TMS570LS31 Hercules™ ARM® Safety MCU Development Kit (HDK)

USER GUIDE

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About This Manual

This document describes the board level operations of the TMS570LS31 **H**ercules **D**evelopment **K**it (HDK). The HDK is based on the Texas Instruments TMS570LS3137 337 BGA Microcontroller. The TMS570LS31 HDK is a table top card that allows engineers and software developers to evaluate certain characteristics of the TMS570LS31 microcontroller to determine if the microcontroller meets the designer's application requirements as well as begin early application development. Evaluators can create software to execute on board or expand the system in a variety of ways.

Notational Conventions

This document uses the following conventions:
The TMS570LS31 HDK will sometimes be referred to as the TMS570 HDK or HDK.

Program listings, program examples, and interactive displays are shown in a special italic typeface. Here is a sample program listing.

equations
!rd = !strobe&rw;

Information About Cautions

This book may contain cautions.
This is an example of a caution statement.
A caution statement describes a situation that could potentially damage your software, or hardware, or other equipment. The information in a caution is provided for your protection. Please read each caution carefully.

Related Documents, Application Notes and User Guides

Information regarding this device can be found at the following Texas Instruments website:

http://www.ti.com/hercules

1. Introduction

This development kit provides a product-ready hardware and software platform for evaluating the functionality of the Texas Instruments TMS570LS31x and TMS570LS21x microcontroller family. Schematics, list of materials, and PCB layout are available to ease hardware development and reduce time to market.

1.1 *Scope of Document*

This user guide will list the contents of the development kit, point out the features of the major components, and provide the instructions necessary to verify your development kit is in working order. Any additional usage instructions or details fall outside the scope of this document. Additional resources will be listed at the end of this user guide.

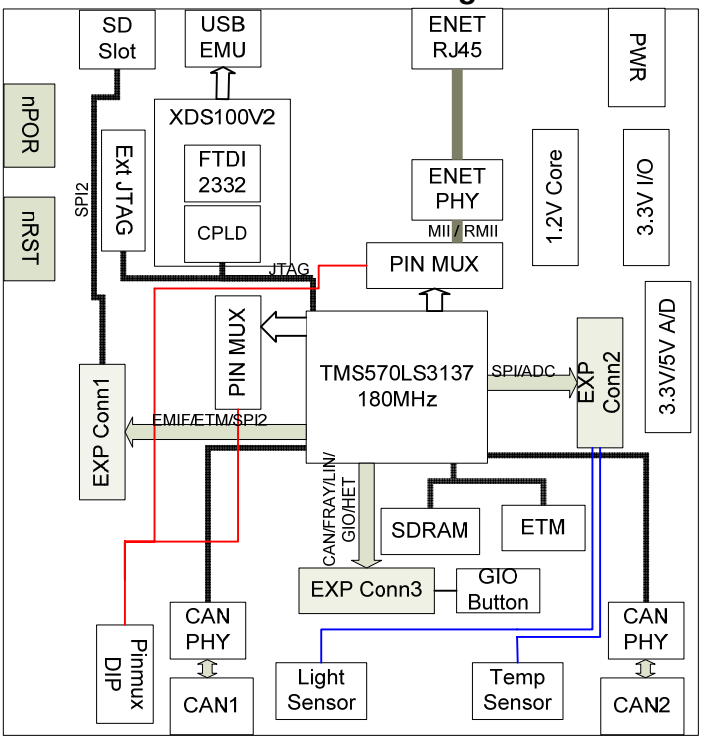
1.2 *TMS570LS31 HERCULES Development Kit (HDK) Features*

The HDK comes with a full complement of on board devices that suit a wide variety of application environments. Key features include:

- A Texas Instruments TMS570LS3137 337-ball BGA microcontroller
- *On board* USB XDS100v2 JTAG emulator
- ARM 20-pin JTAG debug header for *external* JTAG emulator
- External emulator detection circuit
- 10/100 Mbps Ethernet interface
- Two DCAN Transceivers and screw terminal blocks
- One ambient light sensor
- One ambient temperature sensor
- SCI accessible through a USB Virtual Port (VCP)
- One 8MB SDRAM
- Eight user programmable LEDs (2 tri-color LEDs, and 6 white LEDs)
- One user programmable pushbutton
- Three expansion connectors for hardware prototyping and daughter card use
- Reset pushbuttons (nPOR and nRST)
- One SD card slot (SPI mode)
- Embedded trace macrocell (ETM) debug interface via MIPI connector
- Configurable pin mux options
- 5V and 3.3V ADC option jumper (configured 5V by default)
- Current measurement capability for 3.3V IO, 1.2V Core, 1.2V PLL, 3.3V or 5V ADC, and 3.3V VCCP.
- Power supply supporting 5V to 12V DC input

1.3 HDK Board Block Diagram

Figure 1, TMS570LS31 HDK Board Block Diagram



1.4 TMS570LS31 HDK Contents

The kit contains everything needed to develop and run applications for TMS570LS31 microcontrollers including:

Board

- TMS570LS31 Card

Cables and Accessories

- 12 volt power supply with power adapters for US, or Europe
- Type A to mini B USB cable for using on board XDS100V2 JTAG emulator
- Category-5 Ethernet cable
- Flashlight for light sensor demo

DVD Containing

- Texas Instruments' Code Composer Studio™ IDE (CCS)
- nowFlash™ Flash Programming Tools
- nowECC™ ECC Tool
- HALCoGen GUI-based device configuration and driver examples

- HET Co-Processor Assembler and Debug Environment (HET IDE)
- Quickstart application source code (blinky example CCS4.x project)
- Complete documentation

1.5 HDK Specifications

- Board supply voltage: 5V–12V Vdc
- Board supply current: 130mA typ (fully active, CPU at 180 MHz)
- Dimensions: 4.90” x 4.30” x 0.85” (LxWxH)
- RoHS status: Compliant
- CE and FCC status: Compliant

1.6 Basic Operation

The HDK is designed to work with TI’s Code Composer Studio and other ARM IDE development tools. The IDE communicates with the board through the embedded emulator or an external JTAG emulator. To start, follow the instructions in the Quick Start Guide to install Code Composer. This process will install all of the necessary development tools, documentation and drivers.

1.7 Memory Map

The TMS570LS31 family of MCUs have a large byte addressable address space. The memory map table shows the address space of a TMS570LS31 microcontroller on the left with specific details of how each region is used by the HDK on the right. By default, the internal memory sits at the beginning of the address space.

The SDRAM is mapped into CS0 space on the EMIF. CS2/3/4 are used for synchronous memory for example SRAM, NOR flash, NAND flash etc.

Table 1, TMS570LS31 Memory Map

Start Address	End Address	HDK
0x0000 0000	0x002F FFFF	Flash
0x0800 0000	0x0803 FFFF	RAM
0x0840 0000	0x0843 FFFF	RAM-ECC
0x6000 0000	0x63FF FFFF	CS2 Async RAM
0x6400 0000	0x67FF FFFF	CS3 Async RAM
0x6800 0000	0x7BFF FFFF	CS4 Async RAM
0x8000 0000	0x87FF FFFF	CS0 Sync SDRAM

1.8 Power Supply

The HDK board operates from a single +12V external power supply connected to the main power input (P1), a 2.5 mm, barrel-type plug. Internally, the +12V input is converted into +1.2V, +3.3V and +5.0V using Texas Instruments swift voltage regulators and PTH power module. The +1.2V supply is used for the MCU core while the +3.3V supply is used for the MCU's I/O buffers and other module on the board. The +5.0 volt supply is used for ADC power (2nd option).

There are multiple power test points on the HDK board. The three main test point pairs provide a convenient mechanism to check the HDK's current for each supply. The table below shows the voltages for each test point and what the supply is used for.

Table 2, Power Test Points

Test Point Pair	Voltage	Voltage Use
TP14 and TP15	1.2V	MCU core
TP16 and TP17	3.3V	MCU IO and logic
TP18 and TP19	1.2V	MCU PLL
TP20 and TP21	3.3V	MCU Flash pump
TP22 and TP23	3.3V or 5.0V (J8 to enable 5V)	MCU MibADC, and ADREFHI

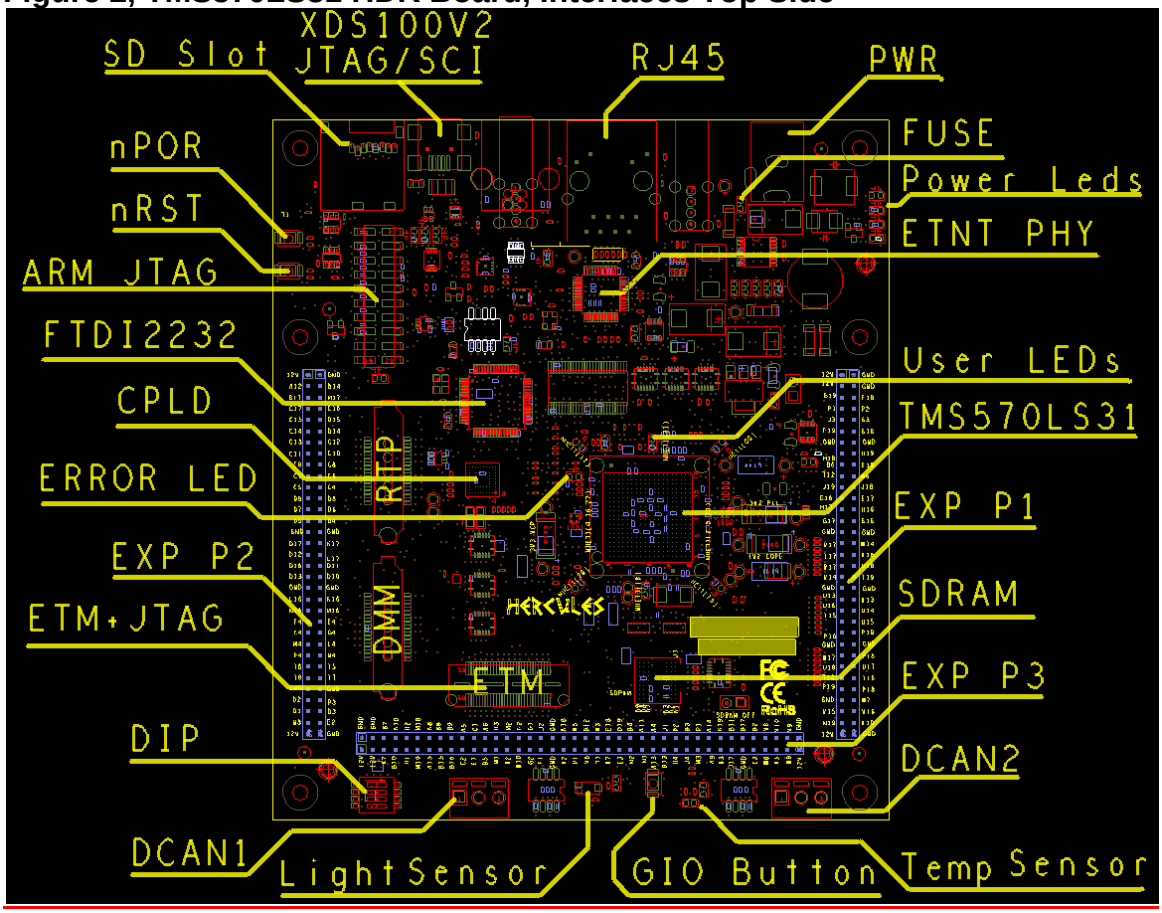
2. Physical Description

This chapter describes the physical layout of the TMS570LS31 HDK board and its interfaces.

2.1 Board Layout

The TMS570LS31 HDK board is a 4.9 x 4.3 inch (125 x 109 mm.) eight (8) layer printed circuit board which is powered by an external +12 volt only power supply. Figure 2 shows the layout of the TMS570LS31 HDK board.

Figure 2, TMS570LS31 HDK Board, Interfaces Top Side



2.2 Connectors

The HDK board has twenty nine (29) interfaces to various peripherals. These interfaces are described in the following sections.

Table 3, Connectors on HDK Board

Connector	Size	Function
J1	RJ45	Ethernet
J2	3 terminal, 2.54mm	DCAN1
J3	3 terminal, 2.54mm	DCAN2
J4	10x2, 2.54mm	ARM 20pin JTAG header
J6	19x2, mictor	RTP
J7	4pin, Mini-B USB	XDS100V2 USB
J9	33x2, 2mm	Exp P1, SPI1, SPI5, ADC
J10	33x2, 2mm	EXP P2, SPI2, EMIF, ECLK
J11	40x2, 2mm	EXP P3, SPI3, GIO, NHET, DCAN, Flexray, LIN
J12	19x2, mictor	DMM
J15		SD card
J19	30x2, MIPI	ETM MIPI Header
P1	2.5mm	+12V In

2.2.1 20Pin ARM JTAG Header

In addition to on board XDS100V2 JTAG. One 20pin ARM JTAG header is added for using external emulator. This is the standard interface used by JTAG emulators to interface to ARM microcontrollers. The pinout for the connector is shown in the figure.

Table 4, 20pin ARM JTAG Header

Signal Name	Pin#	Pin#	Signal Name
Vref	1	2	VCC
nTRST	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
RTCK	11	12	GND
TDO	13	14	GND
nRST	15	16	GND
NC	17	18	GND
NC	19	20	GND

2.2.2 Ethernet Interface

The several configurations of the TMS570LS31 series integrate an Ethernet MAC on chip. Please consult the family datasheets for availability. This interface is routed to the on board PHY via CBT switches. The board uses a DP83640 PHY.

The interface is isolated and brought out to an RJ-45 connector with integrated magnetics, J1. The pinmux control DIP S2 is used to control the CBT FET switch for Ethernet or other functions.

The J1 connector is used to provide a 10/100 Mbps Ethernet interface. This is a standard RJ-45 connector. The cable end pinout for the J1 connector is shown in the table below.

Table 5; J1, Ethernet Interface

Pin #	Signal	Pin #	Signal
1	D0+	2	D0-
3	D1-	4	D2+
5	D2-	6	D1-
7	D3+	8	D3-

Two LEDs are embedded into the connector to report link status (green LED) and transmit/receive status of the PHY (yellow LED).

2.2.3 CAN Interface

The TMS570LS31 has three DCAN interfaces which provide a high speed serial interface. Two 3 pin screw terminal blocks, J2, J3, are used to interface to the DCAN bus. The pinouts for this connector are shown in the figure below. H means CAN High (CAN H), and L means CAN Low (CAN L).

Figure 3, J2, J3 Screw Terminal Block

2.2.4 J19, MIPI ETM Connector

The following figure and table show the 60 pin MIPI header.

Figure 4, J19, 60pin MIPI ETM Header

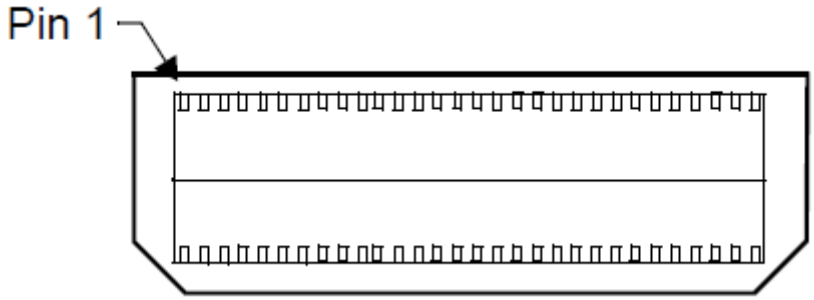


Table 6, J19, MIPI Connector Signal Mapping

MCU Signals	Pin#	Pin#	MCU Signals
3.3V	1	2	TMS
TCK	3	4	TDO
TDI	5	6	System reset
RTCK	7	8	nTRST
NC	9	10	NC
NC	11	12	3.3V
ETMTACECLKOUT	13	14	NC
To GND thru 0 W	15	16	GND
EMTTRACECTL	17	18	ETMDATA[19]
ETMDATA[0]	19	20	ETMDATA[20]
ETMDATA[1]	21	22	ETMDATA[21]
ETMDATA[2]	23	24	ETMDATA[22]
ETMDATA[3]	25	26	ETMDATA[23]
ETMDATA[4]	27	28	ETMDATA[24]
ETMDATA[5]	29	30	ETMDATA[25]
ETMDATA[6]	31	32	ETMDATA[26]
ETMDATA[7]	33	34	ETMDATA[27]
ETMDATA[8]	35	36	ETMDATA[28]
ETMDATA[9]	37	38	ETMDATA[29]
ETMDATA[10]	39	40	ETMDATA[30]
ETMDATA[11]	41	42	ETMDATA[31]
ETMDATA[12]	43	44	NC

ETMDATA[13]	45	46	NC
ETMDATA[14]	47	48	NC
ETMDATA[15]	49	50	NC
ETMDATA[16]	51	52	NC
ETMDATA[17]	53	54	NC
ETMDATA[18]	55	56	NC
GND	57	58	GND
NC	59	60	NC

2.2.5 J7, XDS100V2 USB JTAG Interface

The USB connector J7 is used to connect to the host development system which is running the software development IDE (CCS). The signals on this connector are shown in the table below.

Table 7, J7, XDS100V2 USB JTAG Interface

Pin #	Signal Name
1	USBVDD
2	D-
3	D+
4	NC
5	USBVSS

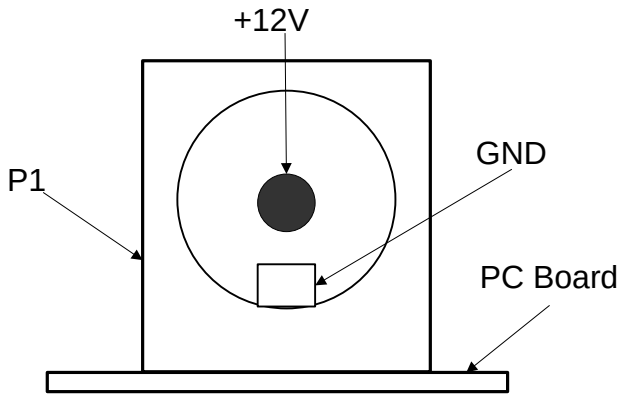
Before the board is shipped, the FTDI port1 is configured as JTAG, and port2 is configured as SCI. The CPLD is also programmed to route FTDI JTAG to MCU JTAG.

The HDK features circuitry to detect the external JTAG emulator. If a device is plugged onto the header J4 and J19, the DS1 LED will be turned on, and XDS100V2 JTAG is disabled.

2.2.6 P1, +12V Input

Connector P1 is the input power connector. This connector brings in +12 volts to the HDK Board. This is a 2.5 mm. jack. The figure below shows this connector as viewed from the card edge.

Figure 5, +12 Volt Input Jack



2.2.7 SCI Interface

The internal SCI on the TMS570LS31 device is routed to the 2nd port of FTDI chip. The FTDI USB driver makes the FT2232H 2nd channel appear as a virtual COM port (VCP). This allows the user to also have standard PC serial communications with the HDK using the same USB interface as the on-board emulator

2.2.8 Daughter Card Interface

The HDK provides expansion connectors that can be used to accept plug-in daughter cards. The daughter card allows users to build on their EVM platform to extend its capabilities and provide customer and application specific I/O. The expansion connectors are for all major interfaces including asynchronous memory, peripherals, Flexray, and A/D expansion.

The pin outs for this interface are documented in Chapter 3. There are three daughter card interfaces, J9, J10, J11. These connectors are described in the table below.

Table 8, Expansion Connector P2 (J10, Right, TopView)

Signal Name	Pin#	No.		Pin#	Signal Name
EXP_12V		1	2		GND
EXP_12V		3	4		GND
MibSPI1ENA	G19	5	6	F18	MibSPI1CLK
MibSPI1CS[1]	F3	7	8	R2	MibSPI1CS[0]
MibSPI1CS[3]	J3	9	10	G3	MibSPI1CS[2]
MibSPI1SIMO	F19	11	12	G18	MibSPI1SOMI
GND		13	14		GND

Signal Name	Pin#	No.		Pin#	Signal Name
MibSPI5ENA	H18	15	16	H19	MibSPI5CLK
MibSPI5CS[1]	B6	17	18	E19	MibSPI5CS[0]
MibSPI5CS[3]	T12	19	20	W6	MibSPI5CS[2]
MibSPI5SIMO[0]	J19	21	22		MibSPI5SOMI[0]
MibSPI5SIMO[1]	E16	23	24	E17	MibSPI5SOMI[1]
MibSPI5SIMO[2]	H17	25	26	H16	MibSPI5SOMI[2]
MibSPI5SIMO[3]	G17	27	28	G16	MibSPI5SOMI[3]
GND		29	30		GND
AD1IN[1]	V17	31	32	W14	AD1IN[0]
AD1IN[3]	T17	33	34	V18	AD1IN[2]
AD1IN[5]	R17	35	36	U18	AD1IN[4]
AD1IN[7]	V14	37	38	T19	AD1IN[6]
GND		39	40		GND
AD2IN[1]	U13	41	42	V13	AD2IN[0]
AD2IN[3]	U16	43	44	U14	AD2IN[2]
AD2IN[5]	T15	45	46	U15	AD2IN[4]
AD2IN[7]	R16	47	48	R19	AD2IN[6]
AGND		49	50		GND
AD1IN[9]	W17	51	52	P18	AD1IN[8]
AD1IN[11]	U19	53	54	U17	AD1IN[10]
AD1IN[13]	T18	55	56	T16	AD1IN[12]
AD1IN[15]	P19	57	58	R18	AD1IN[14]
GND		59	60		POR_RSTn
ADREFHI	V15	61	62	V16	ADREFLO
AD1EVT	N19	63	64	V10	AD2EVT
EXP_12V		65	66		GND

Table 9, Expansion Connector P1 (J9, Left, TopView)

Signal Name	Pin#	No.		Pin#	Signal Name
EXP_12V		1	2		GND

Signal Name	Pin#	No.		Pin#	Signal Name
ECLK	A12	3	4	B14	ERRORn
RST		5	6	M17	EMIF_CS[4]
EMIF_ADDR[21]	C17	7	8	C16	EMIF_ADDR[20]
EMIF_ADDR[19]	C15	9	10	D15	EMIF_ADDR[18]
EMIF_ADDR[17]	C14	11	12	D14	EMIF_ADDR[16]
EMIF_ADDR[15]	C13	13	14	C12	EMIF_ADDR[14]
EMIF_ADDR[13]	C11	15	16	C10	EMIF_ADDR[12]
EMIF_ADDR[11]	C9	17	18	C8	EMIF_ADDR[10]
EMIF_ADDR[9]	C7	19	20	C6	EMIF_ADDR[8]
EMIF_ADDR[7]	C5	21	22	C4	EMIF_ADDR[6]
EMIF_ADDR[5]	D9	23	24	D8	EMIF_ADDR[4]
EMIF_ADDR[3]	D7	25	26	D6	EMIF_ADDR[2]
EMIF_ADDR[1]	D5	27	28	D4	EMIF_ADDR[0]
GND		29	30		GND
EMIF_Wen	D17	31	32	K17	EMIF_CS[3]
EMIF_Oen	D12	33	34	L17	EMIF_CS[2]
EMIF_BA[1]	D16	35	36	D11	EMIF_DQMn[1]
EMIF_BA[0]	D13	37	38	D10	EMIF_DQMn[0]
GND		39	40		GND
EMIFDATA[1]	L16	41	42	K16	EMIFDATA[0]
EMIFDATA[3]	N16	43	44	M16	EMIFDATA[2]
EMIFDATA[5]	F4	45	46	E4	EMIFDATA[4]
EMIFDATA[7]	K4	47	48	G4	EMIFDATA[6]
EMIFDATA[9]	M4	49	50	L4	EMIFDATA[8]
EMIFDATA[11]	P4	51	52	N4	EMIFDATA[10]
EMIFDATA[13]	T6	53	54	T5	EMIFDATA[12]
EMIFDATA[15]	T8	55	56	T7	EMIFDATA[14]
GND		57	58		GND
SPI2_SOMI	D2	59	60	P3	EMIF_nWAIT
SPI2_SIMO	D1	61	62	D3	SPI2_CS1

Signal Name	Pin#	No.		Pin#	Signal Name
SPI2_CS0	N3	63	64	E2	SPI2_CLK
EXP_12V		65	66		GND

Table 10, Expansion Connector P3 (J11, Bottom One, TopView)

Signal Name	Pin#	No.	No.	Pin#	Signal Name
EXP_12V		1	2		GND
EXP_12V		3	4		GND
LINRX	A7	5	6	B7	LINTX
CAN1RX	B10	7	8	A10	CAN1TX
CAN2RX	H1	9	10	H2	CAN2TX
CAN3RX	M19	11	12	M18	CAN3TX
FRAYRX1	A15	13	14	A8	FRAYRX2
FRAYTX1	B15	15	16	B8	FRAYTX2
FRAYTXEN1	B16	17	18	B9	FRAYTXEN2
GIOA[1]	C2	19	20	A5	GIOA[0]
GIOA[3]	E1	21	22	C1	GIOA[2]
GIOA[5]	B5	23	24	A6	GIOA[4]
GIOA[7]	M1	25	26	H3	GIOA[6]
GIOB[1]	K2	27	28	M2	GIOB[0]
GIOB[3]	W10	29	30	F2	GIOB[2]
GIOB[5]	G2	31	32	G1	GIOB[4]
GIOB[7]	F1	33	34	J2	GIOB[6]
GND		35	36		GND
NHET1[1]	V2	37	38	K18	NHET1[0]
NHET1[3]	U1	39	40	W5	NHET1[2]
NHET1[5]	V6	41	42	B12	NHET1[4]
NHET1[7]	T1	43	44	W3	NHET1[6]
NHET1[9]	V7	45	46	E18	NHET1[8]
NHET1[11]	E3	47	48	D19	NHET1[10]
NHET1[13]	N2	49	50	B4	NHET1[12]

Signal Name	Pin#	No.	No.	Pin#	Signal Name
NHET1[15]	N1	51	52	A11	NHET1[14]
NHET1[17]	A13	53	54	A4	NHET1[16]
NHET1[19]	B13	55	56	J1	NHET1[18]
NHET1[21]	H4	57	58	P2	NHET1[20]
NHET1[23]	J4	59	60	B3	NHET1[22]
NHET1[25]	M3	61	62	P1	NHET1[24]
NHET1[27]	A9	63	64	A14	NHET1[26]
NHET1[29]	A3	65	66	K19	NHET1[28]
NHET1[31]	J17	67	68	B11	NHET1[30]
GND		69	70		GND
MibSPI3CS[3]	C3	71	72	B2	MibSPI3CS[2]
MibSPI3SIMO	W8	73	74	V8	MibSPI3SOMI
MibSPI3CS[1]	V5	75	76	V10	MibSPI3CS[0]
MibSPI3ENA	W9	77	78	V9	MibSPI3CLK
EXP_12V		79	80		GND

2.3 LEDs

The TMS570LS31 HDK board has nineteen (19) LEDs. Eight of these LEDs (Table 13 are under user control: seventeen are white LEDs and two are tri-color LEDs. Those LEDs are controlled and programmed by NHET signals.

LEDs DS2, DS3, DS4, and DS5 indicate the presence of the power (+1.2V, +5V, 3.3V, and 12V) s on the board. The LED functions are summarized in the table below.

Table 11, Demo LEDs

LED#	Location	Signals	Color
D3	Left Top	NHET1[17]	White
D4	Top	NHET1[31]	White
D5	Right Top	NHET1[0]	White
D6	Right Bottom	NHET1[25]	White

D7	Bottom	NHET1[18]	White
D8	Left bottom	NHET1[29]	White
LED1 (Tri-color)	Left	NHET1[16] NHET1[27] NHET1[04]	Red Blue Green
LED2 (Tri-color)	Right	NHET1[20] NHET1[05] NHET1[02]	Red Blue Green

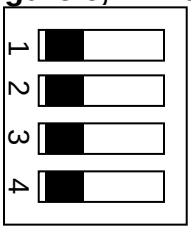
Table 12, Other LEDs as Indicator

Num	LED	Color
D1	nERROR	RED
D10	XDS100V2 SCI RX	Blue
D11	XDS100V2 SCI TX	Blue
D12	XDS100V2 PWRENn	Blue
D2	JTAG TDI	Blue
D9	Ethernet Speed	Blue
DS1	ARM JTAG Plugin	Blue
DS2	VCC_1V2	Blue
DS3	VCC_5V	Blue
DS4	VCC_3V3	Blue
DS5	VCC_12V	Blue

2.4 S2 DIP Switch

There is one 4-position DIP switches located on the left-bottom corner at reference designator S2. By default, all of the switches are set to the “OFF” position and should remain in that position when completing the steps in this user guide.

Figure 6, DIP Switch Settings



The S2 DIP switch is reserved for user applications. Table 15 describes the function of each channel on S2.

Table 13, S2 DIP Switch Functions

Switch	OFF Position	ON Position
S2:1*	Reserved	Reserved
S2:2	Reserved	Reserved
S2:3	Reserved	Reserved
S2:4	Ethernet Disabled	Ethernet Enabled

*Note: S2:1 indicates slide 1 on the S2 DIP switch, S2:2 indicates slide 2 on the S2 DIP switch, and so on.

2.5 Jumpers

HDK board has two (2) jumpers which are used to enable/disable the on-board SDRAM and select 5V or 3.3V ADC as such:

Table 14, Jumpers

Jumper #	Off	On
J8	5V ADC	3.3V ADC
J13	SDRAM on	SDRAM Off

2.6 S4, Power On Reset Switch

Switch S4 is a momentary switch that asserts power on reset to the TMS570LS31 device. The POR condition is intended to reset all logic on the device including the test/emulation circuitry.

TMS570 MCU has two resets: Warm Reset (nRST) and Power On Reset (nPORRST. The POR can be invoked by pushing POR_RESET button, or by RESET signals from XDS100 CPLD, ARM JTAG SREST, or MIPI connector.

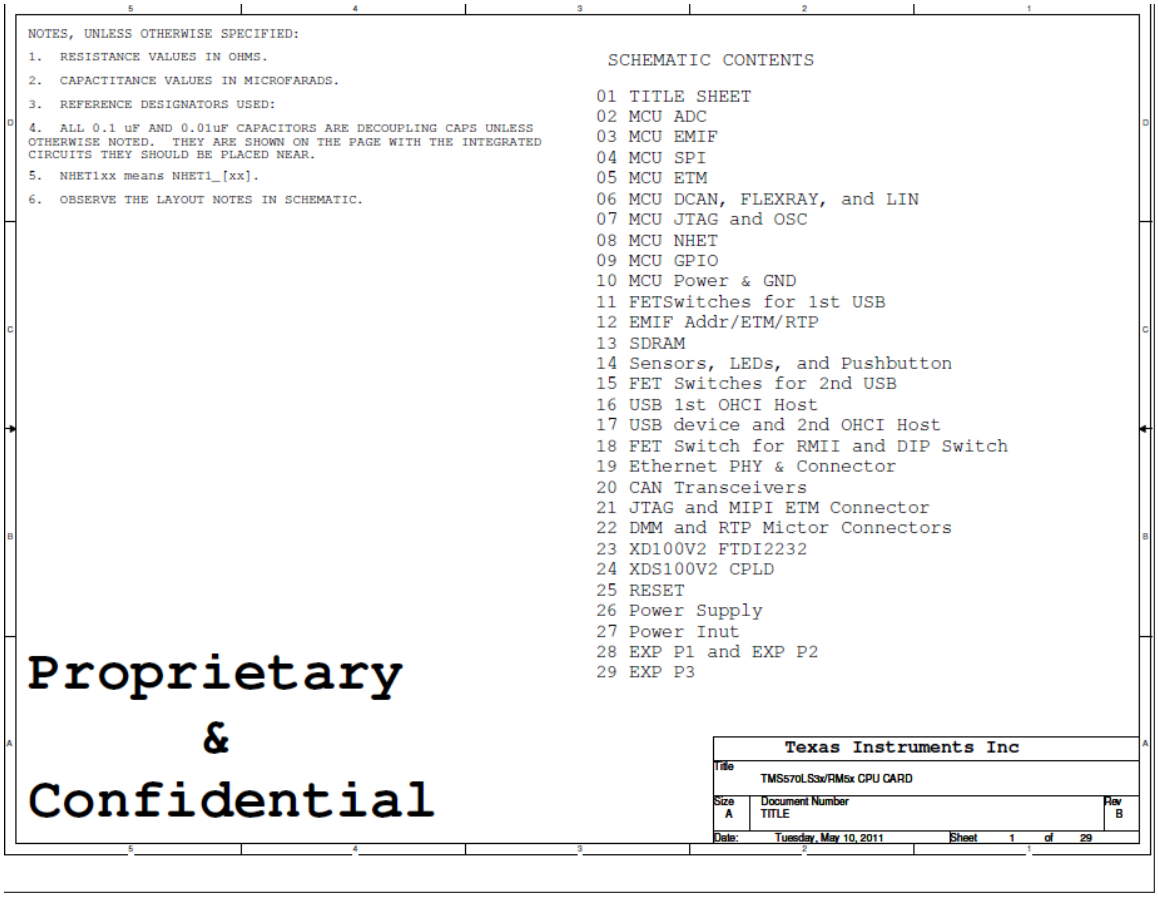
2.7 S3, System Reset Switch

Switch S3 to assert a warm reset the TMS570LS31 device. However, a warm reset does not reset any on-chip test or emulation logic. The reset signal from the windowed watchdog will also assert a warm reset to MCU.

Appendix A

Schematics

This appendix contains the schematics for the TMS570LS31 HDK board.



NOTES, UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VALUES IN OHMS.
2. CAPACTITANCE VALUES IN MICROFARADS.
3. REFERENCE DESIGNATORS USED:
4. ALL 0.1 uF AND 0.01uF CAPACITORS ARE DECOUPLING CAPS UNLESS OTHERWISE NOTED. THEY ARE SHOWN ON THE PAGE WITH THE INTEGRATED CIRCUITS THEY SHOULD BE PLACED NEAR.
5. NHET1xx means NHET1_[xx].
6. OBSERVE THE LAYOUT NOTES IN SCHEMATIC.

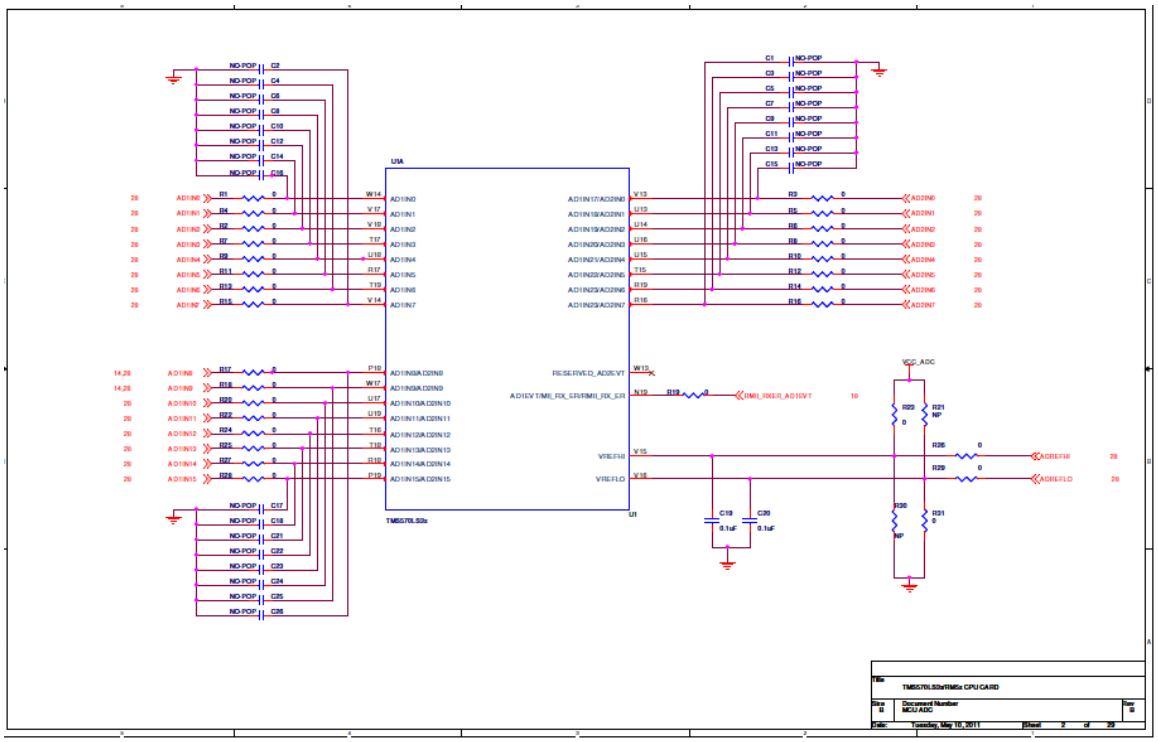
SCHEMATIC CONTENTS

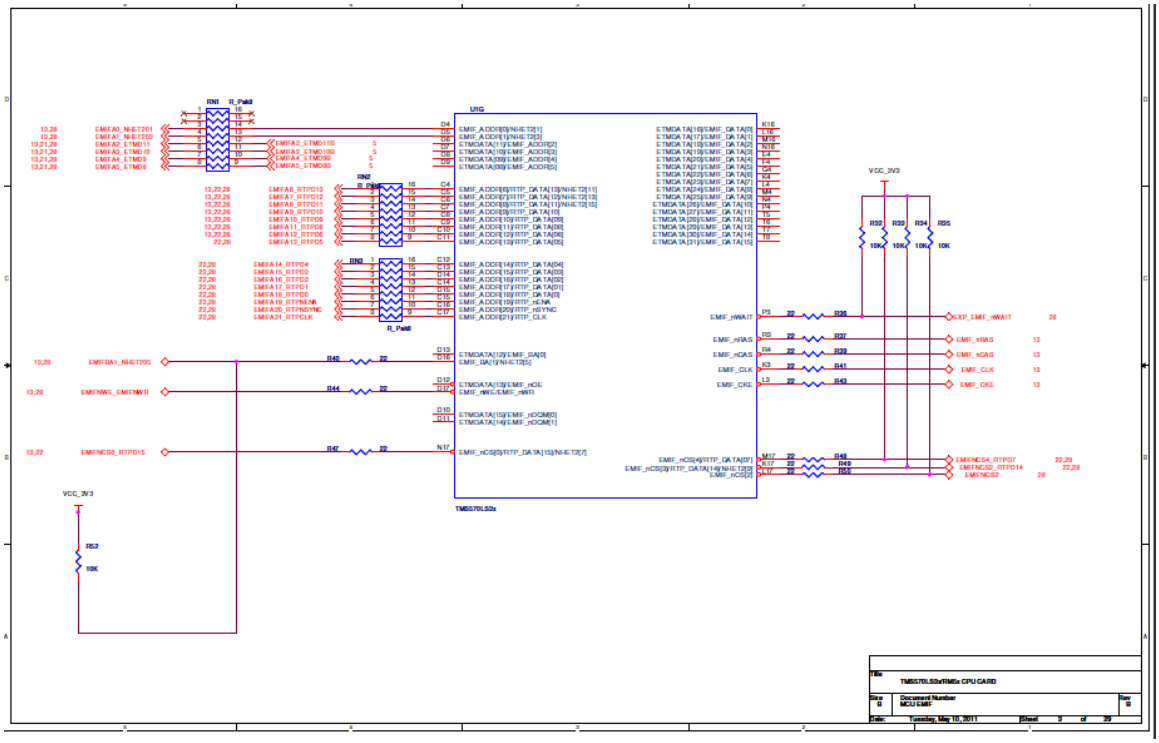
Texas Instruments Inc

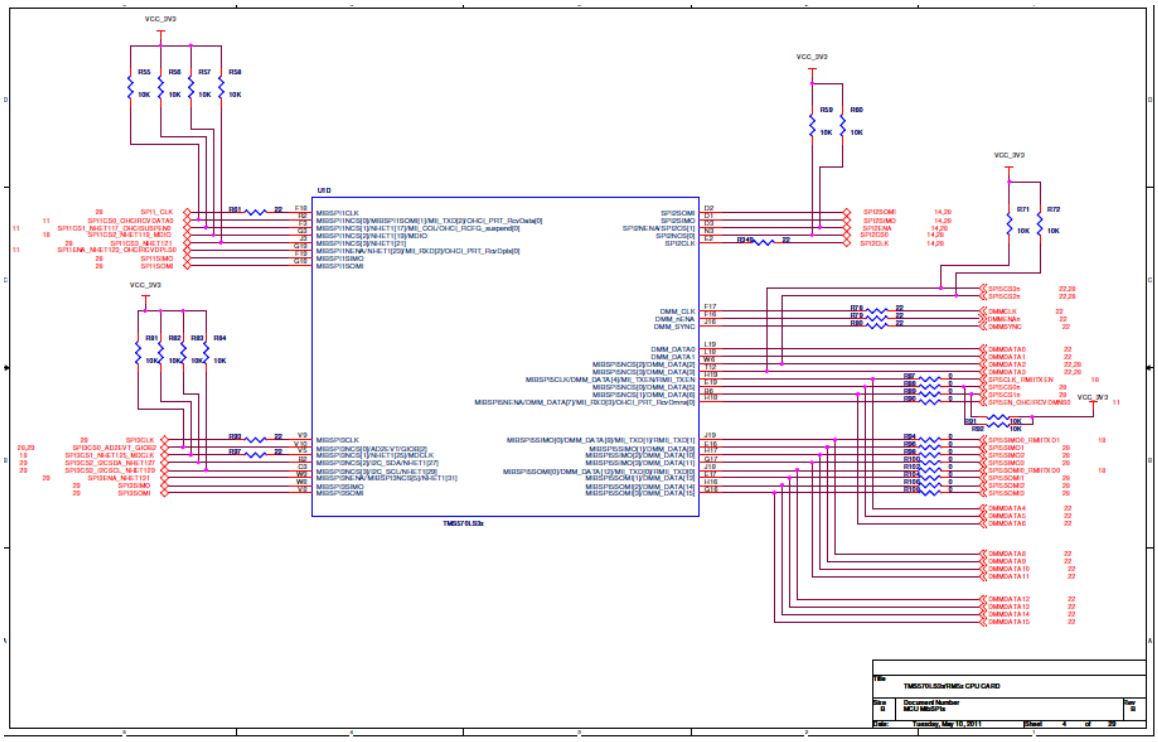
Title: TMS570LS3x/RM5x CPU CARD

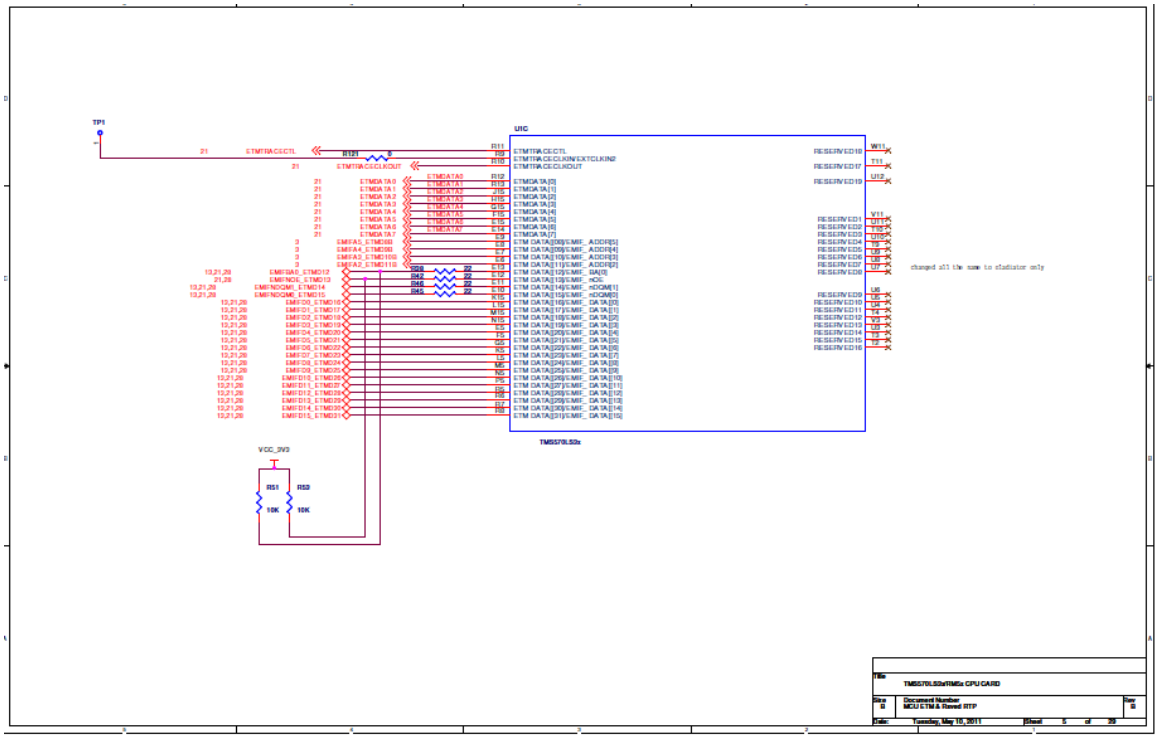
Size: A | Document Number: TITLE | Rev: B

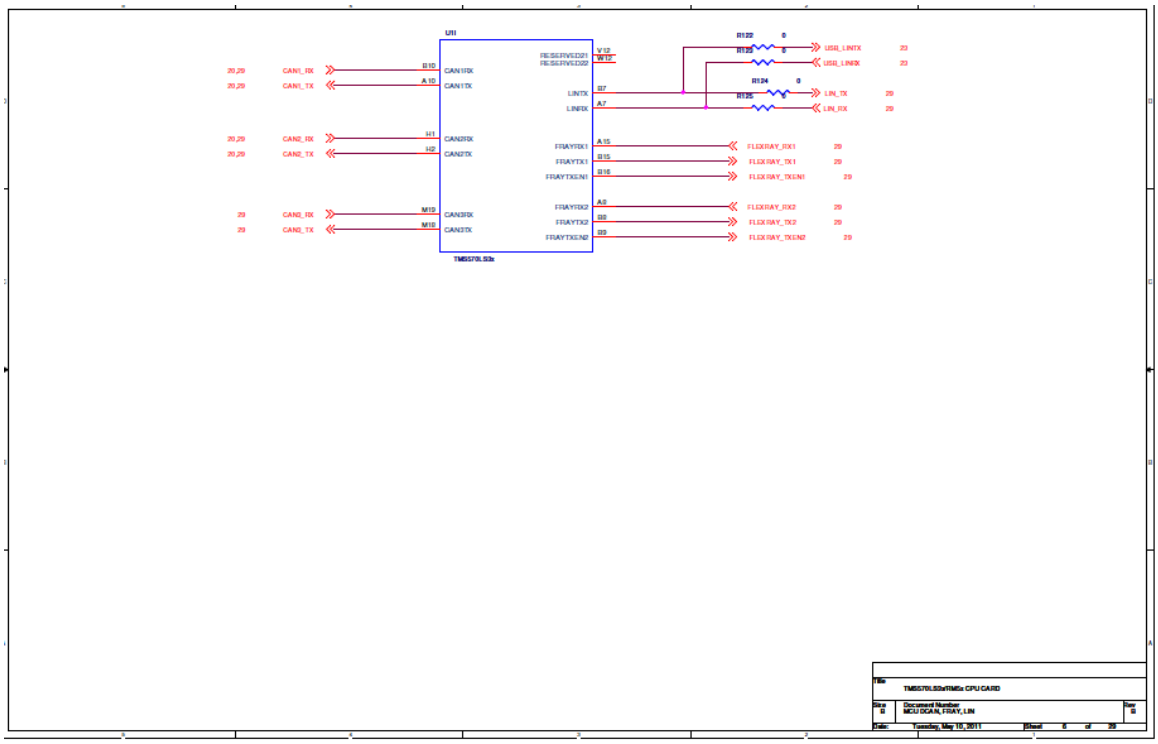
Date: Tuesday, May 10, 2011 | Sheet 1 of 29

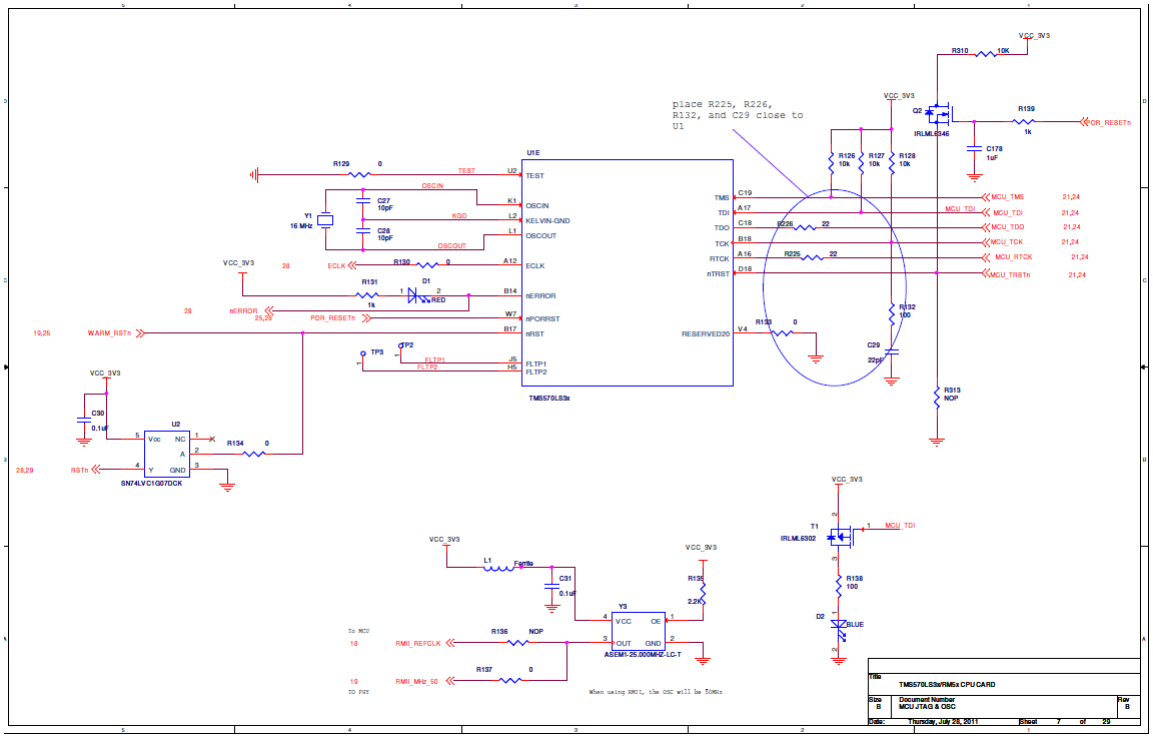


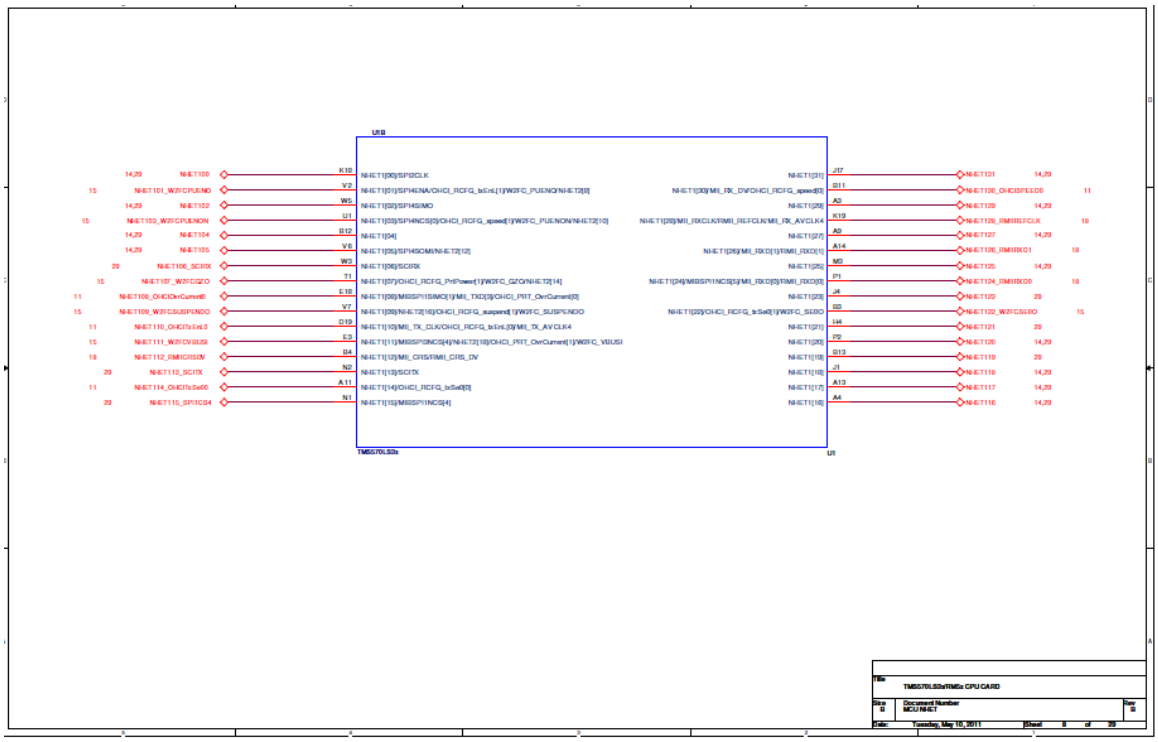


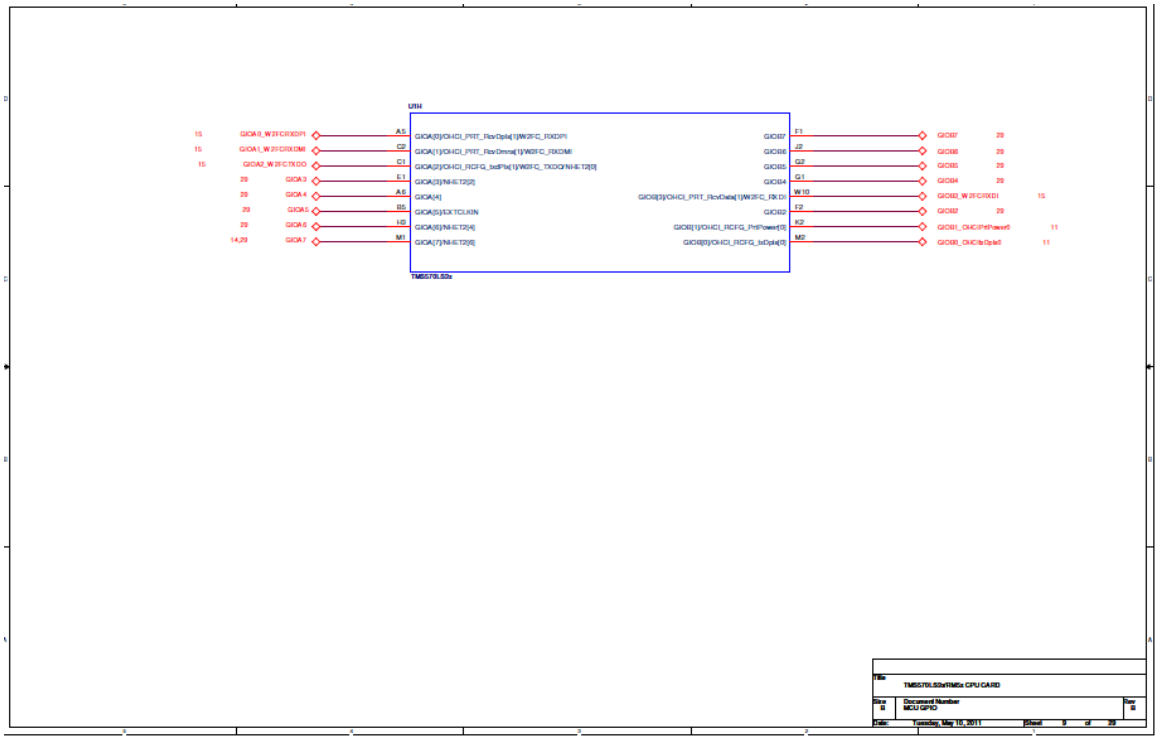


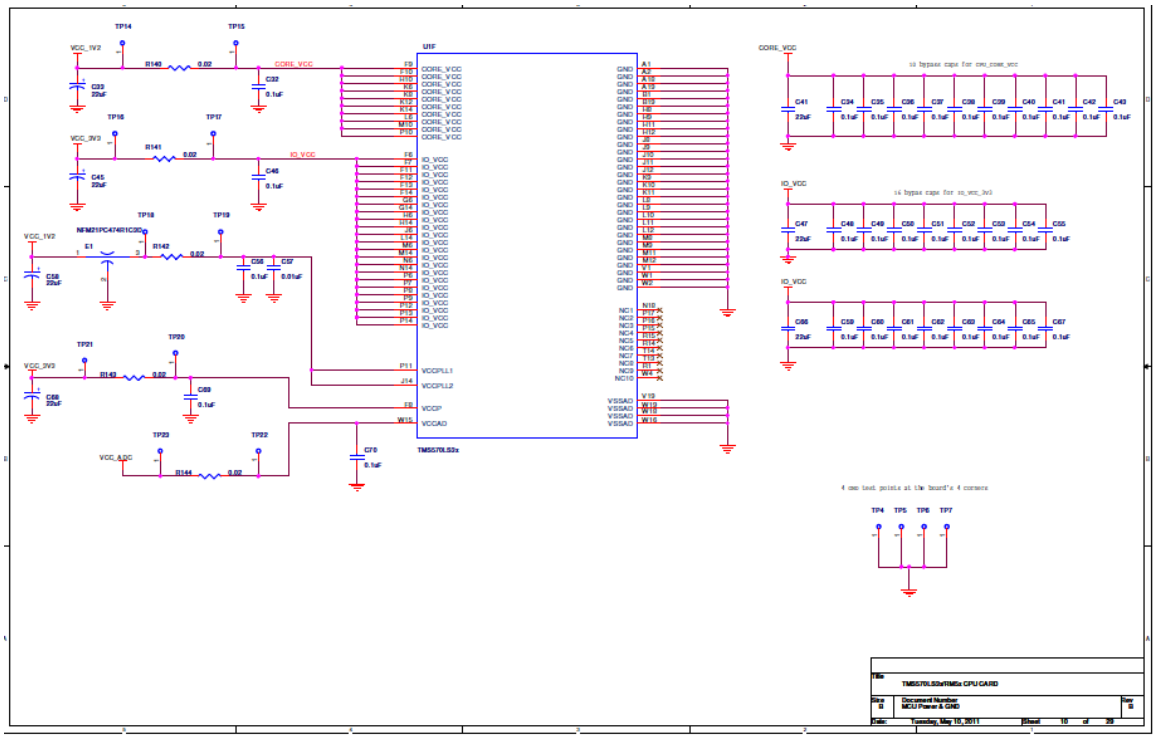


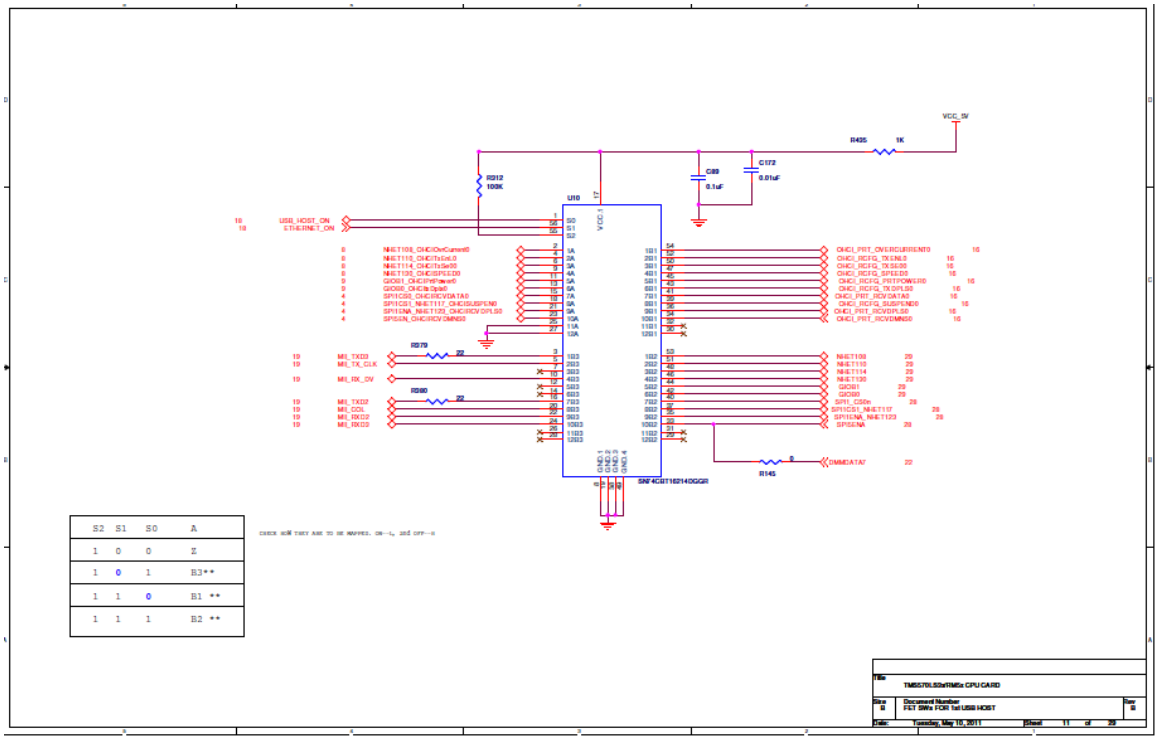

U1I
CAN1RX
CAN1TX
CAN2RX
CAN2TX
CAN3RX
CAN3TX
LINTX
LINRX
FRAYRX1
FRAYTX1
FRAYTXEN1
FRAYRX2
FRAYTX2
FRAYTXEN2
TMS570LS3x
USB_LINTX
USB_LINRX
LIN_TX
LIN_RX
FLEXRAY_RX1
FLEXRAY_TX1
FLEXRAY_TXEN1
FLEXRAY_RX2
FLEXRAY_TX2
FLEXRAY_TXEN2
TMS570LS3x/RM5x CPU CARD
MCU DCAN, FRAY, LIN
Tuesday, May 10, 2011


place R225, R226,
R132, and C29 close to
U1
U1E
TMS570LS3x
TEST
OSCIN
KELVIN-GND
OSCOUT
ECLK
nERROR
nPORRST
nRST
FLTP1
FLTP2
RESERVED20
TMS
TDI
TDO
TCK
RTCK
nTRST
MCU_TMS
MCU_TDI
MCU_TDO
MCU_TCK
MCU_RTCK
MCU_TRSTn
POR_RESETn
WARM_RSTn
RSTn
SN74LVC1G07DCK
IRLML6346
IRLML6302
ASEM1-25.000MHZ-LC-T
RED
BLUE
RMII_REFCLK
RMII_MHz_50
TMS570LS3x/RM5x CPU CARD
JTAG & OSC
Thursday, July 28, 2011

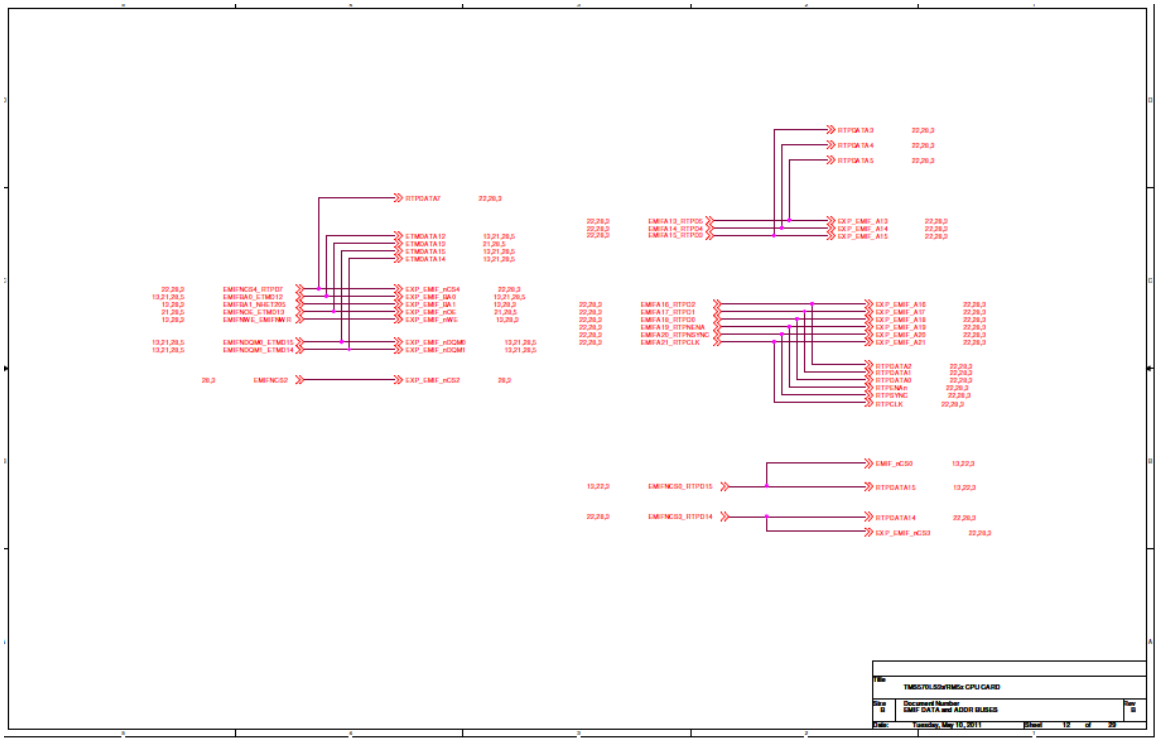


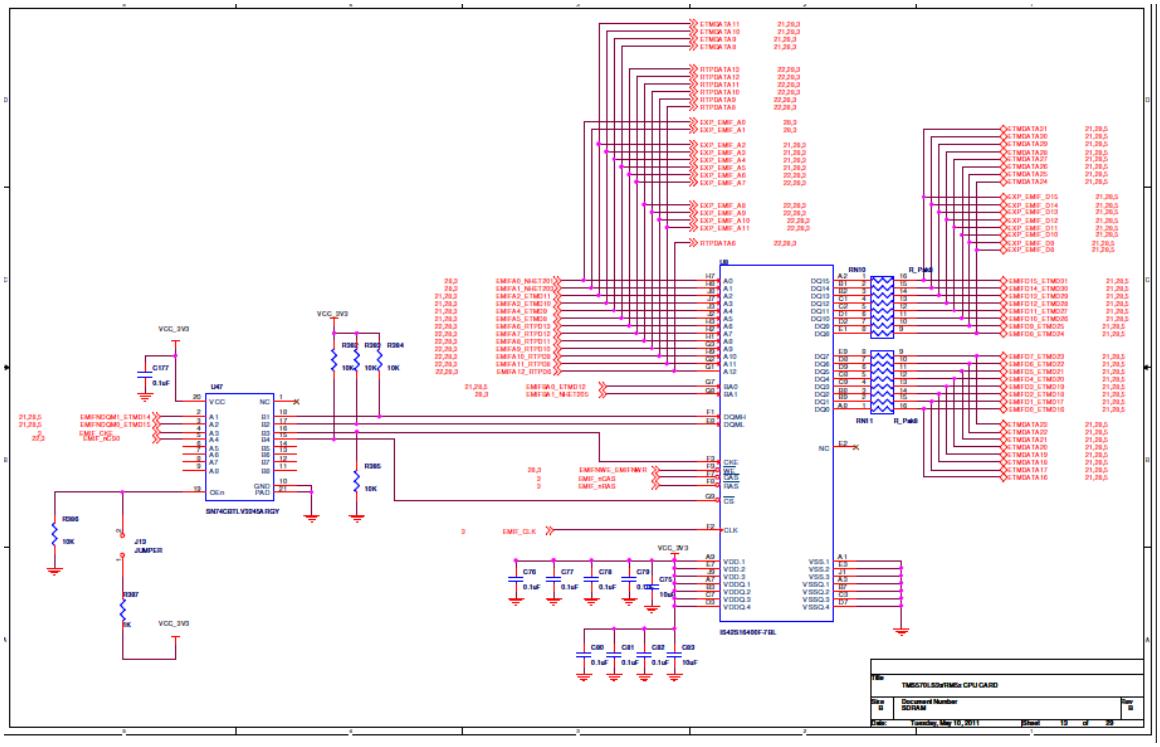


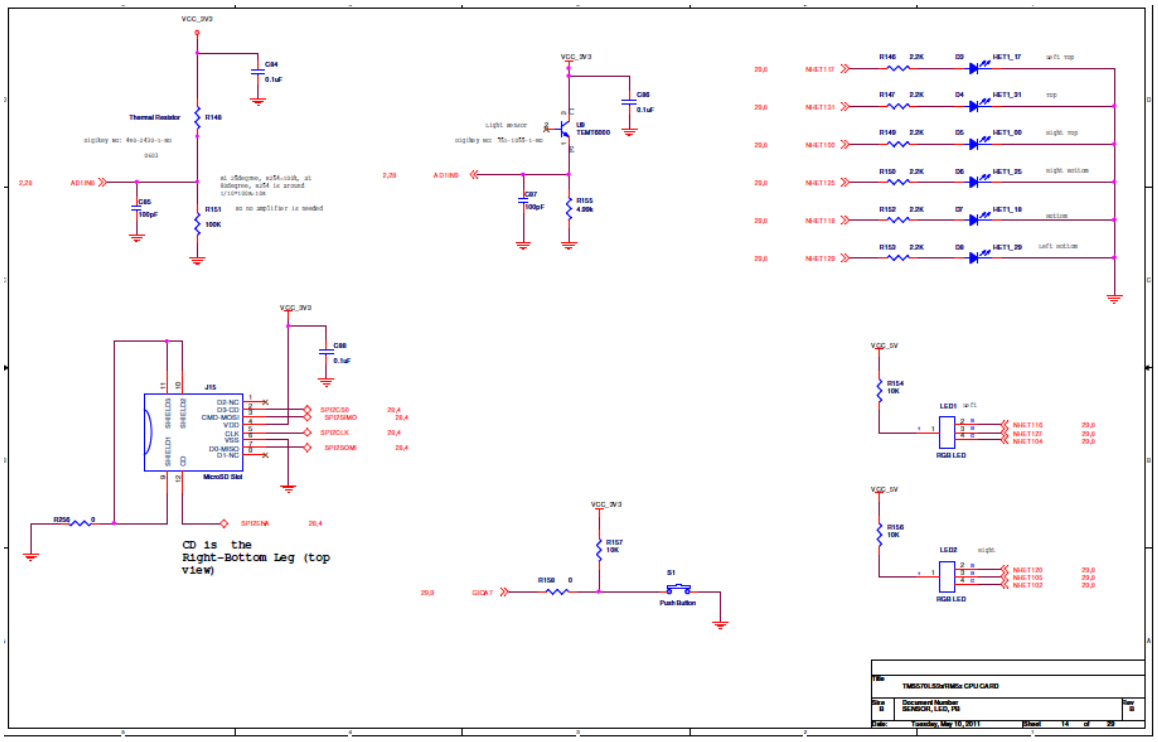


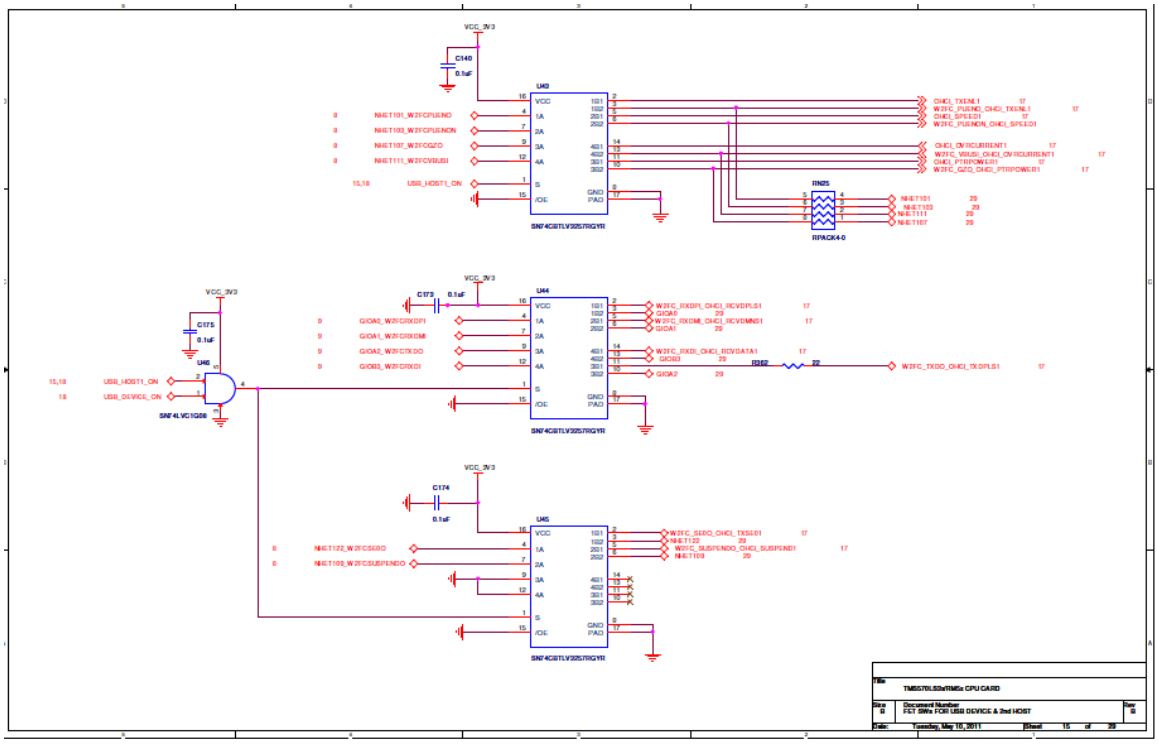


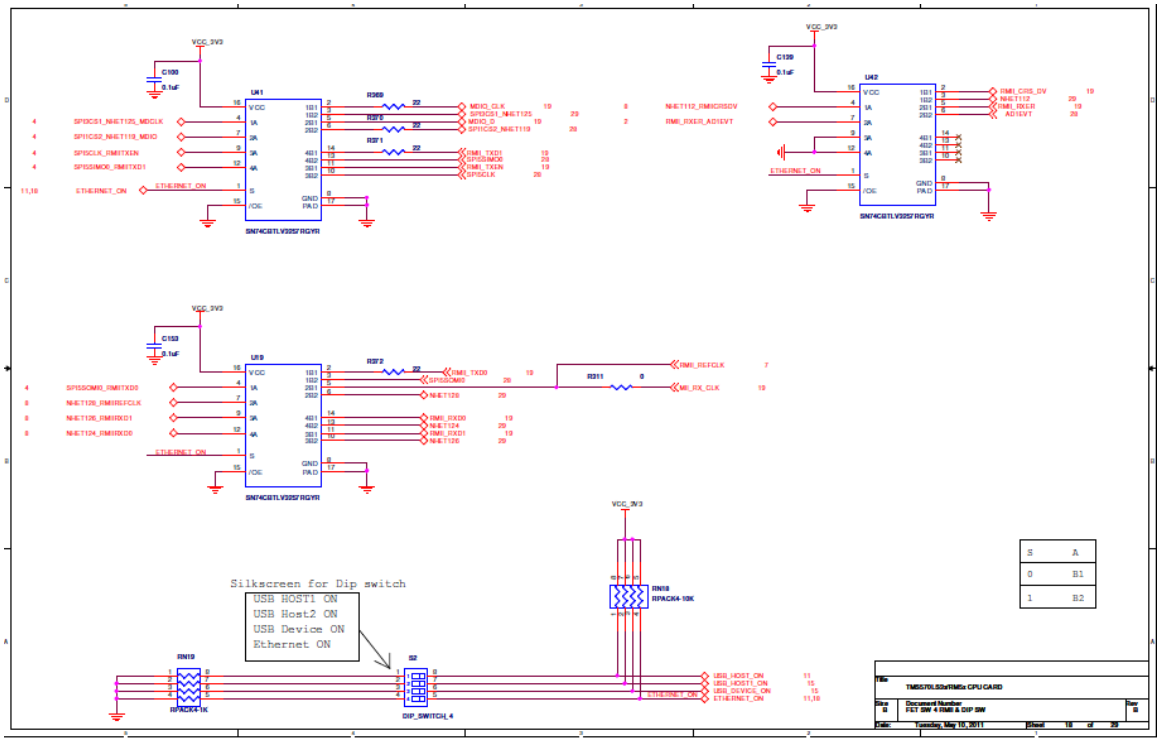
S2	S1	S0	A
1	0	0	Z
1	0	1	B3**
1	1	0	B1 **
1	1	1	B2 **

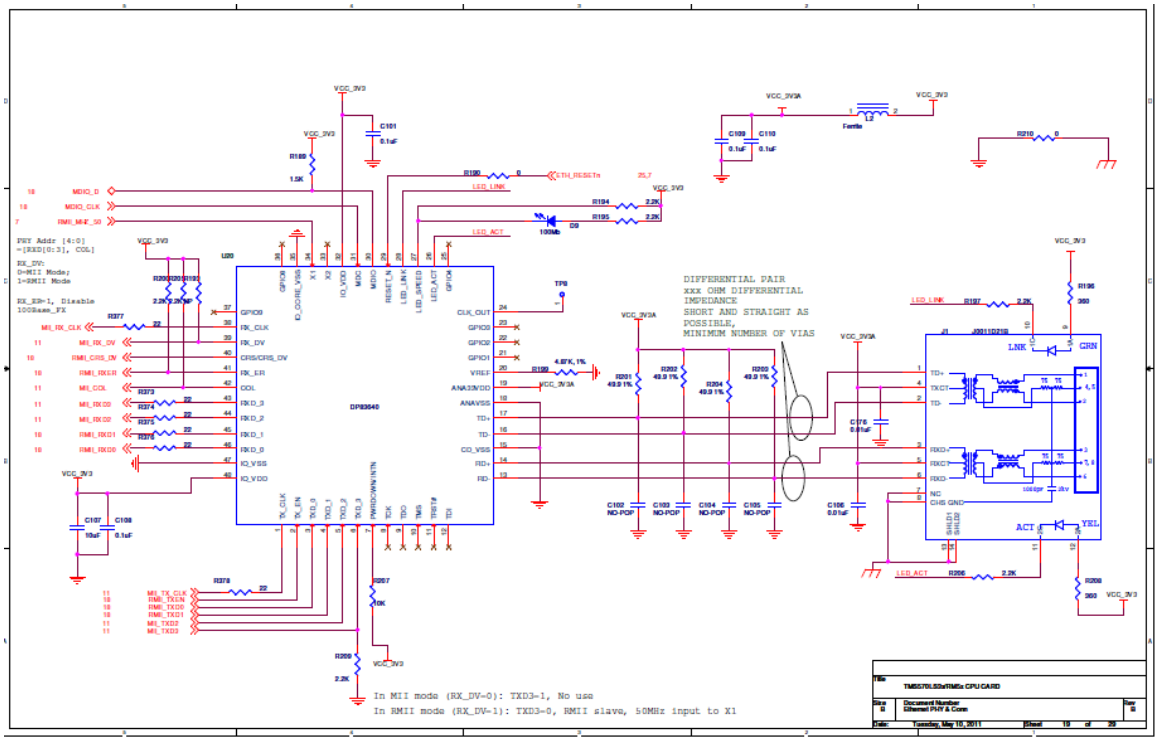


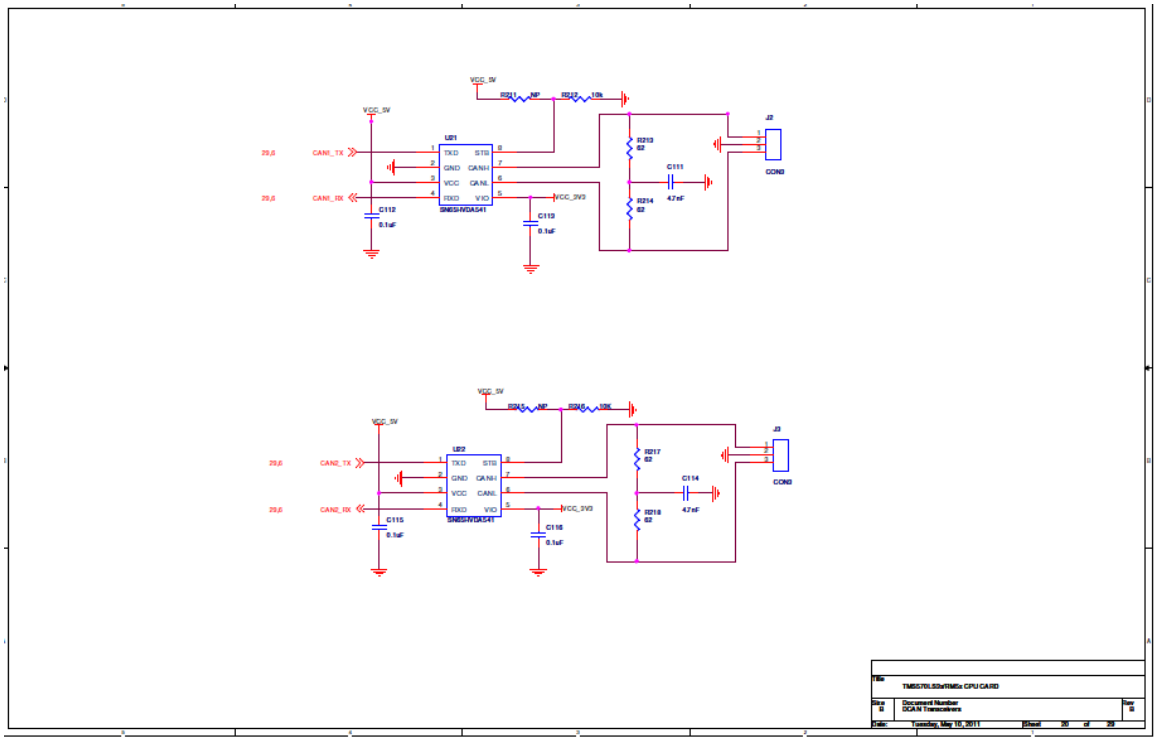


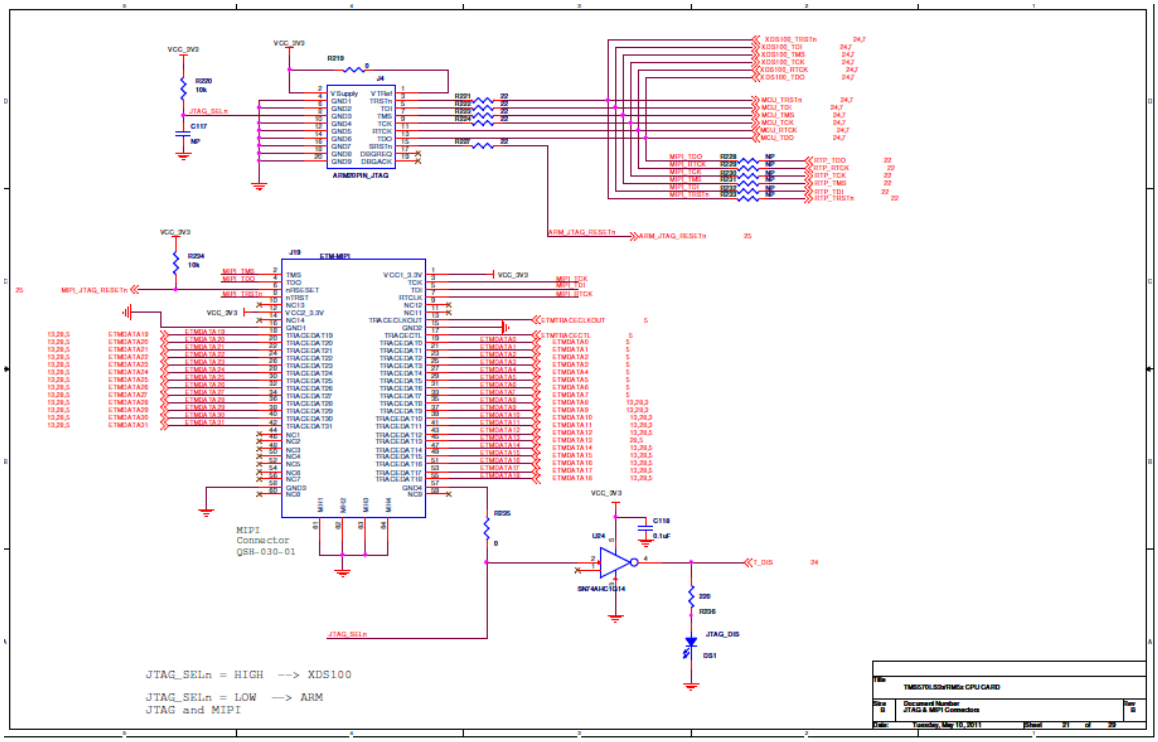

CD is the Right-Bottom Leg (top view)

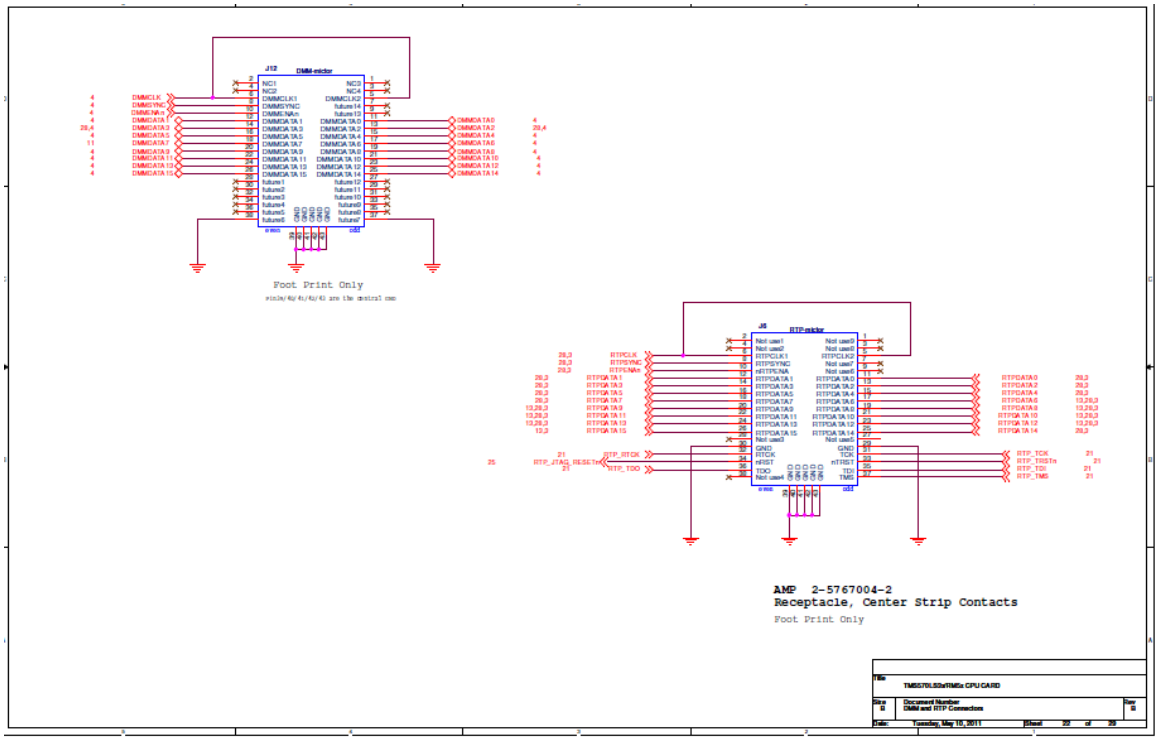


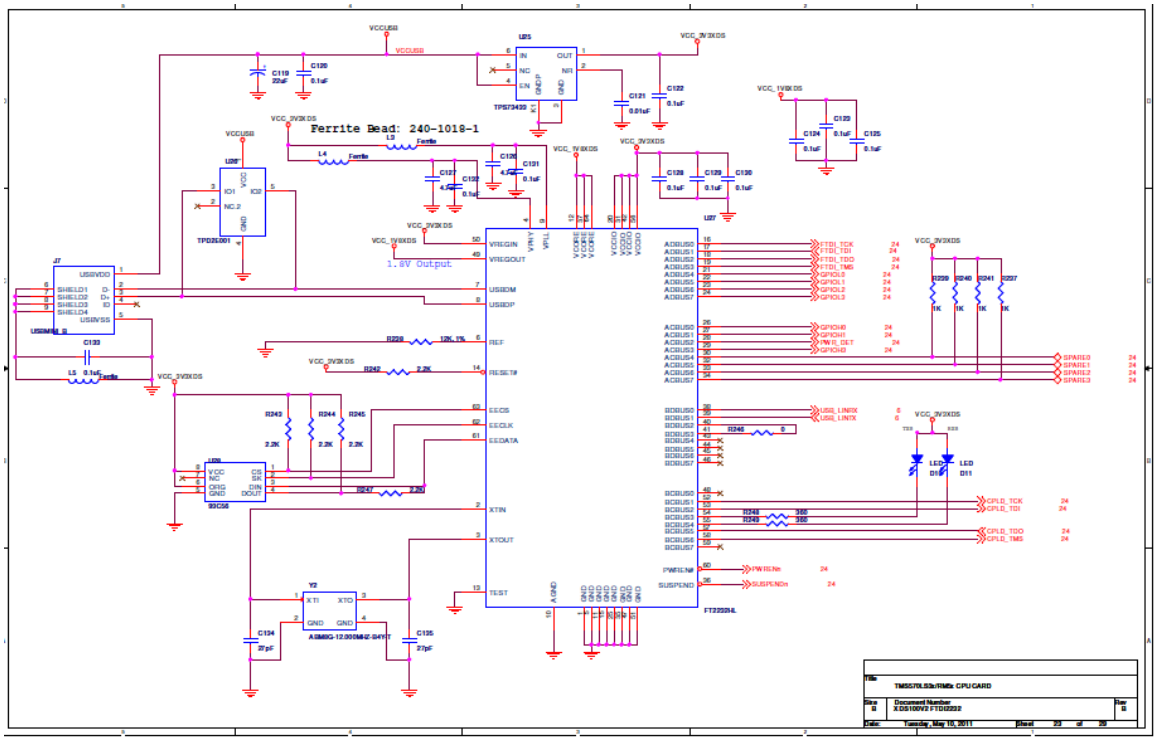

Silkscreen for Dip switch
USB HOST1 ON
USB Host2 ON
USB Device ON
Ethernet ON
S
A
0
B1
1
B2

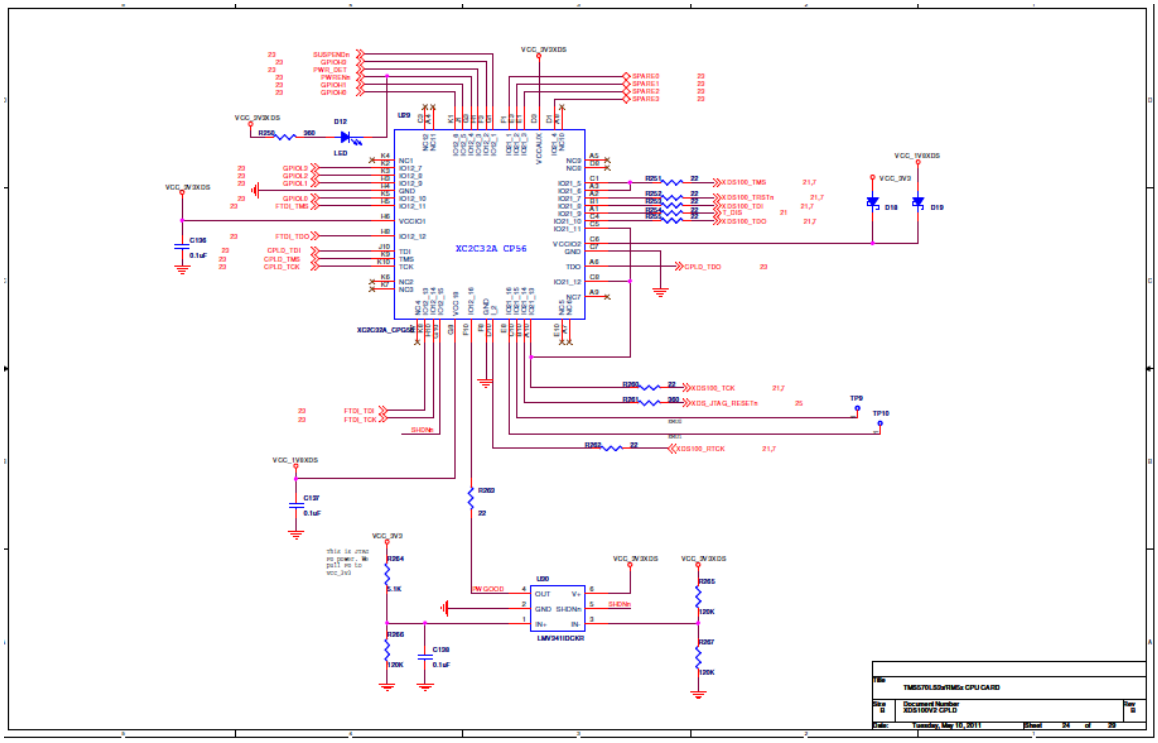

DIFFERENTIAL PAIR
XXX OHM DIFFERENTIAL
IMPEDANCE
SHORT AND STRAIGHT AS
POSSIBLE,
MINIMUM NUMBER OF VIAS
In MII mode (RX_DV=0): TXD3=1, No use
In RMII mode (RX_DV=1): TXD3=0, RMII slave, 50MHz input to X1

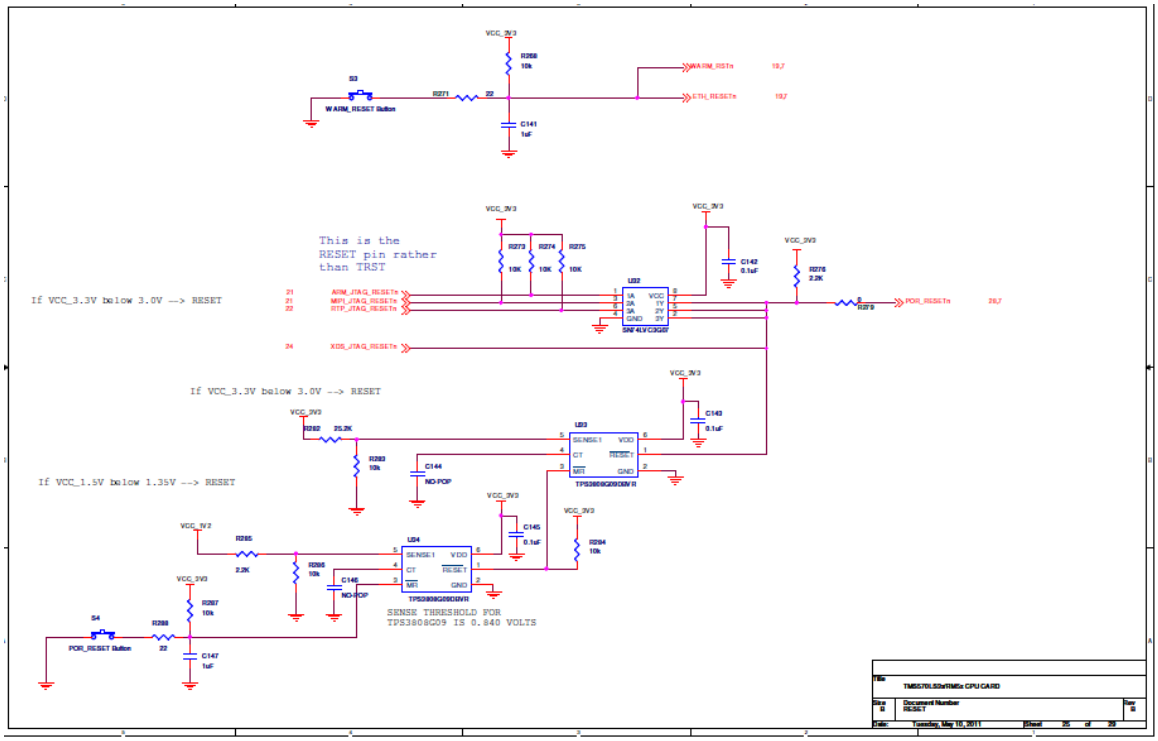


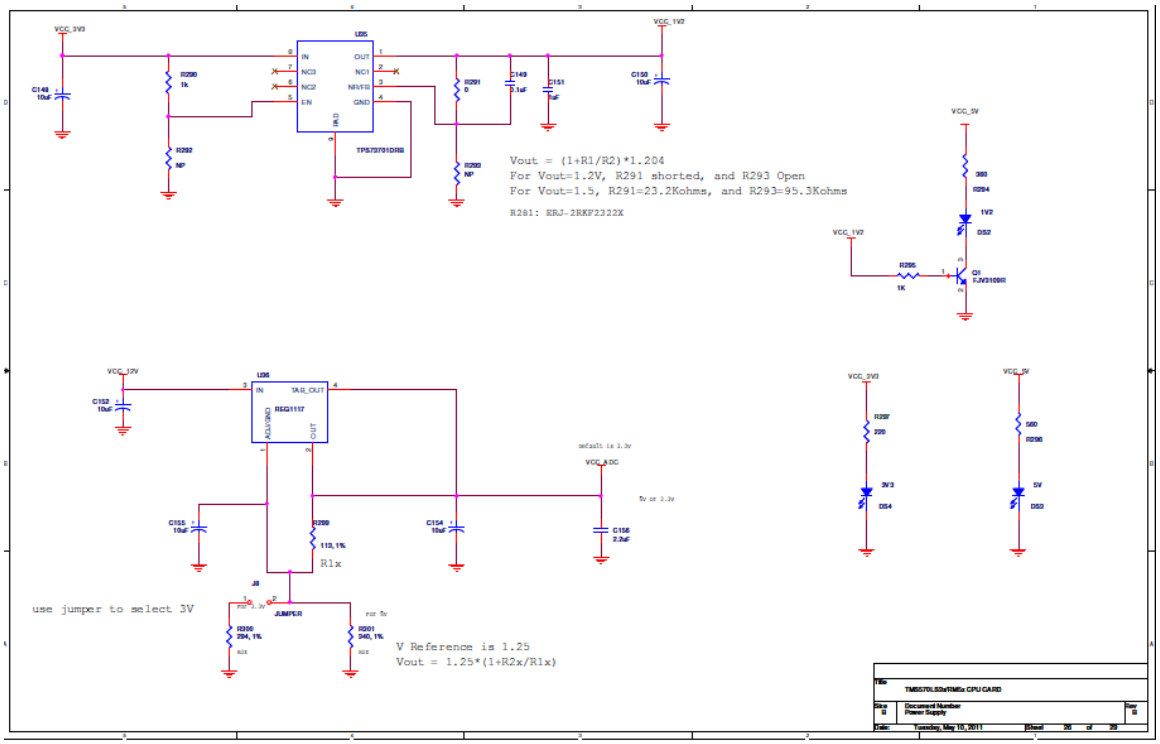

MIPI
Connector
QSH-030-01
JTAG_SELn = HIGH --> XDS100
JTAG_SELn = LOW --> ARM
JTAG and MIPI

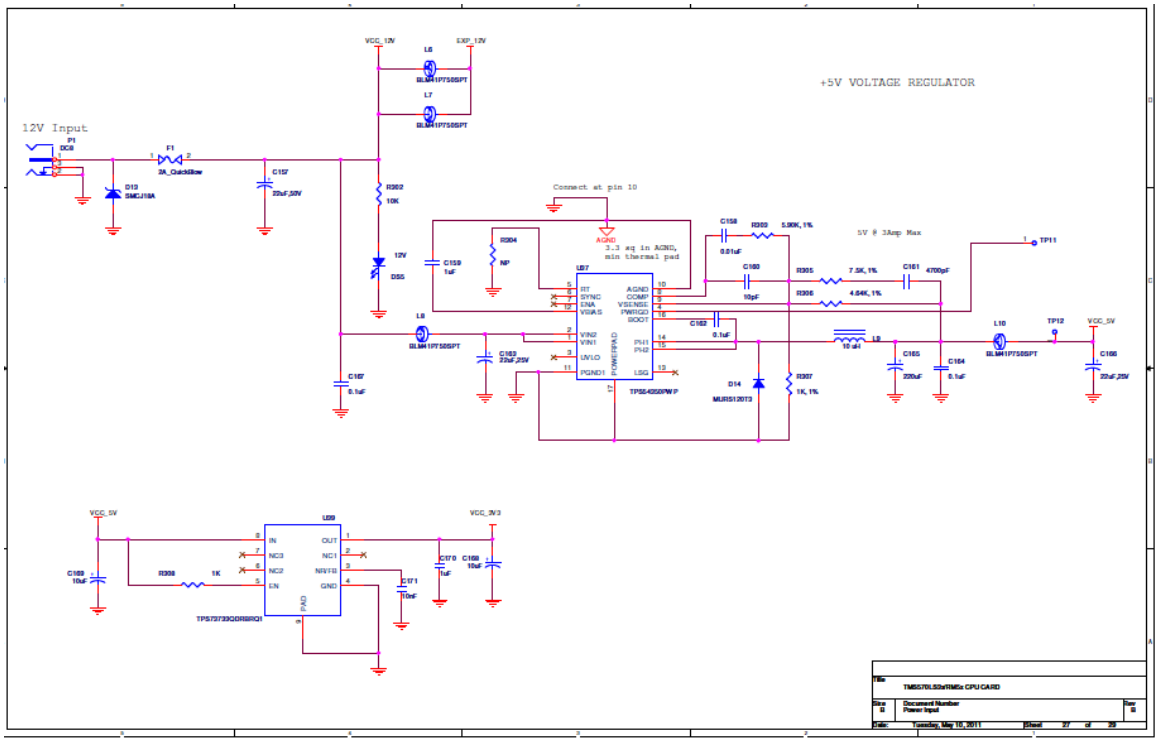

Foot Print Only
AMP 2-5767004-2
Receptacle, Center Strip Contacts
Foot Print Only

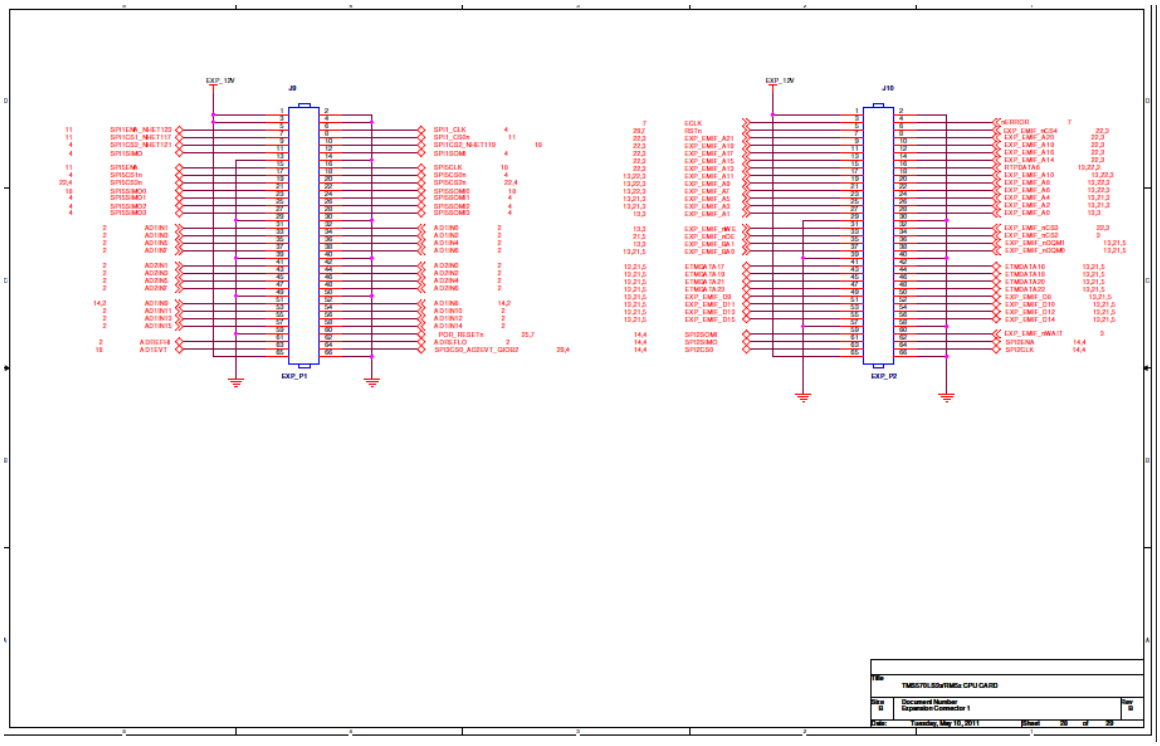

Ferrite Bead: 240-1018-1
1.8V Output

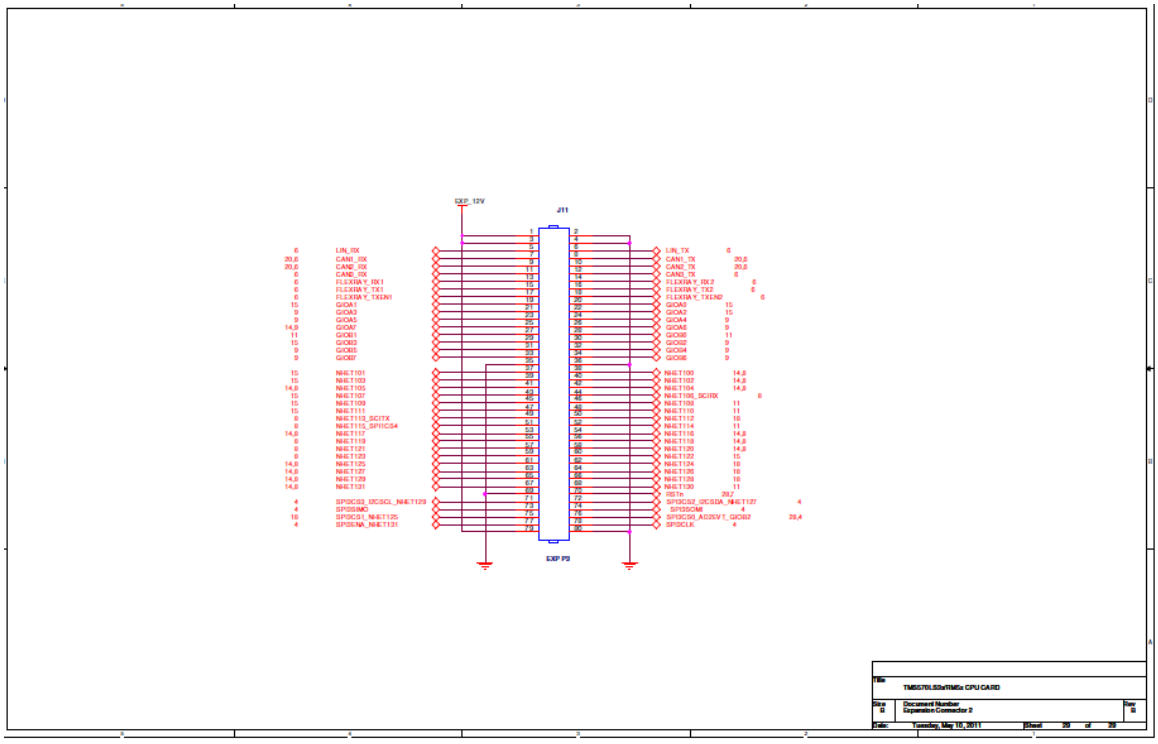

XC2C32A CP56
LMV341IDCKR
TMS570LS3xRMSx CPU CARD
XDS100V2 CPLD


WARM_RESET Button
This is the
RESET pin rather
than TRST
If VCC_3.3V below 3.0V --> RESET
If VCC_3.3V below 3.0V --> RESET
If VCC_1.5V below 1.35V --> RESET
SENSE THRESHOLD FOR
TPS3808G09 IS 0.840 VOLTS
POR_RESET Button
TMS570LS3xRMSx CPU CARD
RESET


Vout = (1+R1/R2)*1.204
For Vout=1.2V, R291 shorted, and R293 Open
For Vout=1.5, R291=23.2Kohms, and R293=95.3Kohms
R281: ERJ-2RKF2322X
use jumper to select 3V
V Reference is 1.25
Vout = 1.25*(1+R2x/R1x)
R1x


+5V VOLTAGE REGULATOR
12V Input





Appendix B

Operation Notices

The user assumes all responsibility and liability for proper and safe handling of the boards. It is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

1 Support Resources

1. If you have problems or need additional information regarding the embedded emulation please refer to the XDS100 USB wiki on the TI web site. The URL for this site is:
   http://tiexpressdsp.com/index.php?title=XDS100

2. Code Composer Studio support is available via a forum at:
   http://community.ti.com/forums/138.aspx

3. Hercules Processor and Kit Support is available at:
   http://www.ti.com/hercules-support

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DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
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Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
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RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connctivity	www.ti.com/wirelessconnectivity		
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