# HummingBoard Schematics

J7

PCIE_RXM
PCIE_RXP
CSI_D0M
CSI_D0P
CSI_D1M
CSI_D1P
CSI_D2M
CSI_D2P
CSI_D3M
CSI_D3P
DSI_D1M
DSI_D1P
DSI_D0M
DSI_D0P
DSI_CLK0M
DSI_CLK0P
SPDIF_OUT
UART1_TX_DATA
UART1_RX_DATA
USB_OTG_ID
LVDS0_TX0_N
LVDS0_TX0_P
LVDS0_TX1_N
LVDS0_TX1_P
LVDS0_TX2_N
LVDS0_TX2_P
LVDS0_CLK_N
LVDS0_CLK_P

CLK1_P
CLK1_N
PCIE_TXM
PCIE_TXP
CSI_CLK0P
CSI_CLK0M
HDMI_D2P
HDMI_D2M
HDMI_D1P
HDMI_D1M
HDMI_D0P
HDMI_D0M
HDMI_CLKP
HDMI_CLKM
HDMI_TX_CEC_LINE
HDMI_TX_DDC_SCL
HDMI_TX_DDC_SDA
HDMI_HPD
AUD5_TXC
AUD5_TXD
AUD5_TXFS
AUD5_RXD
CCM_CLKO1
CCM_CLKO2
POR_B
USB_OTG_OC
USB_H1_OC
USB_OTG_CHD_B
SD2_VSELECT
LVDS0_TX3_P
LVDS0_TX3_N

DF40C-80DS-0.4V(51)

GND GND

SR-uSOM-iMX6 connectivity
Two out of three board to board only required by HummingBoard (J7 and J9)

General notes -
1. There are mainly two assembly options versions. Those versions are marked as base and pro
2. DNP stands for do not place. This is assembly option that means that this part is not assembled.
3. The 3.2V rail is important not to be 3.3V since the same rail is provided to SNVS where it's max AC characterstics is 3.3V.
4. L11 to L18 are initially designed ferrite beads for EMI filtering. But proven to be in the lab to be un-needed so they are replaced by 0603 0 ohm resistors and will be removed in further board spins.

Place around four corners of SOM
Can be mainly used as GND to GNDC coupling capacitors for EMI
R27 is for DC coupling between GND and GNDC

R27 10M DNP
C82 0.1UF DNP
C83 0.1UF DNP
C84 0.1UF DNP

J9

SATA_RXP
SATA_RXN
SATA_TXN
SATA_TXP
USB_OTG_DP
USB_OTG_DN
USB_HOST_DP
USB_HOST_DN
USB_H1_PWR_EN
USB_OTG_PWR_EN
ECSPI2_SS0
ECSPI2_SS1
SD2_CLK
SD2_CMD
SD2_DATA0
SD2_DATA1
SD2_DATA2
SD2_DATA3
SD2_CD_B
DISP1_DATA03
DISP1_DATA02
DISP1_DATA06
DISP1_DATA01
DISP1_DATA05
DISP1_DATA04
DISP1_DATA00
PWM1_OUT

MDI_TRXN3
MDI_TRXP3
MDI_TRXN2
MDI_TRXP2
MDI_TRXN1
MDI_TRXP1
MDI_TRXN0
MDI_TRXP0
LED_10_100_LED_1000
LED_ACT
I2C3_SCL
I2C3_SDA
SD3_CLK
SD3_CMD
PWM2_OUT
ECSPI2_MISO
ECSPI2_MOSI
ECSPI2_SCLK
I2C1_SDA
I2C1_SCL
PWM3_OUT
PWM4_OUT
__NC__SPDIF_CLK_IN

DF40C-80DS-0.4V(51)

ETH_TCT
USB_OTG_VBUS
USB_H1_VBUS
NVCC_SD2
NVCC_SD3
VCC_3V2
NVCC_EIM0
VSNVS_3V0
VIN_5V0

C46 0.1UF DNP
C63 0.1UF DNP
C36 0.1UF DNP
C26 0.1UF DNP
C32 0.1UF DNP
C33 0.1UF DNP
C66 10uF

GND

## 5V micro USB DC in

V_DCJACK_IN F3
VBUS
SH1
SH2
SH1
SH2
D-
D+
ID
GND
FUSE/SM
10103594-0001LF
CON1
D6 SMBJ5.0CA
L8 90Ohm
L10 90OHM DNP
L9 90Ohm
L6 90Ohm
L7 90Ohm
C73 22uF DNP
C74 470pF
C69 470pF
C72 22uF
C70 1nF DNP
V_5V0
VIN_5V0 V_5V0

## 5V to 3.2v (base)

Notice assembly option -
Base - LDO is used
Pro - DC-DC is used

V_5V0
U8
Vin Vout
GND
NCP1117DT33G
BASE
C24 22uF
BASE
R21 309
BASE
C64 33nF
BASE
R22 200 1% BASE
C23 10uF
V_3V2
VCC_3V2
VSNVS_3V0
NVCC_SD3

## 5V to 3.2v (pro)

C31 is assembled in both base and pro in order to provide more capacitance for the 3.2v rail

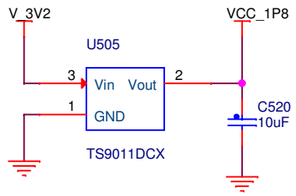
V_5V0
C40 10UF PRO
U13
VIN
LX
PGOOD
FB
RT
COMP
GND (E-Pad)
EN
SS
RT8070 PRO
L1 1.5uH PRO
V_3V2
R13 73.2K PRO 1%
R16 24.0K PRO 1%
C31 22UF
R14 13.0K PRO
C44 560pF PRO
C43 560pF PRO

560pF is important since it makes the 3.2V generation earlier than the i.MX6 uSOM processor and memory power rails

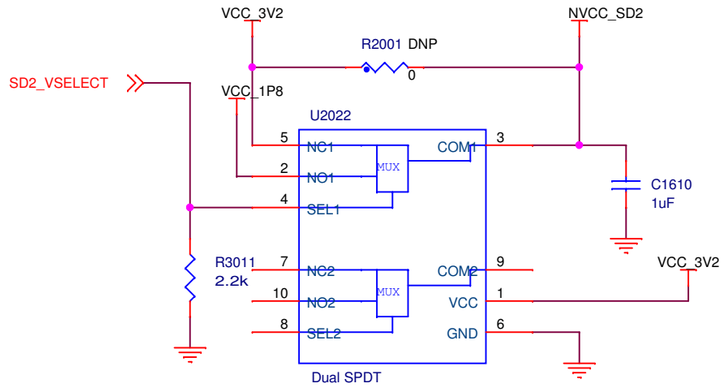


| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - Micro-SOM B2B and Power Supplies | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 1 of 6 | |

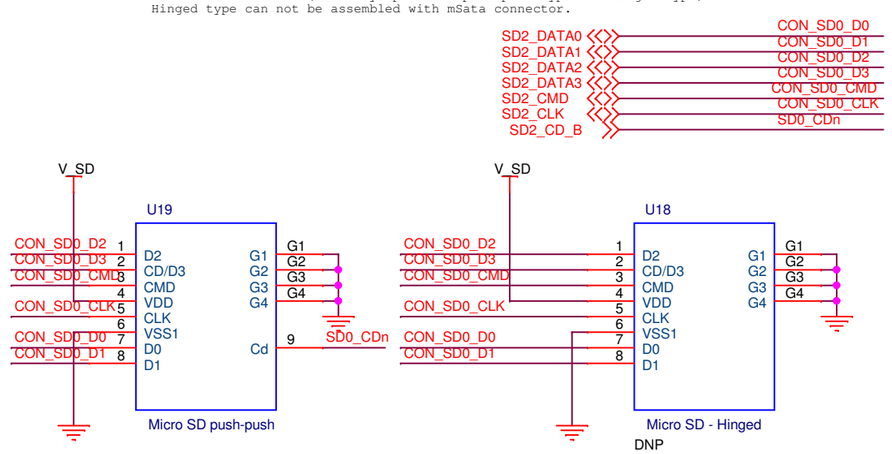
SDIO 3.2v / 1.8v switch circuitry



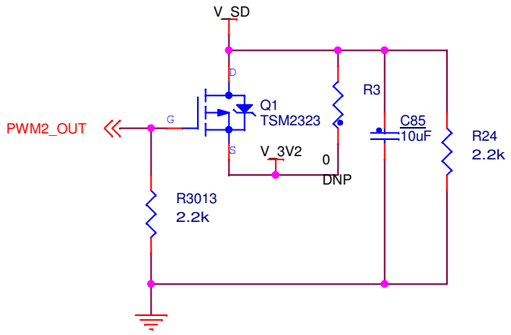

LDO input capacitor is shared
with USB hub filter




micro SD connectors (assembly option of push-push type and hinged type)
Hinged type can not be assembled with mSata connector.




micro SD power on/off

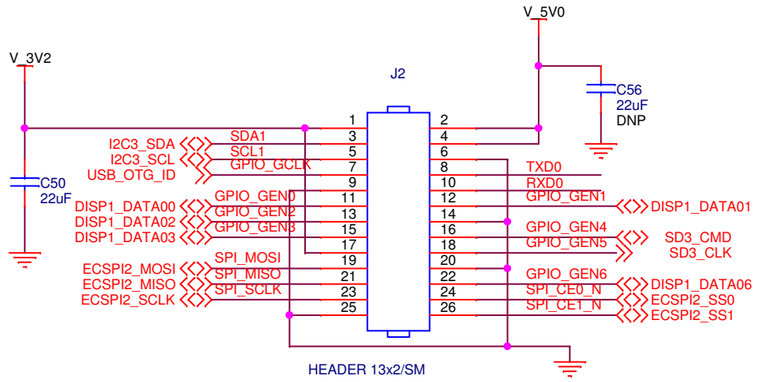



GPIO pin mapping -

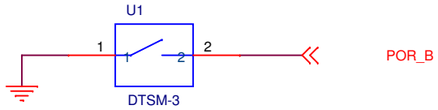
| Pin | GPIO |
|---|---|
| 7 | (1, 1) |
| 11 | (3, 9) |
| 12 | (3, 8) |
| 13 | (3, 7) |
| 15 | (3, 6) |
| 16 | (7, 2) |
| 18 | (7, 3) |
| 22 | (3, 3) |

SPI and I2C can be also
muxed to be GPIO

26 pin header

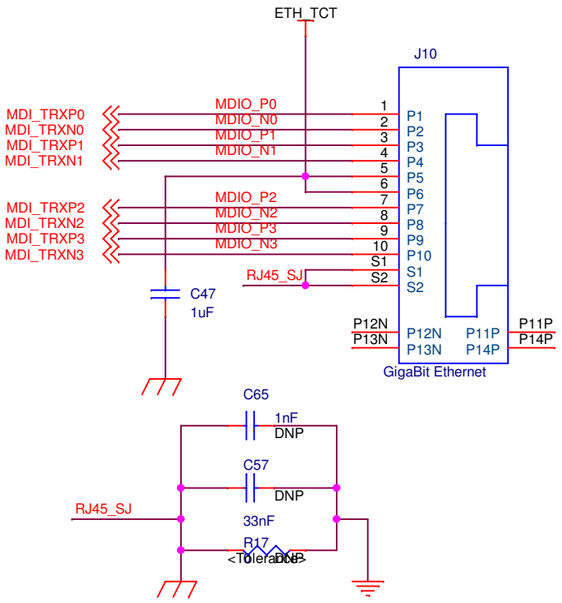


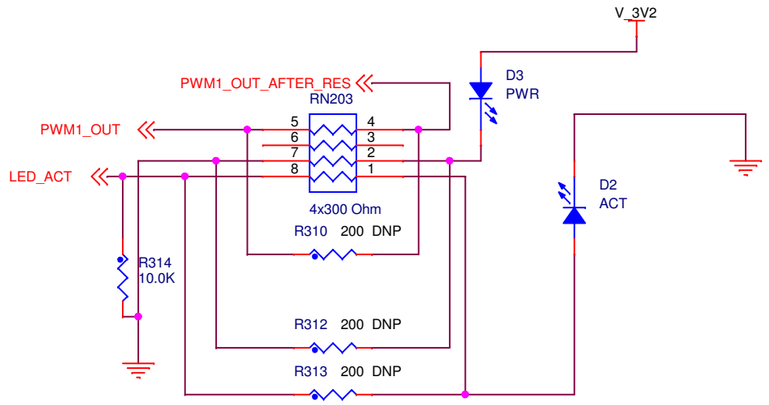

RESET button

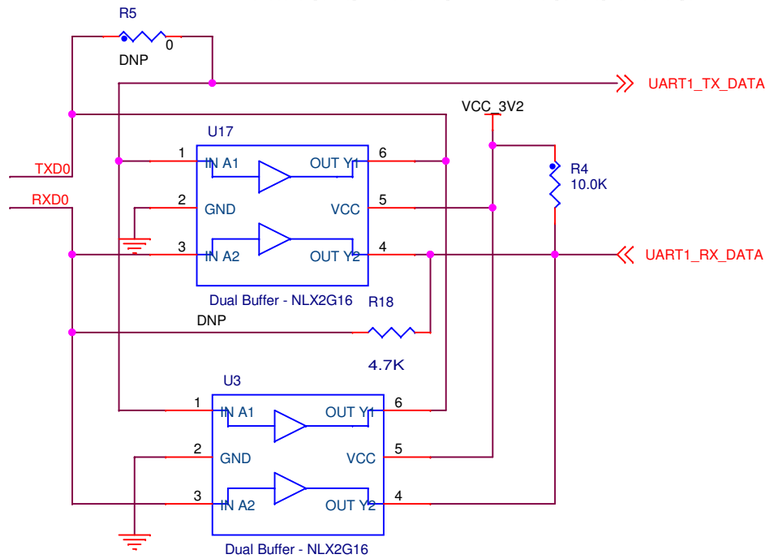



UART buffer (notice either U17 or U3 is assembled).
R18 was initial 0 ohm and marked as DNP (to bypass the
buffer in uart rx).
But in case there is no pull up on the 26 pin header then
the input of the buffer would float and sometimes generates
noise in the uart rx.
The workaround was to assemble R18 as 2.2kohm that
forces a pullup in the 26 pin via i.MX6 pull up circuitry.

RJ45 Connector



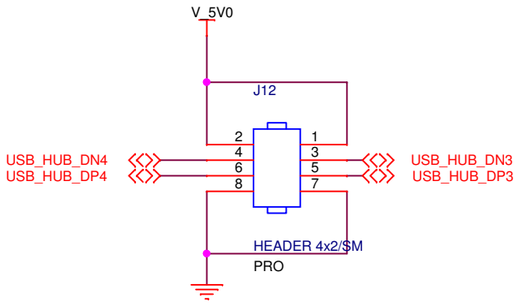





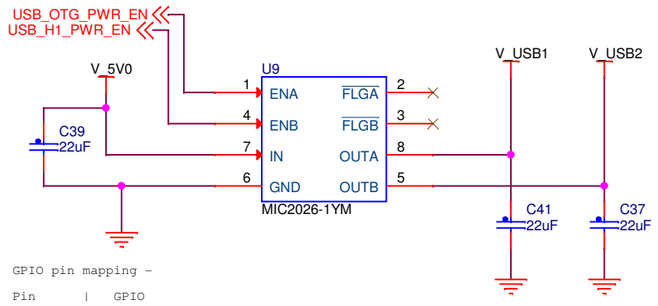

| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - 26 pin header, RJ45, uSD, reset and uart level shifter | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 2 of 6 | |

## Internal dual USB connector

Vbus in the internal header is connected directly to 5V.
In future board spins this will be current limited by a poly fuse to 350mA.

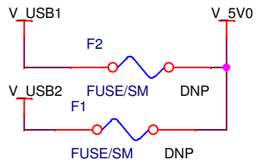



## USB current limiter



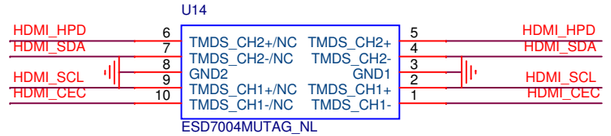

GPIO pin mapping -

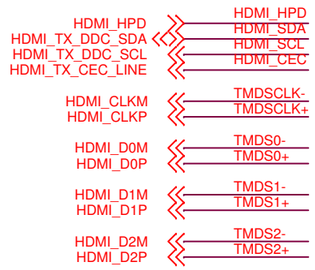
| Pin | GPIO |
|---|---|
| OTG(ENA) | (3, 22) |
| H1(ENB) | (1, 0) |

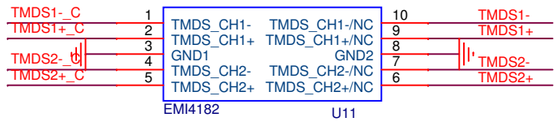


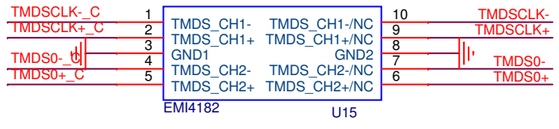

## HDMI Out

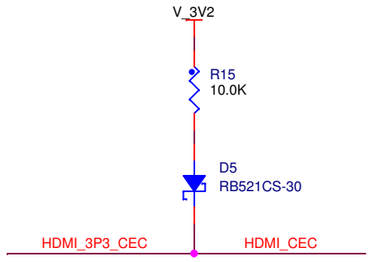
ESD protection and common mode chocke for differential lines.
Notice that EMI analysis with HummingBoard shows that common mode chockes are not needed and can be safely replaced by only ESD protection devices.

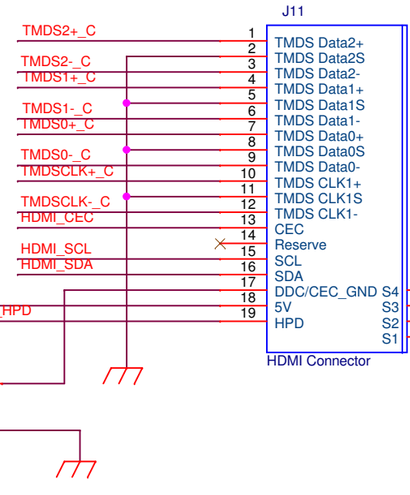


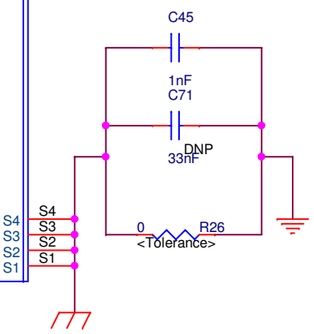



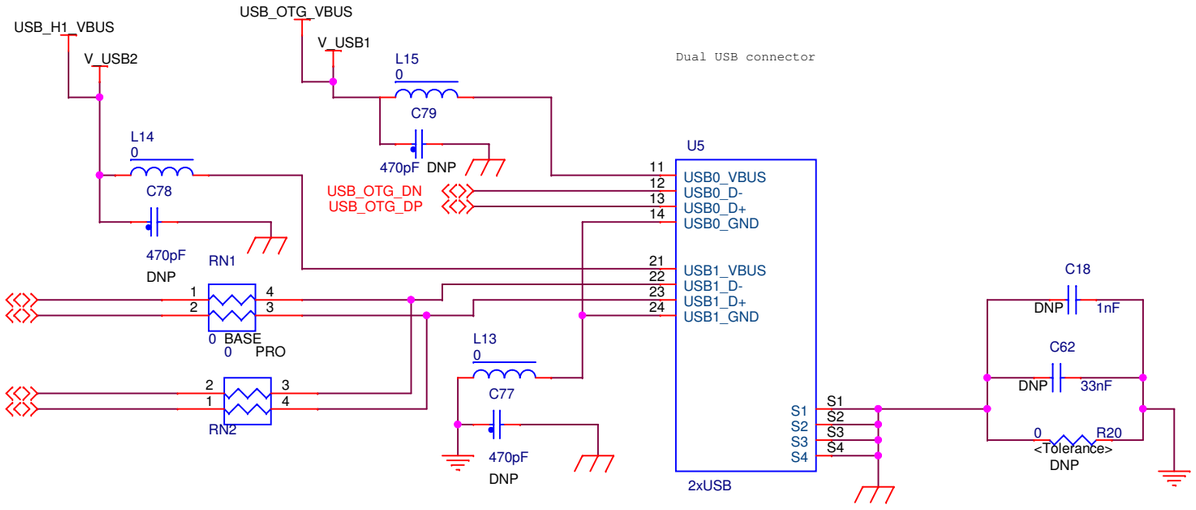



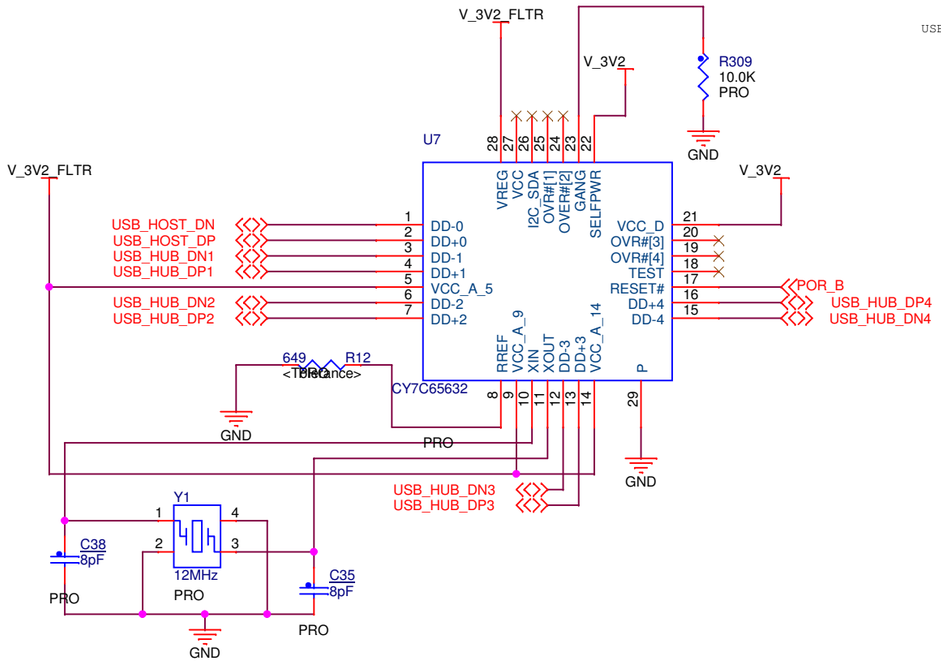



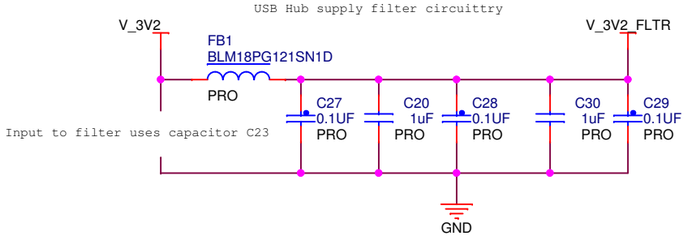




## Dual USB connector

## USB Hub




## USB Hub supply filter circuittry



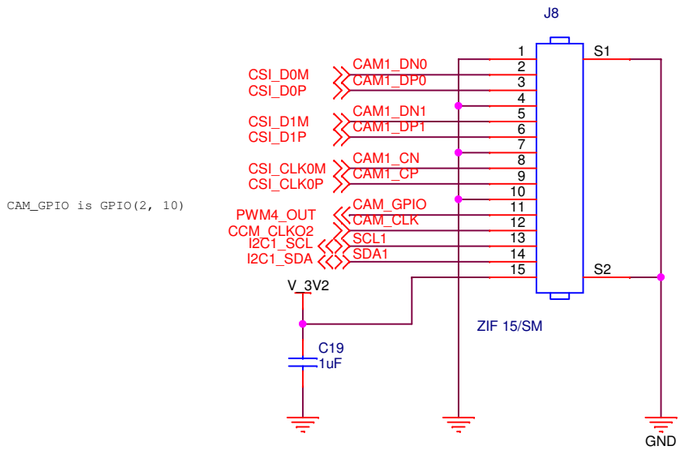

Input to filter uses capacitor C23

Four of the following 4x0.1 are for pins 9 and 14



| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - HDMI and USB | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 3 of 6 | |

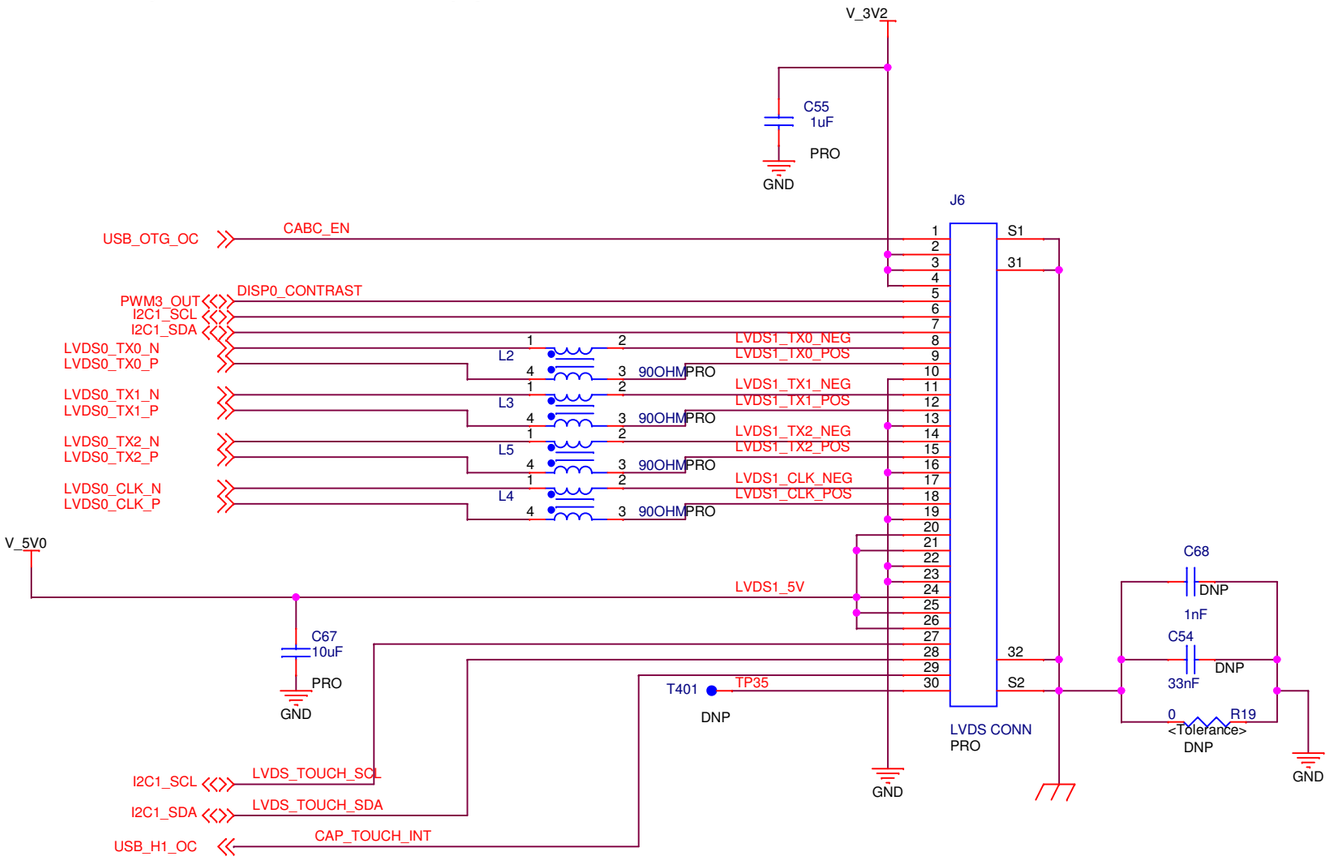
MIPI CSI-2 serial interface




CAM_GPIO is GPIO(2, 10)

LVDS out

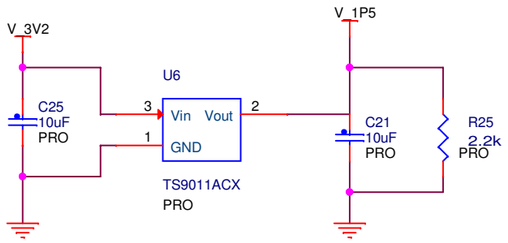
Since there isn't a standard LVDS out connector,
this design uses the Freescale Sabre SD LVDS display.



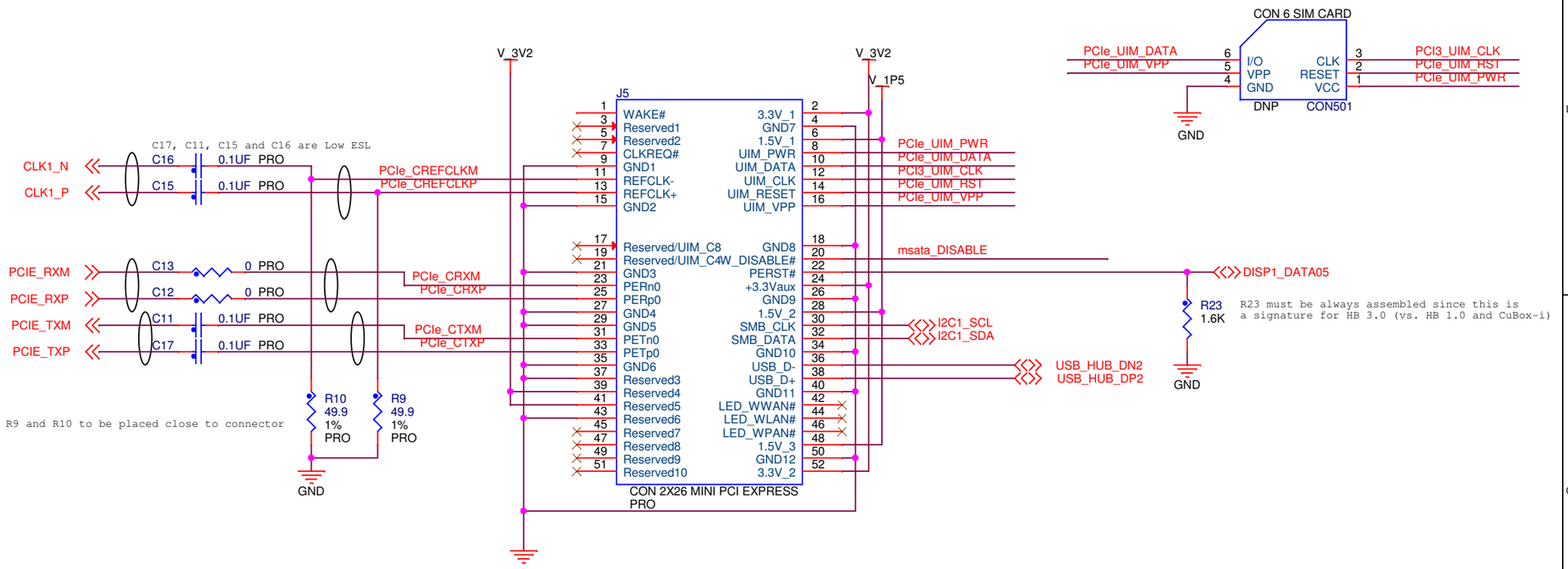



| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - LVDS display out and MIPI CSI2 | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 4 of 6 | |

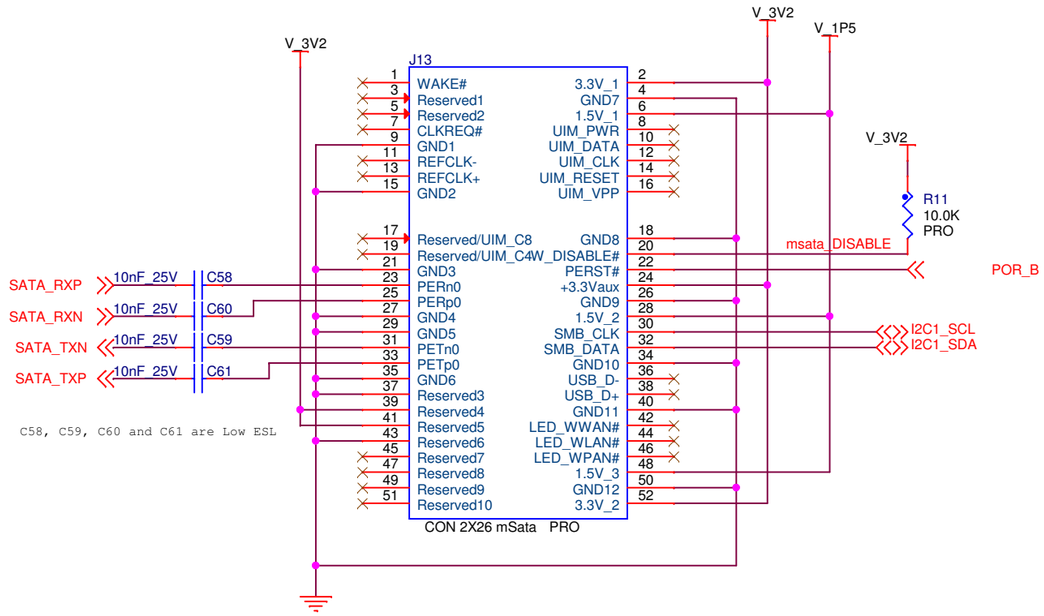
3.3v to 1.5v LDO (for mini pci express)



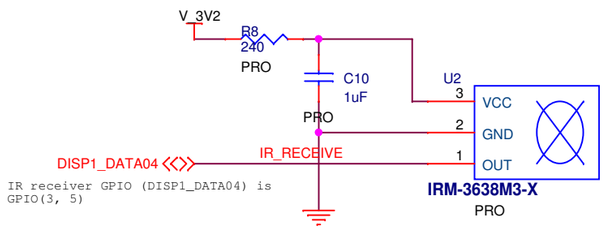

Half size mini PCI express with optional sim card



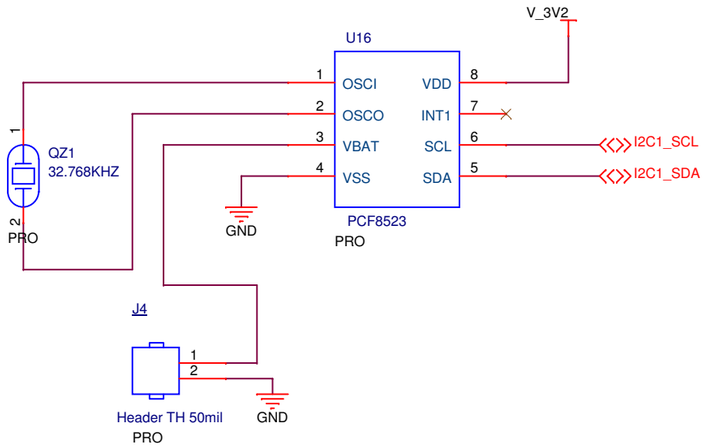

msata (pro and can be used by i.MX6D and i.MX6Q)




Infra red receiver



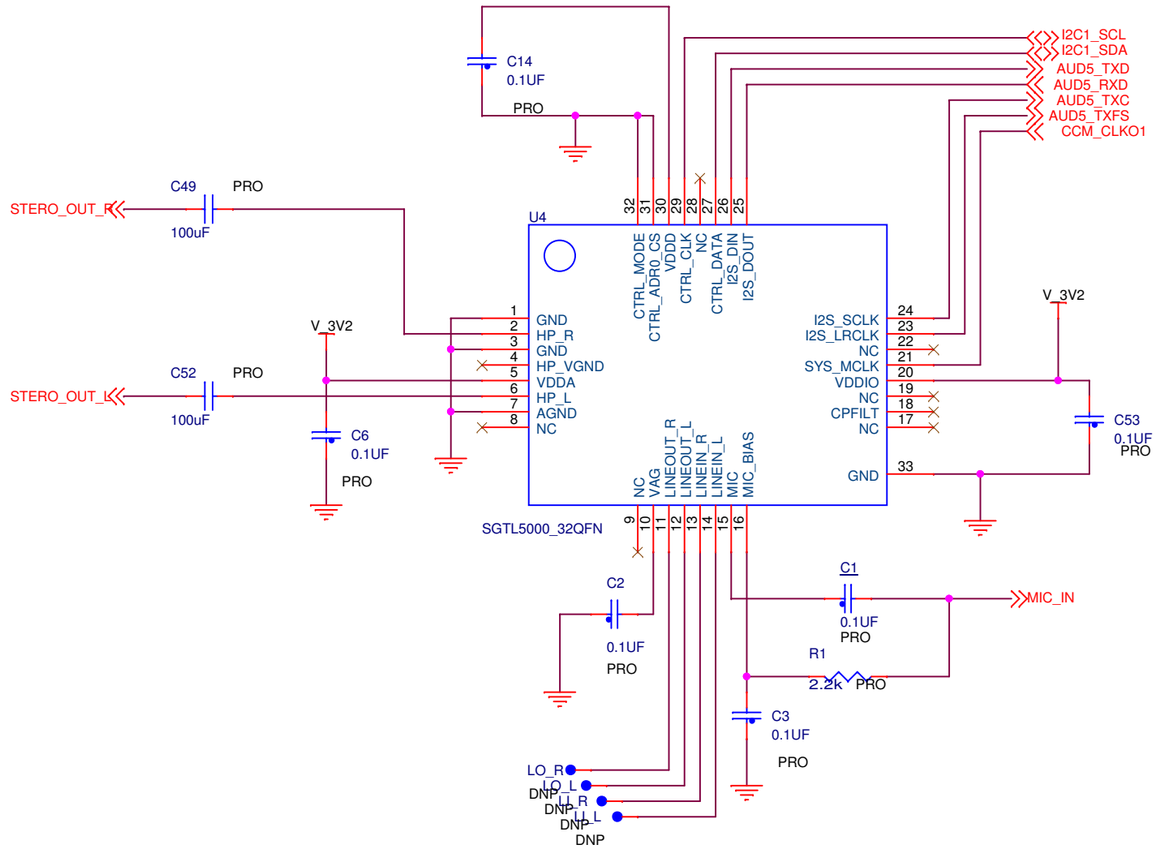

Real time clock (pro)



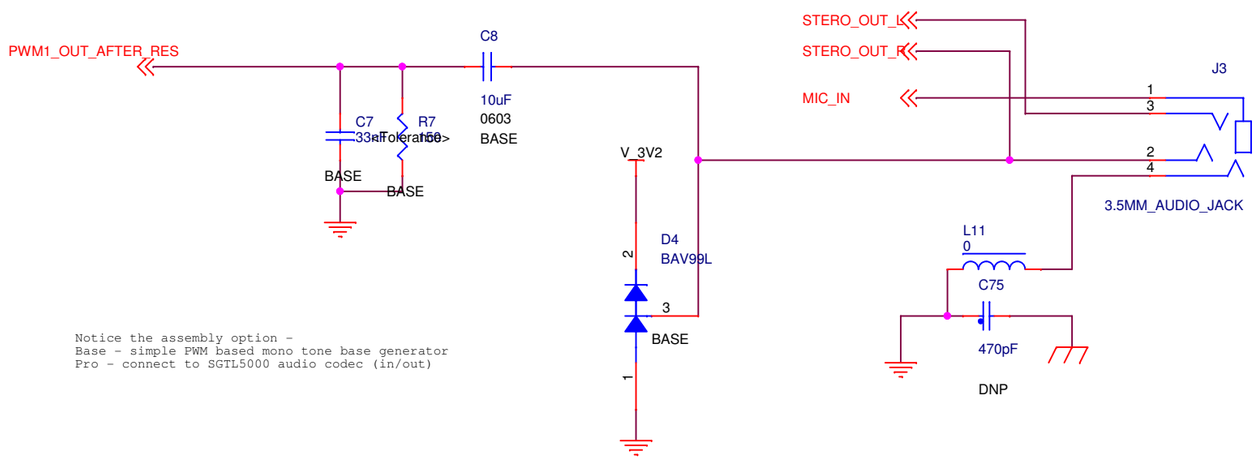



| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - mini pcie, mSata, Infra red and RTC | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 5 of 6 | |

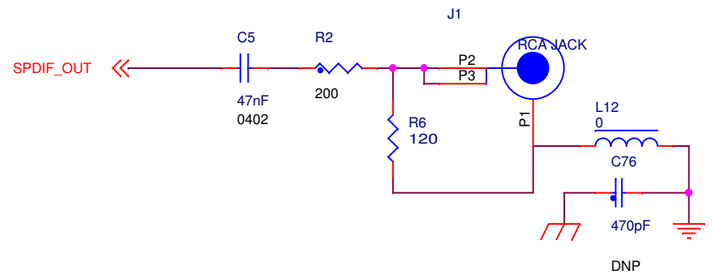
## SGTL5000 audio codec




## Audio in/out connector




## Coax S/PDIF out






| Size | Title | Rev |
|---|---|---|
| A3 | HummingBoard - Analog and digital audio | 3.0 |
| Date: Monday, June 23, 2014 | Sheet 6 of 6 | |