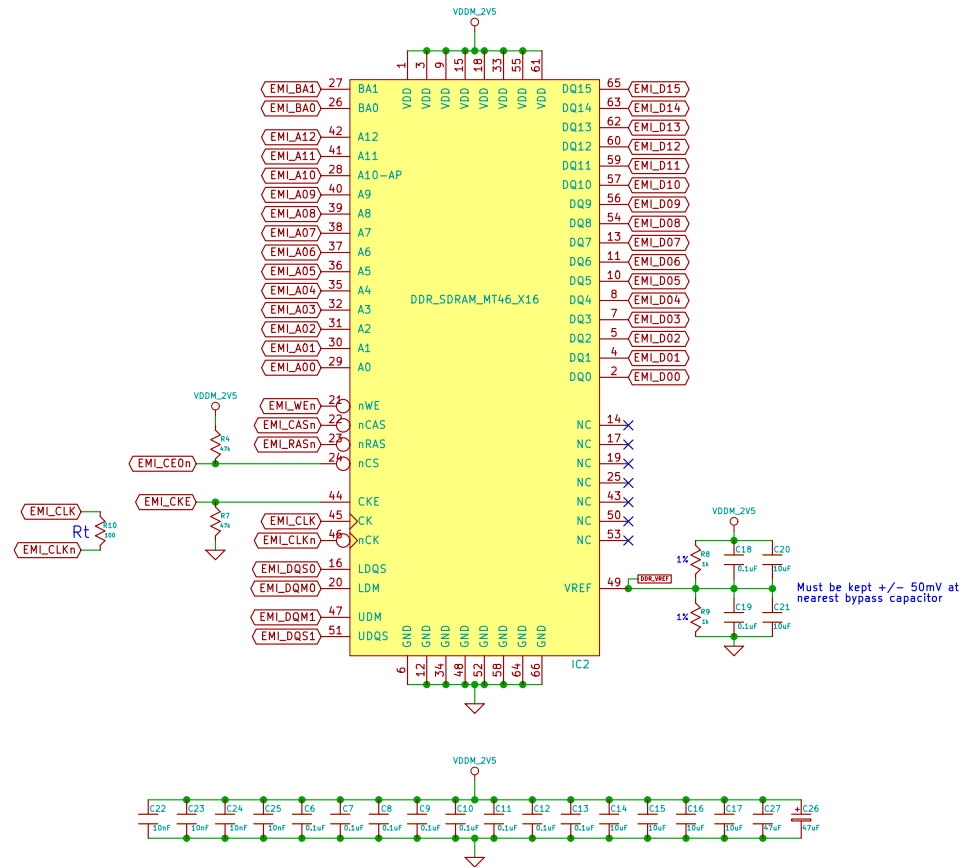


64Mbytes DDR SDRAM



Notes:

- All capacitors are X5R, 6.3V, 20%, ESR < 300mOhm or better unless otherwise noted
- All resistors are 5% unless otherwise noted
- Assuming 2-layer standard 1/16" FR4 (Dk=4.4, Df=0.02) and 7mil-7mil-15mil trace-space-drill design
- Per Micron TN-46-02, need about 7 0.1uF bypass caps but to fake TN-46-14 layout guidelines of GND planes use a lot more and consider external copper foil reference planes
- Cannot meet DDR routing guidelines (TN-46-14) on 2-layers so just keep all signals as short as possible to limit effects on Signal Integrity (SI) of incorrect inter/intra-pair spacing and characteristic trace impedance
- On 2-layer boards impedance of the lines is large so termination resistors should be used per TN-46-06.
- However, all the traces are < 0.8" long and therefore have an electrical length of <8deg at 200MHz. Also, most signals have only one via. Only UDQS (EMI_DQS1) has three vias. Since there is very little room anyway, do not use termination resistors.
- Only using one DDR device so should not require Rt and cannot fit it near i.MX233 IC anyway
- For additional design and layout notes see TN-46-11
- TN AppNotes are available at www.micron.com

For more information visit www.PROpendous.org
 No Copyright – Deeded under the Creative Commons CC0 Public Domain Dedication
<http://creativecommons.org/publicdomain/zero/1.0/>
 Opendous Inc. deeded this hardware design into the Public Domain

Opendous Inc. (www.opendous.org)

File: PROpendous-Memory.sch

Sheet: /Memory/

Title: PROpendous

Size: A4

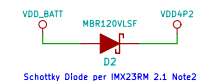
Date: 2 oct 2012

Rev: 1.2

KiCad E.D.A.

Id: 3/8

- Capacitors are X7R, 6.3V, 20% or better unless otherwise noted
- Tantalum capacitors should have ESR < 300mOhm but to reduce costs only use them on the noisiest rails
- VDDIO, VDDD, VDDA should have 33uF of decoupling and LPF >1MHz per IMX23RM 32.2.1.1
- Power Supply Designed to Freescale AppNote AN3883 recommendations
- A PROpendous board must be self/battery-powered to meet the USB Specification's current consumption requirements for USB Suspend mode



The LQH6PP meets the 2.5A inductor current limit of the LM2621. It also meets the typical (2.85A) internal current limit. However, it does not meet the maximum internal current limit of the LM2621 (4A).

Schematic diagram of the USB_HOST pin configuration. The pin is connected to a 200 ohm resistor (R46) and a diode (D3) to ground.

GPM1_CE1n also controls USB Hosting as it controls the USB Connector Switch and VBUS Generator but only if/when R53 in the Connectors_JTAG sheet is populated. To use this LED for debug purposes without also switching to USB Host mode simply depopulate R53.

Battery Temperature Sense

Copied and slightly modified from the TI TSC2007 datasheet. This circuit can be used for monitoring the battery temperature.

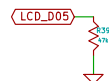
TSC_AUX

TP9

R50, **R51** are copper traces which can be cut

USB-miniB VBUS supplies power for Li-Ion Battery charging as well as board power. However, current consumption does not meet USB Suspend Mode requirements.

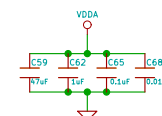
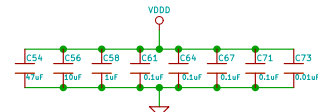
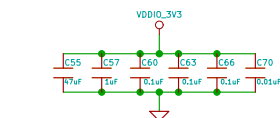
ETM Disabled as LQFP
version does not support it.



Boot Mode	LCD_Data			
	3	2	1	0
USB	0	0	0	0
I2C Master (AUART)	0	0	0	1
SPI SSP1 Flash	0	0	1	0
SPI SSP2 Flash	0	0	1	1
GPMI (NAND)	0	1	0	0
DEBUG (JTAG_WAIT)	0	1	1	0
SPI SSP2 EEPROM	1	0	0	0
SD/MMC 1	1	0	0	1
SD/MMC 2 (Default)	1	0	1	0

Default Boot is SD/MMC2, the captive microSD card.
Jumpers can be mounted to alter the default setting.
LCD_RS High enables jumper boot.
LCD_RS Low enables OTP boot.

Only need to mount jumpers to invert signals
and select boot modes other than SD/MMC2



For more information visit www.PROpendous.org
No Copyright – Deeded under the Creative Commons CC0 Public Domain Dedication
<http://creativecommons.org/publicdomain/zero/1.0/>
Opendous Inc. deeded this hardware design into the Public Domain

OpenSource Inc. (www.opensource.org)

File: PROpendous-Power_Boot.sch

Sheet: /Power_Boot/

Title: PROpendous

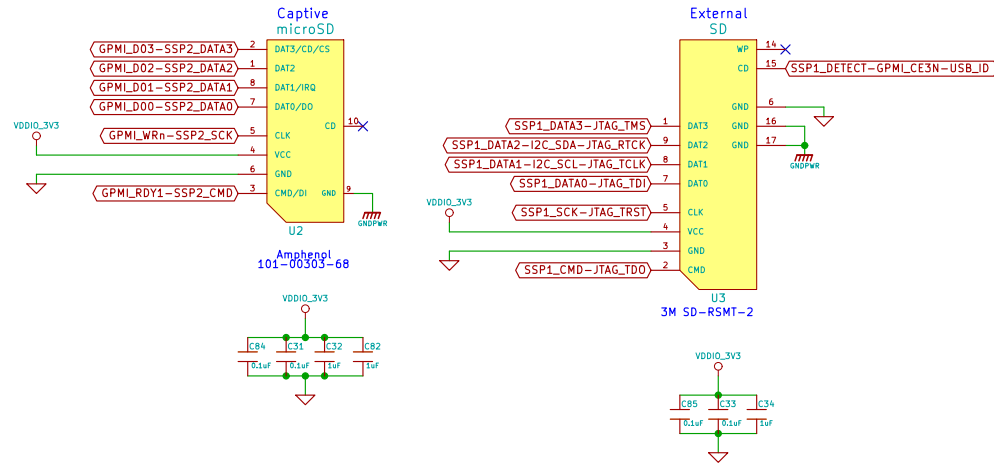
Size: A4	Date: 2 oct 2012
----------	------------------

Rev: 1.2

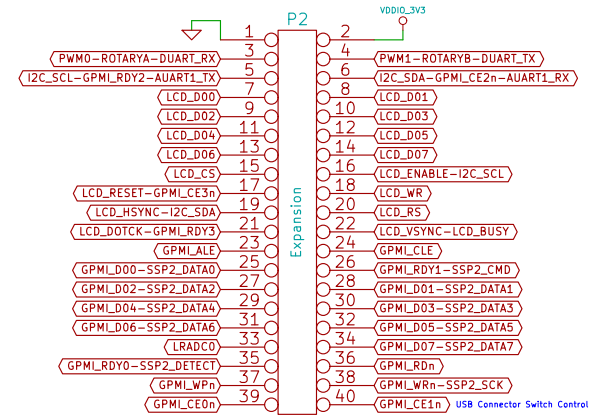
KiCad E.D.A.

Id: 7/8

Storage

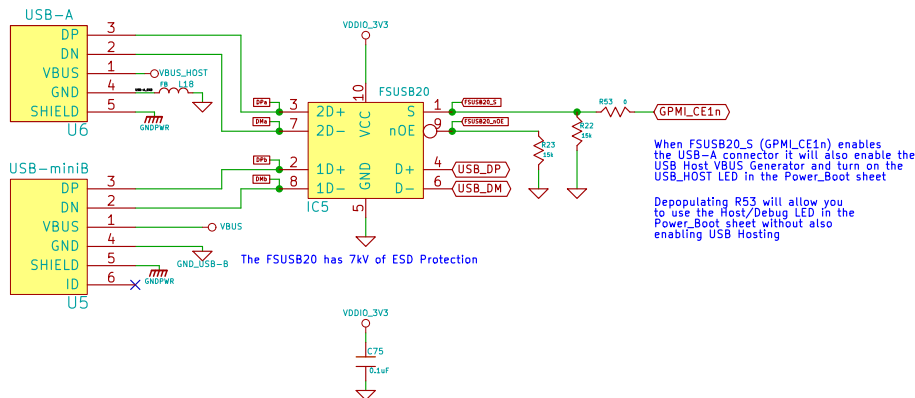


Expansion Header

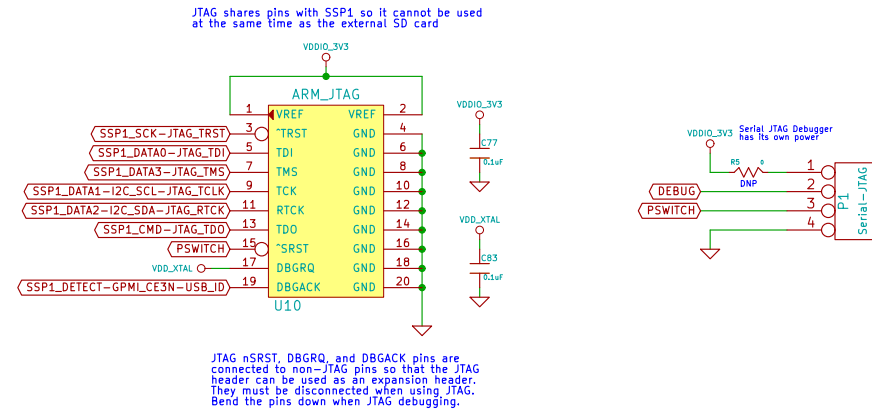


USB

USB requires 90 Ohm differential impedance which for a standard 1/16" 1oz FR4 double-sided board has been calculated to require 22mil traces at 7mil spacing. Make sure to have a solid ground trace underneath the USB lines and keep 12mil spacing on either side of the traces to GND.



Debug/Expansion Headers



For more information visit www.PROpendous.org
No Copyright – Deeded under the Creative Commons CC0 Public Domain Dedication
<http://creativecommons.org/publicdomain/zero/1.0/>
Opendous Inc. deeded this hardware design into the Public Domain

Opendous Inc. (www.opendous.org)

File: PROpendous-Connectors_JTAG.sch

Sheet: /Connectors_JTAG/

Title: PROpendous

Size: A4

Date: 2 oct 2012

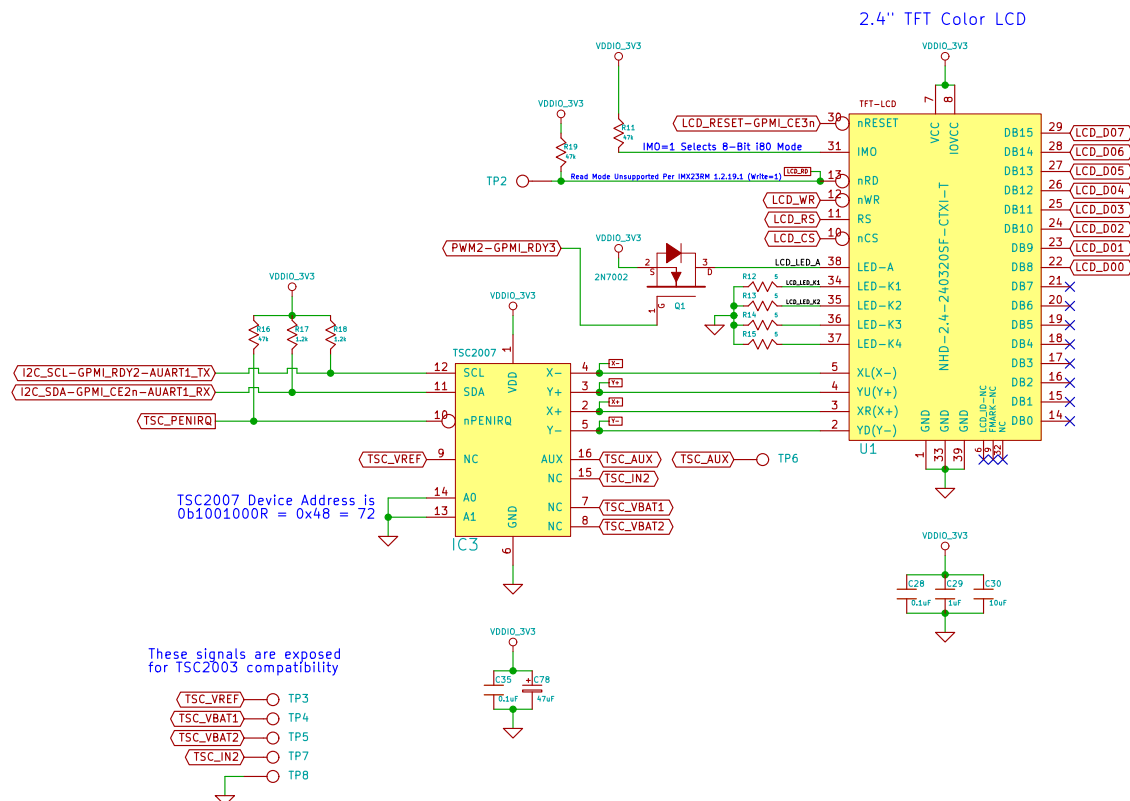
Rev: 1.2

KiCad E.D.A.

Id: 4/8

Notes:

- Capacitors can be any available 6.3V+
- 2.4" LCD can be either of:
NHD-2.4-240320SF-CTXI-T which has a touchscreen
NHD-2.4-240320SF-CTXI which does not have a touchscreen
- TSC2007 Touchscreen controller is only required
if populating the NHD-2.4-240320SF-CTXI-T
- The NHD-2.4-240320SF LCDs are rated at 2.8V but can withstand up to 3.3V
- Visit www.newhavendisplay.com for more information on these LCDs which are available from DigiKey.com



For more information visit www.PROpendous.org
 No Copyright - Deeded under the Creative Commons CC0 Public Domain Dedication
<http://creativecommons.org/publicdomain/zero/1.0/>
 Opendous Inc. deeded this hardware design into the Public Domain

Opendous Inc. (www.opendous.org)

File: PROpendous-LCD.sch

Sheet: /LCD/

Title: PROpendous

Size: A4

Date: 2 oct 2012

Rev: 1.2

KiCad E.D.A.

Id: 5/8