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5	'18 169MAPBGA MCU/SKT
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Revisions			
Rev	Description	Date	Approved
X1	Initial	25-Sept-13	Wang Hao
A	Release	12-Nov-13	Wang Hao
B	Release	23-Apr-14	Wang Hao
C	Release	12-Dec-14	Wang Hao
D	Release	16-Mar-15	Wang Hao

# TWR-K65F180M

**1. Unless Otherwise Specified:**

- All resistors are in ohms
- All capacitors are in uF
- All voltages are DC
- All polarized capacitors are aluminum electrolytic

**2. Interrupted lines coded with the same letter or letter combinations are electrically connected.**

**3. Device type number is for reference only. The number varies with the manufacturer.**


**4. Special signal usage:**

- \_B Denotes - Active-Low Signal
- <> or [] Denotes - Vectored Signals

**5. Interpret diagram in accordance with American National Standards Institute specifications, current revision, with the exception of logic block symbology.**

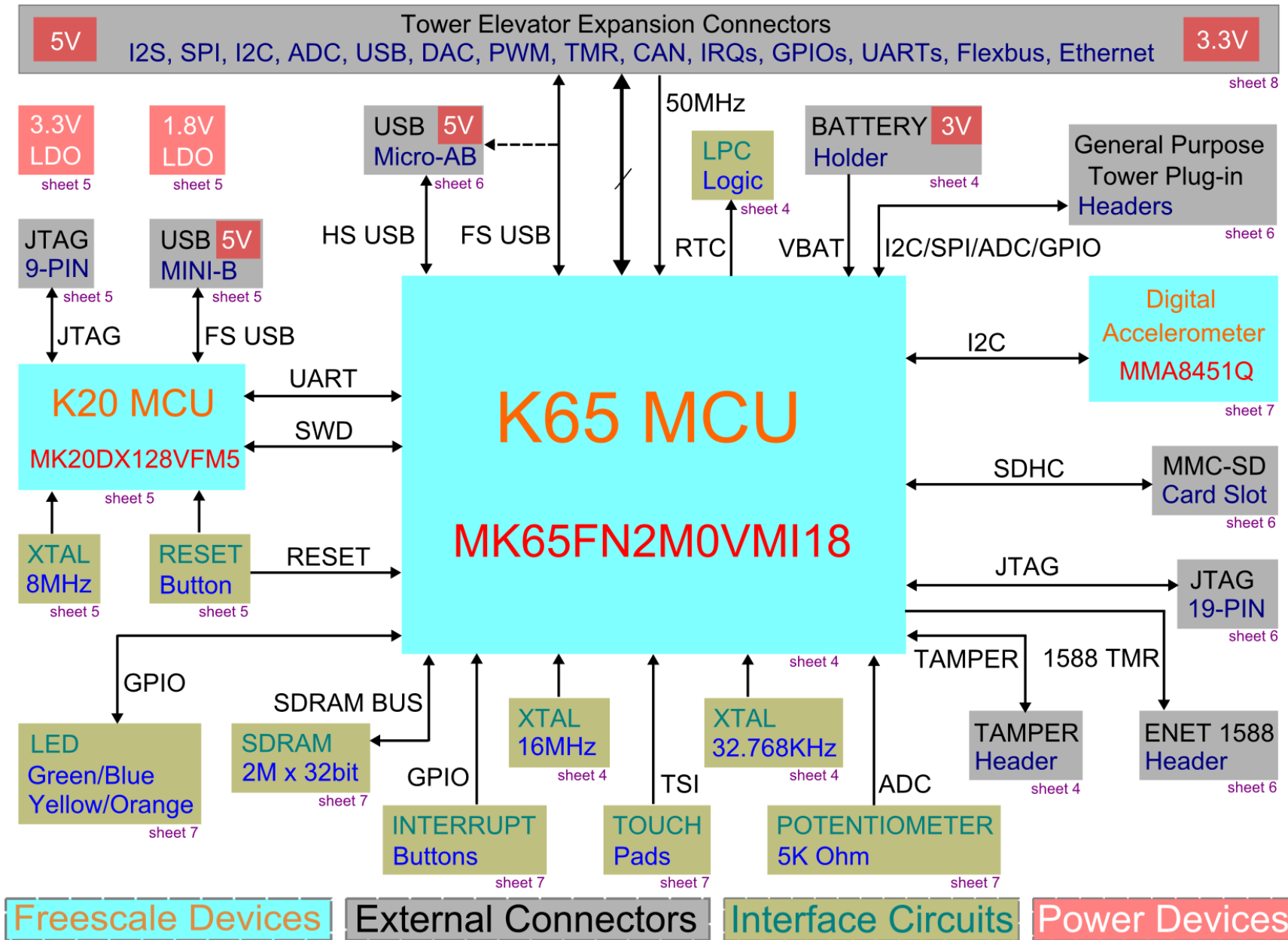
**6. Net function indications:**

Some nets have functions indicated in addition to the net names. The net names are shown in red and the MCU functions associated with the net are shown in blue. If a net has no blue function shown the net name indicates the associated function.

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Designer: Wang Hao/Qiao Jun	Drawing Title: <b>X-TWR-K65F180M</b>	ICAP Classification:	FQP: FUC: X PUB:
Drawn by: Qiao Jun	Page Title: <b>Table of Contents/Revisions/Notes</b>		
Approved: Wang Hao	Size C	Document Number SCH-28036 PDF: SPF-28036	Rev D
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# BLOCK DIAGRAM

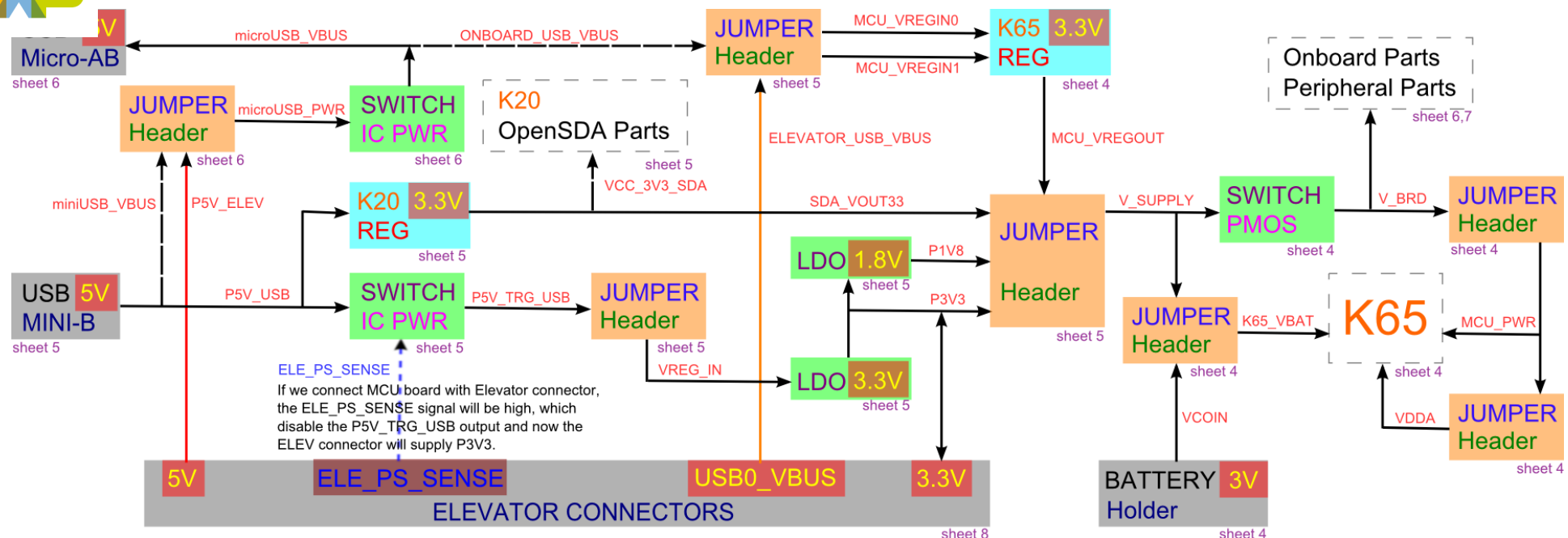


**Freescale Devices**    **External Connectors**    **Interface Circuits**    **Power Devices**

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Page Title:			
<b>Block Diagram</b>			
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# POWER NETS



If we connect MCU board with Elevator connector, the ELE\_PS\_SENSE signal will be high, which disable the P5V\_TRG\_USB output and now the ELEV connector will supply P3V3.

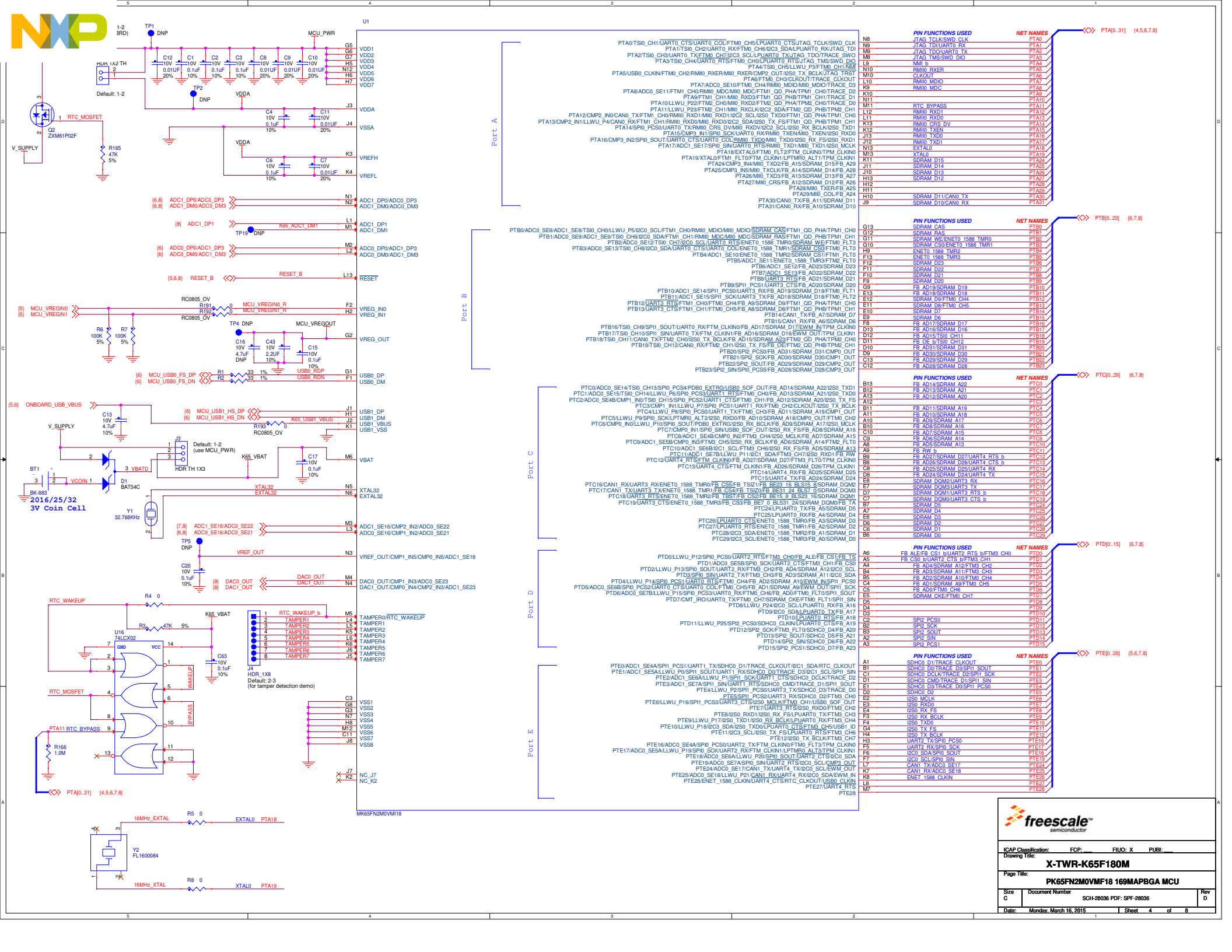
NET	VOLTAGE	DESCRIPTION
miniUSB_VBUS	5V	Primary input power.
microUSB_PWR	5V	Output from jumper header to select miniUSB_VBUS or P5V_ELEV. Also could be supplied externally via header pins.
P5V_USB	5V	Filtered from miniUSB_VBUS.
microUSB_VBUS	5V	Secondary input power.
ONBOARD_USB_VBUS	5V	Filtered from microUSB_VBUS.
P5V_ELEV	5V	Third input power from primary elevator connector.
ELEV_USB_VBUS	5V	USB power from primary elevator connector.
P5V_TRG_USB	5V	Output from USB power switch, which is controlled by the K20's VTRG_EN and elevator's ELE_PS_SENSE.
VREG_IN	5V	Output from jumper header, to select P5V_TRG_USB. Also could be supplied externally via header pin.
P3V3	3.3V	Output from LDO or from/to the Elevator connector.
P1V8	1.8V	Output from LDO.
SDA_VOUT33	3.3V	Output from the K20 internal regulator.
VCC_3V3_SDA	3.3V	Output from SDA_VOUT33 via 0ohm resistor.
MCU_VREGIN0	5V	Output from jumper header to select ONBOARD_USB_VBUS or ELEV_USB_VBUS.
MCU_VREGIN1	5V	Output from jumper header to select ONBOARD_USB_VBUS or ELEV_USB_VBUS.
MCU_VREGOUT	3.3V	Output from the K65 internal regulator.
V_SUPPLY	3.3V or 1.8V	Output from jumper header, to select 1.8V, 3.3V, SDA_VOUT33, MCU_VREGOUT. Also could be supplied externally via header pins.
V_BRD	3.3V or 1.8V	Output from V_SUPPLY via MOSFET, which is controlled by RTC_MOSFET.
MCU_PWR	3.3V or 1.8V	Output from jumper header, to select V_MCU. Also could be supplied externally via header pin.
VCOIN	3V	Output from the coin battery.
K65_VBAT	3.3V or 1.8V	Output from jumper header, to select MCU_PWR or VCOIN. Also could be supplied externally via header pin.
VDDA	3.3V or 1.8V	Output from jumper header to select MCU_PWR. Also could be supplied externally via header pin.
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 Ground.

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 Drawing Title: **X-TWR-K65F180M**

Page Title: **Power Nets**

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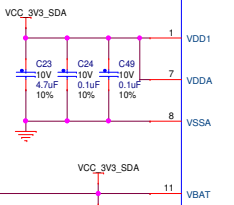




# Serial Interface

**OPEN SDA POWER OUTPUTS**

Note: You can power openSDA with your own power supplies by replacing this rail (SDA\_VOUT33) with your 3.3V power supply rail.



JTAG\_TCLK\_SWD\_CLK\_EZP\_CLK\_TSI0\_CH1PTA0UART0\_CTSUART0\_C0LFTM0\_CH5  
 JTAG\_TDIEZP\_DIVTSI0\_CH2PTA1UART0\_RXFTM0\_CH8  
 JTAG\_TDO TRACE\_SWO\_EZP\_DOTSI0\_CH3PTA2UART0\_TXFTM0\_CH7  
 JTAG\_TMS\_SWD\_RST\_TSI0\_CH4PTA3UART0\_RSTFTM0\_CH0  
 NMEZP\_CS\_TSI0\_CH5PTA4FTM0\_CH1LLWU\_P3



ADC0\_SE8/TSI0\_CH0PTB0VCO\_SCLFTM1\_CH0FTM1\_OD\_PHALLUW\_P5  
 ADC0\_SE8/TSI0\_CH6PTB1VCO\_SDAFTM1\_CH1FTM1\_OD\_P#6

ADC0\_SE19/TSI0\_CH14PTC1/SPI0\_PCS3/UART1\_RTS/FTM0\_CH0/IS20\_TXD0/LLWU\_P6  
 ADC0\_SE4B/CMP1\_IN0/TSI0\_CH15/PTC2/SPI0\_PCS2/UART1\_CTS/FTM0\_CH1/IS20\_TX\_FS  
 CMP1\_IN1/PTC3/SPI0\_PCS1/UART1\_RXFTM0\_CH2/IS20\_TX\_BCLK/LLWU\_P7  
 PTC4/SPI0\_PCS0/UART1\_TXFTM0\_CH3/CMP1\_OUT/LLWU\_P8  
 PTC5/SPI0\_SCK/LPTMR0\_ALT2/IS20\_RXD0/CMP0\_OUT/LLWU\_P9  
 CMP0\_IN0/PTC6/SPI0\_SOUT/PTB0\_EXTR0/IS20\_RX\_BCLK/IS20\_MCLK/LLWU\_P10  
 CMP0\_IN1/PTC7/SPI0\_SIN/USB\_SOF\_OUT/IS20\_RX\_FS

PTD4/SPI0\_PCS1/UART0\_RTS/FTM0\_CH4/EWM\_IN/LLWU\_P14  
 ADC0\_SE6B/PTD5/SPI0\_PCS2/UART0\_CTS/UART0\_C0LFTM0\_CH5/EWM\_OUT  
 ADC0\_SE7B/PTD6/SPI0\_PCS3/UART0\_RXFTM0\_CH6/FTM0\_FLT0/LLWU\_P15  
 PTD7/CMT\_IRQ0/UART0\_TXFTM0\_CH7/FTM0\_FLT1

SDA\_SPI0\_RST\_B TP8  
 SDA\_SPI0\_CS TP9  
 K20\_UART1\_RX  
 K20\_UART1\_SCK  
 SI\_SPI0\_SIN  
 SI\_SPI0\_SOUT

LED\_K20  
 SDA\_USB\_PSV\_SENSE  
 POWER\_EN

PTD4/SPI0\_PCS1/UART0\_RTS/FTM0\_CH4/EWM\_IN/LLWU\_P14  
 ADC0\_SE6B/PTD5/SPI0\_PCS2/UART0\_CTS/UART0\_C0LFTM0\_CH5/EWM\_OUT  
 ADC0\_SE7B/PTD6/SPI0\_PCS3/UART0\_RXFTM0\_CH6/FTM0\_FLT0/LLWU\_P15  
 PTD7/CMT\_IRQ0/UART0\_TXFTM0\_CH7/FTM0\_FLT1

VTRG\_FAULT\_B  
 VTRG\_EN  
 ELE\_PS\_SENSE\_O1

PSV\_TRG\_USB  
 PSV\_ELEV

MC20D128VFM5

**BOARD POWER SELECTOR TABLE**

Shunt	V_SUPPLY Source
1-2	3.3V from K20 internal regulator
3-4	1.8V from regulator
5-6	3.3V from regulator (default)
7-8	3.3V from K65 internal regulator

**V\_SUPPLY** can also be sourced by removing all shunts and applying an external supply voltage to J9 pin 2 with the associated GND connected to TP11 or TP12. (Note that the RESET LED - D2 [sheet 5], the four user LEDs - D6, D7, D8, D9 [sheet 7], and the accelerometer - U15 [sheet 7] are powered by P3V3 and will not work possibly when using only an external source.)

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.

**BOARD POWER SELECTOR (See Table)**

**K65 VREG IN SELECTOR TABLE**

Shunt	R65 VREG IN Source
1-2	VREG_IN0 connected with ONBOARD_VBUS
1-3	VREG_IN1 connected with ONBOARD_VBUS
2-4	VREG_IN0 connected with ELEV_USB_VBUS
3-4	VREG_IN1 connected with ELEV_USB_VBUS

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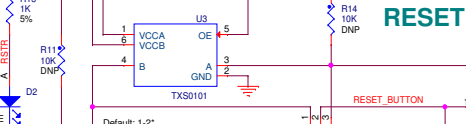
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Drawing Title: **X-TWR-K65F180M**

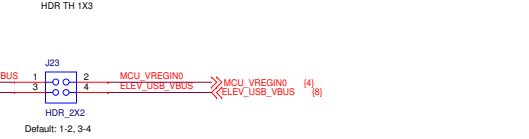
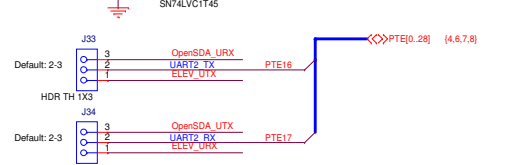
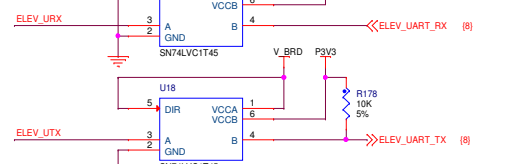
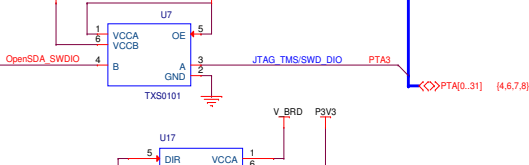
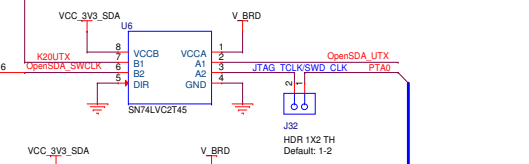
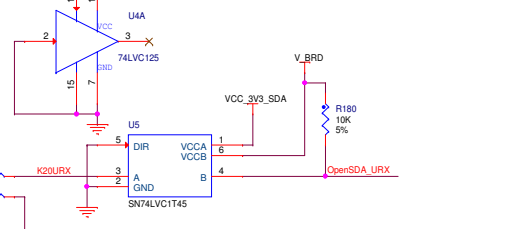
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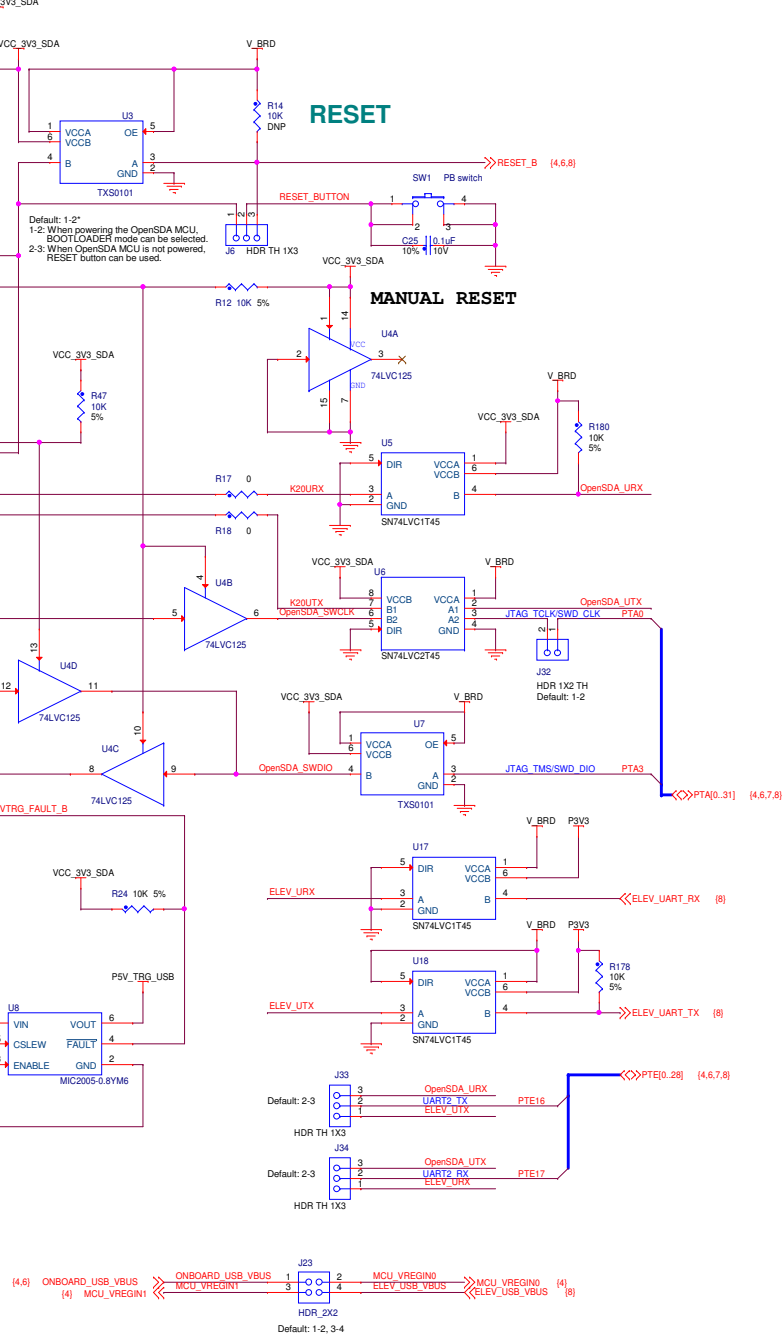
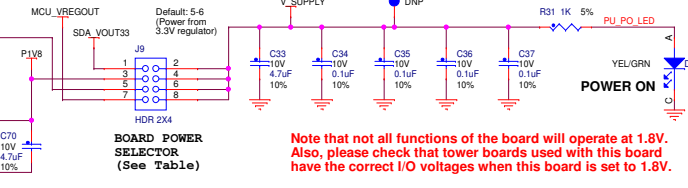
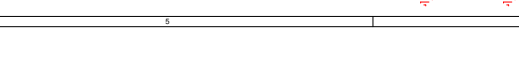
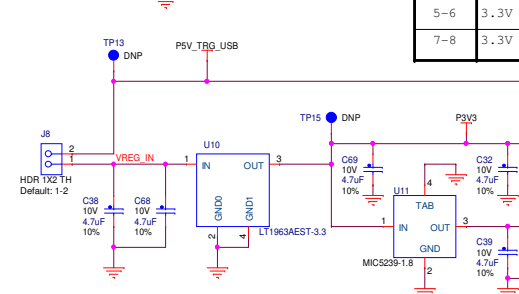
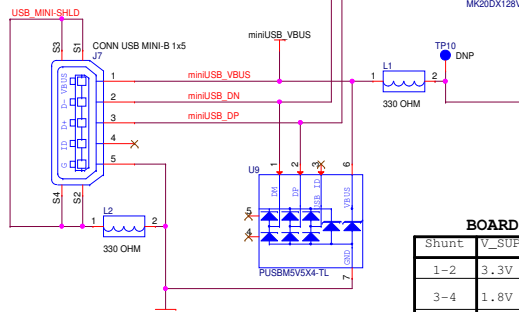
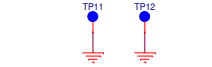
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## MANUAL RESET



## GND TESTPOINT



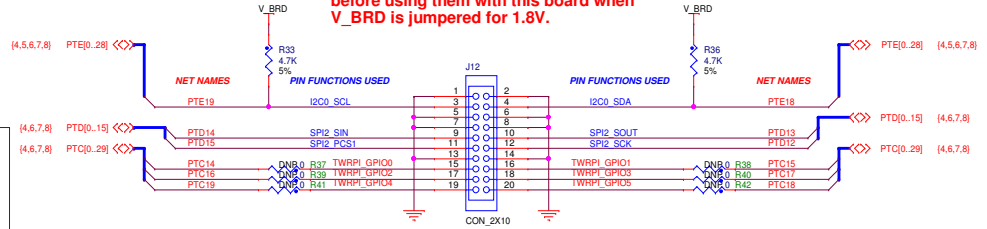
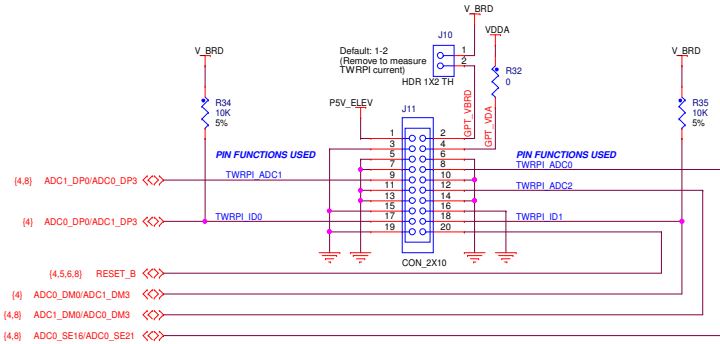


### GENERAL PURPOSE TWRP I

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.

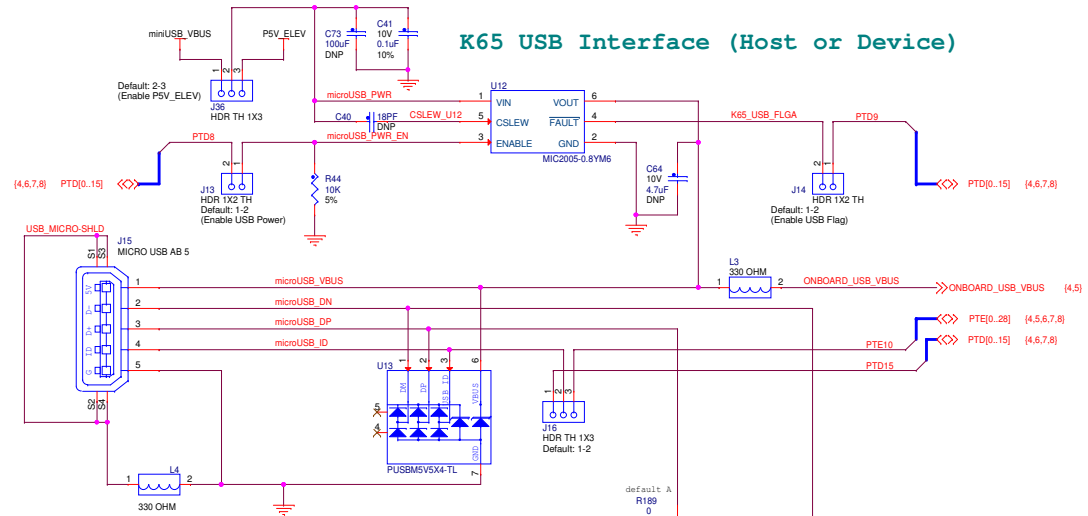
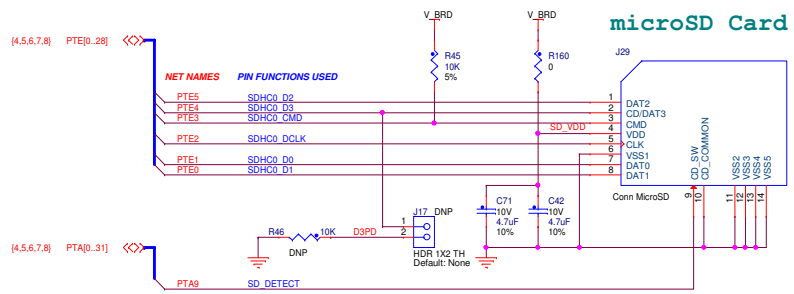
Check that TWRPI boards will work at 1.8V before using them with this board when V\_BRD is jumpered for 1.8V.



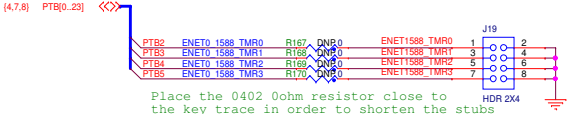
Place the 0402 0ohm resistor close to the key trace in order to shorten the stubs

Note: this SDHC socket is powered by V\_BRD which may be 1.8V or 3.3V. No provision is made for dynamic switching between the two voltages. Therefore, this interface may not work properly when the MCU is running from 1.8V.

### K65 USB Interface (Host or Device)

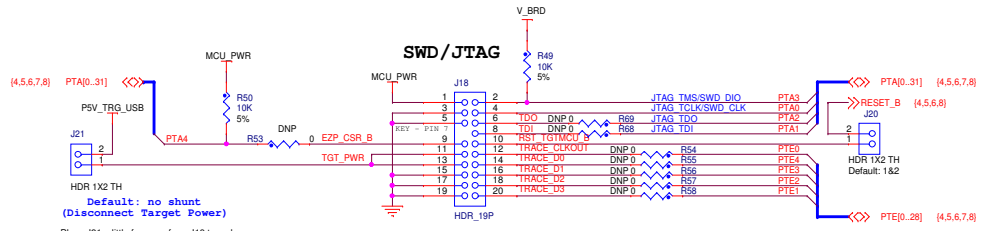


### ENET0\_1588\_TMR HEADER

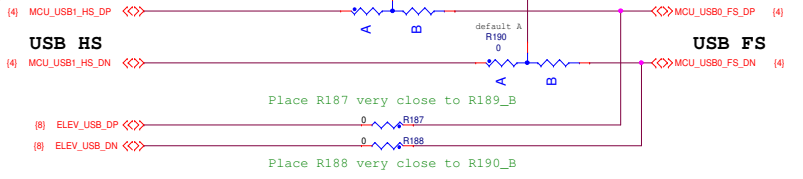


Place the 0402 0ohm resistor close to the key trace in order to shorten the stubs

### K65-CORTEX JTAG SECTION



Place J21 a little far away from J18 to make sure that J-LINK connector can be populated normally



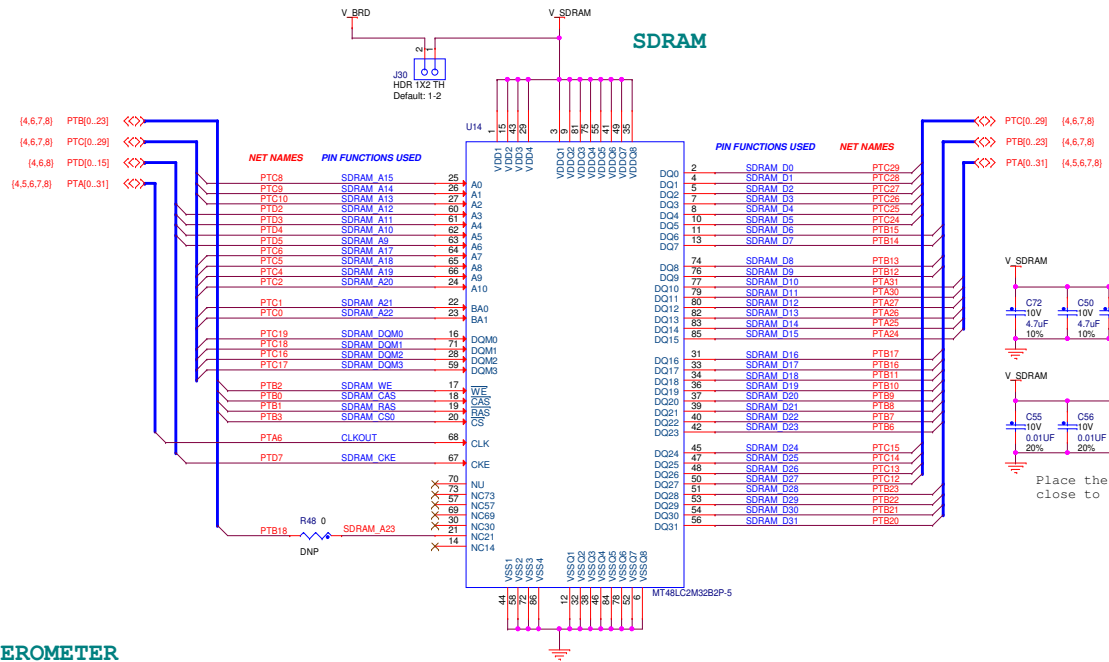
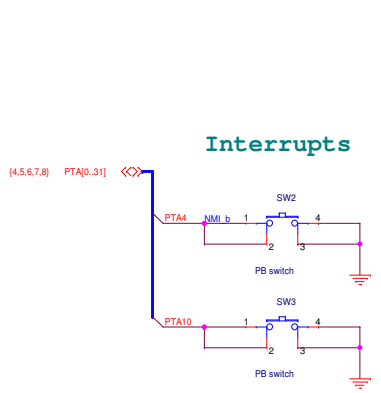
Note that there is never a combination that allows sending the USB1 (HS) to the elevator.

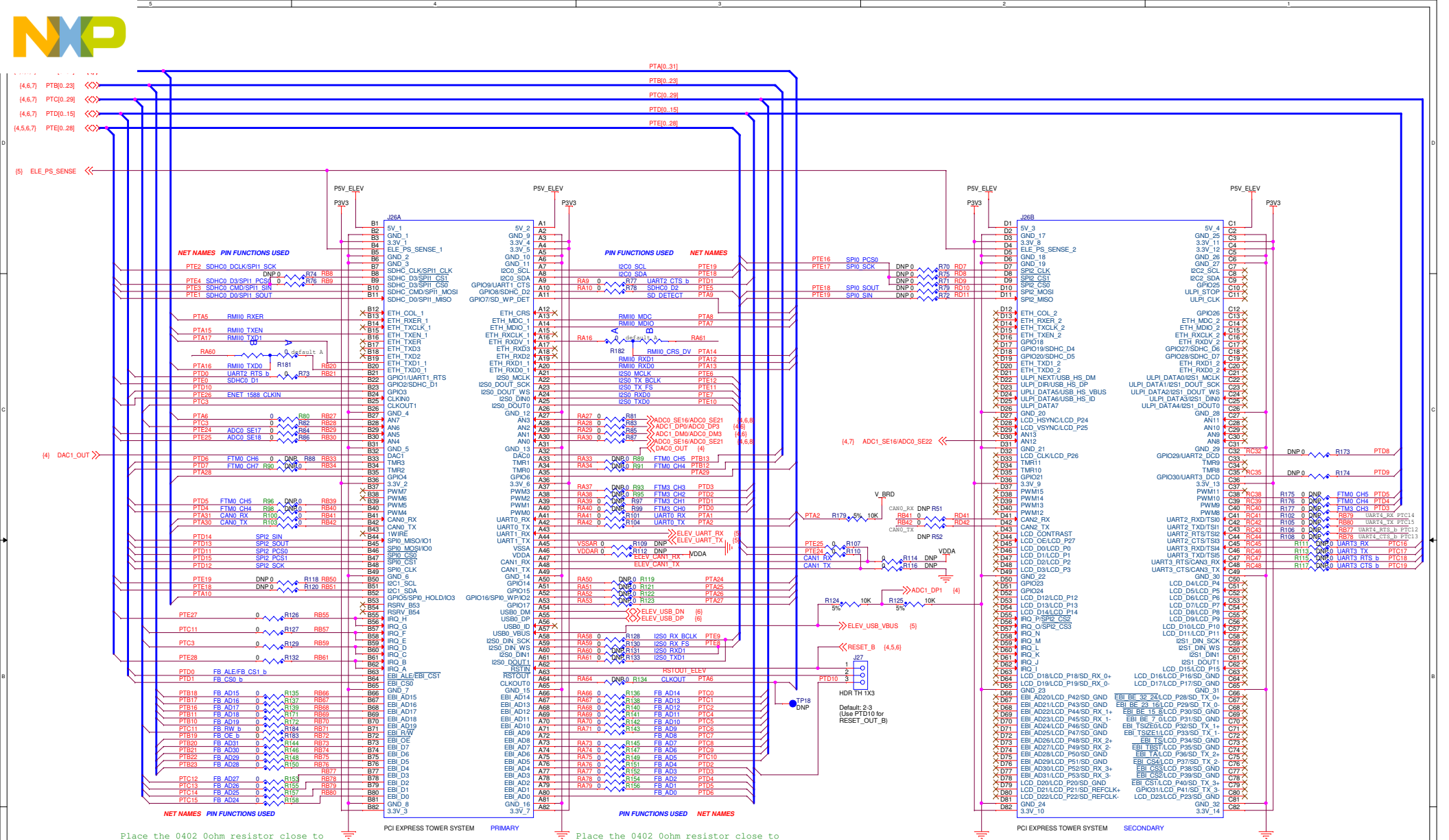
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Place the 0402 0ohm resistor close to the key trace in order to shorten the stubs

Place the 0402 0ohm resistor close to the key trace in order to shorten the stubs

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: **Elevator Connectors**

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