iMX6 Rex Development Baseboard

Variant: Prototype

12/3/2013
V1I1

REALEASED 03-DEC-2013

DESIGN CONSIDERATIONS

DESIGN NOTE:
Example text for informational design notes .

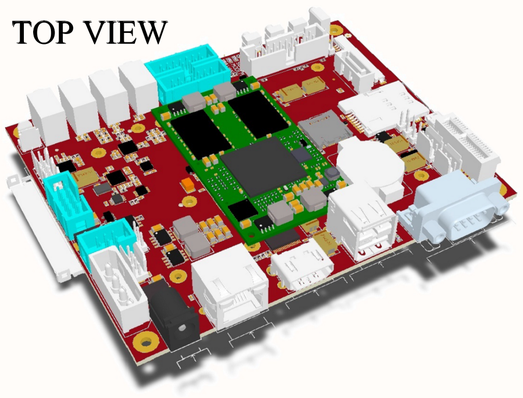
DESIGN NOTE:
Example text for cautionary design notes.

DESIGN NOTE:
Example text for debug notes.

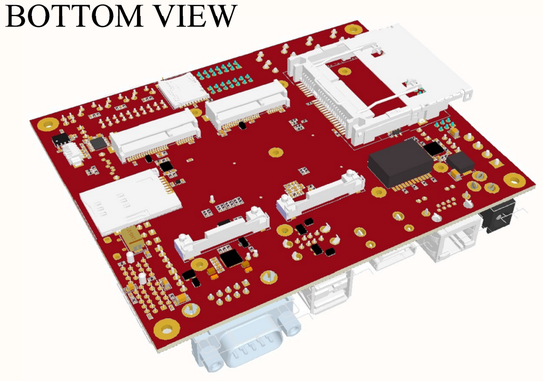
DESIGN NOTE:
Example text for critical design notes.

LAYOUT NOTE:
Example text for critical layout guidelines.

TOP VIEW



BOTTOM VIEW



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iMX6 Rex Development Baseboard

(Block Diagram)

Page 17 — Input power Jack (7~24V DC)

Page 17 — ATX Connector (Optional) — +I2V

Page 16 — DC / DC Regulator +5V, +3.3V — +3V3, +5V

(OPTIONAL +5V POWER FOR HDD)

+3V3 — POWER LED (GREEN)

+3V3 — USER LED (RED)

ON / OFF

RESET Button

User Button

Page 15 — System Header — ON/OFF, RST_IN, RST_OUT, CPU_INT, USR_BUT, LEDS; GPIO6.7

Page 10 — RJ45 1Gb Ethernet

Page 10 — Magnetics

Page 07 — HDMI Connector

Page 07 — HDMI Port Protection — 1x I2C2

Page 12 — Micro SD1 socket

Page 13 — RS232 - DB9 (COM1)

Page 13 — RS232 Transceiver

Page 9 — USB OTG - Micro AB (Optional) — USB0

Page 9 — USB A connector

Page 9 — USB A connector

Page 9 — USB Host on Header

Page 9 — USB0 Hub — USB0

Page 5 — PCIE Mini 2 - USB Only (Support for modems)

Page 5 — SIM card socket

Page 5 — Modem Audio Codec (#2)

Page 5 — Microphone input

Page 5 — Line input

Page 5 — Modem Audio Amplifier

Page 5 — Speaker output - LEFT

Page 5 — Speaker output - RIGHT

iMX6 Rex Module

Page 3 — BOARD CONNECTOR 1

- ON/OFF, RST_IN, RST_OUT
- 1x SPI2
- RGMII
- 1x HDMI
- 1x SD card (SD3)
- 1x full UART1
- 1x USB OTG
- 1x I2C2
- TSC_INT, CPU_INT

Page 3 — BOARD CONNECTOR 2 (Optional)

- Digital audio, I2C1
- 1x MMC card (SD2)
- 1x SATA
- 1x PCIE
- 1x USB HOST
- 1x UART2
- 1x LVDS0
- JTAG
- 1x I2C3

Page 14 — RTC

Page 14 — EEPROM

TSC_INT

Page 14 — Touch screen controller

Page 14 — I2C GPIO Expander

Page 14 — Battery

Page 14 — Touch screen Header

Page 15 — GPIO Header

Page 11 — Audio Codec (#1)

Page 11 — Microphone input - Jack

Page 11 — Line input - Jack

Page 11 — Line output - Jack

Page 11 — Headphones - Jack

+3V3 — uSD2 ACTIVITY LED (RED)

Page 12 — Micro SD2 socket

Page 6 — SATA Connector (Optional) — SATA

Page 6 — CFAST Socket — SATA

Page 4 — x1 PCI Express Slot (Optional) — PCIE

Page 4 — PCIE Mini 1 — PCIE, USB1

Page 9 — USB HOST - Header (Optional) — USB1

Page 13 — Serial port - CMOS (COM2)

Page 8 — LVDS Connector

Page 14 — Backlight header

Page 15 — JTAG

http://www.iMX6Rex.com

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CONNECTORS

DESIGN NOTE:
Input voltage for module (VIN): from +7 to +24V (DC)

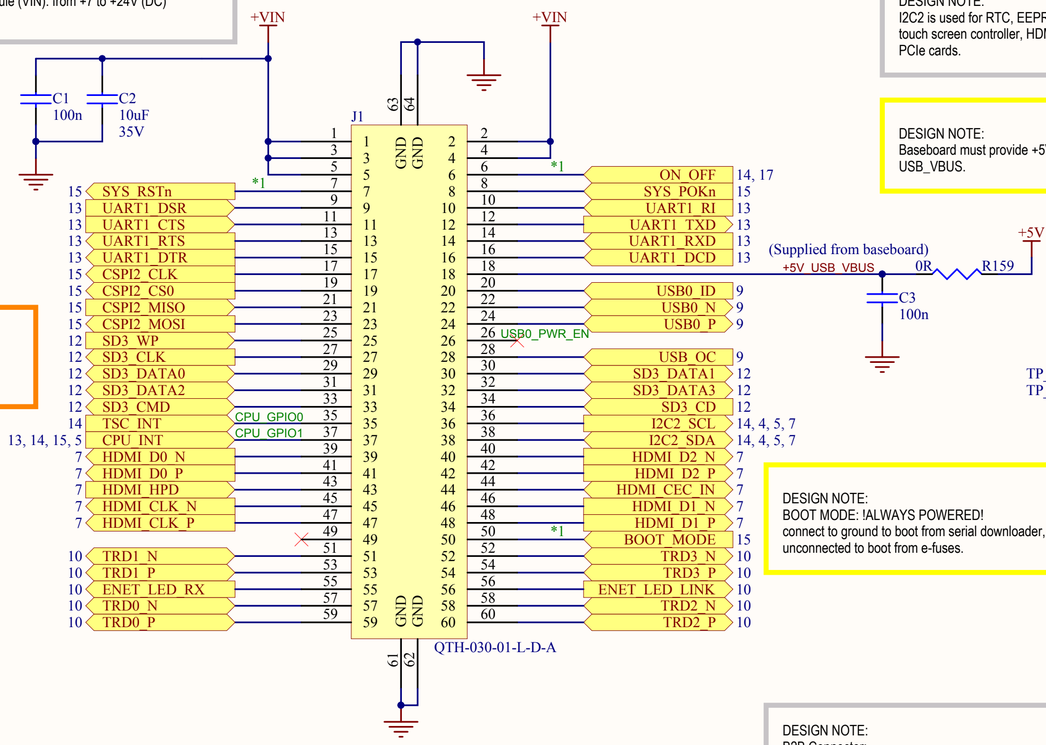
DESIGN NOTE:
*1 Be careful during debugging phase - this pin is connected to +3V0_ALWAYS.

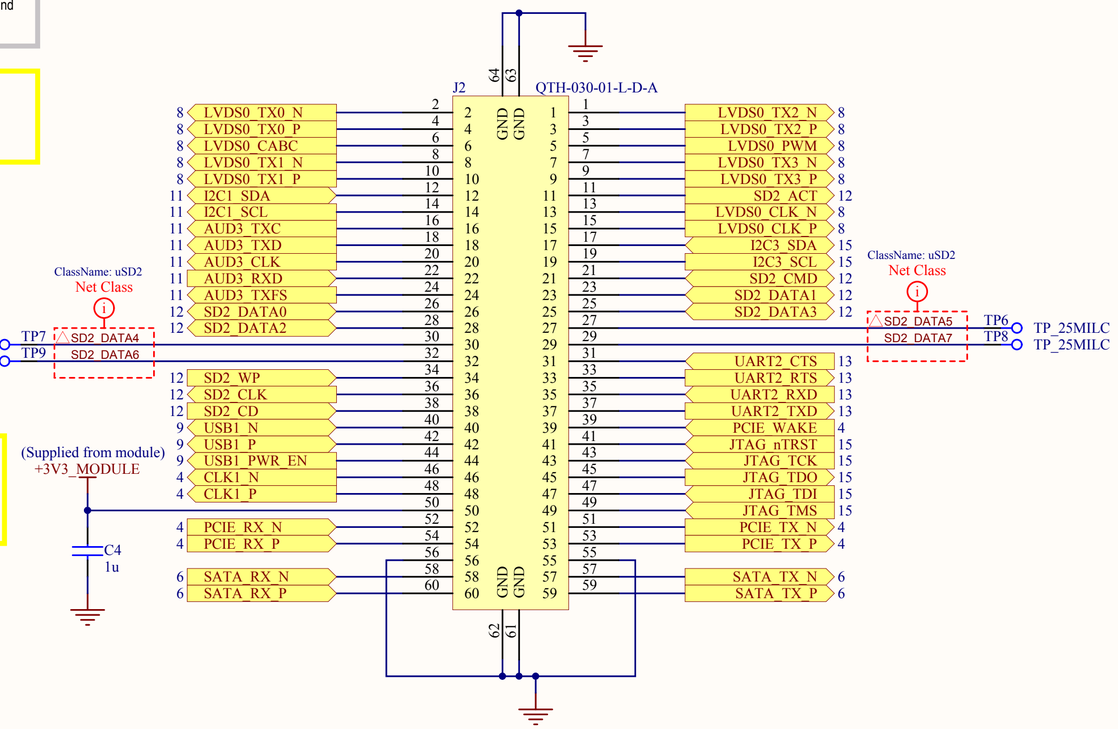
DESIGN NOTE:
I2C1 is used with AUDIO

DESIGN NOTE:
I2C2 is used for RTC, EEPROM, IO expander, touch screen controller, HDMI, Audio2 and PCIe cards.

DESIGN NOTE:
Baseboard must provide +5V for USB_VBUS.

DESIGN NOTE:
BOOT MODE: !ALWAYS POWERED!
connect to ground to boot from serial downloader, left unconnected to boot from e-fuses.





DESIGN NOTE:
B2B Connector:
1.0A per contact, 7.8A ground plane

DESIGN NOTE:
+3V3_Module is supplied from the module. Max. 1A

DESIGN NOTE:
If required, use Pin 49 on Connector 1 for Ethernet Tap Voltage.

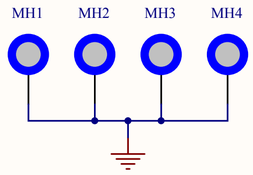
LAYOUT NOTE:
Distance between connector J1 and mounting hole MH3 (On module MH3 near Ethernet PHY):
X = 4.33mm
Y = 16.26mm

DESIGN NOTE:
Mating connector: QSH-030-01-L-D-A

http://www.digikey.com/product-detail/en/QSH-030-01-L-D-A/SAM8180-ND/1106524

LAYOUT NOTE:
Distance between connector J1 and mounting hole MH3 (On module MH3 near Ethernet PHY):
X = 34.73mm
Y = 16.26mm

Module Mounting Holes



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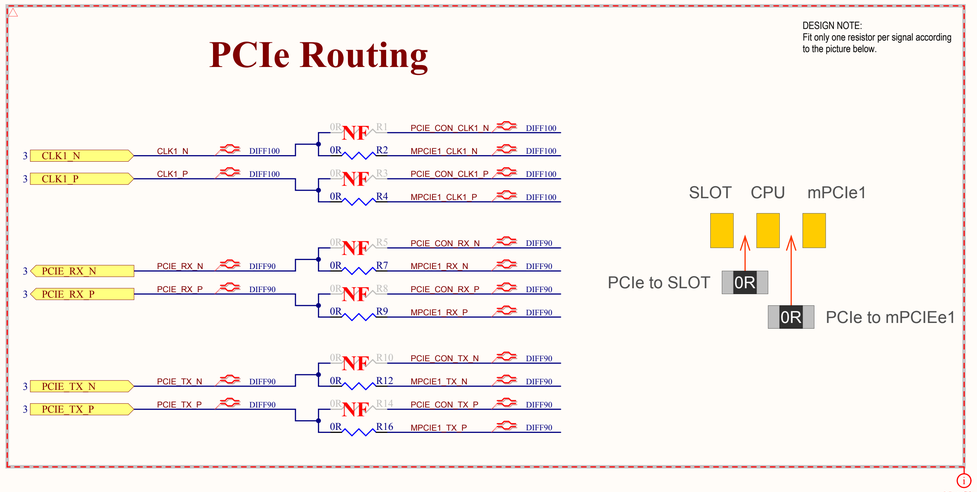
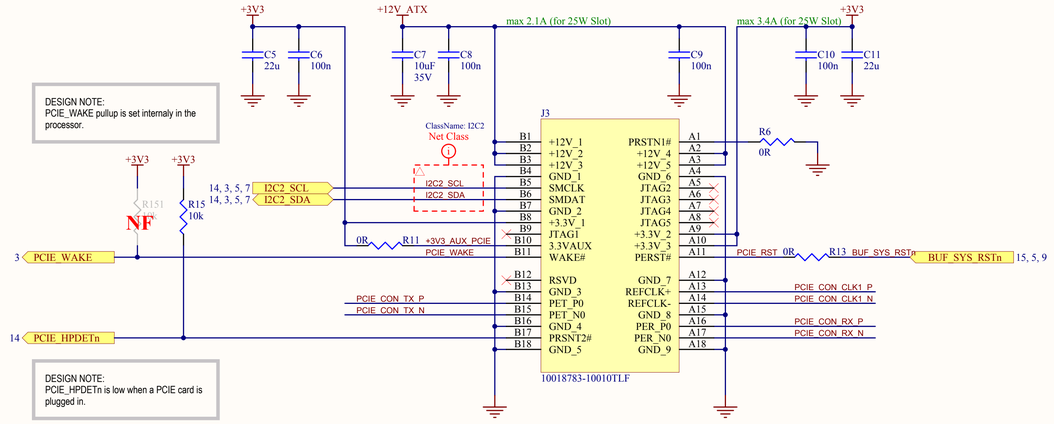
PCIE MINI 1, PCIE

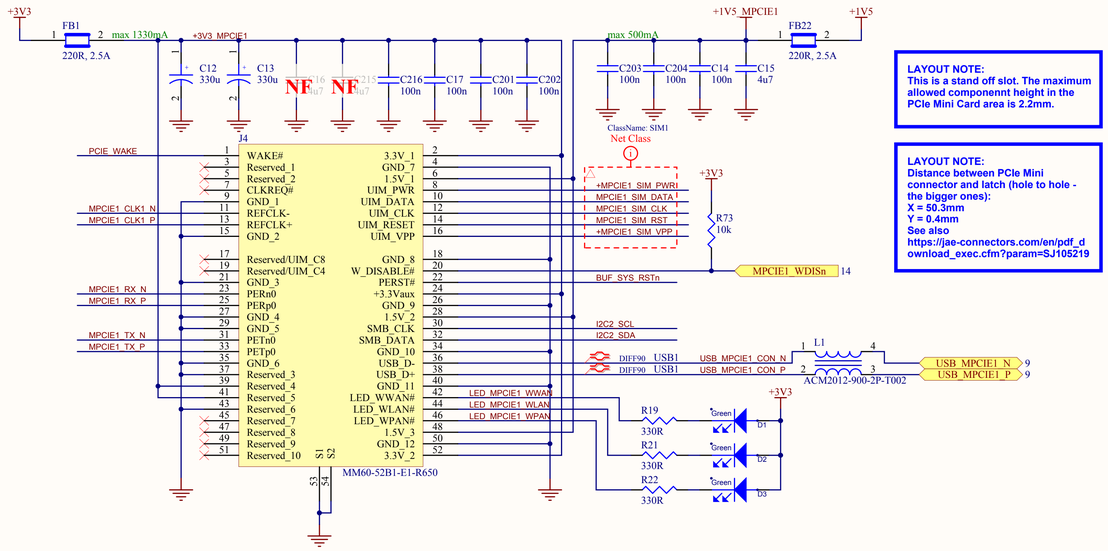
PCIe Routing



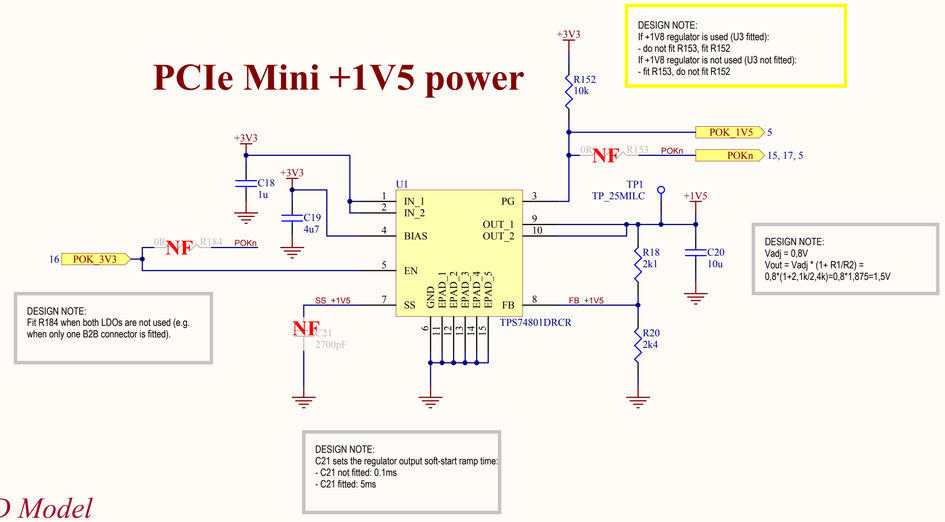
PCI Express Slot (Optional)



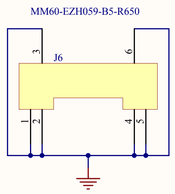
PCIe Mini 1



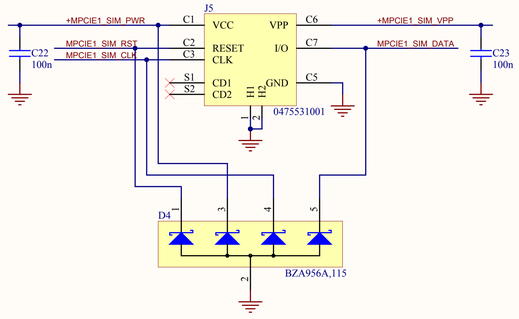
PCIe Mini +1V5 power



Card Latch for PCIe Mini 1



SIM card for PCIe Mini 1



PCIe Mini 1 Card for 3D Model

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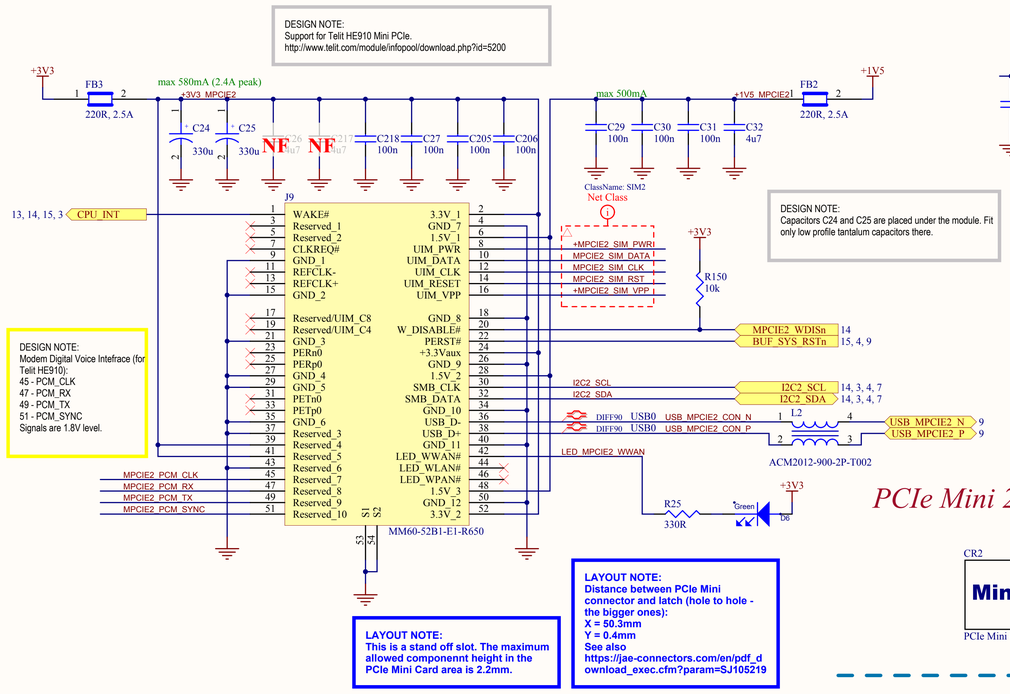
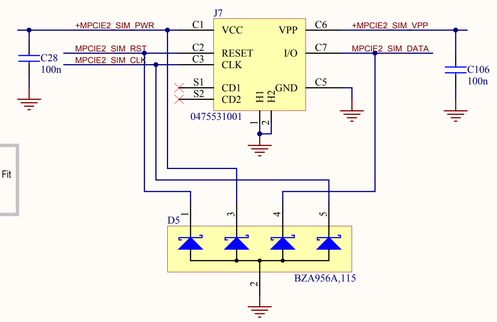
PCIE MINI 2, AUDIO2

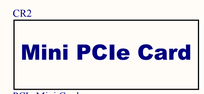
PCIe Mini 2 - USB only
(support for wireless modems e.g GSM, 3G, ...)



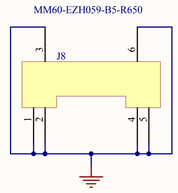
SIM card for PCIe Mini 2



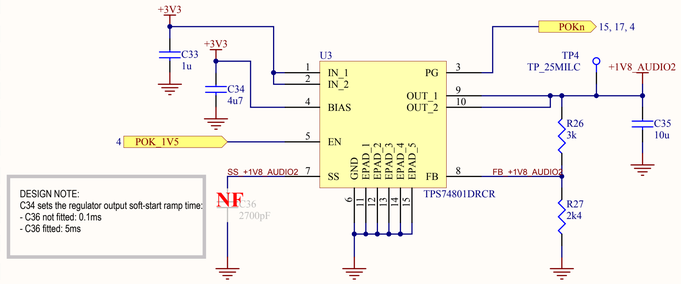
Card Latch for PCIe Mini 2



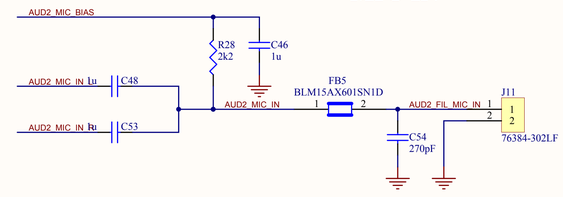
PCIe Mini 2 Card for 3D Model



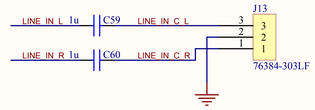
Audio2 +1V8 power



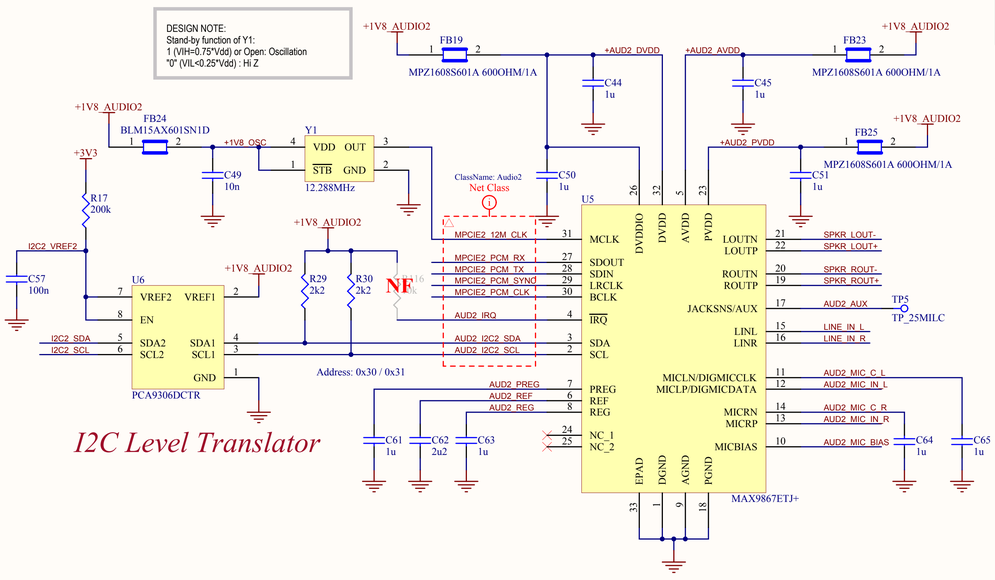
MIC IN

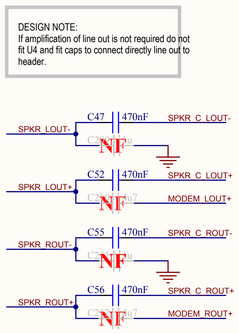


LINE IN

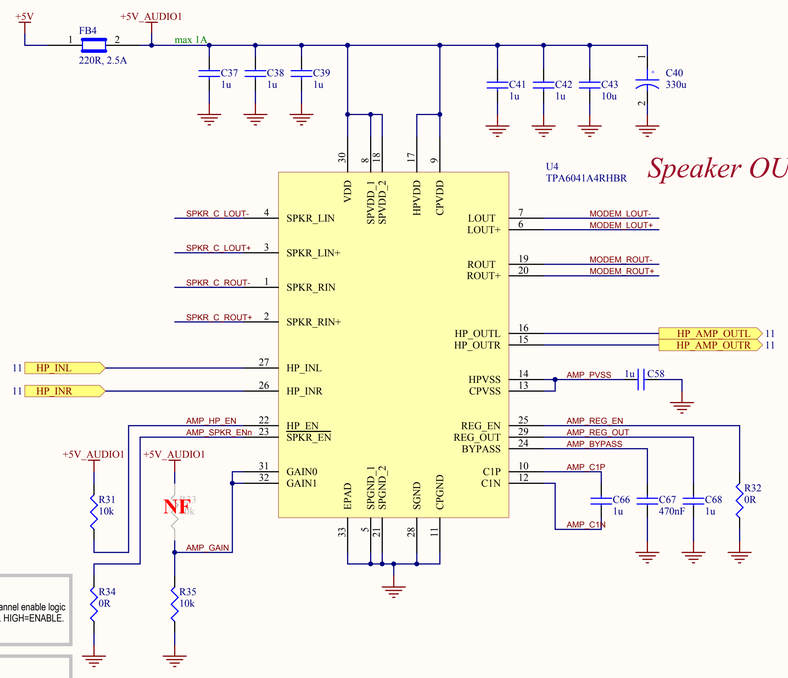


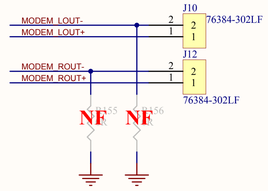
Audio 2
(support for wireless modem voice output / input)





Audio Amplifier





DESIGN NOTE:
HP_EN - Headphone channel enable logic input; active high enable. HIGH=ENABLE.

DESIGN NOTE:
#SPKR_EN - Speaker channel enable logic input; active low enable. LOW=ENABLE.

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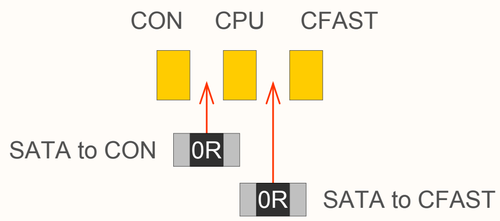
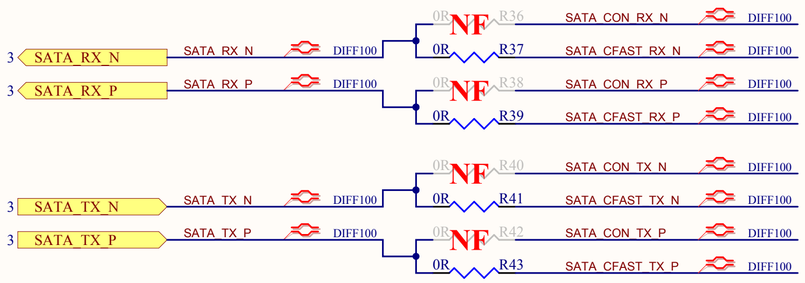
SATA, CFAST

SATA Routing

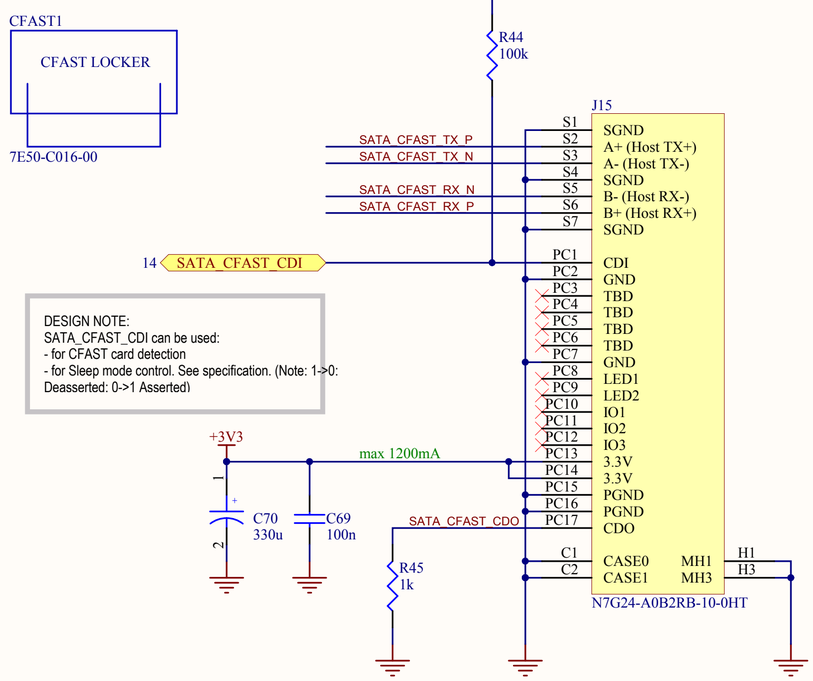
DESIGN NOTE:
Fit only one resistor per signal according to the picture below.



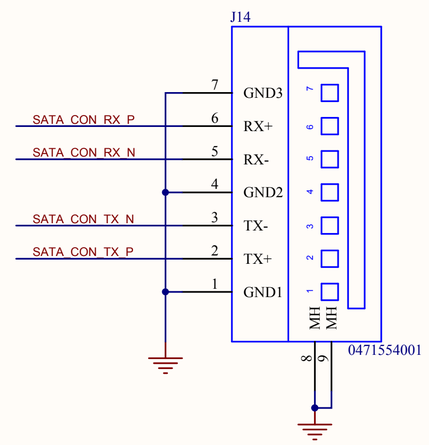


Net Class
ClassName: SATA

CFAST



SATA



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HDMI

DESIGN NOTE:
If TPD12S521 (a different chip) is used as HDMI protection replace R46 0R resistor with 10k.

+3V3
R46
0R
+3V3_HDMI
C72
100n
+5V
C71
100n
+5V_HDMI_CON
C73
100n
C74
100n

U7
CM2020-00TR

3	HDMI_D2_P	HDMI_D2_P	DIFF100	4	TMDSI_D2+
				5	TMDS_GND_1
3	HDMI_D2_N	HDMI_D2_N	DIFF100	6	TMDSI_D2-
3	HDMI_D1_P	HDMI_D1_P	DIFF100	7	TMDSI_D1+
				8	TMDS_GND_2
3	HDMI_D1_N	HDMI_D1_N	DIFF100	9	TMDSI_D1-
3	HDMI_D0_P	HDMI_D0_P	DIFF100	10	TMDSI_D0+
				11	TMDS_GND_3
3	HDMI_D0_N	HDMI_D0_N	DIFF100	12	TMDSI_D0-
3	HDMI_CLK_P	HDMI_CLK_P	DIFF100	13	TMDSI_CK+
				14	TMDS_GND_4
3	HDMI_CLK_N	HDMI_CLK_N	DIFF100	15	TMDSI_CK-
3	HDMI_CEC_IN	HDMI_CEC_IN		16	CE_REMOTE_IN
14, 3, 4, 5	I2C2_SCL	I2C2_SCL		17	DDC_CLK_IN
14, 3, 4, 5	I2C2_SDA	I2C2_SDA		18	DDC_DAT_IN
3	HDMI_HPD	HDMI_HPD		19	HOTPLUG_DET_IN

Net Class
ClassName: HDMI

38	5V_OUT		
37	ESD_BYP		
36	GND_2		
35	TMDSO_D2+	HDMI_D2_P	1
34	TMDS_GND_8		2
33	TMDSO_D2-	HDMI_D2_N	3
32	TMDSO_D1+	HDMI_D1_P	4
31	TMDS_GND_7		5
30	TMDSO_D1-	HDMI_D1_N	6
29	TMDSO_D0+	HDMI_D0_P	7
28	TMDS_GND_6		8
27	TMDSO_D0-	HDMI_D0_N	9
26	TMDSO_CK+	HDMI_CLK_P	10
25	TMDS_GND_5		11
24	TMDSO_CK-	HDMI_CLK_N	12
23	CE_REMOTE_OUT	HDMI_CEC_CON	13
22	DDC_CLK_OUT	HDMI_SCL_CON	14
21	DDC_DAT_OUT	HDMI_SDA_CON	15
20	HOTPLUG_DET_OUT	HDMI_HPD_CON	16

HDMI_SCL_CON_R 0R R163
HDMI_SDA_CON_R 0R R164

Net Class
ClassName: HDMI

R47
15k
C108
100n

0R R162 NF

J16
47151-0001

1	D2+
2	D2 SHIELD
3	D2-
4	D1+
5	D1 SHIELD
6	D1-
7	D0+
8	D0 SHIELD
9	D0-
10	CK+
11	CK SHIELD
12	CK-
13	CE REMOTE
14	NC.14
15	DDC CLK
16	DDC DATA
17	GND
18	+5V
19	HP DET
MTG1	MTG1
MTG2	MTG2
MTG3	MTG3
MTG4	MTG4

+5V_HDMI_CON
R48
4k99
+5V_HDMI_CON
R49
4k99
+3V3
D7
BAT54HT1G
R50
27k

DESIGN NOTE:
E-DDC I2C Address 0x60
DDC2 I2C Address 0xA1

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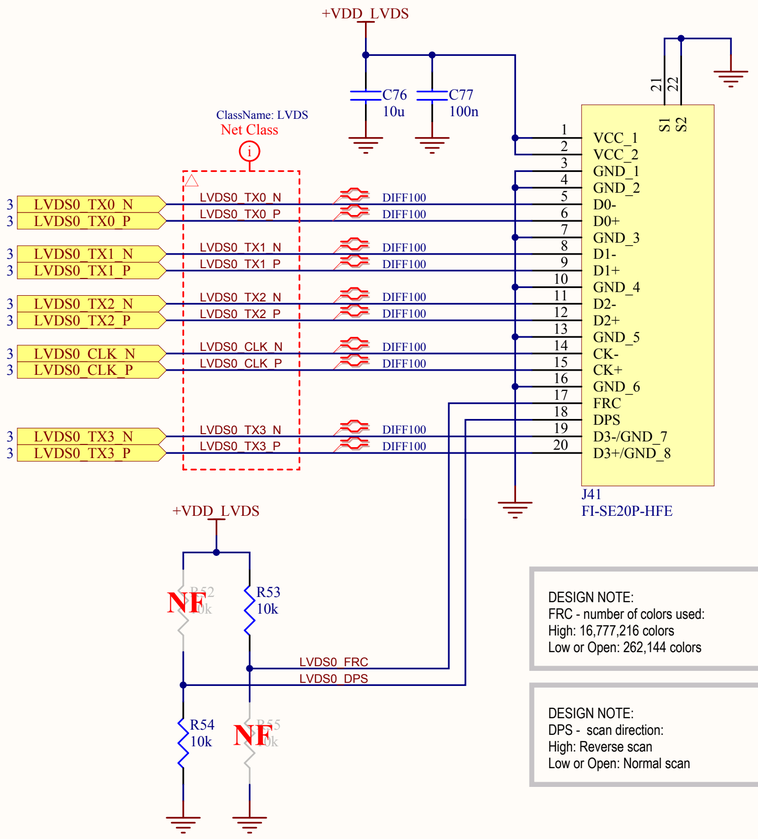
LVDS

LVDS Connector

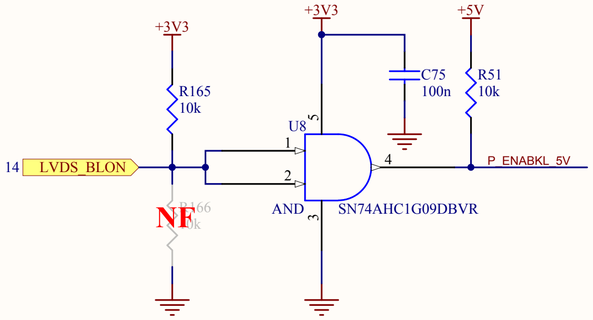


DESIGN NOTE:
FRC - number of colors used:
High: 16,777,216 colors
Low or Open: 262,144 colors

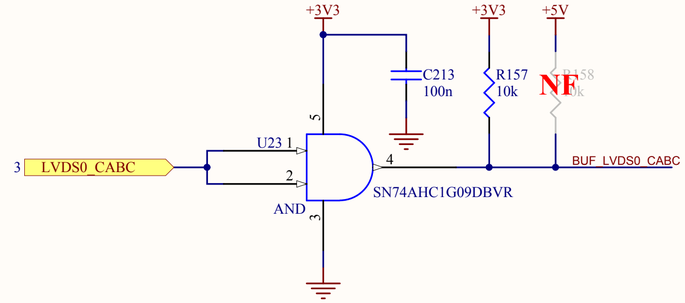
DESIGN NOTE:
DPS - scan direction:
High: Reverse scan
Low or Open: Normal scan

DESIGN NOTE:
Fit pullup to LVDS_BLON for prototype only. Once a software support is implemented, pull the LVDS_BLON to low by default.

Display enable

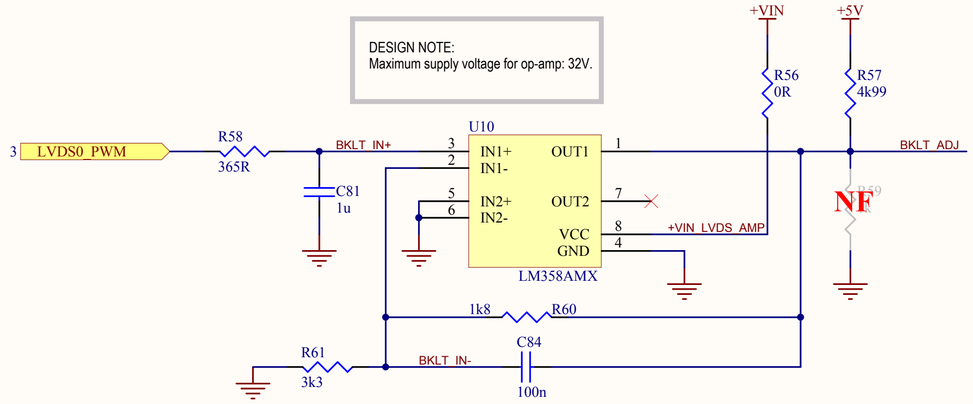


LVDS0 CABC buffer



Backlight adjustment

DESIGN NOTE:
Maximum supply voltage for op-amp: 32V.

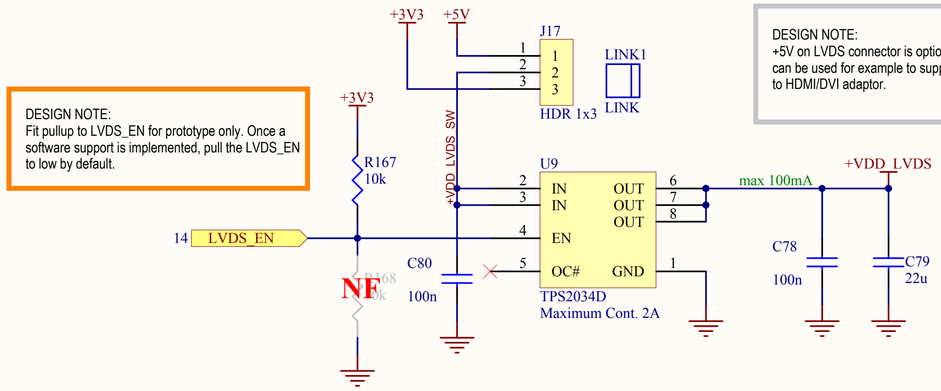


LVDS Switch

DESIGN NOTE:
Fit pullup to LVDS_EN for prototype only. Once a software support is implemented, pull the LVDS_EN to low by default.

DESIGN NOTE:
J17 default:
2-3: connect +VDD_LVDS_SW to +3V3.

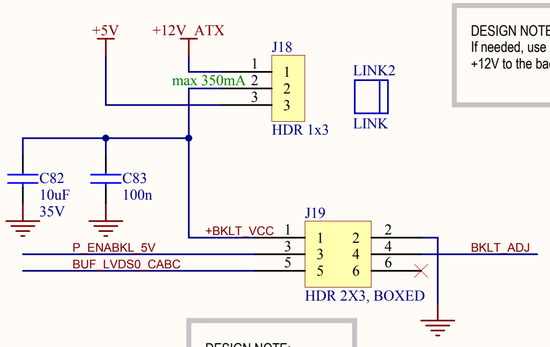
DESIGN NOTE:
+5V on LVDS connector is optional and can be used for example to supply a LVDS to HDMI/DVI adaptor.



Backlight connector

DESIGN NOTE:
J18 default:
Link 2-3: connect +BKLT_VCC to +5V

DESIGN NOTE:
If needed, use ATX connector to supply +12V to the backlight inverter.



DESIGN NOTE:
Max 2A per pin (use wire AWG #22).

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Size:	DWG NO	Revision: V1I1
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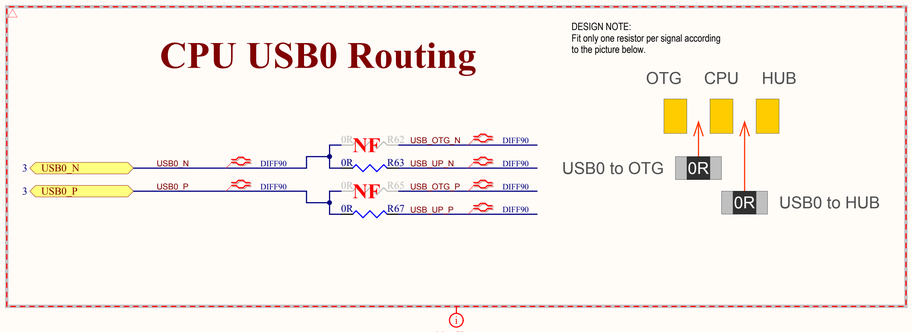
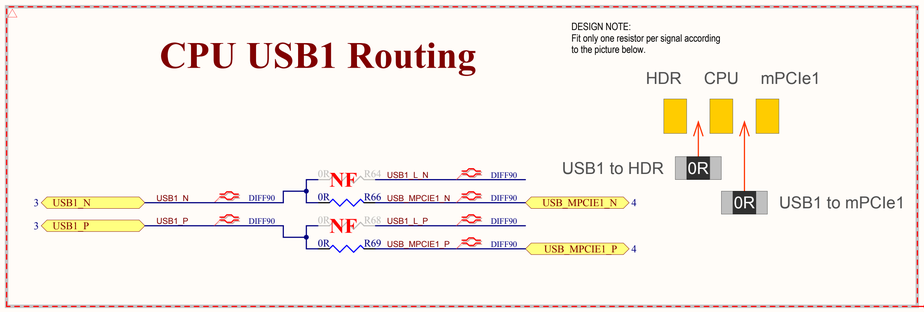
USB

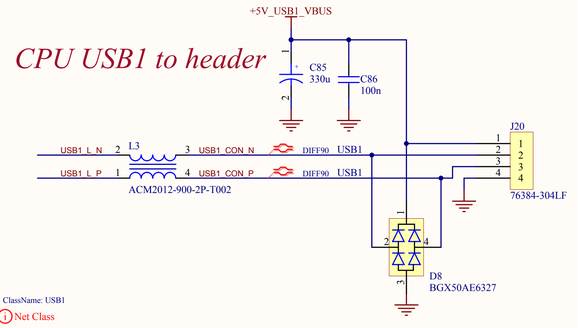
CPU USB0 Routing



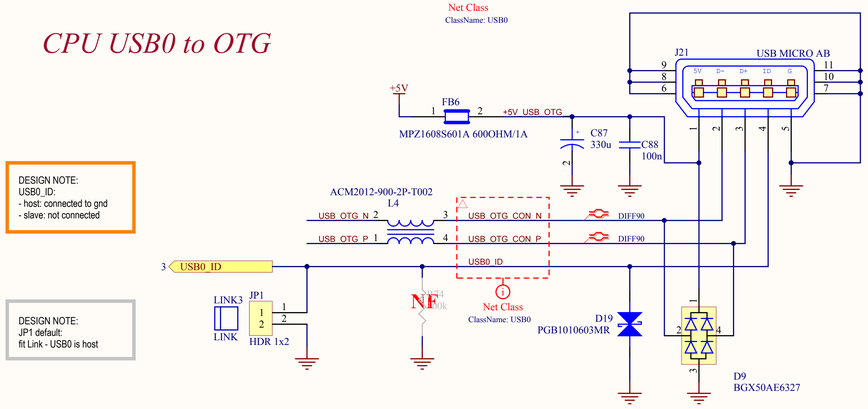
CPU USB1 Routing



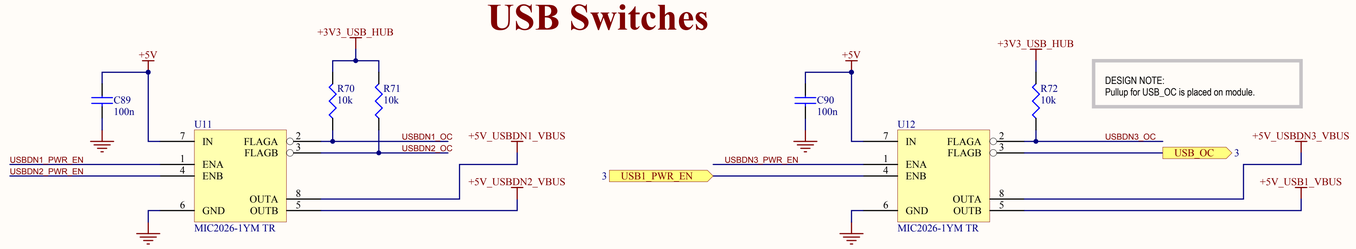
CPU USB1 to header



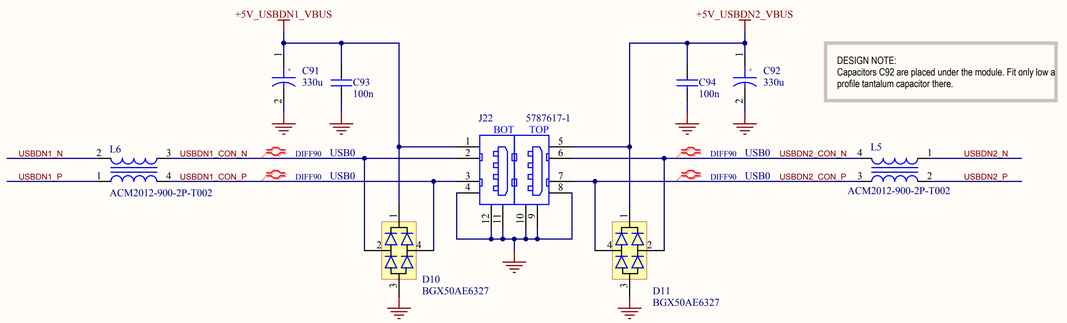
CPU USB0 to OTG



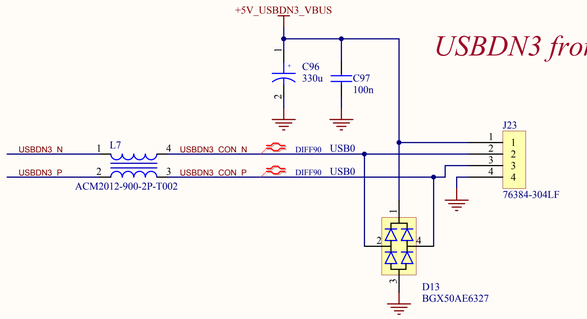
USB Switches



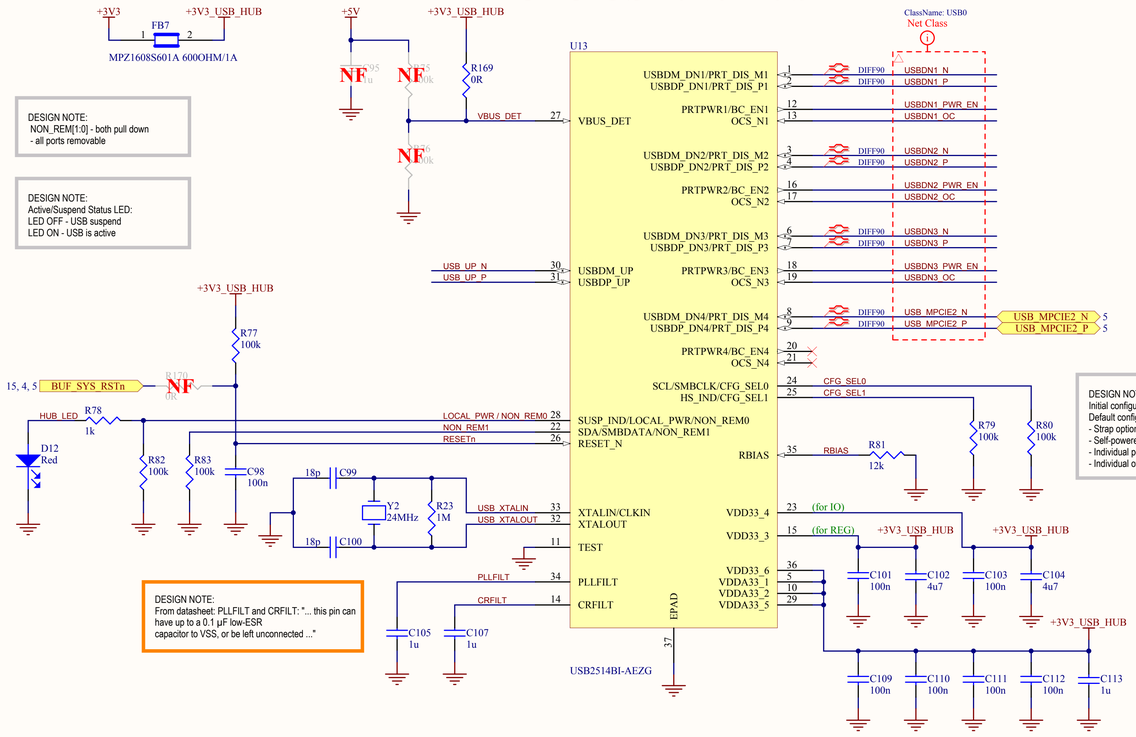
USBDN1 & USBDN2 from HUB



USBDN3 from HUB



CPU USB0 to Hub



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Page Contents:	[09] - USB.SchDoc	Checked by	
Size:	DWG NO		Revision: V111
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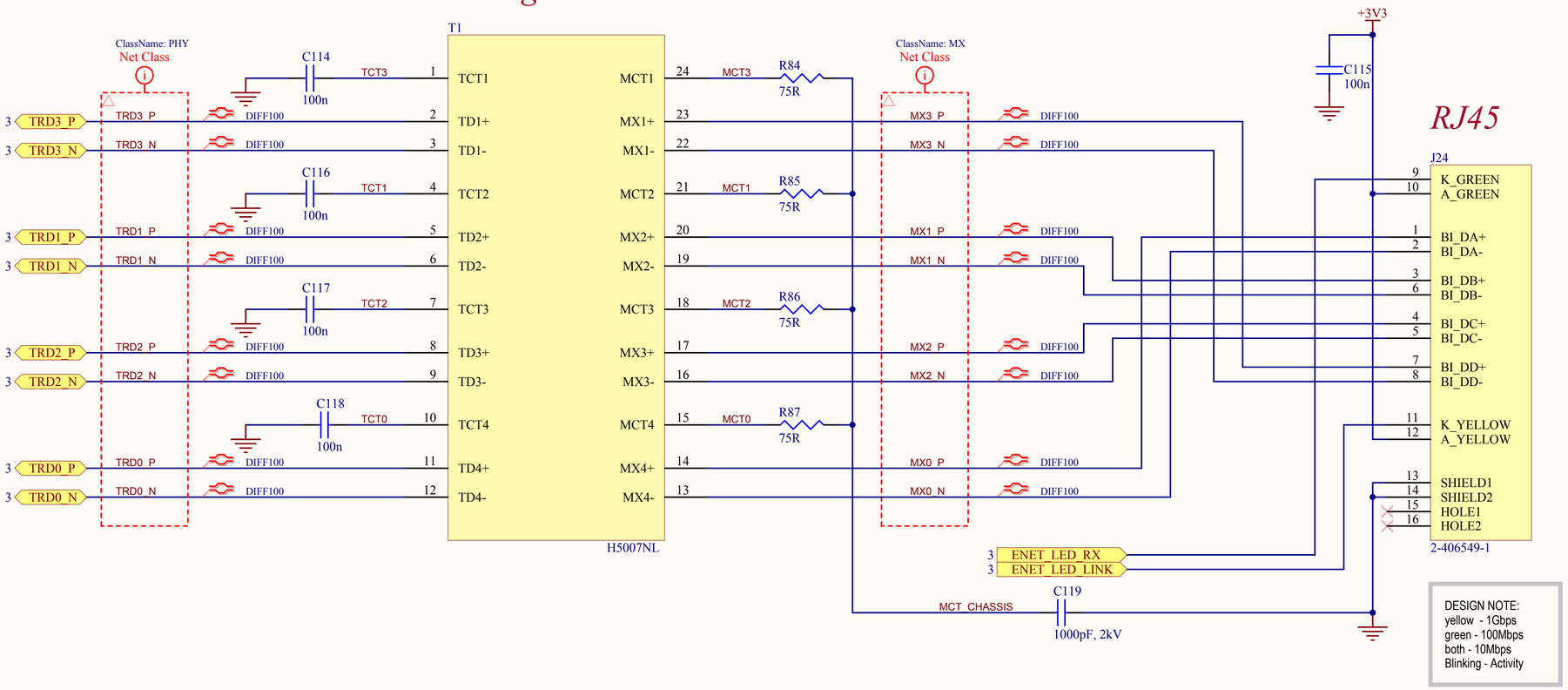
ETHERNET

Magnetics



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Title:	iMX6 Rex Development Baseboard	Variant: Prototype	
Page Contents:	[10] - ETHERNET.SchDoc	Checked by	
Size:	DWG NO		Revision: V1I1
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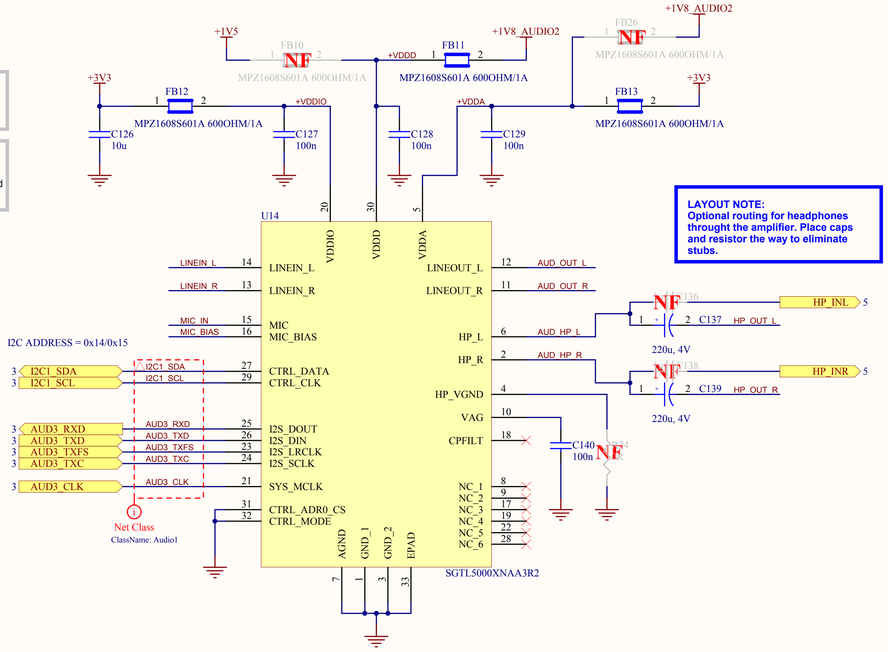
AUDIO1

AUDIO CODEC
(System audio connected to CPU)

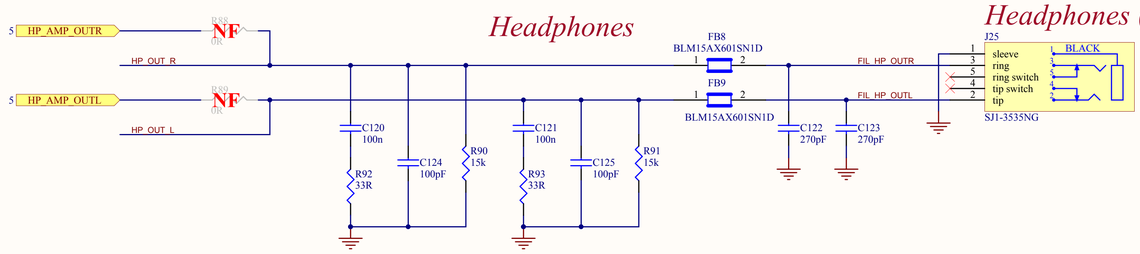
DESIGN NOTE:
External VDDD is required.

DESIGN NOTE:
If either VDDIO or VDDA is above 3V, the CPFILT pin must not be connected to capacitor.



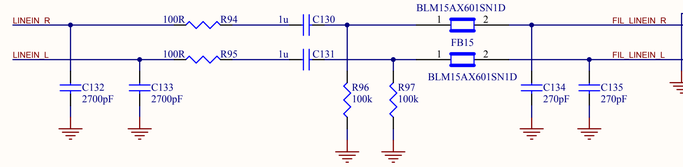
LAYOUT NOTE:
Optional routing for headphones throught the amplifier. Place caps and resistor the way to eliminate stubs.

Headphones

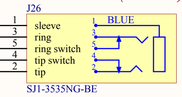


Headphones (Black)

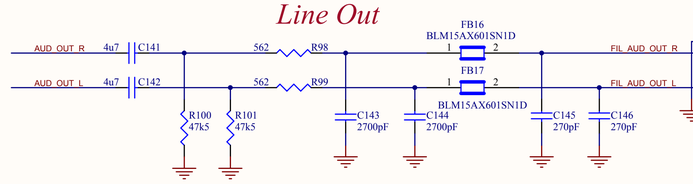
Line In



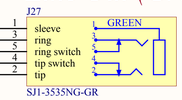
Line In (Blue)



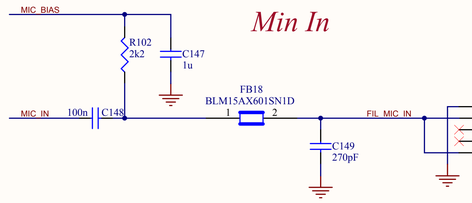
Line Out



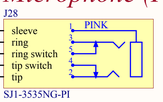
Line Out (Green)



Min In

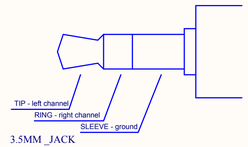


Microphone (Pink)



DESIGN NOTE:
Source for the audio filters is
http://www.cirrus.com/en/pubs/rdDatasheet/CDB4207_DB1.pdf

3.5mm jack reference



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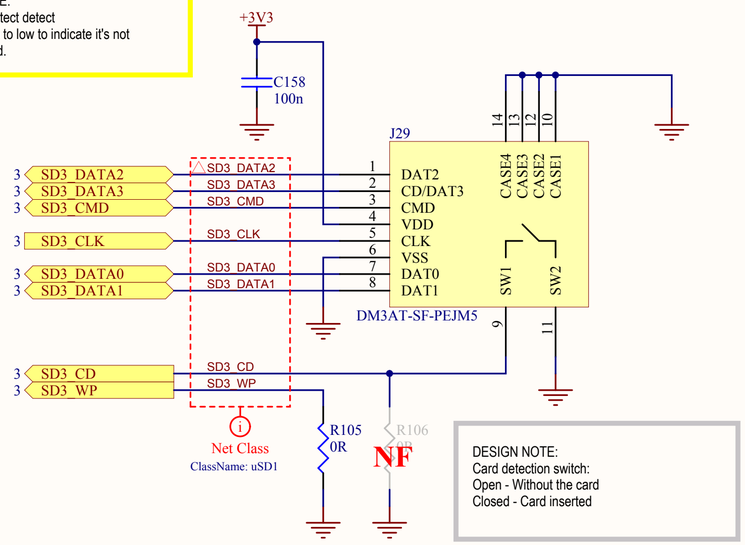
SD CARDS

Micro SD1

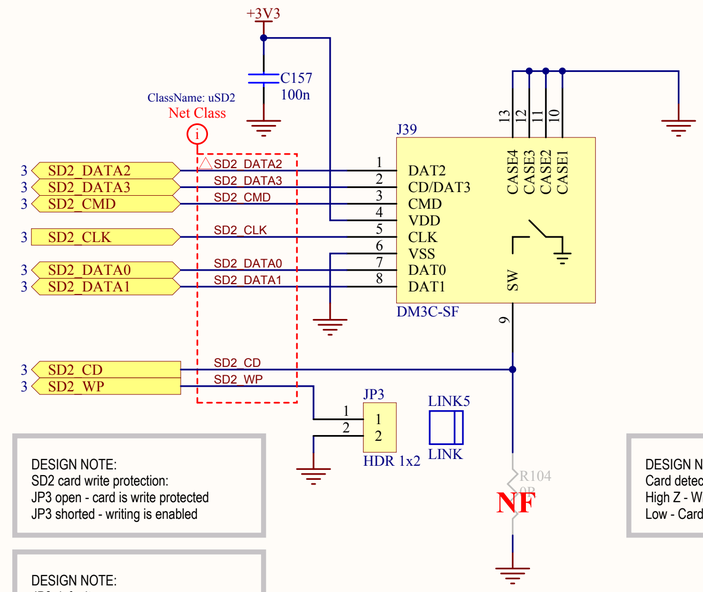
DESIGN NOTE:
Card detection pin:
If not used,tie to low to indicate there is a card attached.

DESIGN NOTE:
Card write protect detect
If not used, tie to low to indicate it's not write protected.



DESIGN NOTE:
Card detection switch:
Open - Without the card
Closed - Card inserted

Micro SD2
(intended to use for OS storage)

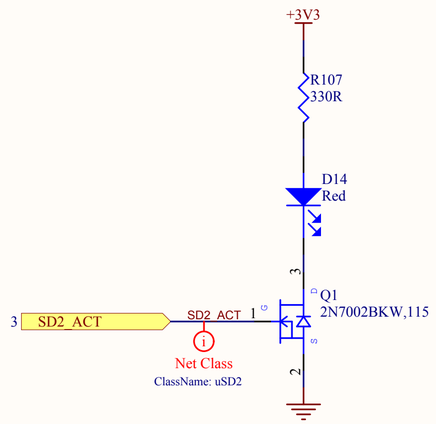


DESIGN NOTE:
SD2 card write protection:
JP3 open - card is write protected
JP3 shorted - writing is enabled

DESIGN NOTE:
JP3 default:
fit Link - card is not write protected

DESIGN NOTE:
Card detection switch:
High Z - Without the card
Low - Card inserted

uSD2 Activity LED



DESIGN NOTE:
In case you need to use an On Board NAND FLASH Memory, connect MTFC32GJVED-4M.

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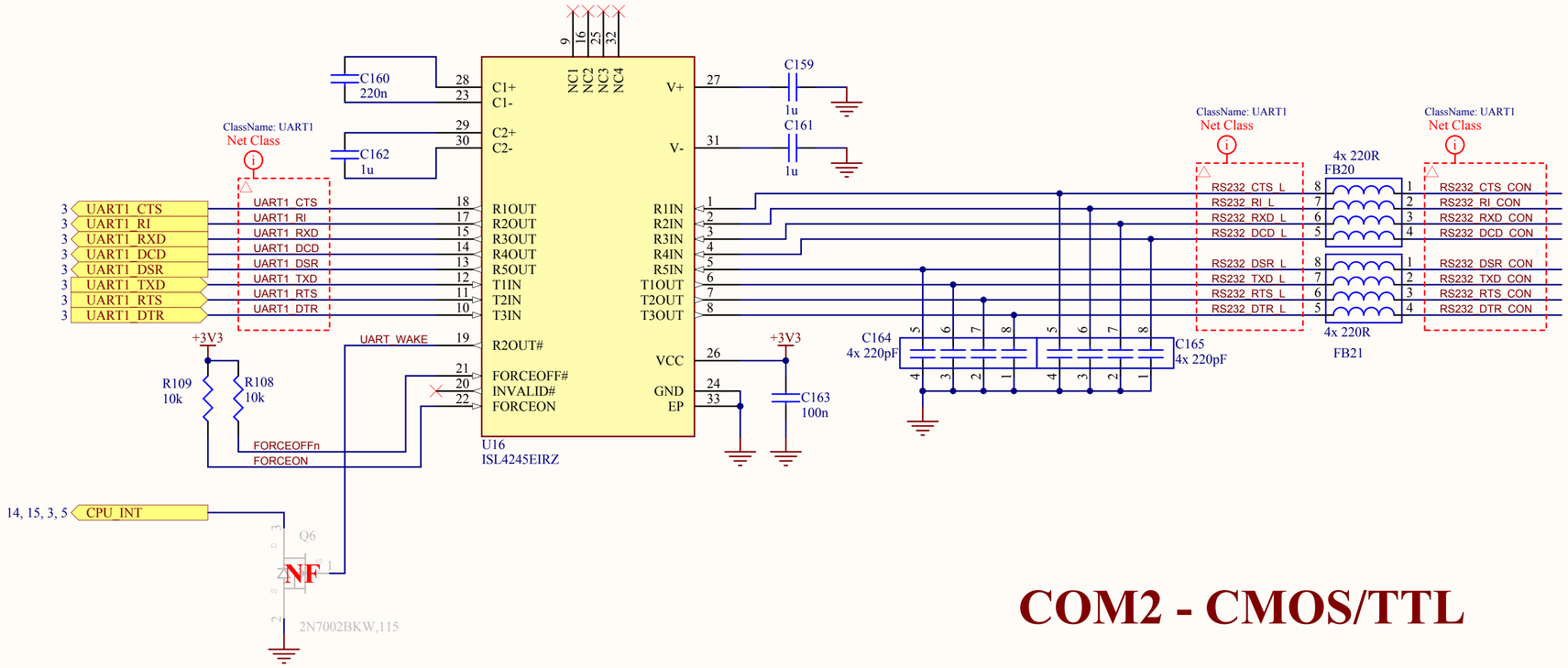
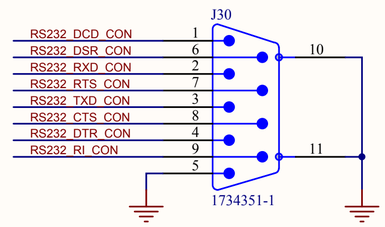
UARTS

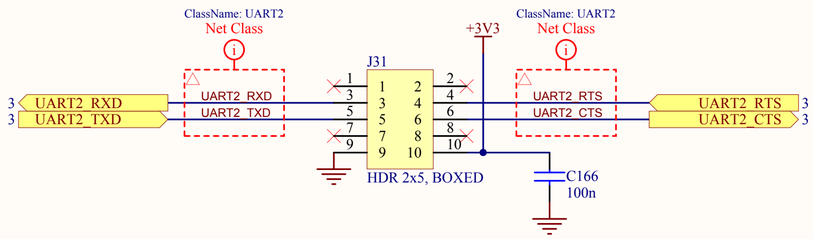
RS232 Transceiver



COM1 - RS232



COM2 - CMOS/TTL



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Title:	iMX6 Rex Development Baseboard	Variant: Prototype	
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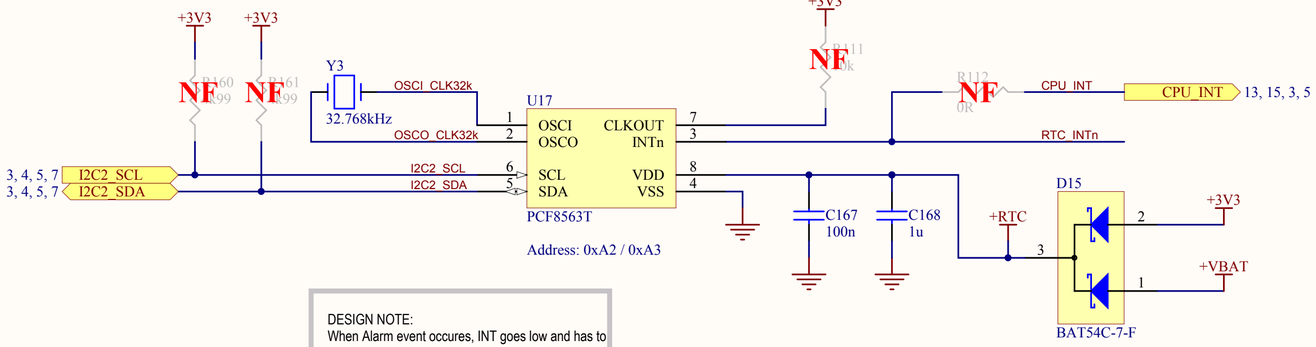
RTC, EEPROM, GPIO, TOUCH SCREEN

RTC Clock

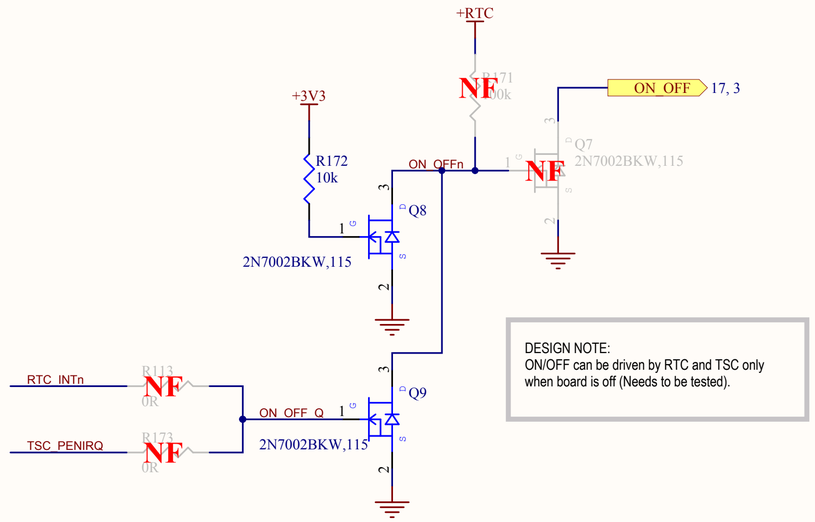
DESIGN NOTE:
Fit optional pullups fo I2C2 when there is a need for lower pullup value.

LAYOUT NOTE:
Place optional pullup resistor to the end of I2C lines.



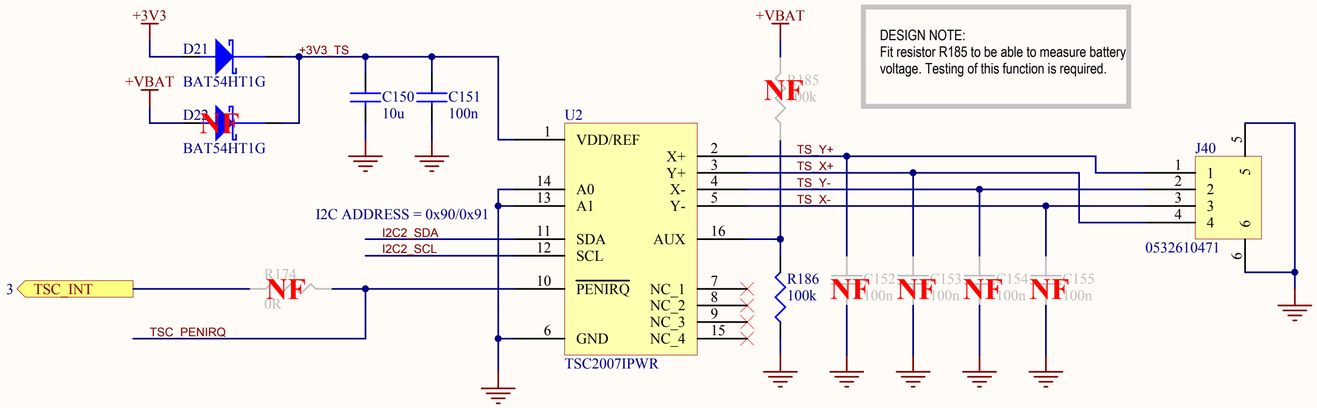
DESIGN NOTE:
When Alarm event occures, INT goes low and has to be cleared by application. Possibly use Timer to generate a pulse.

RTC & Touch screen ON/OFF support



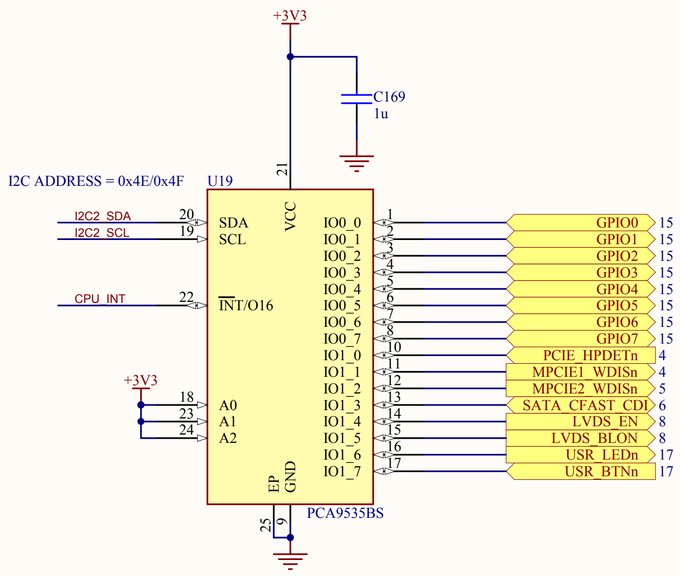
DESIGN NOTE:
ON/OFF can be driven by RTC and TSC only when board is off (Needs to be tested).

Touch screen controller

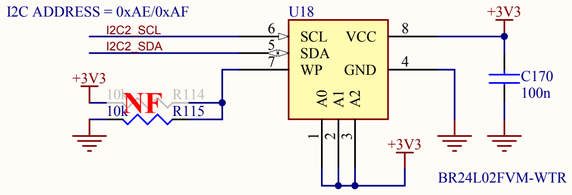


DESIGN NOTE:
Fit resistor R185 to be able to measure battery voltage. Testing of this function is required.

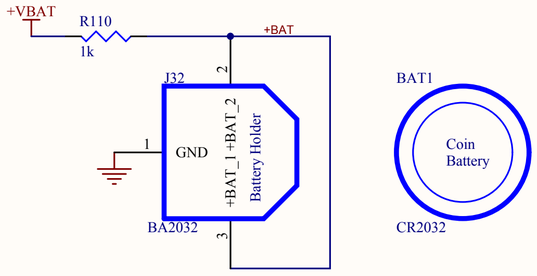
I2C GPIO Expander



EEPROM



RTC Battery



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Title:	iMX6 Rex Development Baseboard	Variant: Prototype
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Size:	DWG NO	Revision: V1I1
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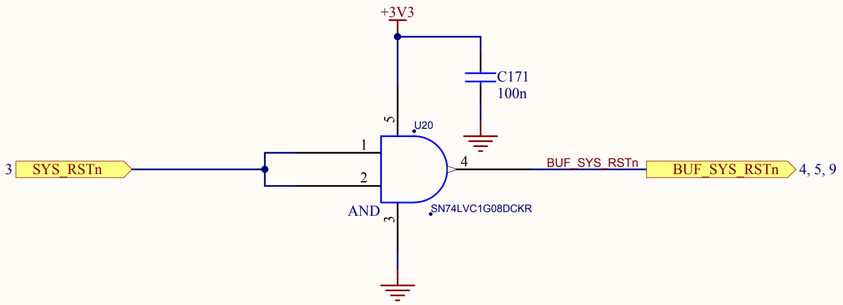
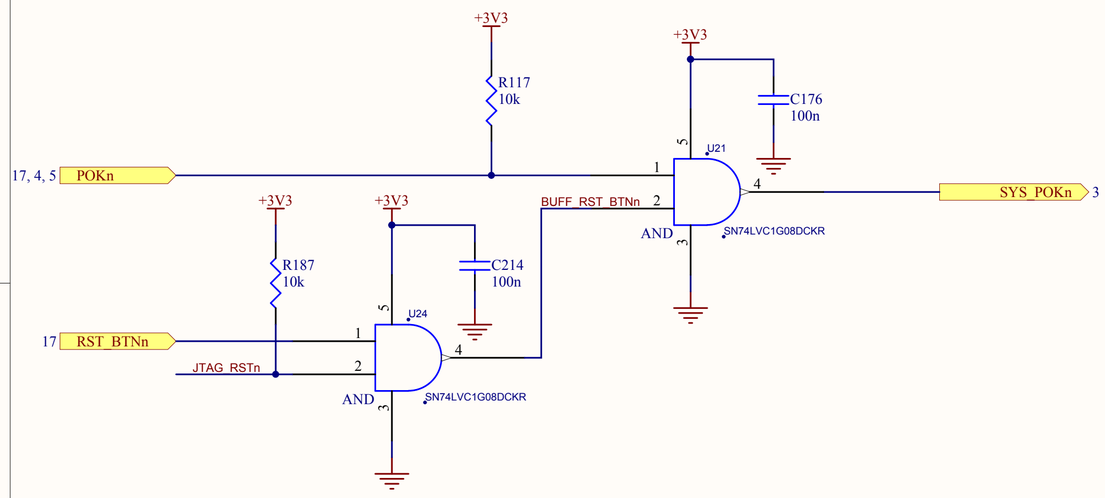
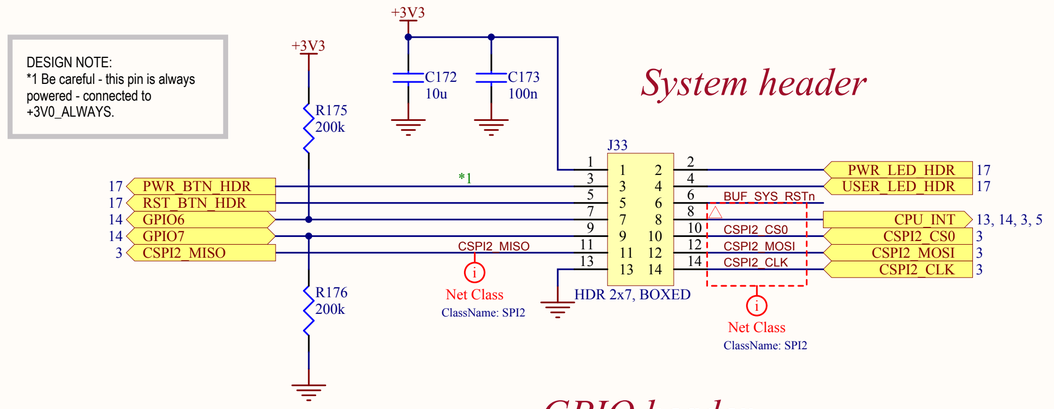
MISC, JTAG, HEADERS

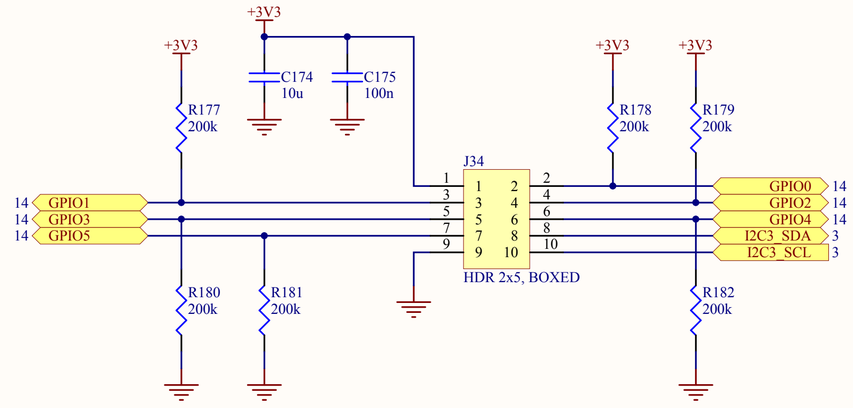
Reset buffers



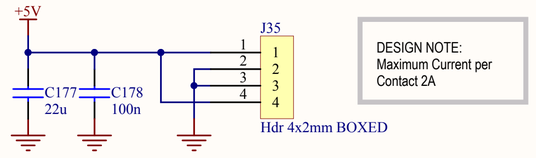


Headers

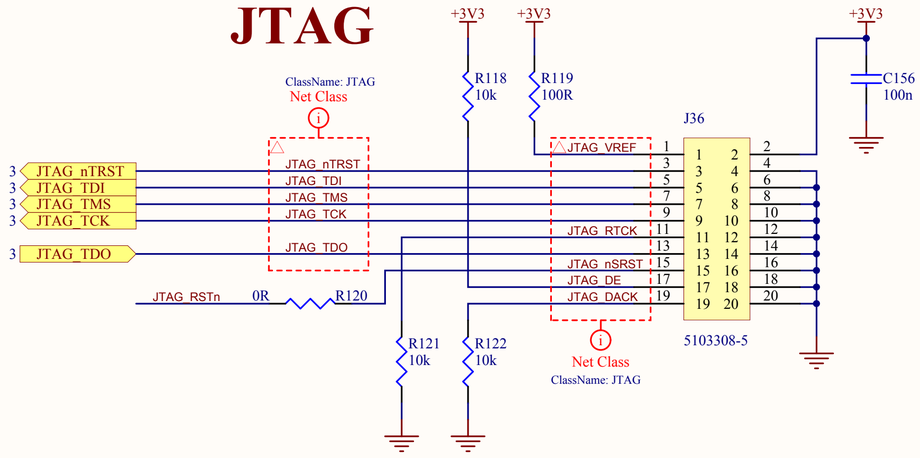




+5V Out
(For General Use eg. HDD power)



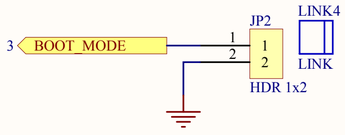
JTAG



DESIGN NOTE:
Leave open to boot from on module SPI flash, short to boot from USB OTG.

DESIGN NOTE:
JP2 default:
unfit Link - boot from SPI Flash

Boot mode selection



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Title:	iMX6 Rex Development Baseboard	Variant:	Prototype
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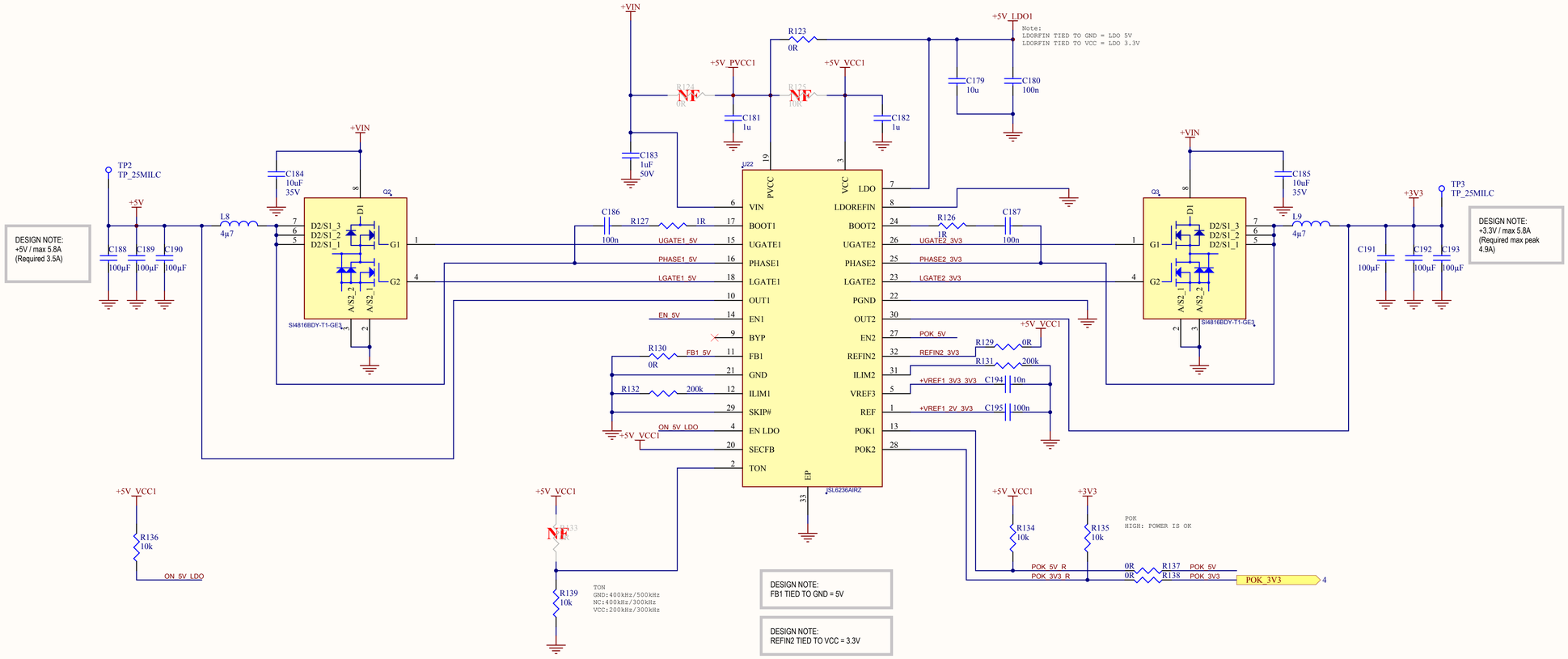
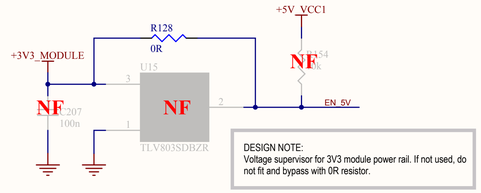
POWERS +5V, +3V3



+3V3_MODULE voltage monitor



DESIGN NOTE:
Voltage supervisor for 3V3 module power rail. If not used, do not fit and bypass with 0R resistor.

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Size:	DWG NO		Revision: V1I1
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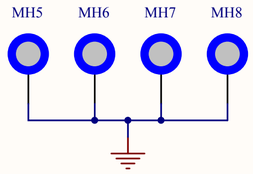
PWR IN, LEDS, BUTTONS, MECH

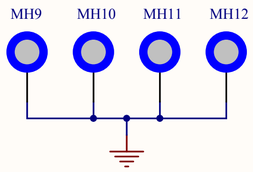
Mechanical

Mounting holes



Mounting holes 7.4mm pad 3.2mm drill
BOARD MOUNTING HOLES
ONE IN EACH CORNER

Mounting holes 5.2mm pad 2.7mm drill
BOARD MOUNTING HOLES
AND IN THE MIDDLE



Mounting holes 5.2mm pad 2.7mm drill
HEATSINK MOUNTING HOLES
ONE IN EACH CORNER

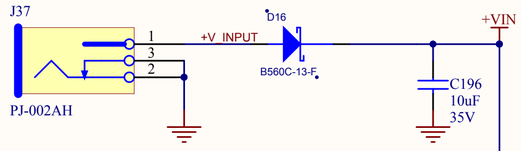
Gnd testpoint

Fiducials

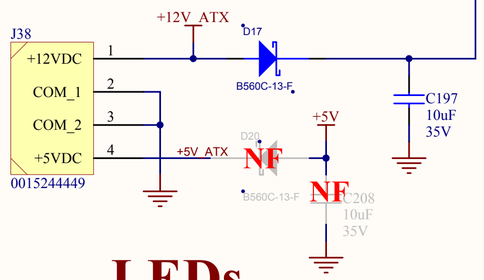
FIDICIALS 4x TOP

FIDICIALS 4x BOTTOM

Power Input



ATX power connector (Optional)



DESIGN NOTE:
For automotive aplication use ATX connector. You can for example place all the required protections on a separate board (e.g. load dump protection) and then connect this baseboard.

DESIGN NOTE:
If ATX connector is used for suppling baseboard with power, fit D17 and C197. If is used as power oputput then fit D20 and C197. Do not fit both diodes at once!

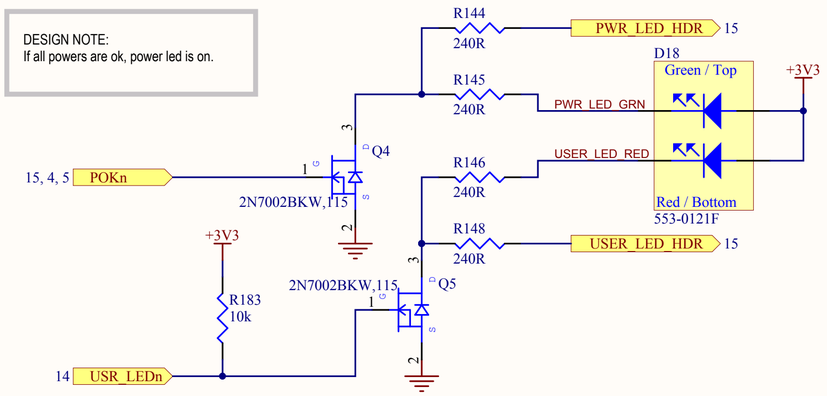
DESIGN NOTE:
If +12V is required by PCIe Card or LVDS Backlight inverter, use ATX connector to power the baseboard.

DESIGN NOTE:
Optional: A 2.5" hard drive can be supplied from this connector (requires only +5V power). Use standard SATA power cable and fit the correct ATX connector on the Baseboard.

LEDs

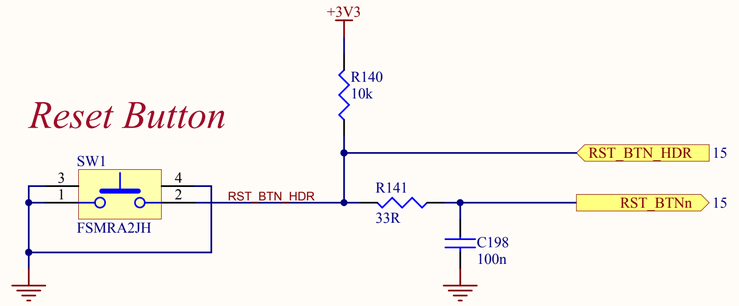
Power & Use LEDs

DESIGN NOTE:
If all powers are ok, power led is on.



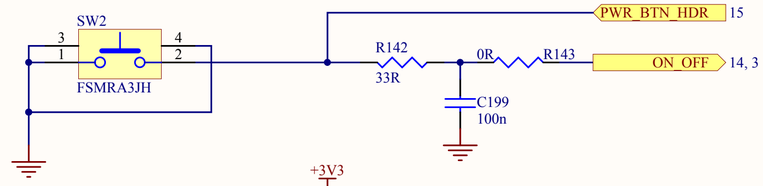
Buttons

Reset Button

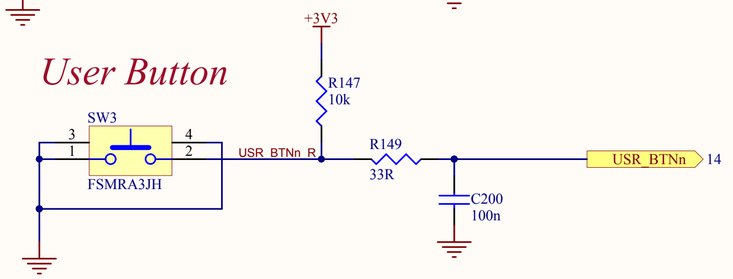


Power Button

DESIGN NOTE:
Power button has on module pull up resistor (conected to +3V0_ALWAYS).



User Button



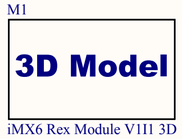
PCB

PCB1

iMX6 Rex Baseboard V111 PCB

iMX6 Rex Module 3D Model

M1



iMX6 Rex Module V111 3D

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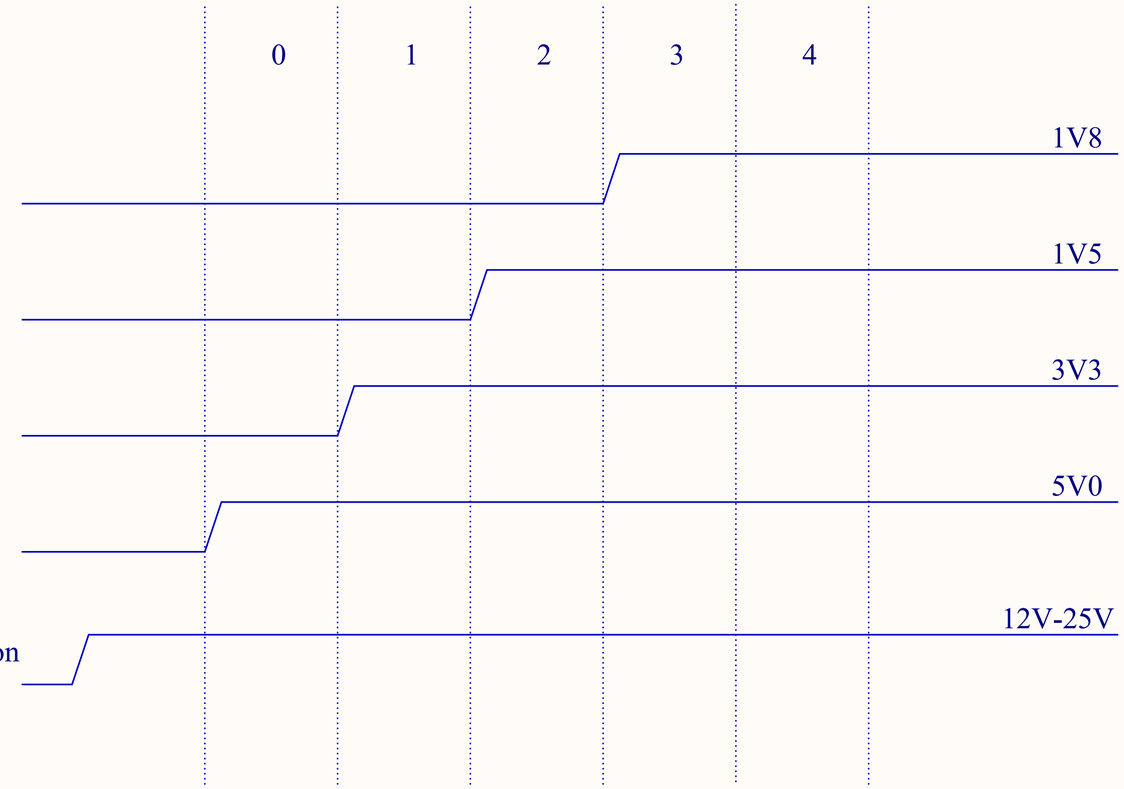
DOC, POWER SEQUENCING

CONTROLED BY	NAME	USED BY
POK_1V5	+1V8_AUDIO2	audio
POK_3V3	+1V5	mini PCIe 1, audio
POK_5V	+3V3	peripherals
+3V3_MODULE	+5V	USB hub, USB con, backlight
	+VIN	switching power supplies, PCIe con



I2C USAGE AND ADDRESS TABLE

NAME	PERIPHERAL	ADDRESS
I2C1	*Audio*	*0x14 / 0x15*
I2C2	*Audio 2*	*0x30 / 0x31*
	EEPROM	*0xAE / 0xAF*
	GPIO Expander	*0x4E / 0x4F*
	HDMI	*0x60 , 0xA1*
	Mini PCIe / PCIe	
	RTC Clock	*0xA2 / 0xA3*
	Touchscreen	*0x90 / 0x91*
I2C3	*For general use (On header)*	

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REVISION HISTORY

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[01] - COVER PAGE.SchDoc
[01] - COVER PAGE.SchDoc

[02] - BLOCK DIAGRAM.SchDoc
[02] - BLOCK DIAGRAM.SchDoc

[03] - CONNECTORS.SchDoc
[03] - CONNECTORS.SchDoc

[04] - PCIE MINI 1, PCIE.SchDoc
[04] - PCIE MINI 1, PCIE.SchDoc

[05] - PCIE MINI 2, AUDIO2.SchDoc
[05] - PCIE MINI 2, AUDIO2.SchDoc

[06] - SATA, CFAST.SchDoc
[06] - SATA, CFAST.SchDoc

[07] - HDMI.SchDoc
[07] - HDMI.SchDoc

[08] - LVDS.SchDoc
[08] - LVDS.SchDoc

[09] - USB.SchDoc
[09] - USB.SchDoc

[10] - ETHERNET.SchDoc
[10] - ETHERNET.SchDoc

[11] - AUDIO1.SchDoc
[11] - AUDIO1.SchDoc

[12] - SD.SchDoc
[12] - SD.SchDoc

[13] - UARTS.SchDoc
[13] - UARTS.SchDoc

[14] - RTC, EEPROM, GPIO, TOUCH SCREEN.SchDoc
[14] - RTC, EEPROM, GPIO, TOUCH SCREEN.SchDoc

[15] - MISC, JTAG, HEADERS.SchDoc
[15] - MISC, JTAG, HEADERS.SchDoc

[16] - POWERS 5V, 3V3.SchDoc
[16] - POWERS 5V, 3V3.SchDoc

[17] - PWR IN, LEDS, BUTTONS, MECH.SchDoc
[17] - PWR IN, LEDS, BUTTONS, MECH.SchDoc

[18] - DOC, POWER SEQUENCING.SchDoc
[18] - DOC, POWER SEQUENCING.SchDoc

[19] - REVISION HISTORY.SchDoc
[19] - REVISION HISTORY.SchDoc

TEMPLATE NOTES

Set Project Parameters

1) Go to Project -> Project Options -> Parameters
2) Set Company, Project and VersionRevision

Mark Not Fitted Components as
NF

Net Class Example

Differential signal example

TITLE Examples (You can change the color to reflect your company color)

PAGE TITLE

Peripheral / Group of component title

Smaller Ttitle

Schematic Status Explanation

DRAFT - Very early stage of schematic, ignore details.

PRELIMINARY - Close to final schematic.

CHECKED - There should not be any mistakes. Tell the engineer if you find one.

RELEASED - A board with this schematic has been sent to production.

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Page Contents:	iMX6 Rex Development Baseboard V1I1 Project.SchDoc Checked by		
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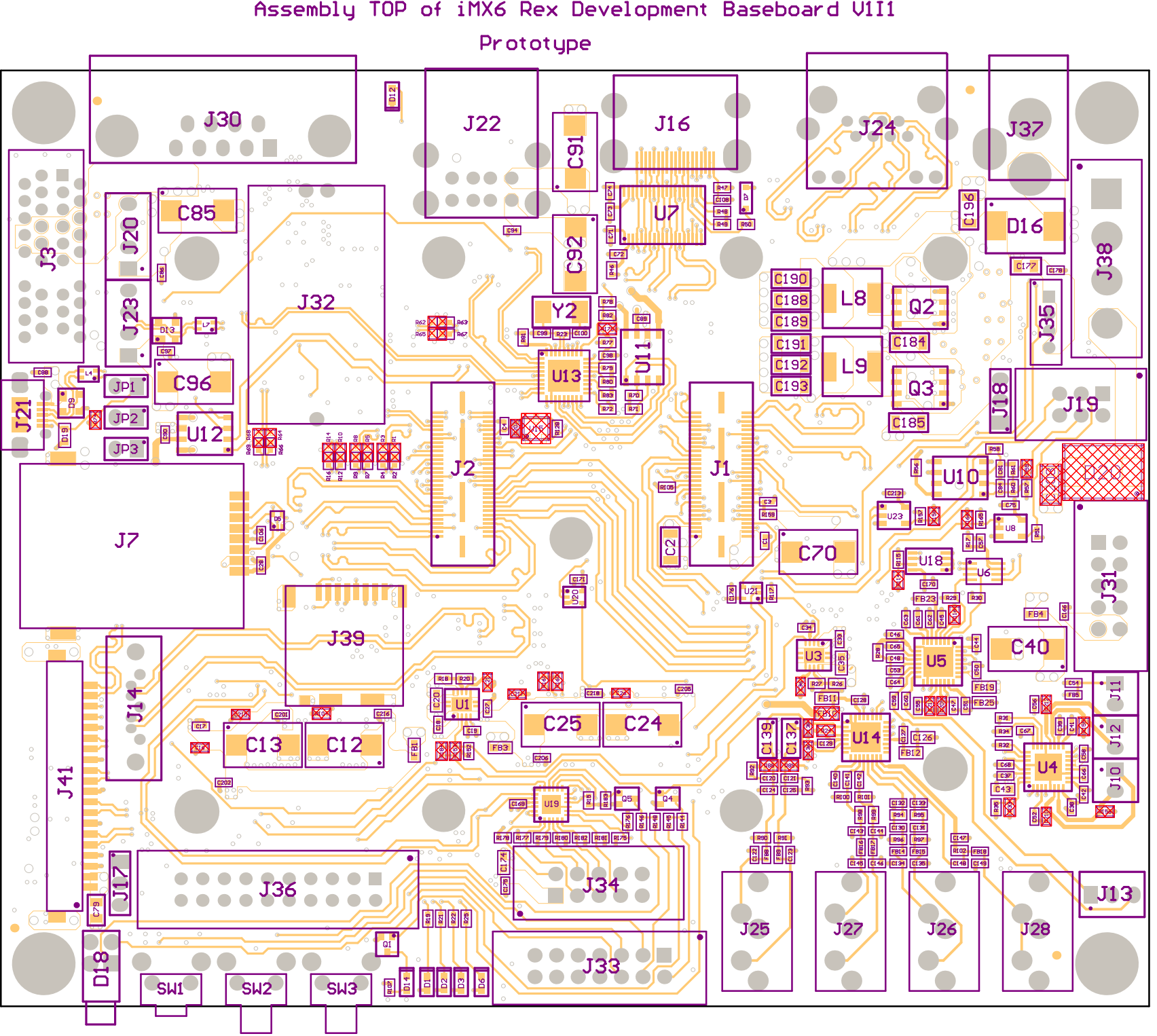
Assembly TOP of iMX6 Rex Development Baseboard V1I1
Prototype
J30
J22
J16
J24
J37
J3
J20
J23
C85
J32
C91
C92
U7
C196
D16
J38
J35
C190
C188
C189
C191
C192
C193
L8
L9
Q2
Q3
C184
C185
Y2
U13
U11
J18
J19
J21
JP1
JP2
JP3
C96
U12
J2
J1
U10
J7
C70
U18
U6
J31
J39
U5
C40
J14
U1
C25
C24
U3
U14
U4
J41
C13
C12
C139
C137
C126
J11
J12
J10
J17
J36
J34
J13
J25
J27
J26
J28
J33
D18
SW1
SW2
SW3

Assembly BOTTOM of iMX6 Rex Development Baseboard V1I1

Prototype