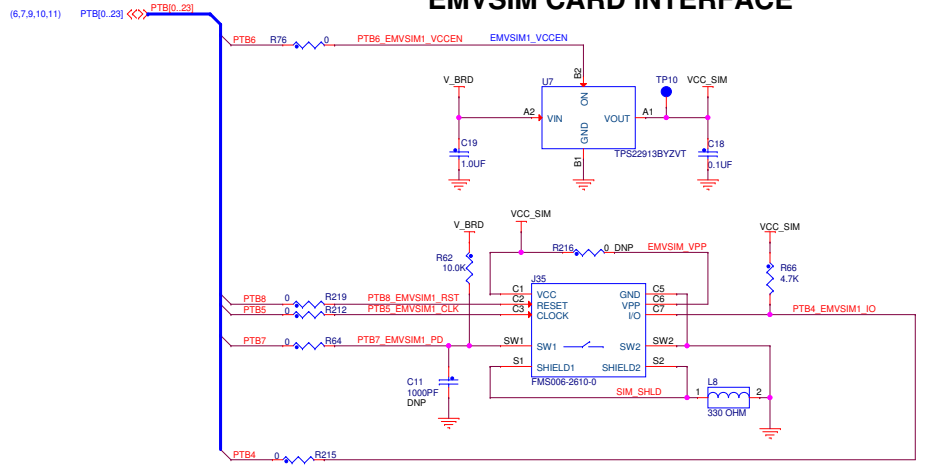


Note: This domain is powered by VDDIO\_E, not V\_BRD, which is 1.8V by default because of the QuadSPI voltage requirement.

### 16-Bit SDRAM

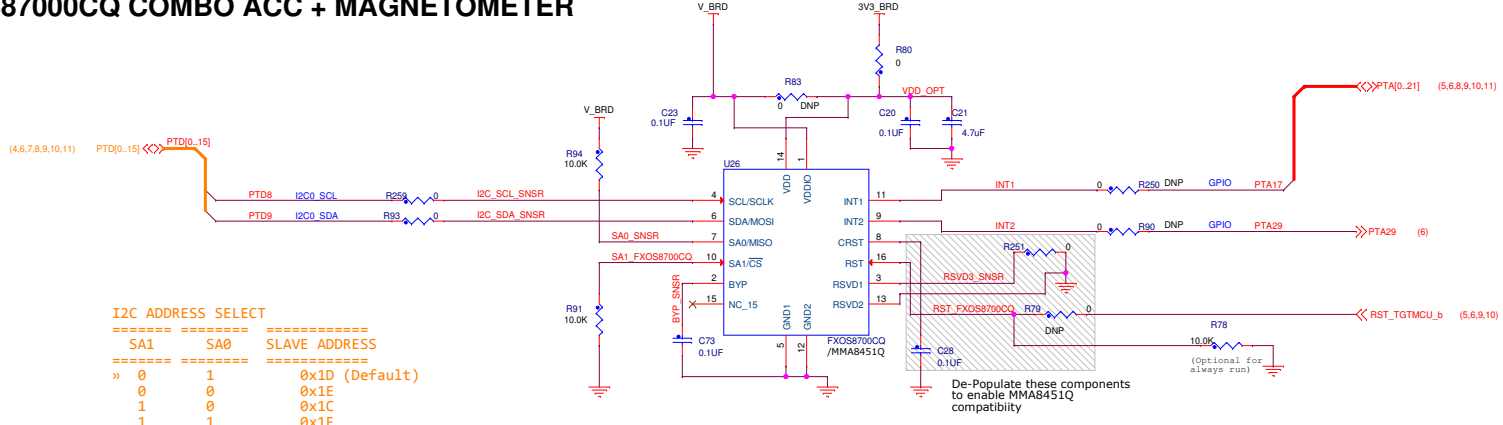


### EMVSIM CARD INTERFACE





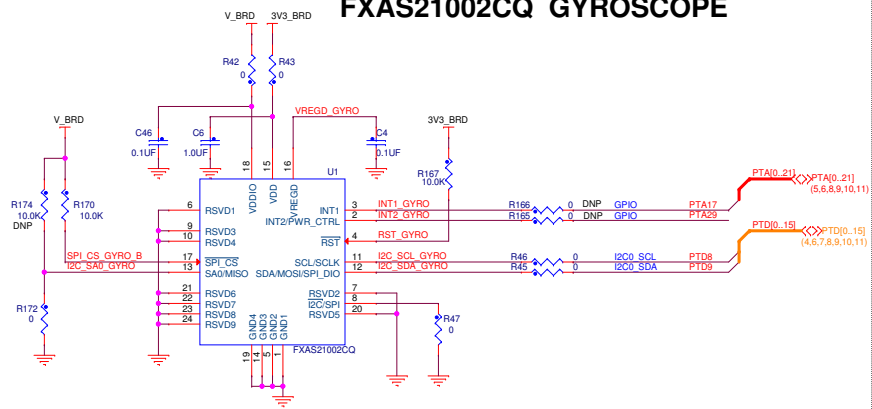
# MMA8451Q ACCELEROMETER / FXOS8700CQ COMBO ACC + MAGNETOMETER



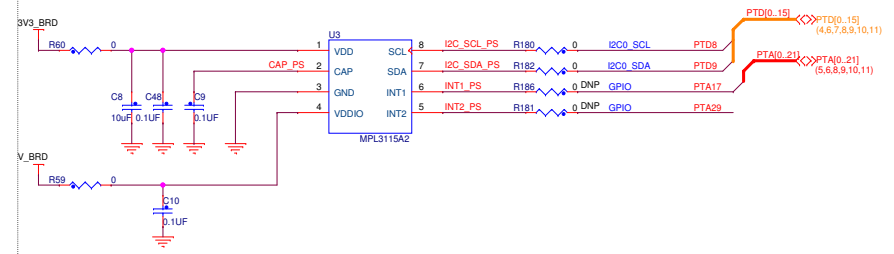
**I2C ADDRESS SELECT**

SA1	SA0	SLAVE ADDRESS
0	1	0x1D (Default)
0	0	0x1E
1	0	0x1C
1	1	0x1F

# FXAS21002CQ GYROSCOPE



# MPL3115A2 PRESSURE/ALTITUDE & TEMPERATURE SENSOR

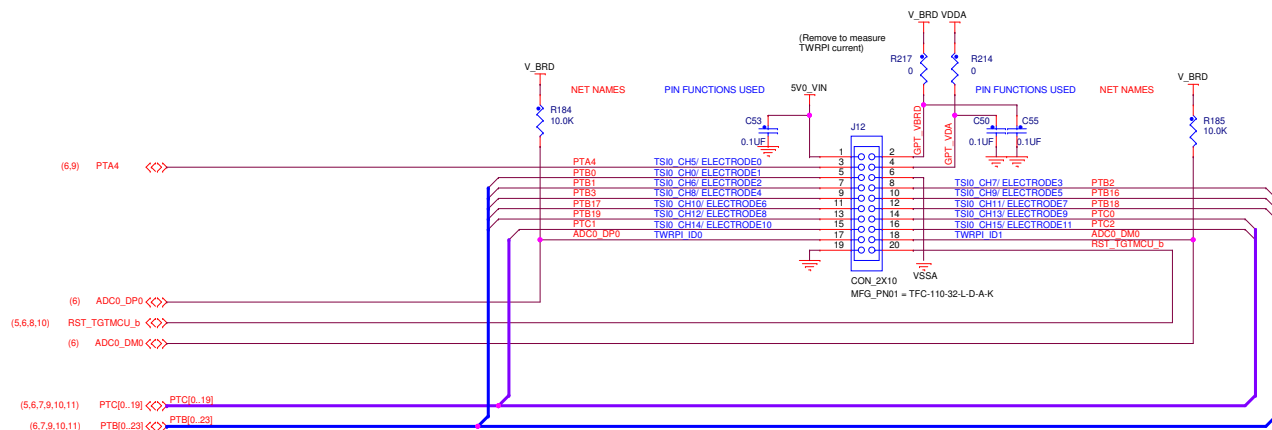


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<b>SENSORS</b>			
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# TOUCH PAD TWRPI HEADER



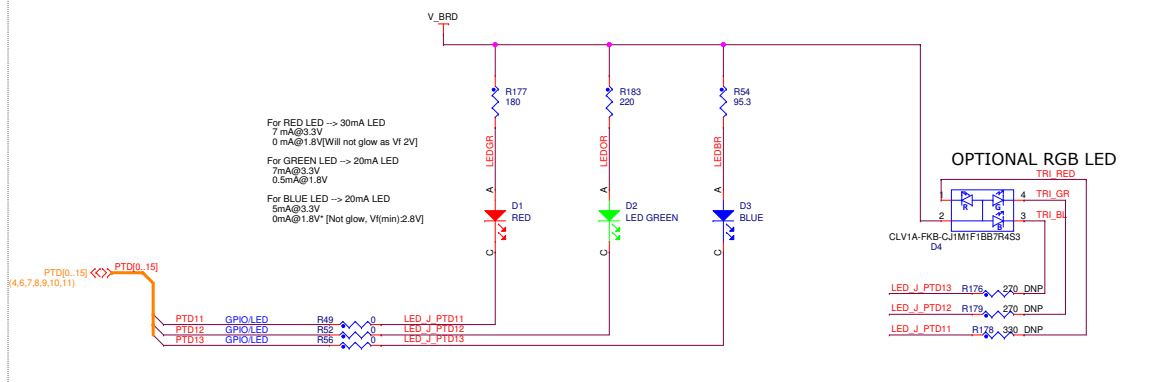
**Note: The TWRPI connectors are powered by V\_BRD which may be 1.8V or 3.3V.**

**Not all TWRPI boards will work at 1.8V.**

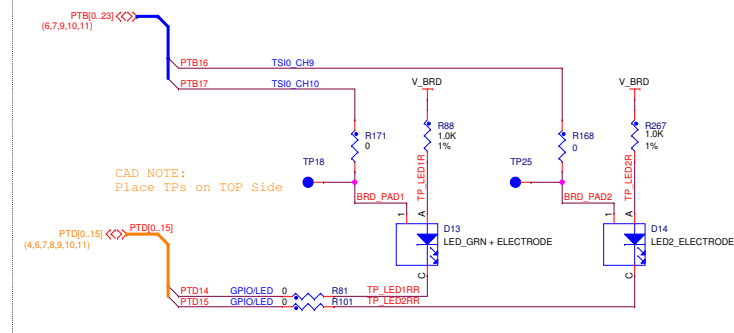
**Check that TWRPI boards will work at 1.8V before using them with this board when V\_BRD is jumpered for 1.8V.**

**CAD NOTE:**  
Component Height allowed under Touch Pad TOWERPI: Plug-in board is 11mm

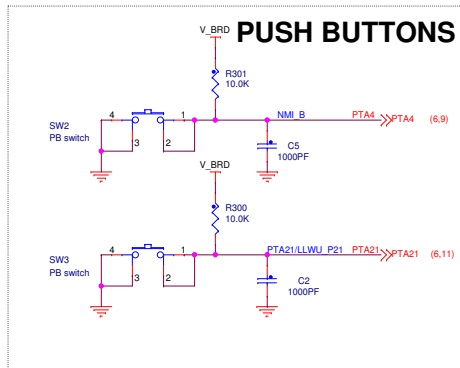
## LEDS



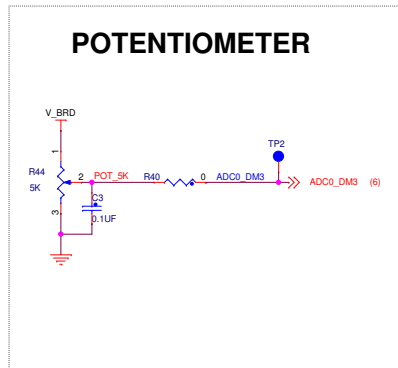
## TOUCH PADS + LEDES



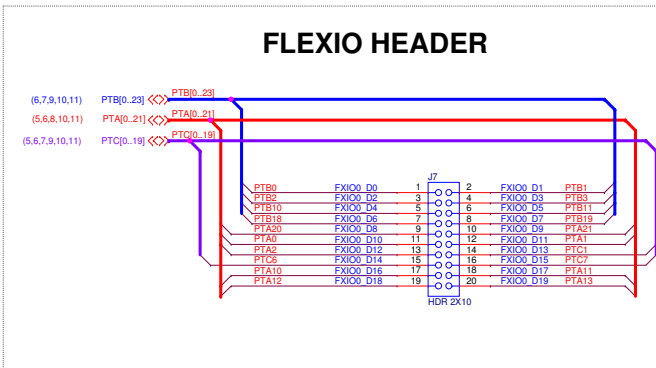
## PUSH BUTTONS



## POTENTIOMETER

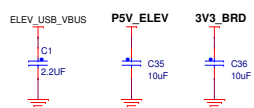
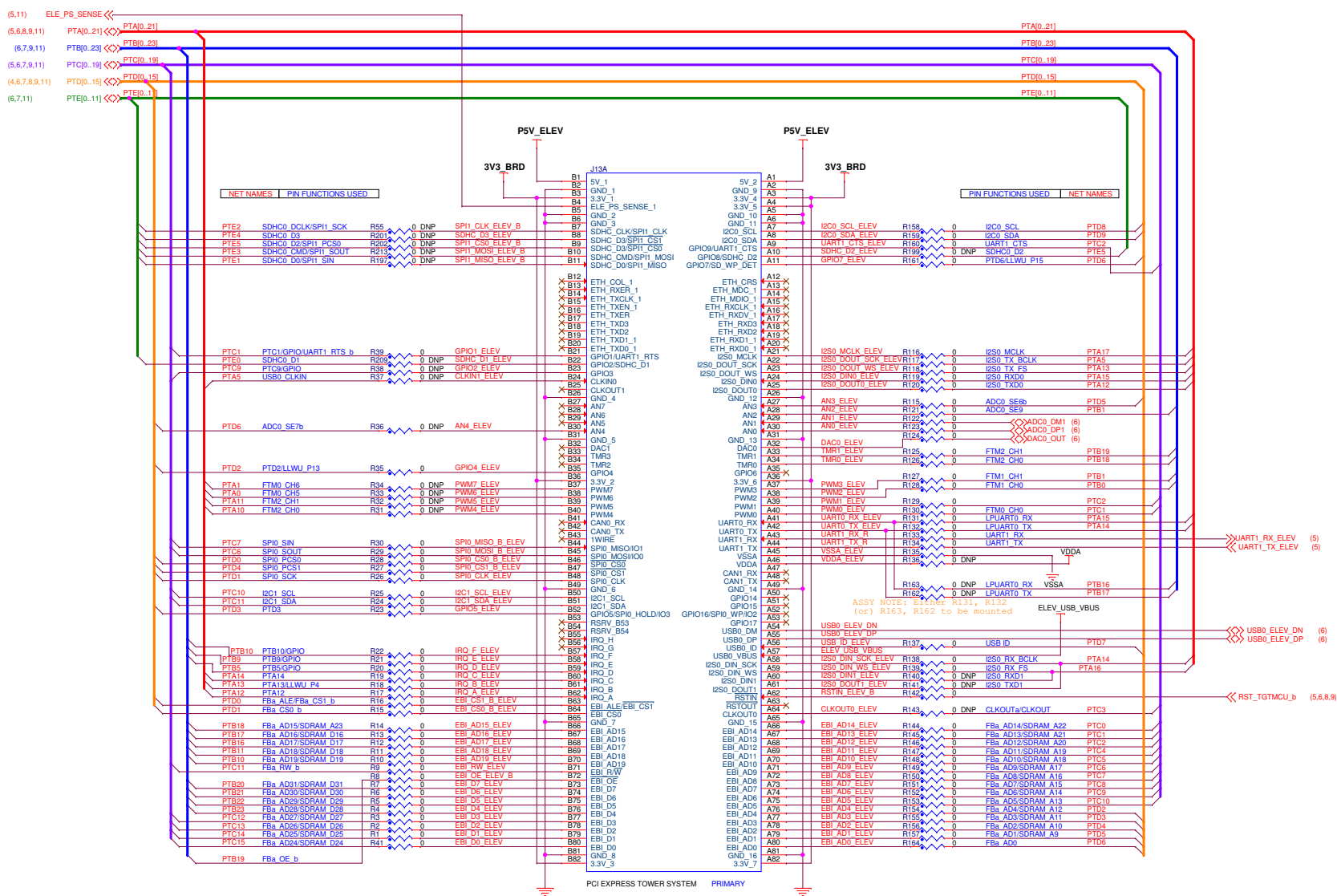


## FLEXIO HEADER





# TOWER ELEVATOR CONNECTOR - PRIMARY



Note that signals coming from the elevator are usually 3.3V. They should not be used when the board is configured for 1.8V operation.

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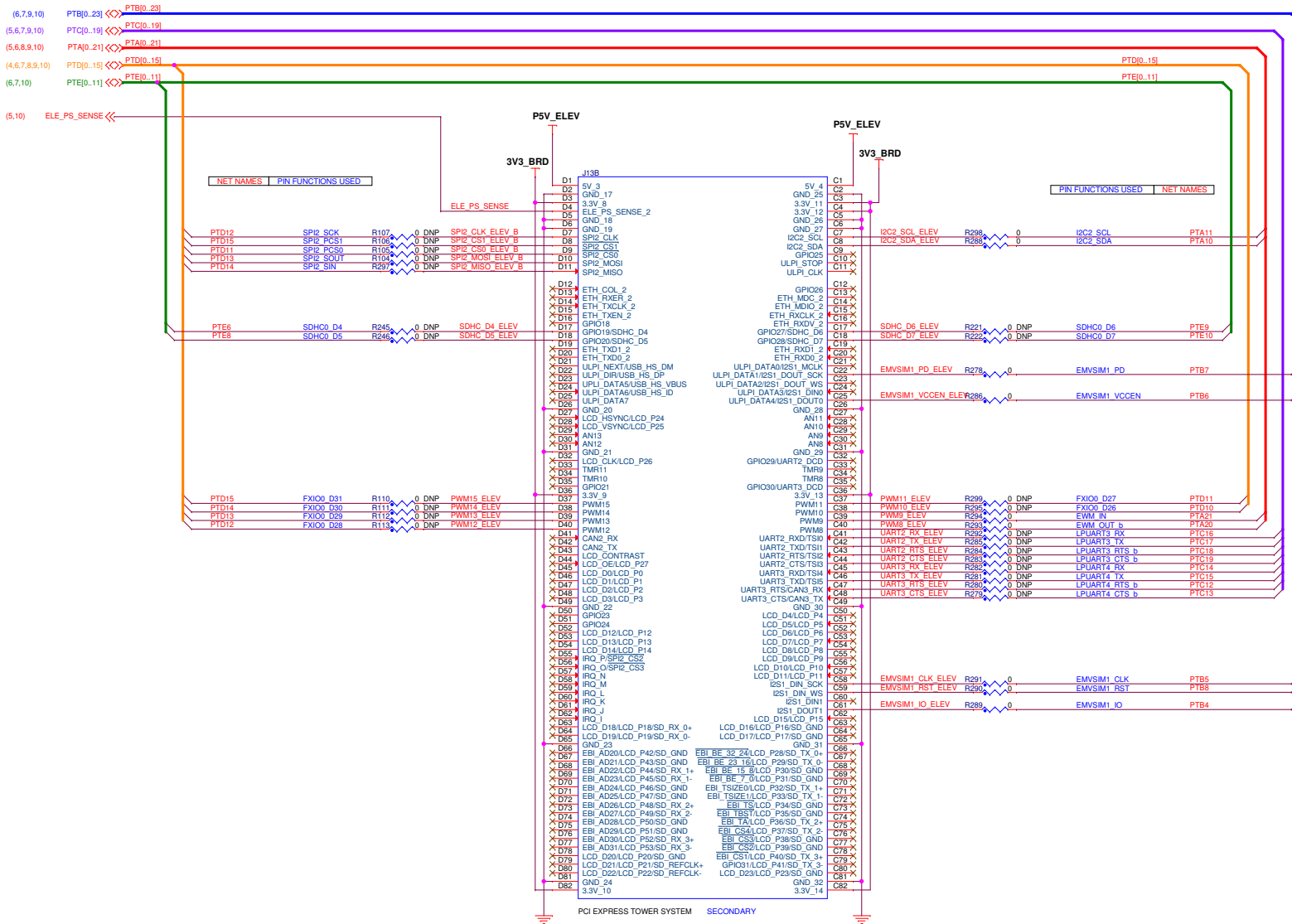
Page Title: **TWR ELEVATOR CONNECTOR PRIMARY**

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# TOWER ELEVATOR CONNECTOR - SECONDARY



Note that signals coming from the elevator are usually 3.3V. They should not be used when the board is configured for 1.8V operation.

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ICAP Classification: FCP: FUC: X PUB: \_\_\_\_\_  
 Drawing Title: **X-TWR-K80F150M**  
 Page Title: **TWR ELEVATOR CONNECTOR SECONDARY**

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