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3	Block Diagram
4	TWR-K60F120M MCU
5	USB/OSBDM/V-TRAN/PWR
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7	Sensors
8	NAND Flash
9	Elevator Connectors

Revisions

Rev	Description	Date	Approved
X1	Initial Release	02 Aug 11	M.H
X2	1. L9 replaced with DNP 0 ohm resistor. 2.Note updated for R172 & R173 Placement 3.C77, C78, R91, R92 & R93 removed 4.Jumper added on Y1 power 5.PTB4 to PTB7 used for Analog inputs on Primary elevator 6.IRQ signals removed from Secondary Elevator	03 Aug 11	M.H
X3	1. Jumper added between potentiometer and ADC1_DM1 2. I2S signals added on the elevator connector (A58-A61) 3.accelerometer part chnaged to MMA8451QT 4.0 ohms added to PTC16 to isolate Nand Flash & R118 5.UART connections swapped on Elevator	08 Aug 11	M.H
X4	Net names changed for PTD0 & PTD1 on OSBDM circuit	16 Aug 11	M.H
A	Proto Release	22 Aug 11	M.H
A1	Re-run ECO for A085 to correct BOM import.	16 Sept 11	E.T
AX1	1. PTE8 , PTE9 used instead of PTC16 & PTC17 on Primary elevator UART connections 2. Similarly RTS & CTS connections changed to PTE10 & PTE11 3. I2S signals extracted from PTA series through Jumpers 4. Board ID pull down resistor changed to 1.3K	14 Nov 11	M.H
AX2	1. I2S0 Header connections sourced from either PTC or PTA through Jumper 2. 0 ohm resistor added for Trace clock out(PTA6) 3. 0 ohm resistor added between elevator and MCU for Ethernet signals on PTA pins 4. IRQ signals added to secondary elevator 5. 0 ohms resistor added between Nand flash and MCU on PTC signals which is shared with I2S0	15 Nov 11	M.H
B	Prototype Release	17 Nov 11	M.H
BX1	CLK OSC Circuitry for FCC: Removed J18 3 Pin Jumper Added 2 Pin Jumper to ON / OFF OSC	10 Feb 12	Peter, Kevin
C	Production Release	14 Feb 12	Peter, Kevin

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Microcontroller Solutions Group

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Austin, TX 78735-8598

ICAP Classification: FCP: FIUO: X PUBI:

Designer: ionDSN	Drawing Title: **TWR-K60F120M**	
Drawn by: ionDSN	Page Title: **Table of Contents/Revisions**	
Approved: Melissa Hunter	Size C / Document Number SCH-27167 PDF: SPF-27167	Rev C
	Date: Tuesday, February 14, 2012	Sheet 1 of 9

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.

Power & Ground Nets

NET	VOLTAGE	DESCRIPTION
P5V_USB	5V	Primary input power. Filtered from USB connector. Input to USB power switch.
P5V_SW	5V	Output of USB power switch controlled by the 5V_EN signal from the JM60 MCU. Used by OSBDM voltage translation circuits.
P5V_TRG_USB	5V	Output of USB power switch controlled by the VTRG_EN signal from the JM60 MCU. Provides input to regulator.
P3V3	3.3V	Output of regulator using USB power input (P5V_TRG_USB).
P3V3_MCU	3.3V	MCU digital power. Filtered from P3V3.
VDDA	3.3V	VDDA power for MCU and analog circuits. Filtered from P3V3_MCU.
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: **TWR-K60F120M**

Page Title: **Notes**

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Sheet 9

ELEVATOR CONNECTORS

Sheet 5

OSJTAG/USB Bridge Circuit

USB Mini B Connector

MC9S08JM60

Voltage Translation

OSJTAG/JTAG Header

SCI Source Selectors

Power Supply Circuits

Sheet 4

K60NF1M MCU

50 MHz XTAL

12 MHz XTAL

32.768 KHz XTAL

VSSA/VDDA filter

VREFH/VREFL filter

VREF_OUT

VREGIN, VOUT33

VBAT

Sheet 6

INFRARED PORT

Sheet 6

PUSH BUTTONS

Sheet 6

SD CARD SOCKET

Sheet 7

ANALOG INPUTS

MMA7660 ACCELEROMETER

POTENTIOMETER

Sheet 8

NAND Flash

Sheet 7

TOWER PLUG-IN (TWRPI)

SENSOR HEADERS

Sheet 7

TOWER PLUG-IN (TWRPI)

TOUCH HEADER

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Drawing Title: **TWR-K60F120M**

Page Title: **Block Diagram**

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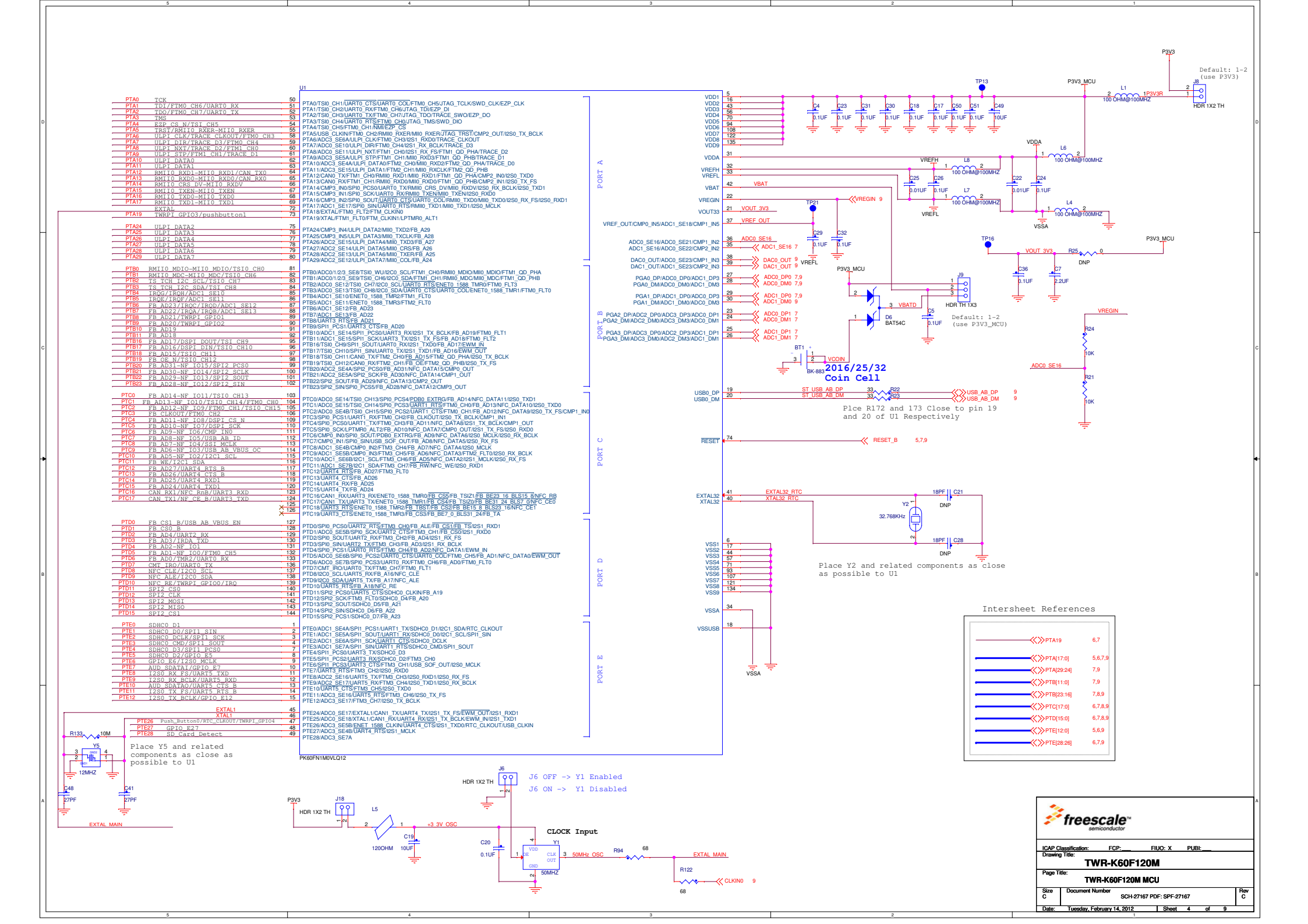
Date: Tuesday, February 14, 2012 Sheet 3 of 9


U1
PK60FN1M0VLQ12
PORT A
PORT B
PORT C
PORT D
PORT E
PTA0 TCK
PTA1 TDI/FTM0_CH6/UART0_RX
PTA2 TDO/FTM0_CH7/UART0_TX
PTA3 TMS
PTA4 EZP_CS_N/TSI_CH5
PTA5 TRST/RMII0_RXER-MII0_RXER
PTA6 ULPI_CLK/TRACE_CLKOUT/FTM0_CH3
PTA7 ULPI_DIR/TRACE_D3/FTM0_CH4
PTA8 ULPI_NXT/TRACE_D2/FTM1_CH0
PTA9 ULPI_STP/FTM1_CH1/TRACE_D1
PTA10 ULPI_DATA0
PTA11 ULPI_DATA1
PTA12 RMII0_RXD1-MII0_RXD1/CAN_TX0
PTA13 RMII0_RXD0-MII0_RXD0/CAN_RX0
PTA14 RMII0_CRS_DV-MII0_RXDV
PTA15 RMII0_TXEN-MII0_TXEN
PTA16 RMII0_TXD0-MII0_TXD0
PTA17 RMII0_TXD1-MII0_TXD1
EXTAL
PTA19 TWRPI_GPIO3/pushbutton1
XTAL
PTA24 ULPI_DATA2
PTA25 ULPI_DATA3
PTA26 ULPI_DATA4
PTA27 ULPI_DATA5
PTA28 ULPI_DATA6
PTA29 ULPI_DATA7
PTB0 RMII0_MDIO-MII0_MDIO/TSI0_CH0
PTB1 RMII0_MDC-MII0_MDC/TSI0_CH6
PTB2 TS_TCH_I2C_SCL/TSI0_CH7
PTB3 TS_TCH_I2C_SDA/TSI_CH8
PTB4 IRQC/IRQH/ADC1_SE10
PTB5 IRQE/IRQF/ADC1_SE11
PTB6 FB_AD23/IRQC/IRQD/ADC1_SE12
PTB7 FB_AD22/IRQA/IRQB/ADC1_SE13
PTB8 FB_AD21/TWRPI_GPIO1
PTB9 FB_AD20/TWRPI_GPIO2
PTB10 FB_AD19
PTB11 FB_AD18
PTB16 FB_AD17/DSPI_DOUT/TSI_CH9
PTB17 FB_AD16/DSPI_DIN/TSI0_CH10
PTB18 FB_AD15/TSI0_CH11
PTB19 FB_OE_N/TSI0_CH12
PTB20 FB_AD31-NF_IO15/SPI2_PCS0
PTB21 FB_AD30-NF_IO14/SPI2_SCLK
PTB22 FB_AD29-NF_IO13/SPI2_SOUT
PTB23 FB_AD28-NF_IO12/SPI2_SIN
PTC0 FB_AD14-NF_IO11/TSI0_CH13
PTC1 FB_AD13-NF_IO10/TSI0_CH14/FTM0_CH0
PTC2 FB_AD12-NF_IO9/FTM0_CH1/TSI0_CH15
PTC3 FB_CLKOUT/FTM0_CH2
PTC4 FB_AD11-NF_IO8/DSPI_CS_N
PTC5 FB_AD10-NF_IO7/DSPI_SCK
PTC6 FB_AD9-NF_IO6/CMP_IN0
PTC7 FB_AD8-NF_IO5/USB_AB_ID
PTC8 FB_AD7-NF_IO4/SSI_MCLK
PTC9 FB_AD6-NF_IO3/USB_AB_VBUS_OC
PTC10 FB_AD5-NF_IO2/I2C1_SCL
PTC11 FB_WE/I2C1_SDA
PTC12 FB_AD27/UART4_RTS_B
PTC13 FB_AD26/UART4_CTS_B
PTC14 FB_AD25/UART4_RXD1
PTC15 FB_AD24/UART4_TXD1
PTC16 CAN_RX1/NFC_RnB/UART3_RXD
PTC17 CAN_TX1/NF_CE_B/UART3_TXD
PTD0 FB_CS1_B/USB_AB_VBUS_EN
PTD1 FB_CS0_B
PTD2 FB_AD4/UART2_RX
PTD3 FB_AD3/IRDA_TXD
PTD4 FB_AD2-NF_IO1
PTD5 FB_AD1-NF_IO0/FTM0_CH5
PTD6 FB_AD0/TMR2/UART0_RX
PTD7 CMT_IRO/UART0_TX
PTD8 NFC_CLE/I2C0_SCL
PTD9 NFC_ALE/I2C0_SDA
PTD10 NFC_RE/TWRPI_GPIO0/IRQ
PTD11 SPI2_CS0
PTD12 SPI2_CLK
PTD13 SPI2_MOSI
PTD14 SPI2_MISO
PTD15 SPI2_CS1
PTE0 SDHC0_D1
PTE1 SDHC0_D0/SPI1_SIN
PTE2 SDHC0_DCLK/SPI1_SCK
PTE3 SDHC0_CMD/SPI1_SOUT
PTE4 SDHC0_D3/SPI1_PCS0
PTE5 SDHC0_D2/GPIO_E5
PTE6 GPIO_E6/I2S0_MCLK
PTE7 AUD_SDATA1/GPIO_E7
PTE8 I2S0_RX_FS/UART5_TXD
PTE9 I2S0_RX_BCLK/UART5_RXD
PTE10 AUD_SDATA0/UART5_CTS_B
PTE11 I2S0_TX_FS/UART5_RTS_B
PTE12 I2S0_TX_BCLK/GPIO_E12
EXTAL1
XTAL1
PTE26 Push_Button0/RTC_CLKOUT/TWRPI_GPIO4
PTE27 GPIO_E27
PTE28 SD_Card_Detect
PTE24/ADC0_SE17/EXTAL1/CAN1_TX/UART4_TX/I2S1_TX_FS/EWM_OUT/I2S1_RXD1
PTE25/ADC0_SE18/XTAL1/CAN1_RX/UART4_RX/I2S1_TX_BCLK/EWM_IN/I2S1_TXD1
PTE26/ADC3_SE5B/ENET_1588_CLKIN/UART4_CTS/I2S1_TXD0/RTC_CLKOUT/USB_CLKIN
PTE27/ADC3_SE4B/UART4_RTS/I2S1_MCLK
PTE28/ADC3_SE7A
VDD1 VDD2 VDD3 VDD4 VDD5 VDD6 VDD7 VDD8 VDD9
VDDA
VREFH
VREFL
VBAT
VREGIN
VOUT33
VREF_OUT/CMP0_IN5/ADC1_SE18/CMP1_IN5
ADC0_SE16/ADC0_SE21/CMP1_IN2
ADC1_SE16/ADC0_SE22/CMP2_IN2
DAC0_OUT/ADC0_SE23/CMP1_IN3
DAC1_OUT/ADC1_SE23/CMP2_IN3
PGA0_DP/ADC0_DP0/ADC1_DP3
PGA0_DM/ADC0_DM0/ADC1_DM3
PGA1_DP/ADC1_DP0/ADC0_DP3
PGA1_DM/ADC1_DM0/ADC0_DM3
PGA2_DP/ADC2_DP0/ADC3_DP3/ADC0_DP1
PGA2_DM/ADC2_DM0/ADC3_DM3/ADC0_DM1
PGA3_DP/ADC3_DP0/ADC2_DP3/ADC1_DP1
PGA3_DM/ADC3_DM0/ADC2_DM3/ADC1_DM1
USB0_DP
USB0_DM
RESET
EXTAL32
XTAL32
VSS1 VSS2 VSS3 VSS4 VSS5 VSS6 VSS7 VSS8 VSS9
VSSA
VSSUSB
P3V3
P3V3_MCU
VREGIN
VBATD
VCOIN
VREFL
VSSA
VDDA
TP13
TP21
TP16
J6
J8
J9
J18
L1
L4
L5
L6
L7
L8
D6
BAT54C
BT1
BK-883
HDR 1X2 TH
HDR TH 1X3
100 OHM@100MHZ
120OHM
DNP
Default: 1-2
(use P3V3)
(use P3V3_MCU)
2016/25/32
Coin Cell
Plce R172 and 173 Close to pin 19
and 20 of U1 Respectively
Place Y2 and related components as close as possible to U1
Place Y5 and related components as close as possible to U1
Intersheet References
PTA19 6,7
PTA[17:0] 5,6,7,9
PTA[29:24] 7,9
PTB[11:0] 7,9
PTB[23:16] 7,8,9
PTC[17:0] 6,7,8,9
PTD[15:0] 6,7,8,9
PTE[12:0] 5,6,9
PTE[28:26] 6,7,9
RESET_B 5,7,9
USB_AB_DP 9
USB_AB_DM 9
ADC0_SE16
CLKIN0 9
EXTAL_MAIN
Y1
Y2
Y5
50MHZ
12MHZ
32.768KHz
J6 OFF -> Y1 Enabled
J6 ON -> Y1 Disabled
CLOCK Input
50MHz OSC
+3.3V OSC
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ICAP Classification: FCP:___ FIUO: X PUBI:___
Drawing Title: TWR-K60F120M
Page Title: TWR-K60F120M MCU
Size C
Document Number SCH-27167 PDF: SPF-27167
Rev C
Date: Tuesday, February 14, 2012
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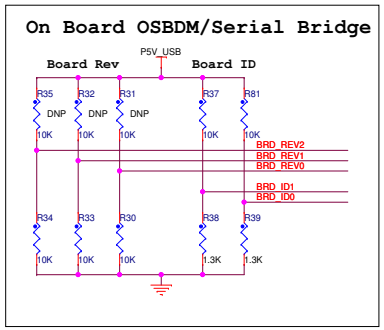

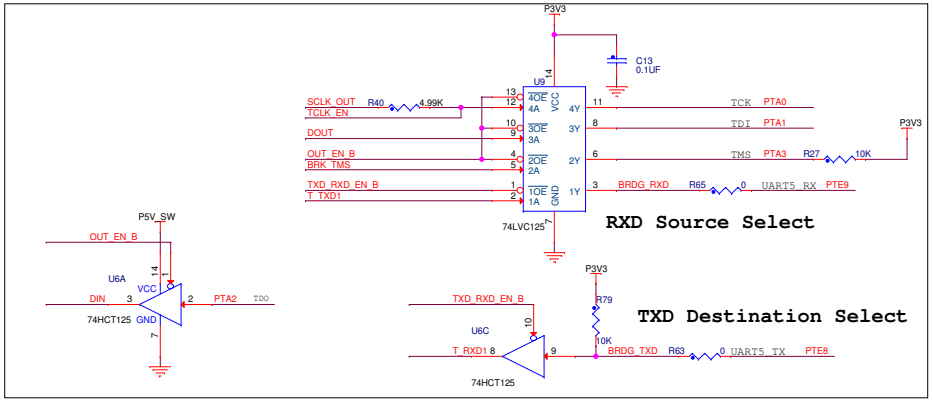

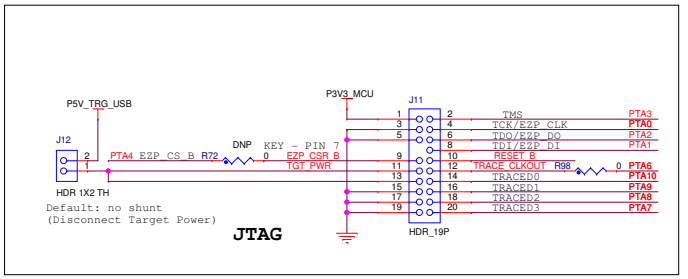

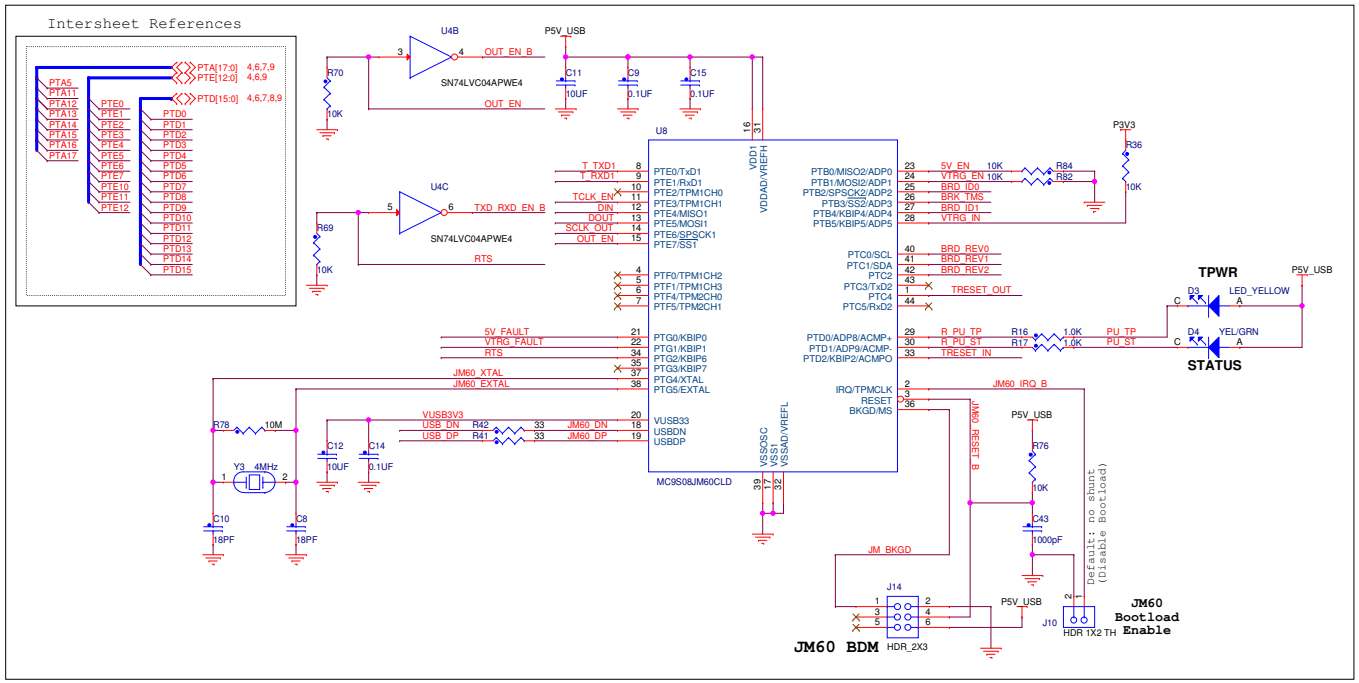

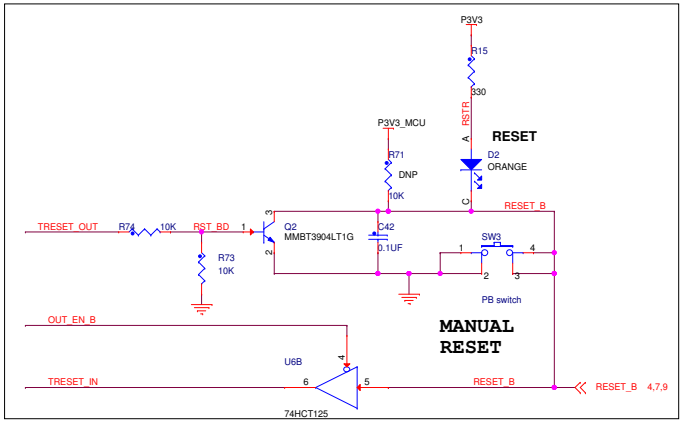

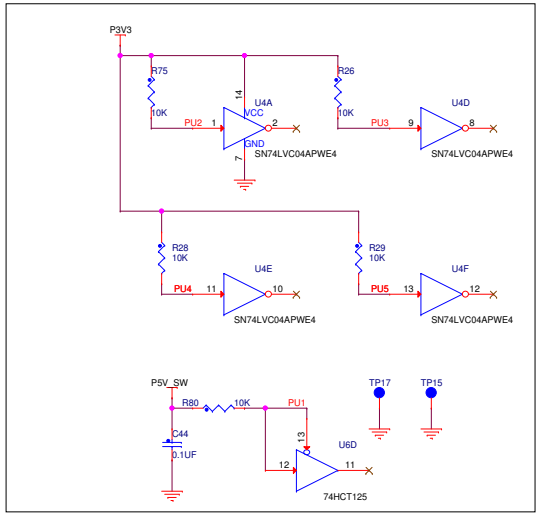

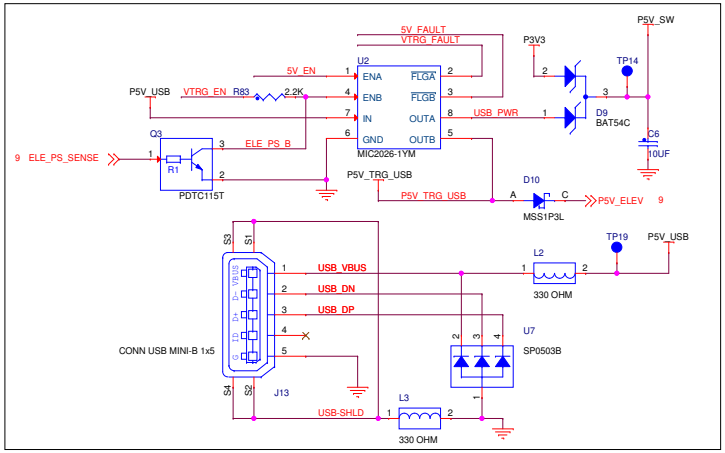

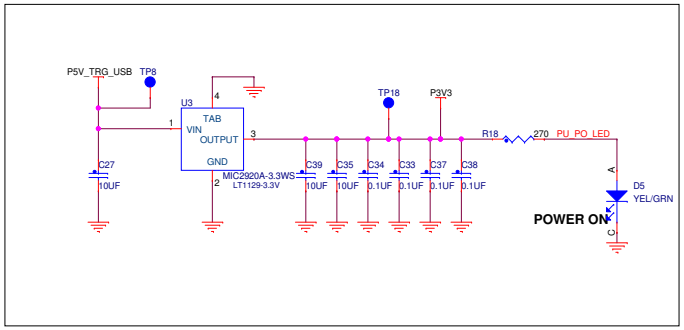

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ICAP Classification:	FCP: ___	FIUO: X	PUBI: ___

Drawing Title: **TWR-K60F120M**

Page Title: **USB/OSBDM/VTRAN/PWR**

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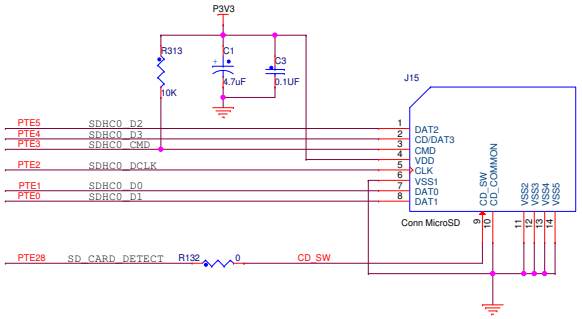
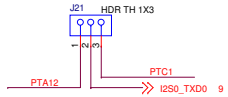
MICRO SD INTERFACE





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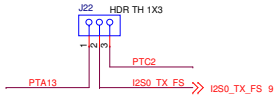
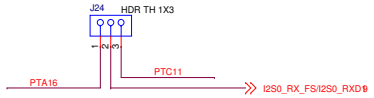


Default: no shunt

Default: no shunt



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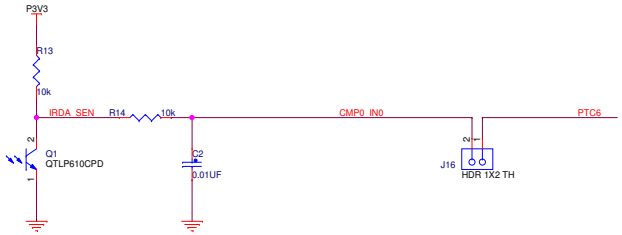

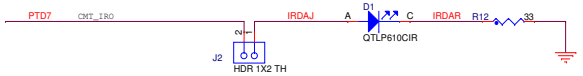

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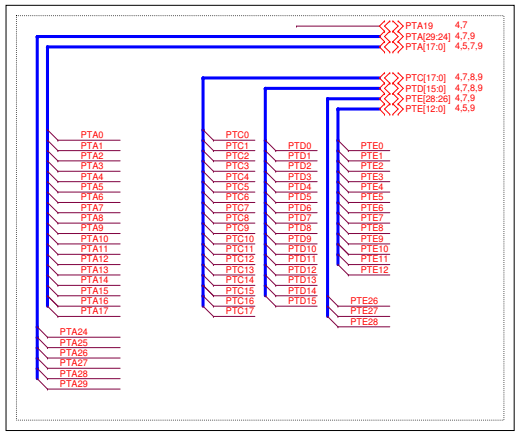
IRDA

Intersheet References



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Drawing Title: **TWR-K60F120M**

Page Title: **Peripherals**

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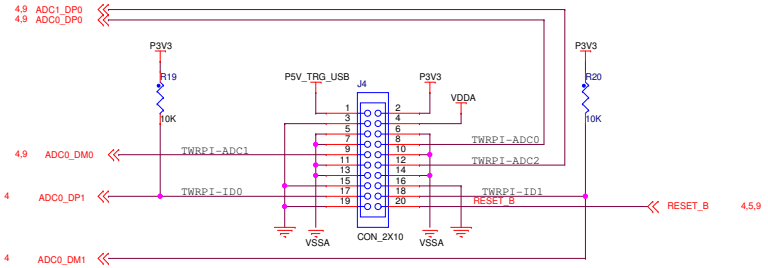
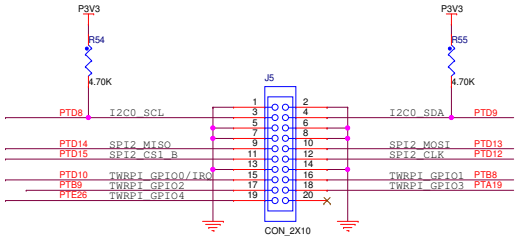
GENERAL PURPOSE TWRPI





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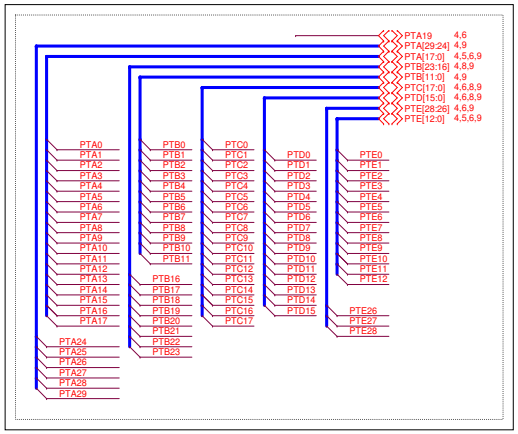
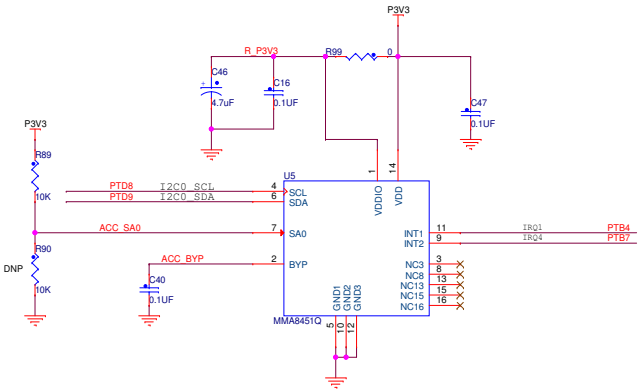
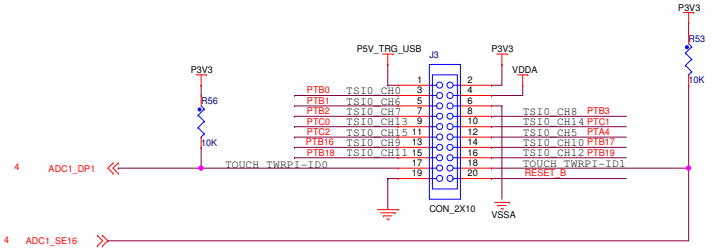
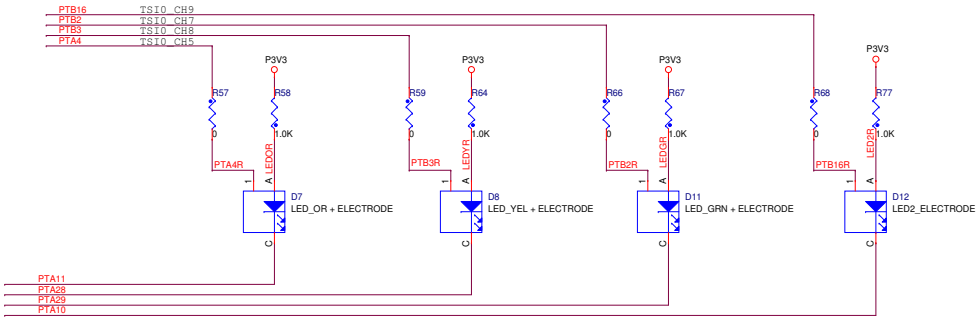


Accelerometer



TOUCH PAD TWRPI





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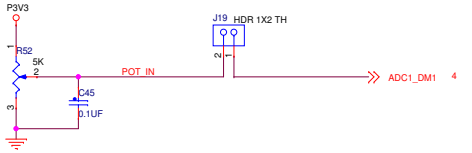

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Drawing Title: **TWR-K60F120M**

Page Title: **Sensors**

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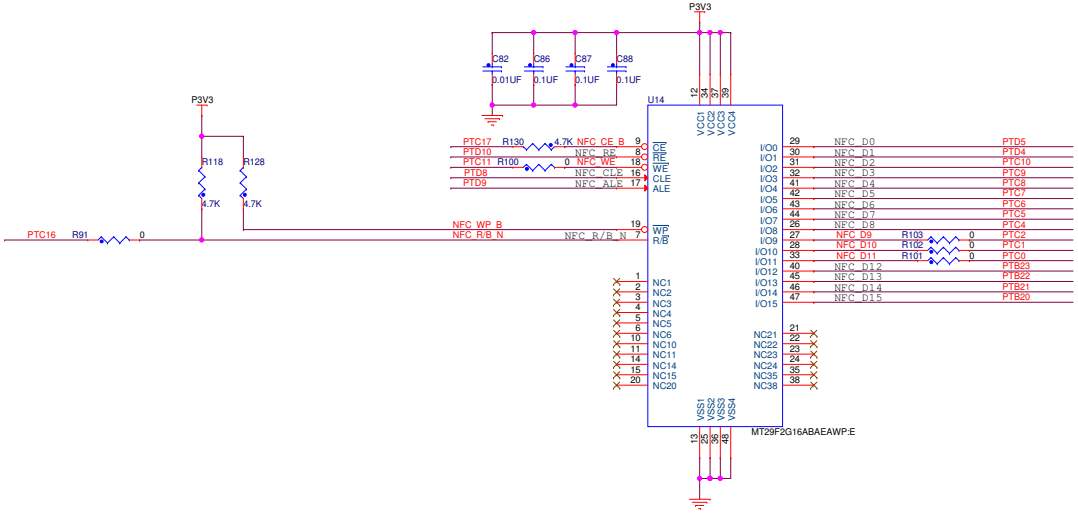
NAND FLASH



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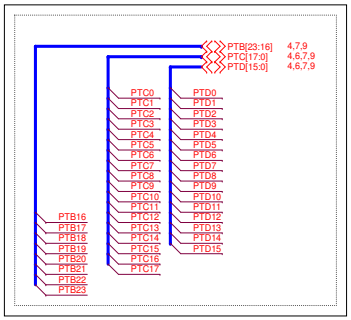

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ICAP Classification: FCP: ___ FIUO: X PUBI: ___

Drawing Title: **TWR-K60F120M**

Page Title: **NAND Flash**

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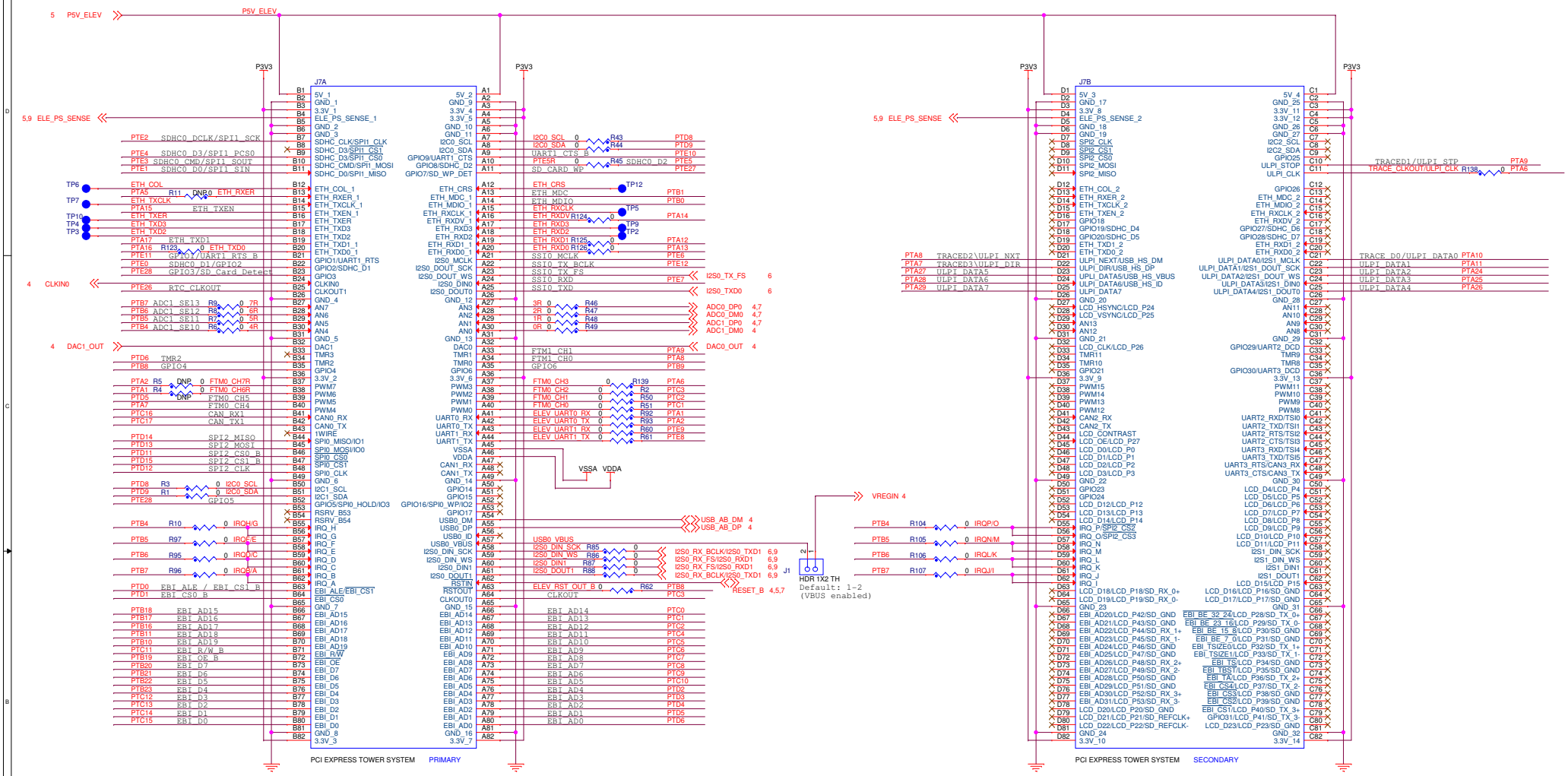

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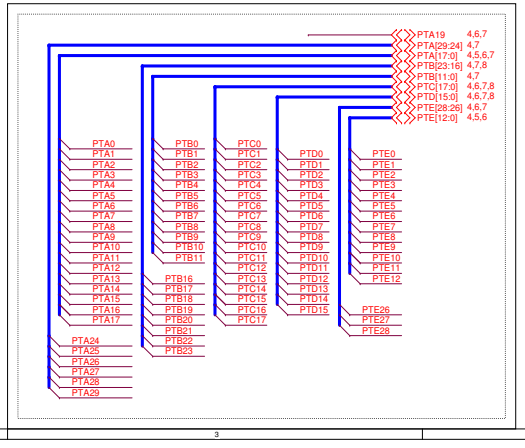

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Drawing Title: **TWR-K60F120M**

Page Title: **Elevator Connector**

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