i.MX53 and i.MX6 SABRE Automotive Base Board

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freescale™

Networking & Multimedia Solutions Group

6501 William Cannon Drive West
Austin, TX 78735-8598

ICAP Classification: FCP: FIUO: PUBI: X

Designer: Rafael	Drawing Title: MX53 & MX6 Automotive Base Board		
Drawn by: Rafael	Page Title: Title Page		
Approved: David	Size C	Document Number SCH: SCH-26662 PDF: SPF-SCH-26662	Rev E
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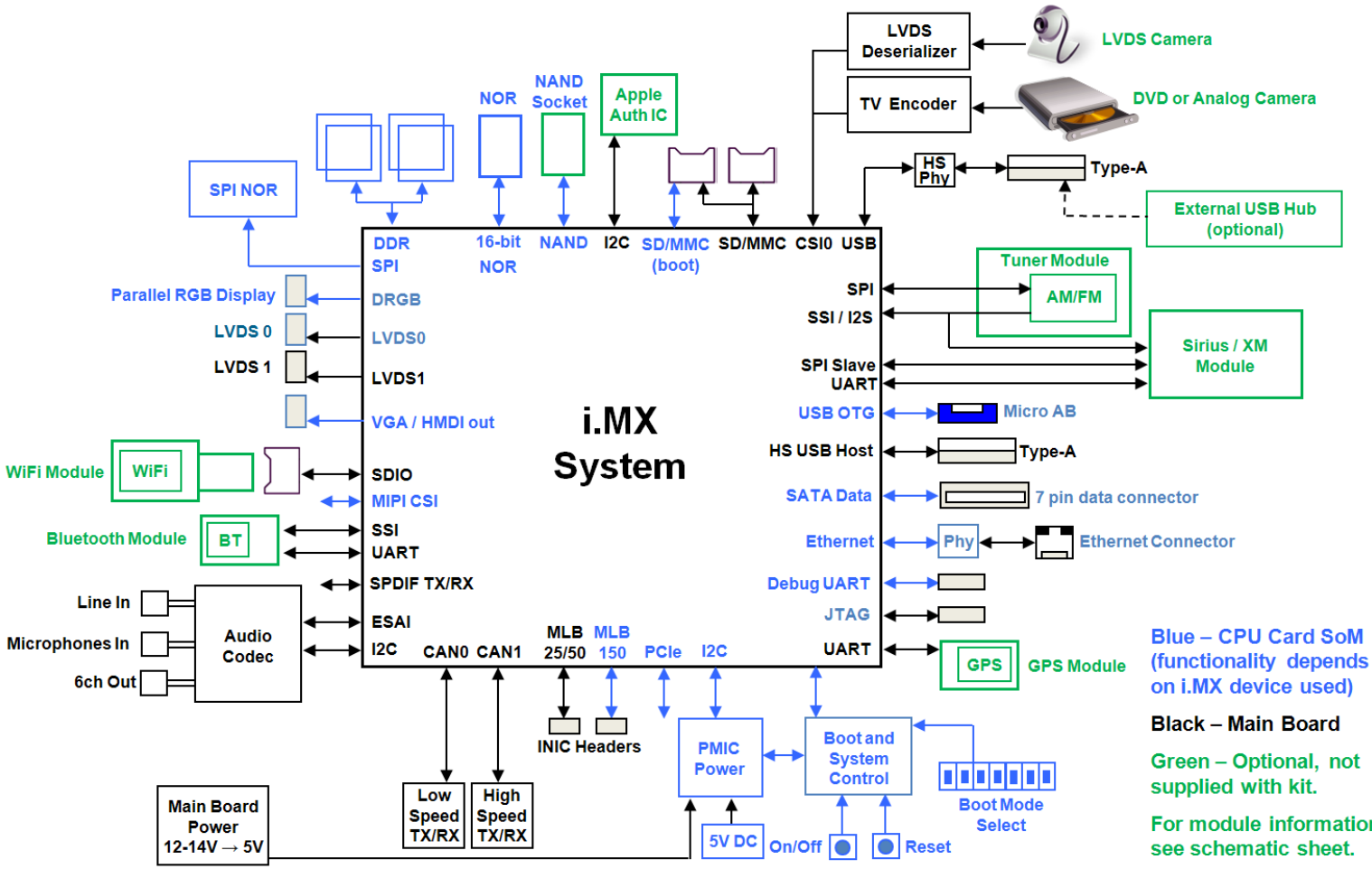

Blue – CPU Card SoM (functionality depends on i.MX device used)

Black – Main Board

Green – Optional, not supplied with kit.

For module information, see schematic sheet.

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Drawing Title: MX53 & MX6 Automotive Base Board

Page Title: Block Diagram

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LAYOUT NOTES:

- All testpoint pads should be on TOP.
- Make sure that there is GND plane on adjacent layer under the xtal circuits.
- Add vias to all ICs that have GND pad on the bottom of package (Exposed Pad)
- Some signals require differential routing and are noted on the particular schematic page.
- Route USB diff. pairs on TOP layer only 90 ohm differential, length matched unless otherwise indicated.

FAB NOTES:

- The zero ohm cut trace resistors have a "Short Layer" in layout, this layer MUST be included when generating Gerber files (films) in order to have the two pads of each resistor connected (shorted)

SCHEMATIC NOTES:

- Net names with extended names only apply with MX53 CPU Card usage.
- For example: ESAI_INT(EMI_EB1_GPI2_29) connects to MX53 I/O EMI_EB1 which is configured as GPIO2_29.
- For the MX6 interface, determine the MX6 I/O using these steps:
  1. Search for ESAI_INT on the MX6 CPU schematic Card Edge Fingers sheet.
  2. Note the complete net name; ESAI_INT(SD2_CLK_GPIO1_10) for this example.
  3. The I/O is SD2_CLK configured as GPIO1_10.

```
Compatible CPU Card Part Numbers
--------------------------------
MCIMX53ACPUV1 --> i.MX53
MCIMX6QAICPU1 --> i.MX 6Quad
MCIMX6UAICPU1 --> i.MX 6DualLite
```

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Drawing Title: **MX53 & MX6 Automotive Base Board**

Page Title: **Notes**

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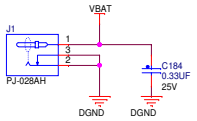
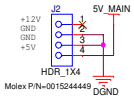
Power Supplies

Power Input 12 Vdc typical

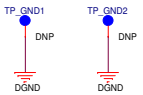
+12V - 5.5A DC supply with integrated protection

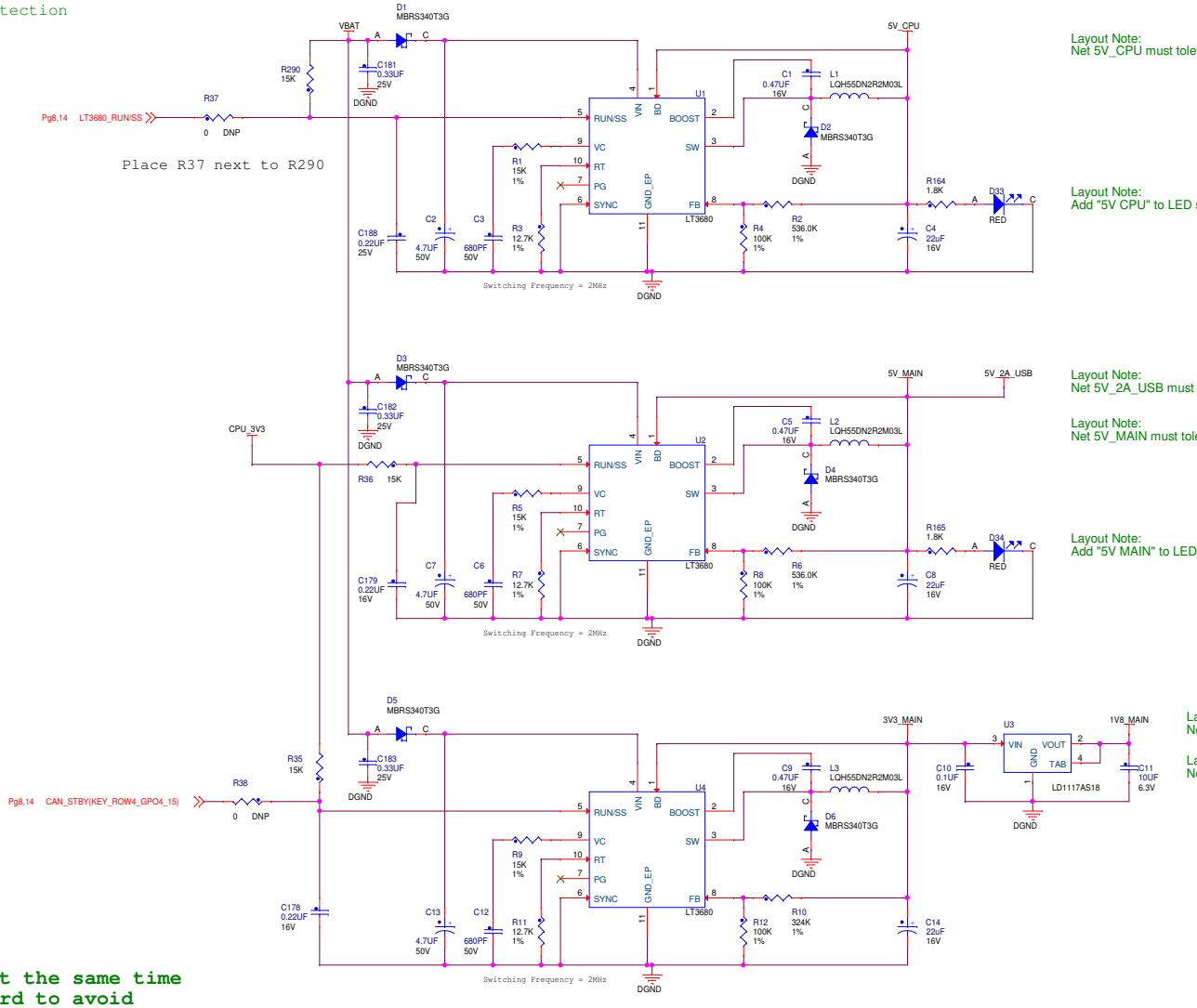


Power for SATA HDD via PATA power adapter cable



Ground Points





Layout Note:
Net 5V_CPU must tolerate a current of 3.5A.

Layout Note:
Add "5V CPU" to LED silkscreen

Layout Note:
Net 5V_2A_USB must tolerate a current of 2A.

Layout Note:
Net 5V_MAIN must tolerate a current of 1.5A.

Layout Note:
Add "5V MAIN" to LED silkscreen

Layout Note:
Net 3V3_MAIN must tolerate a current of 2A.

Layout Note:
Net 1V8_MAIN must tolerate a current of 0.5A.

Notes:

1. CAN_STBY forces 3V3_MAIN off at the same time as the 3.3 V supply on the CPU Card to avoid supply backfeed/leakage issues.

2. To enable CAN wake up, fit 0 ohms to R37 and R38, remove R290. Users could consider use of values higher than 0 ohms for soft start.

   Reverse to return to default, always-powered mode.

3. Although the 3 switchers can support up to 36 volt input, the external component selection has been set up on the assumption of a 12 to 14 volt nominal input.

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Drawing Title: **MX53 & MX6 Automotive Base Board**

Page Title: **POWER - 12V to 5V, 3V3, 1V8**

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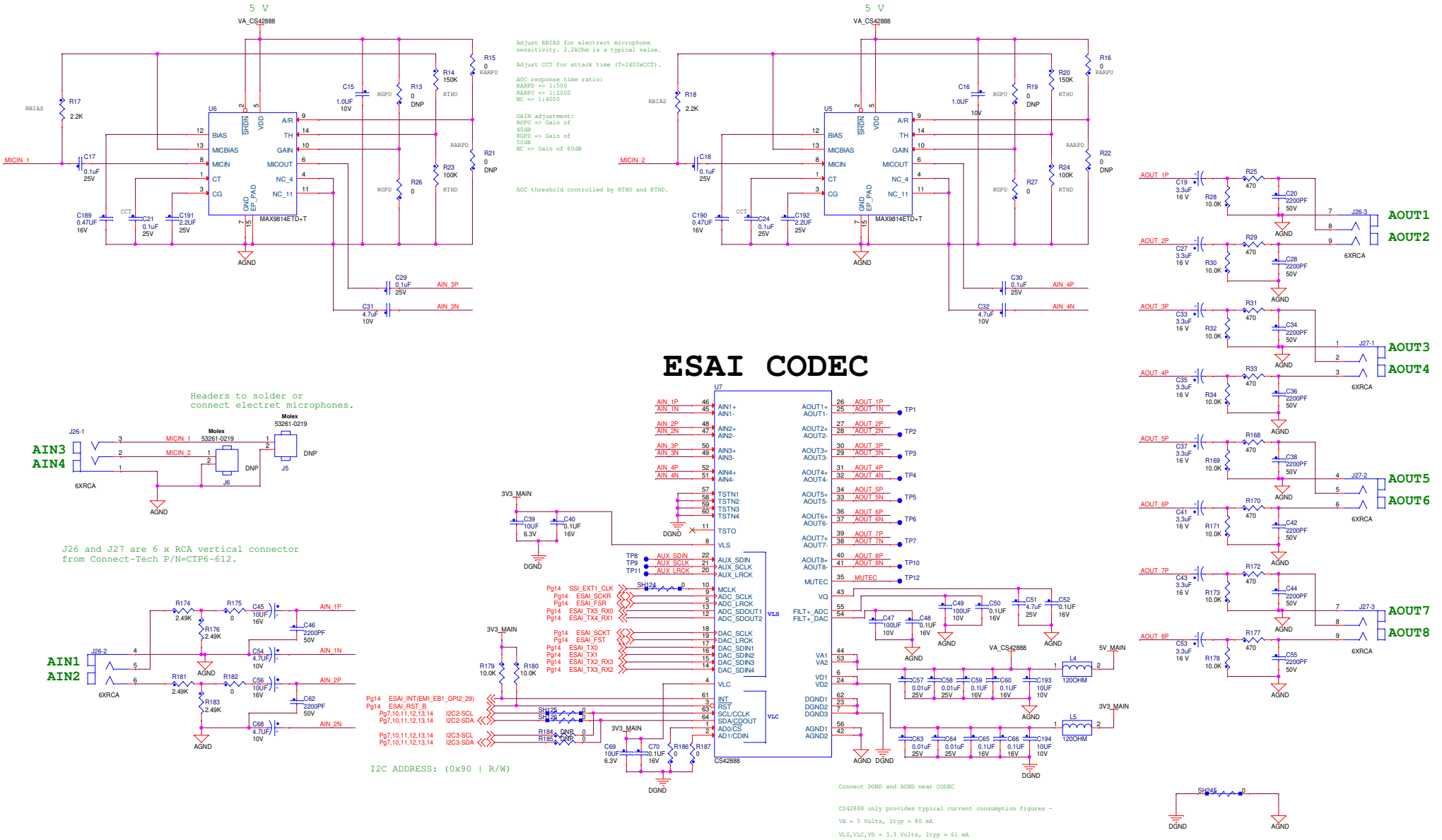
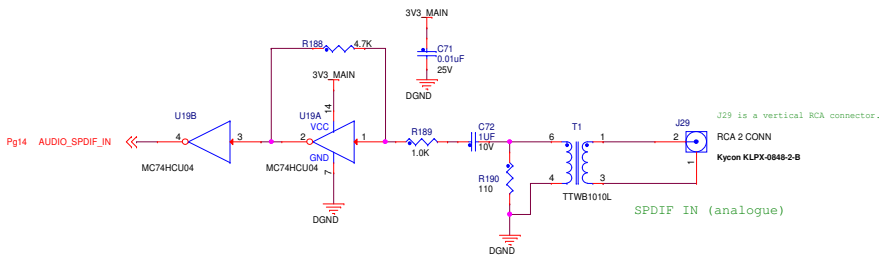
ESAI CODEC

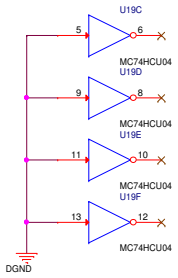


Headers to solder or connect electret microphones.

J26 and J27 are 6 x RCA vertical connector from Connect-Tech P/N=CTP6-612.

SPDIF IN





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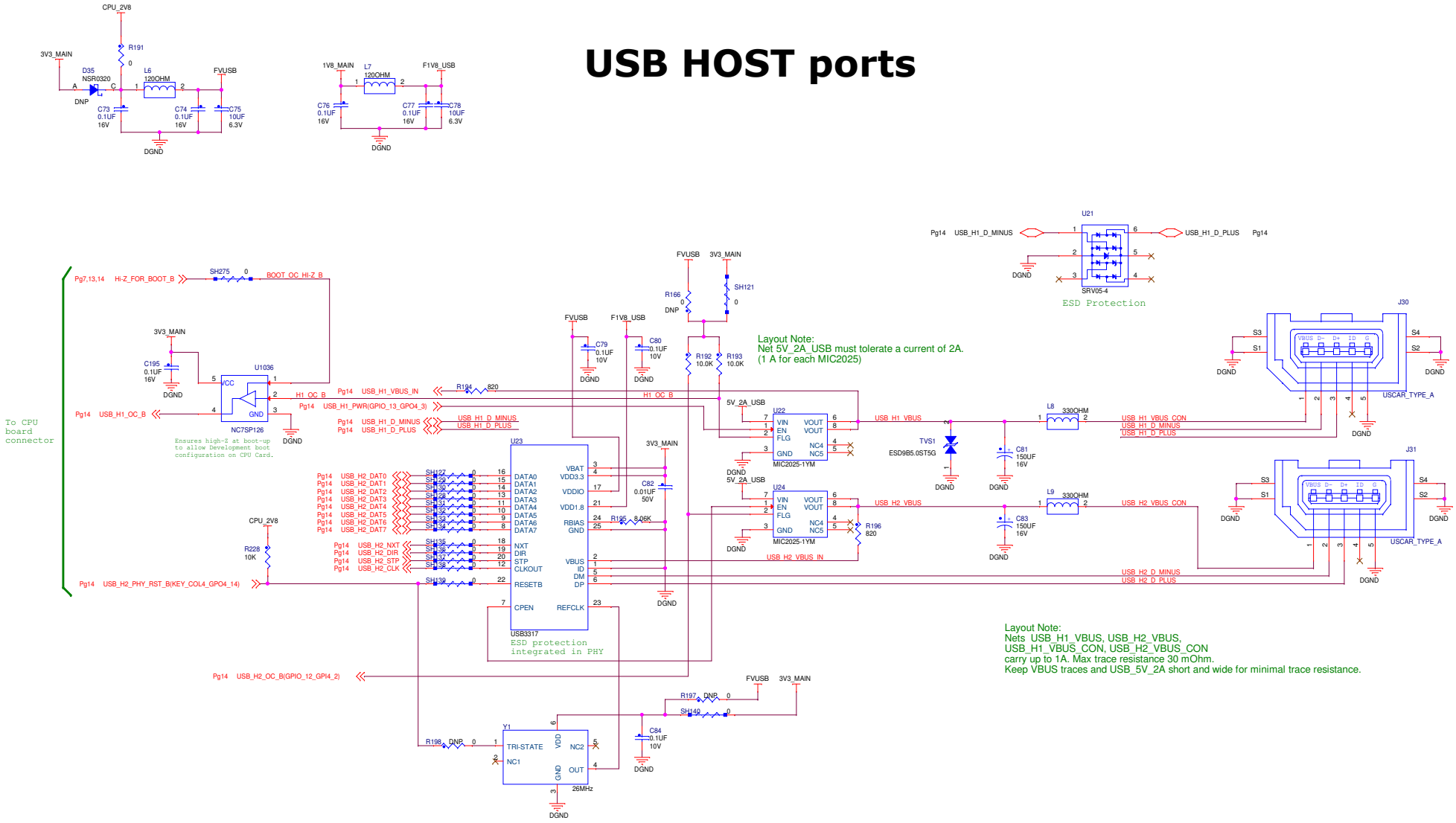
USB HOST ports



USB_H1_VBUS_IN only required for MX53 CPU Card.
MX6 CPU Card has on-board VBUS power source.

Host 2 port only used with MX53 CPU Card.

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Page Title: **USB**

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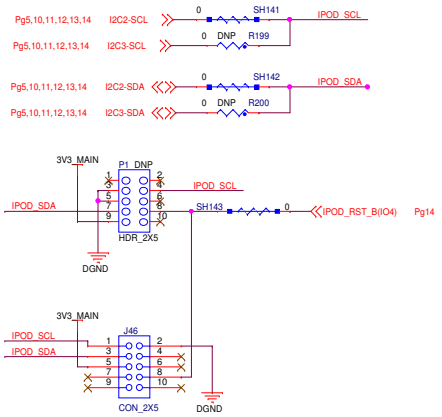
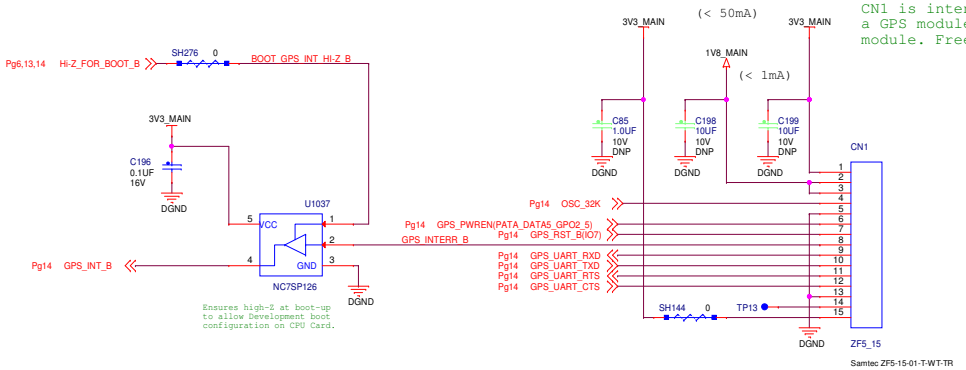
iPOD



P1 accommodates Freescale v2.0B coprocessor module.
Vtyp = 3.3 V, Imax = 7.5 mA

J46 accommodates MFi (Made for iPOD) module
available from Avnet. https://mfi.avnet.com/MFI/

GPS



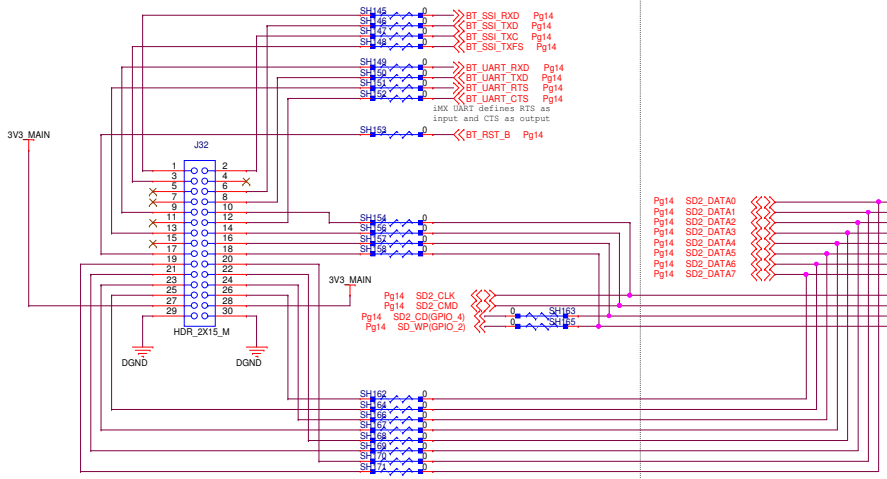
CN1 is intended to provide a set of signals to interface a GPS module. The connector is not intended for a specific module. Freescale does not provide a GPS module.

From CPU side		From GPS side
GPS_UART_TXD : Output	→	GPS_RXD : Input
GPS_UART_RXD : Input	←	GPS_TXD : Output
GPS_UART_RTS : Input	←	GPS_RTS : Output
GPS_UART_CTS : Output	→	GPS_CTS : Input

Bluetooth

Infineon PBA31308 Interface

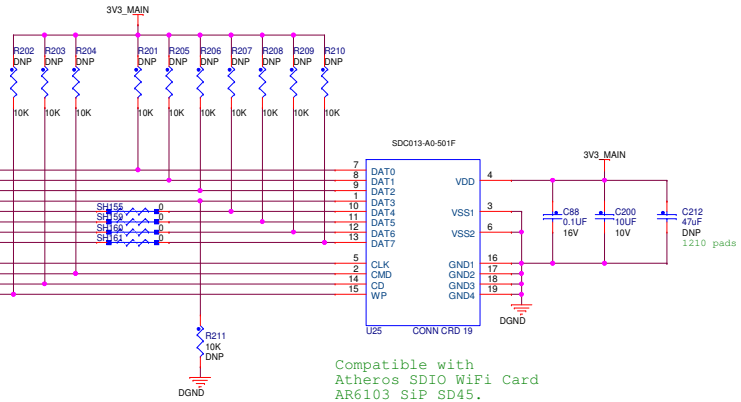
1 - PCMOUT
2 - PCMCLK
3 - PCMFR
4 - WUP-HOST
5 - WUP-BT
6 - PCMIN (wire-add)
7 -
8 - UARTRXD
9 - UARTTXD
10 -
11 -
12 - UARTCTS
13 - UARTRTS (wire-add)
14 -
15 -
16 -
17 - RESET
18 -
19 -
20 -
21 -
22 - SDA (test only)
23 -
24 - SCL (test only)
25 -
26 -
27 - 3.3 Volts
28 -
29 - GND
30 - GND



Voltage and current requirements -

PBA31308 : Voltage range 2.9 to 4.1 Volts, 100 mA max

WiFi SD slot



Compatible with
Atheros SDIO WiFi Card
AR6103 SiP SD45.

Software note:
WP and CD must have MX6 on-chip
47k or 100k pull-up enabled.
47k tolerates more leakage.

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Drawing Title: **MX53 & MX6 Automotive Base Board**

Page Title: **BT, GPS, iPOD, SD Interface**

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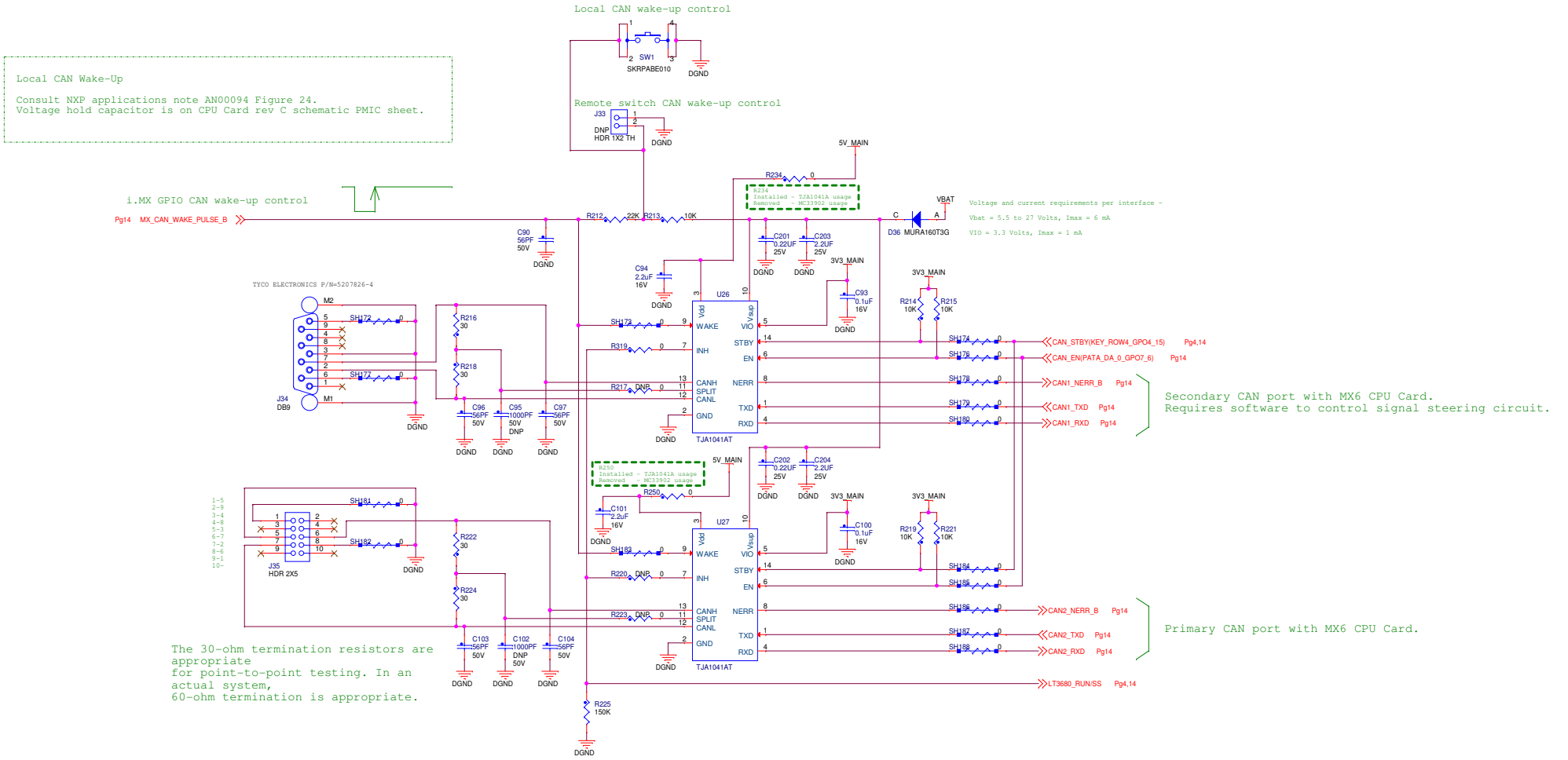
CAN



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Page Title: **CAN**

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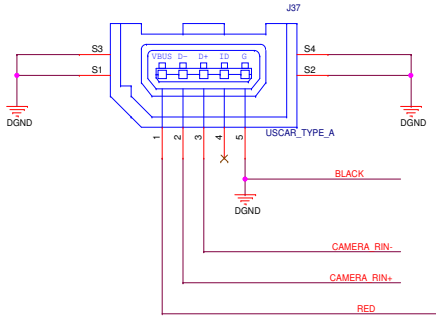
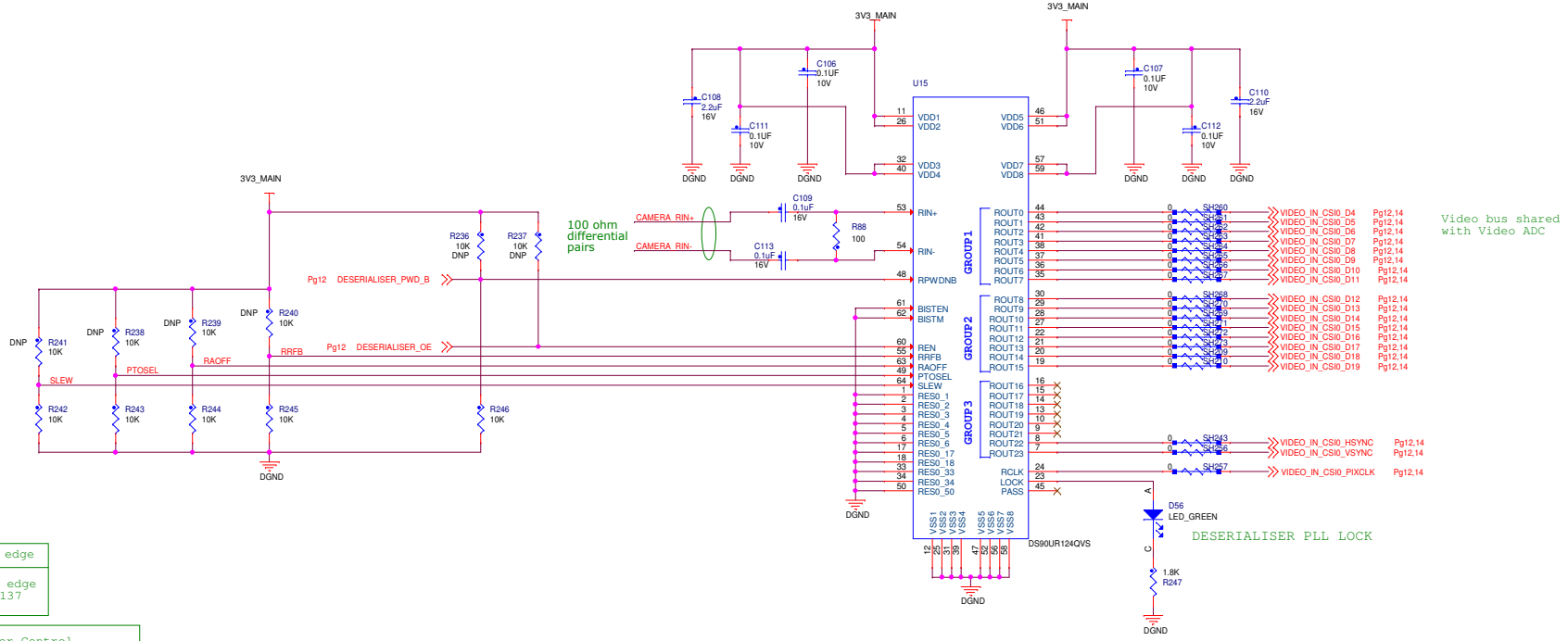
Deserialiser for Rear Camera

NOT FOR USB FUNCTION
Add a note on the silkscreen to avoid confusion with USB.



CAUTION
JP1 of National Serializer
eval board must be removed if that
board is supplied with 3V3 already.



RRFB - Receiver clock edge	
Rising edge Place R138	Falling edge Place R137

RAOFF - Randomizer Control	
DS90C241 random mode Place R135	New random mode Place R134

PTOSEL - Progressive Turn On	
Grouped mode Place R133	Spread mode Place R132

SLEW - Slew Rate Control	
Low drive 2mA Place R130	High drive 4mA Place R131

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Drawing Title: **MX53 & MX6 Automotive Base Board**

Page Title: **Camera Deserialiser**

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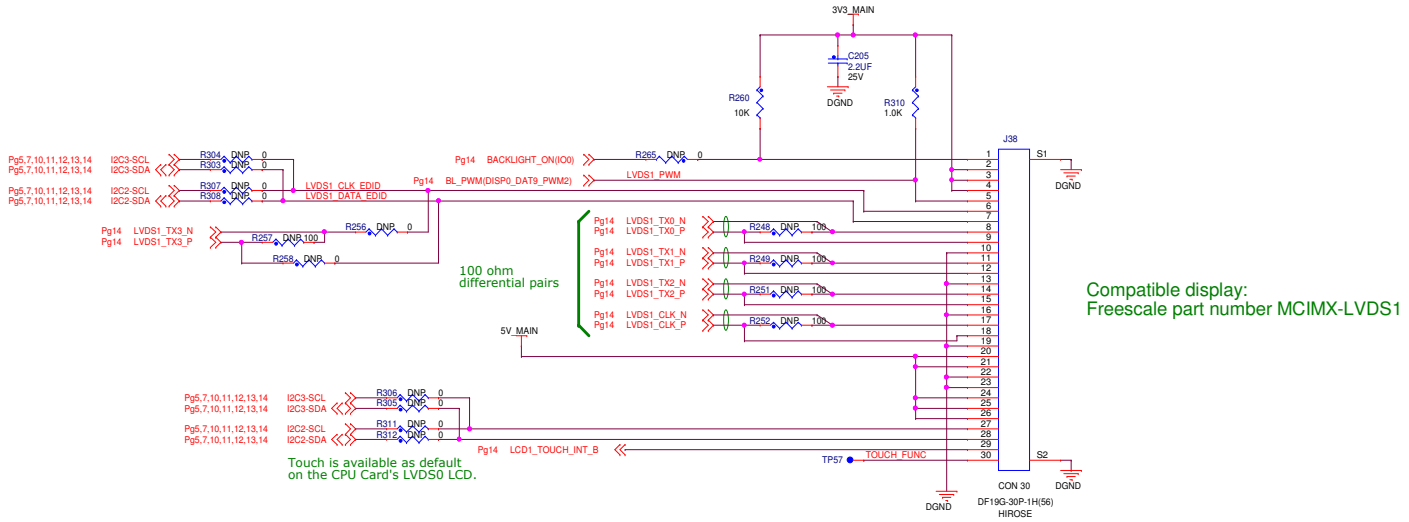
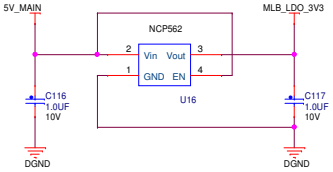
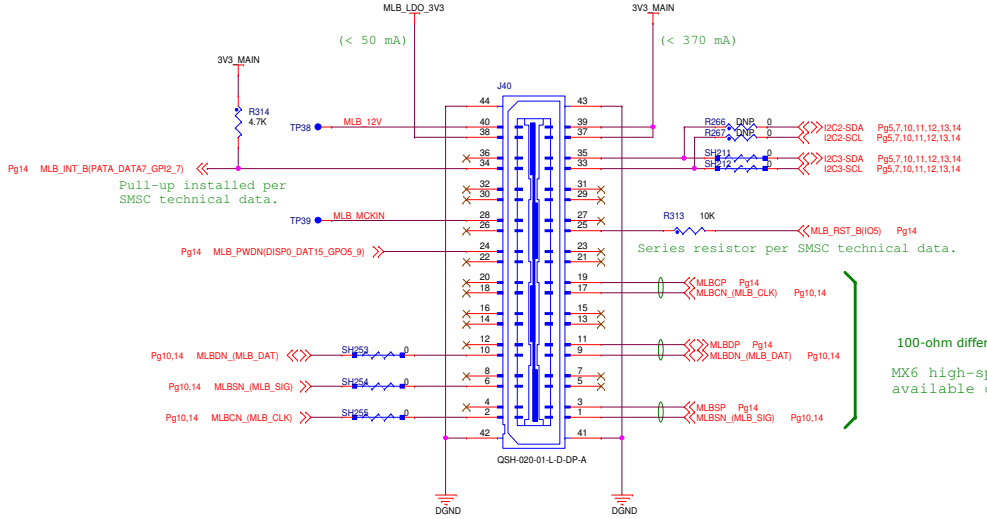
LVDS Display with Backlight Connector



Compatible display:
Freescale part number MCIMX-LVDS1

MLB Connector





I2C ADDRESS = (0x40 | R/W)

100-ohm differential pairs

MX6 high-speed signals only
available on CPU Card.

Compatible with SMSC MOST cards.

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Drawing Title: **MX53 & MX6 Automotive Base Board**

Page Title: **LVDS1, MLB Interfaces**

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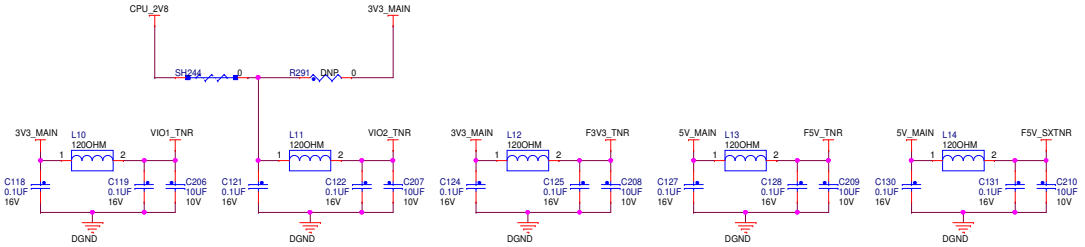
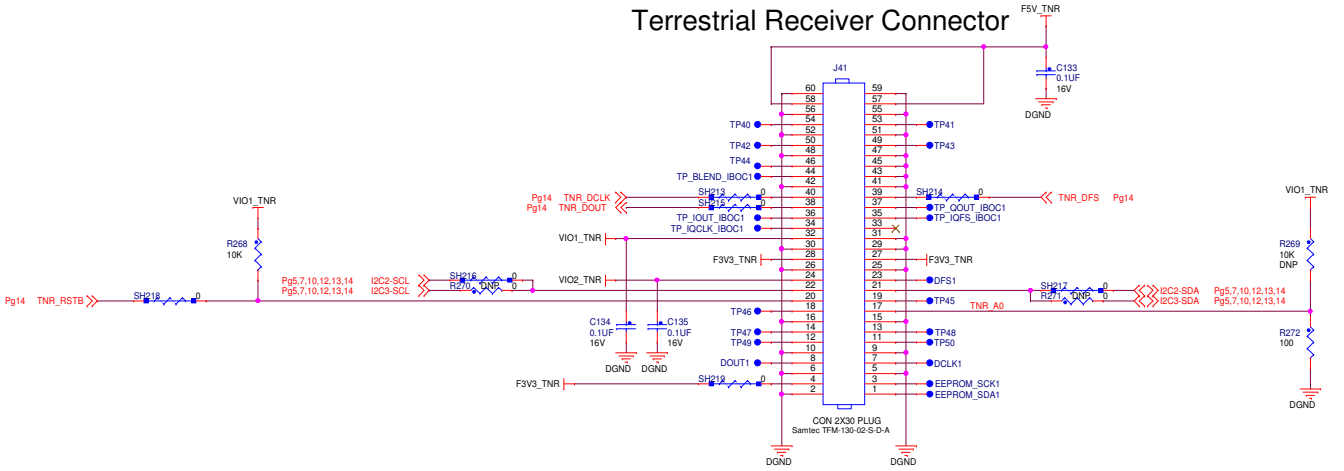
power requirements
VA - 5V @ 150ma (typ)
VD - 3.3V @ 50mA (typ)
VIO1 - 3.3V @ 5mA (typ)
VIO2 - 3.3V @ 2mA (typ)



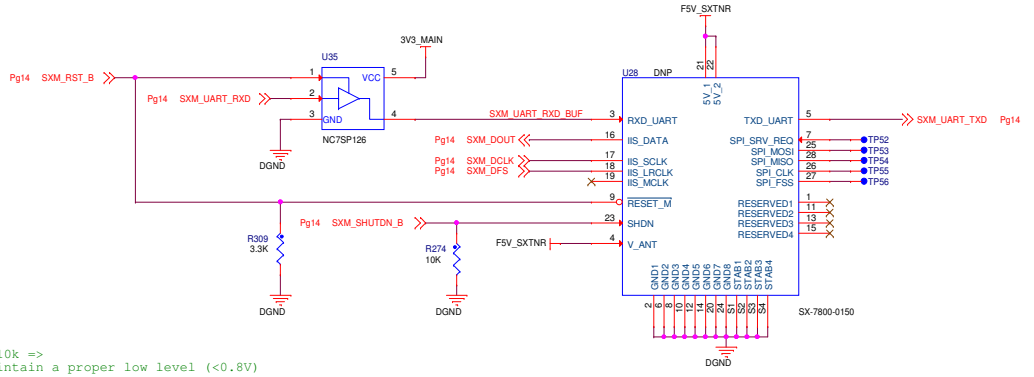
Terrestrial Receiver Connector



I2C address is set for 0xC4

Compatible with Silicon Labs Si475x/6x-EVB daughter cards.
HD is not accommodated due to the second I2S channel requirement.

Satellite Receiver



RESET_M is internally pulled-up with 10k =>
Strong pull-down R309 required to maintain a proper low level (<0.8V) until out of reset. SXM_RST_B floating at power-up.

R274 maintains a proper low level until out of shutdown.

U35 isolates SXM_UART_RXD input when in reset or in shutdown.
Indeed, the SXM has to be in reset to be allowed to enter shutdown.

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Page Title: **Tuner Interface**

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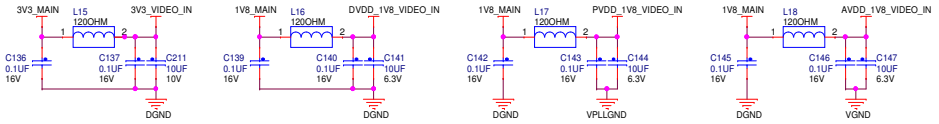
Video In ADC

Power requirements

3V3 @ 5mA (max)
1V8 @ 143mA (max)



Layout Note :- VPLLGND and VGND need a separate return path to DGND near the power supply and separate from each other.

J42 and J43 are vertical RCA connectors.

Analog Inputs
75-ohm impedance

CVBS_1_IN

CVBS_2_IN

J42
RCA 2 CONN Kycon KLPX-0848-2-B

J43
RCA 2 CONN
Kycon KLPX-0848-2-B

VGND and DGND should have a small space between them.

ALSB = '1' : I2C ADDRESS = (0x42 | R/W) (Default)
ALSB = '0' : I2C ADDRESS = (0x40 | R/W)

Video bus shared with Deserializer

Keep VREFP and VREFN capacitors close as possible to ADV7180 and on the same side of PCB

Keep crystal close as possible to ADV7180 and on the same side of PCB

U29
ADV7180

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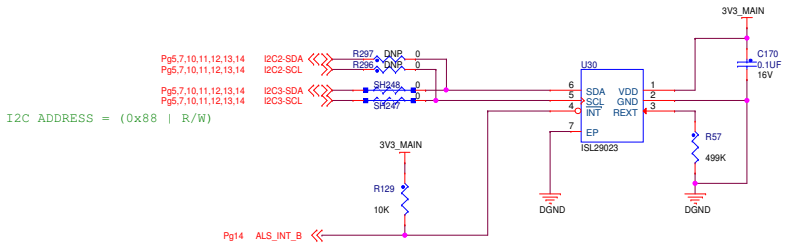
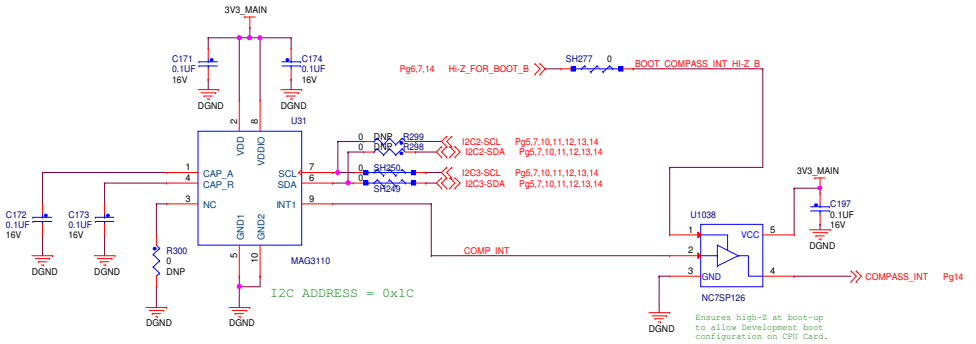
Ambient Light Sensor



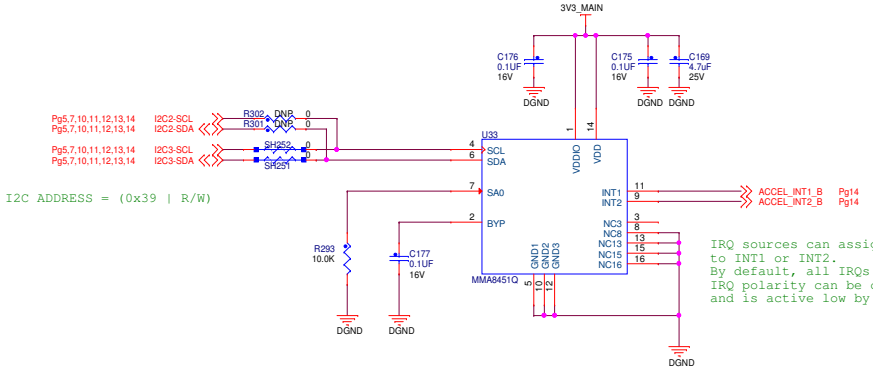
I2C ADDRESS = (0x88 | R/W)

Digital eCompass



I2C ADDRESS = 0x1C

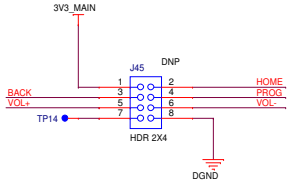
3-Axis Accelerometer



I2C ADDRESS = (0x39 | R/W)

IRQ sources can assigned through registers to INT1 or INT2.
By default, all IRQs are routed to INT2.
IRQ polarity can be changed with bit IPOL, and is active low by default.

Connector for Optional External Keypad

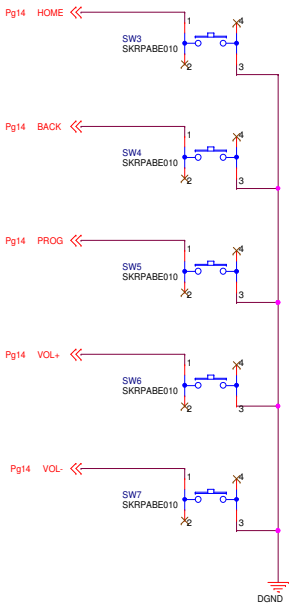


SMT header (2.54mm).

GPIOs used for keypad are muxed with a SPI if the i.MX53 CPU board is used.
i.MX53 mux table is summarized below:

	ALT0	ALT1	ALT2
HOME	DISP0_DAT16	GPIO5_10	eCSPI2_MOSI
BACK	DISP0_DAT17	GPIO5_11	eCSPI2_MISO
PROG	DISP0_DAT18	GPIO5_12	eCSPI2_SS0
VOL+	DISP0_DAT19	GPIO5_13	eCSPI2_CLK

Android Keys



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Page Title: **Sensors, Keypad**

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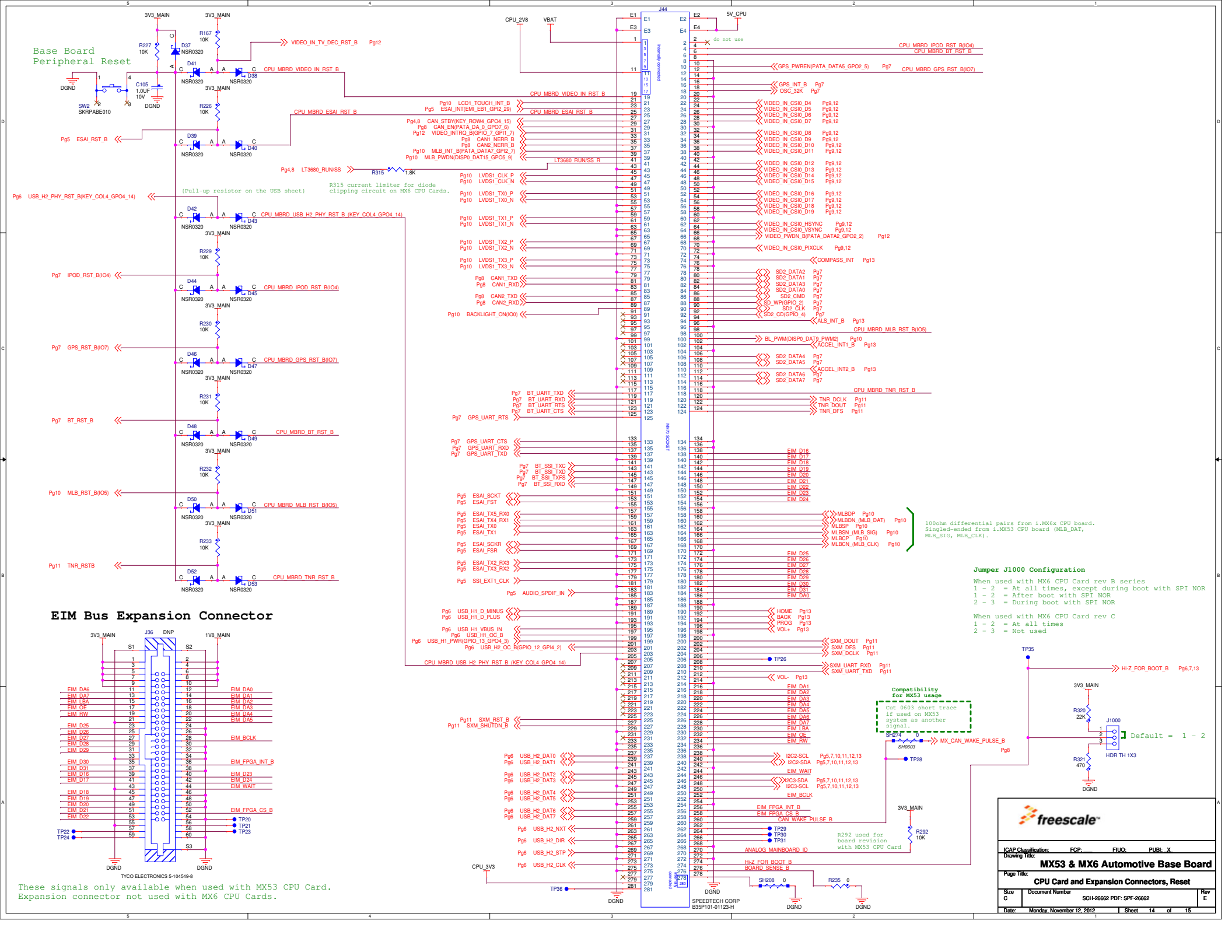
Base Board
Peripheral Reset
EIM Bus Expansion Connector
These signals only available when used with MX53 CPU Card.
Expansion connector not used with MX6 CPU Cards.
TYCO ELECTRONICS 5-104549-8
SPEEDTECH CORP
B35P101-01123-H
Jumper J1000 Configuration
When used with MX6 CPU Card rev B series
1 - 2 = At all times, except during boot with SPI NOR
1 - 2 = After boot with SPI NOR
2 - 3 = During boot with SPI NOR
When used with MX6 CPU Card rev C
1 - 2 = At all times
2 - 3 = Not used
Compatibility for MX53 usage
Cut 0603 short trace if used on MX53 system as another signal.
100ohm differential pairs from i.MX6x CPU board. Singled-ended from i.MX53 CPU board (MLB_DAT, MLB_SIG, MLB_CLK).
R315 current limiter for diode clipping circuit on MX6 CPU Cards.
(Pull-up resistor on the USB sheet)
R292 used for board revision with MX53 CPU Card
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Page Title: CPU Card and Expansion Connectors, Reset
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REVISION HISTORY

X15 - David B Nov 12, 2012

Throughout doc - Changed all sheets from
FIUO (Freescale Internal Use Only) to PUBI (Public Information).

Revision Summary

Rev A - released Jun 2010
Rev B1 - released Jan 2011
Rev C - internal prototype only
Rev D - internal design review
Rev E - released Sep 2012

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Networking & Multimedia Solutions Group
6501 William Cannon Drive West
Austin, TX 78735-8598

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Designer: Rafael del R	Drawing Title: MX53 & MX6 Automotive Base Board		
Drawn by: Rafael del R	Page Title: Revision History		
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