Mini3250 User Manual

Rev 1.0

Release: 2012-09-05

Revision History

Rev	Date	Description
1.0	2012-09-05	Initial version

Contact information

For additional information, please visit: **http://www. timll.com**

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Chapter 1 Mini3250 Introduction

Mini3250 is designed as a compact, stable, and reliable ARM-based module board. It is ready to be the core of your new product. The Mini3250 measuring only 75mm by 55mm, however it has integrated one LCD connector, one MicroSD card socket and one USB 2.0 OTG port on board, which helps to speed up your development sharply.

1.1 Processor Introduction

The Mini3250 is based on NXP's 32-bit ARM926EJ core microcontroller LPC3000 series, which is the only ARM9 microcontroller that provides a vector floating-point co-processor. The LPC3000 series is able to run in ultra-low-power mode even down to 0.9V, as well as the lowest power consumption. The LPC3000 series owns abundant peripheral resource, one of the most distinguishing features is to provide 7 UART controllers which is rare in ARM microprocessors, moreover, it integrated a USB 2.0 OTG controller, Ethernet controller and so on. With such outstanding performance, the Mini3250 is perfect to be employed in Industrial field, Medical Equipment, Intelligent Instrument, Consumer Electronics, Communication Product, and etc.

1.2 Features

- Microprocessor:
  - NXP LPC3250, operates at 208MHz up to 266MHz
  - A 32 KB instruction cache and a 32 KB data cache on chip
  - Up to 256 KB of internal SRAM
- Memory
  - SDRAM: 64MB
  - NANDFLASH: 128MB
  - NORFLASH: 4MB, up to 32MB supported
- Connector
  - Extended via double 2.0mm pitch 3 lines 27-pin respectively connectors
  - One JTAG port on the rear of the board (Optional)
  - One 40-pin LCD connector
  - MicroSD Card Socket
  - One USB OTG 2.0 connector, mini-B type, with ESD protection
- Indicator
  - One power indicator
  - One programmable LED
- Other facility
  - Watchdog timer, supported with the microprocessor
  - RTC

Chapter 2 hardware on Mini3250

This chapter describes the hardware circuit facility of the Mini3250 , and a detailed description of the interface signals.

2.1 Mini3250 system block diagram

The block diagram of the Mini3250 is shown in Figure 2.1.

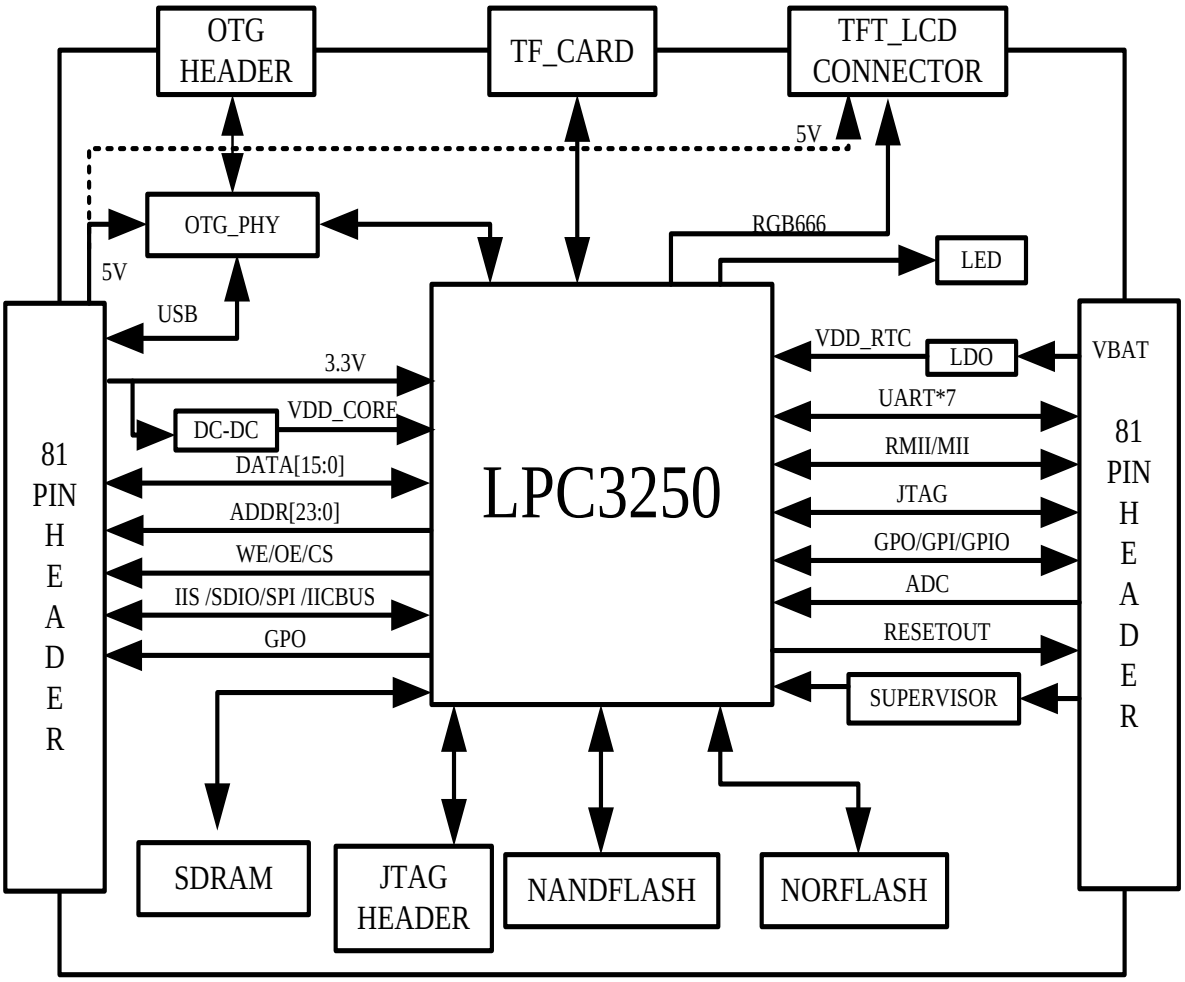


Figure 2.1 Block Diagram of Mini3250

2.2 Layout

The Mechanical Structure of Mini3250 is shown as figure 2.2.

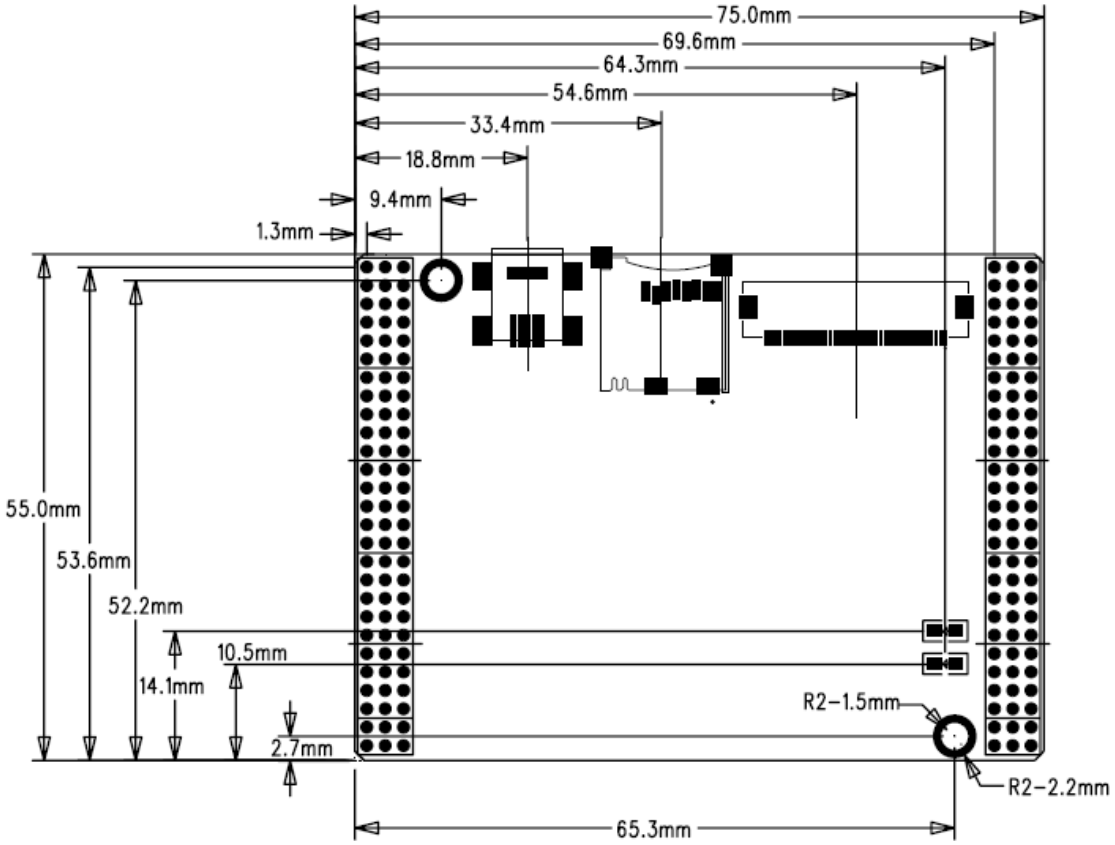


Figure 2.2 Mechanical Structure of Mini3250

2.3 Pin Allocation

The pin definition of the Mini3250 Expansion Interface is shown in Figure 2.3

Figure 2.3 Pin definition of the Mini3250 Expansion Interface

Pin Allocation of the Mini3250 Expansion Interface connector is shown in Table 2-1:

Table 2-1-a Pin Allocation of Mini3250 1 of 2

No	A	B	C
1	GND	USB_D+	USB_D-
2	GPIO_05/SSEL0/MCFB0	SPI1_DATIO/MOSI0/MCFB2	SPI1_DATIN/MISO0/GPI_25 /MCFB1
3	SPI1_CLK/SCK0	GPO_11	GND
4	I2C1_SDA	I2C1_SCL	I2C2_SDA
5	I2C2_SCL	MS_DIO3/MAT0.3	MS_DIO2/MAT0.2
6	MS_SCLK	MS_DIO1/MAT0.1	MS_DIO0/MAT0.0
7	MS_BS	GPIO_01	I2S1TX_WS/CAP3.0
8	I2S1TX_SDA	I2S1TX_CLK/MAT3.0	GPI_00/I2S1RX_SDA
9	I2S1RX_WS	P0.0/I2S1RX_CLK	GPO_20
10	GND	GPO_14	GPO_05
11	GPO_04	GPO_00/TST_CLK1	VCC5
12	EMC_CS1_N	USB_ID	EMC_OE_N
13	EMC_WR_N	EMC_CS2_N	ADDR16
14	ADDR23	ADDR22	ADDR21
15	ADDR20	ADDR19	ADDR18
16	ADDR17	GND	ADDR15
17	ADDR14	ADDR13	ADDR12
18	ADDR11	ADDR10	ADDR9
19	ADDR8	ADDR7	ADDR6
20	ADDR5	ADDR4	ADDR3
21	ADDR2	ADDR1	ADDR0
22	DATA15	DATA14	DATA13
23	DATA12	DATA11	DATA10
24	DATA9	DATA8	DATA7
25	DATA6	DATA5	DATA4
26	DATA3	DATA2	DATA1
27	GND	DATA0	VDD33

Table 2-1-b Pin Allocation Pin Allocation of Mini3250 2 of 2

No	D	E	F
1	ADIN0/TS_XM	GND	GND
2	ADIN1/TS_YM	RESOUT_N	GND
3	GPO_02/MAT1.0/LCDVD[0]	GPO_03/LCDVD[1]	GPO_07/LCDVD[2]
4	GPO_10/MC2B/LCDPWR	GPO_06/LCDVD[18]	GPO_09/LCDVD[9]
5	PWM_OUT2/LCDVD[19]	SPI2_DATIO/MOSI1 /LCDVD[20]	SPI2_DATIN/MISO1 /LCDVD[21]/GPI_27
6	GPIO_04/SSEL1/LCDVD[22]	SPI2_CLK/SCK1/LCDVD[23]	GPO_08/LCDVD[8]
7	GPO_22/U7_HRTS /LCDVD[14]	U7_RX/CAP0.0/LCDVD[10] /GPI_23	U7_TX/MAT1.1/LCDVD[11]
8	U7_HCTS/CAP0.1 /LCDCLKIN/GPI_22	GPO_21/U4_TX/LCDVD[3]	GPI_01/SERVICE_N
9	GPI_04/SPI1_BUSY	GPI_07/CAP4.0/MCABOR	GPIO_00
10	GND	KEY_COL4/ENET_RXD0	KEY_COL5/ENET_RXD1
11	KEY_COL3/ENET_CRS	KEY_COL2/ENET_RX_ER	KEY_COL1/ENET_RX_CLK /ENET_REF_CLK
12	KEY_ROW4/ENET_TXD0	KEY_ROW5/ENET_TXD1	KEY_ROW3/ENET_TX_EN
13	KEY_COL0/ENET_TX_CLK	GPI_02/CAP2.0 /ENET_RXD3	GPI_06/HSTIM_CAP /ENET_RXD2
14	GPI_08/KEY_COL6 /SPI2_BUSY/ENET_RX_DV	GPI_09/KEY_COL7 /ENET_COL	KEY_ROW2/ENET_TXD3
15	KEY_ROW1/ENET_TXD2	KEY_ROW0/ENET_TX_ER	GPIO_02/KEY_ROW6 /ENET_MDC
16	GPIO_03/KEY_ROW7 /ENET_MDIO	DBGEN	MR_RESET
17	RESET_N	TMS	RTCK
18	TDO	TDI	TCK
19	NTRST	U6_IRTX	U6_IRRX/GPI_21
20	U5_TX	U5_RX/GPI_20	GPO_12/MC2A/LCDLE
21	GPI_19/U4_RX	GPI_28/U3_RI	GPI_05/U3_DCD
22	U3_TX	U3_RX/GPI_18	U2_TX/U3_DTR
23	GPO_23/U2_HRTS/U3_RTS	U2_RX/U3_DSR/GPI_17	U2_HCTS/U3_CTS/GPI_16
24	U1_TX	U1_RX/CAP1.0/GPI_15	GND
25	ADIN2/TS_AUX_IN	ONSW	GPO_17
26	EMC_BLS1	EMC_BLS0	EMC_CS3_N
27	VDD33	VSBAT	GND

2.4 Signal Mapping

The signal mapping of Mini3250 is show as table 2-2.

Table 2-2 signal mapping

Signal	Function
system signal	
ONSW	Connect to ONSW of LPC3250
TST_CLK1	Connect to GPO_00/TST_CLK1 of LPC3250
MR_RESET	Connect to nMR of MP811 with 100KOHM pull-up
NRESET	Connect to RESET_N of LPC3250 and NRESET of MP811 with 100KOHM pull-up
RESOUT	Connect to RESOUT_N of LPC3250
Memory bus signal	
ADDR[0:23]	Connect to EMC_A[0:23] of LPC3250
DATA[0:15]	Connect to EMC_D[0:15]of LPC3250
NBLS[0:1]	Connect to EMC_BLS[0:1] of LPC3250
EMC_CS[1:3]_N	Connect to EMC_CS[1:3]_N of LPC3250
NWE	Connect to EMC_WR_N of LPC3250
NOE	Connect to EMC_OE_N of LPC3250
UART signal	
U1_TX	Connect to U1_TX of LPC3250
U1_RX	Connect to U1_RX/CAP1.0/GPI_15 of LPC3250
U2_TX	Connect to U2_TX/U3_DTR of LPC3250
U2_RX	Connect to U2_RX/U3_DSR/GPI_17 of LPC3250
U2_HRTS	Connect to GPO_23/U2_HRTS/U3_RTS
U3_TX	Connect to U3_TX of LPC3250
U3_RX	Connect to U3_RX/GPI_18 of LPC3250
U3_CTS	Connect to U2_HCTS/U3_CTS/GPI_16 of LPC3250
U3_DCD	Connect to GPI_05/U3_DCD
U3_RI	Connect to GPI_28/U3_RI
U4_RX	Connect to GPI_19/U4_RX of LPC3250
U4_TX	Connect to GPO_21/U4_TX/LCDVD[3] of LPC3250
U5_RX	Connect to U5_RX/GPI_20 of LPC3250
U5_TX	Connect to U5_TX of LPC3250
U6_IRTX	Connect to U6_IRTX of LPC3250
U6_IRRX	Connect to U6_IRRX/GPI_21 of LPC3250
U7_RX	Connect to U7_RX/CAP0.0/LCDVD[10]/GPI_23of LPC3250
U7_HRTS	Connect to GPO_22/U7_HRTS/LCDVD[14]
U7_HCTS	Connect to U7_HCTS/CAP0.1/LCDCLKIN/GPI_22
U7_TX	Connect to U7_TX/MAT1.1/LCDVD[11] of LPC3250
I2C signal	
I2C1_SCL	Connect to I2C1_SCL of LPC3250
I2C1_SDA	Connect to I2C1_SDA of LPC3250
I2C2_SCL	Connect to I2C2_SCL of LPC3250
I2C2_SDA	Connect to I2C2_SDA of LPC3250
I2S signal	

I2S1TX_CLK	Connect to I2S1TX_CLK/MAT3.0 of LPC3250
I2S1TX_SDA	Connect to I2S1TX_SDA of LPC3250
I2S1TX_WS	Connect to I2S1TX_WS/CAP3.0 of LPC3250
I2S1RX_CLK	Connect to P0.0/I2S1RX_CLK of LPC3250
I2S1RX_SDA	Connect to GPI_00/I2S1RX_SDA of LPC3250
I2S1RX_WS	Connect to I2S1RX_WS of LPC3250
SPI signal	
SPI2_CLK	Connect to SPI2_CLK/SCK1/LCDVD[23] of LPC3250
SPI1_CLK	Connect to SPI1_CLK/SCK0 of LPC3250
MISO1	Connect to SPI2_DATIN/MISO1/LCDVD[21]/GPI_27 of LPC3250
MISO0	Connect to SPI1_DATIN/MISO0/GPI_25/MCFB1of LPC3250
MOSI1	Connect to SPI2_DATIO/MOSI1/LCDVD[20] of LPC3250
MOSI0	Connect to SPI1_DATIO/MOSI0/MCFB2 of LPC3250
SSEL0	Connect to GPIO_05/SSEL0/MCFB0 of LPC3250
SPI1_BUSY	Connect to GPI_04/SPI1_BUSY of LPC3250
SPI2_BUSY	Connect to GPI_08/KEY_COL6/SPI2_BUSY/ENET_RX_DV of LPC3250
SSEL1	Connect to GPIO_04/SSEL1/LCDVD[22] of LPC3250
ADC signal	
ADIN0	Connect to ADIN0/TS_XM of LPC3250
ADIN1	Connect to ADIN1/TS_YM of LPC3250
ADIN2	Connect to ADIN2 /TS_AUX_IN of LPC3250
GPIO signal	
GPO_02	Connect to GPO_02/MAT1.0/LCDVD[0] of LPC3250
GPO_03	Connect to GPO_03/LCDVD[1] of LPC3250
GPO_04	Connect to GPO_04of LPC3250
GPO_05	Connect to GPO_05of LPC3250
GPO_06	Connect to GPO_06/LCDVD[18] of LPC3250
GPO_07	Connect to GPO_07/LCDVD[2]of LPC3250
GPO_08	Connect to GPO_08/LCDVD[8] of LPC3250
GPO_09	Connect to GPO_09/LCDVD[9] of LPC3250
GPO_10	Connect to GPO_10/MC2B/LCDPWR of LPC3250
GPO_11	Connect to GPO_11 of LPC3250
GPO_12	Connect to GPO_12/MC2A/LCDLE of LPC3250
GPO_14	Connect to GPO_14 of LPC3250
GPO_17	Connect to GPO_17 of LPC3250
GPO_20	Connect to GPO_20 of LPC3250
GPI_01	Connect to GPI_01/SERVICE_N of LPC3250
GPI_02	Connect to GPI_02/CAP2.0/ENET_RXD3 of LPC3250
GPI_07	Connect to GPI_07/CAP4.0/MCABORT of LPC3250
GPIO_00	Connect to GPIO_00 of LPC3250
Ethernet signal	

ENET_RXD1	Connect to KEY_COL5/ENET_RXD1 of LPC3250
ENET_RX_CLK	Connect to KEY_COL1/ENET_RX_CLK /ENET_REF_CLK of LPC3250
ENET_TX_EN	Connect to KEY_ROW3/ENET_TX_EN of LPC3250
ENET_RXD2	Connect to GPI_06/HSTIM_CAP/ENET_RXD2 of LPC3250
ENET_TXD3	Connect to KEY_ROW2/ENET_TXD3 of LPC3250
ENET_MDC	Connect to GPIO_02/KEY_ROW6/ENET_MDC of LPC3250
ENET_RXD0	Connect to KEY_COL4/ENET_RXD0 of LPC3250
ENET_RX_ER	Connect to KEY_COL2/ENET_RX_ER of LPC3250
ENET_TXD1	Connect to KEY_ROW5/ENET_TXD1 of LPC3250
ENET_TX_ER	Connect to KEY_ROW0/ENET_TX_ER of LPC3250
ENET_CRS	Connect to KEY_COL3/ENET_CRS of LPC3250
ENET_TXD0	Connect to KEY_ROW4/ENET_TXD0 of LPC3250
ENET_TX_CLK	Connect to KEY_COL0/ENET_TX_CLK of LPC3250
ENET_TXD2	Connect to KEY_ROW1/ENET_TXD2 of LPC3250
ENET_MDIO	Connect to GPIO_03/KEY_ROW7/ENET_MDIO of LPC3250
ENET_COL	Connect to GPI_09/KEY_COL7/ENET_COL of LPC3250
USB signal	
USB_D+	Connect to USB_D+ of ISP1301 with ESD protection
USB_D-	Connect to USB_D- of ISP1301 with ESD protection
USB_ID	Connect to ID of ISP1301
SD signal	
MS_DIO0	Connect to MS_DIO0/MAT0.0 of LPC3250 with 10kOHM pull-up
MS_DIO1	Connect to MS_DIO1/MAT0.1 of LPC3250 with 10kOHM pull-up
MS_DIO2	Connect to MS_DIO2/MAT0.2 of LPC3250 with 10kOHM pull-up
MS_DIO3	Connect to MS_DIO3/MAT0.3 of LPC3250 with 10kOHM pull-up
MS_SCLK	Connect to MS_SCLK of LPC3250 with 10kOHM pull-up
MS_BS	Connect to MS_BS of LPC3250 with 10kOHM pull-up
GPIO_01	Connect to GPIO_01 of LPC3250 and MicroSD slot detect pin
Power signal	
VDD33	Mini3250 main power supply and power supply for LCD
VCC5	USB HOST and power supply for LCD
VSBAT	LPC3250 RTC back-up power supply
GND	GND of Mini3250
PWM signal	
PWM_OUT2	Connect to PWM_OUT2/LCDVD[19] of LPC3250
JTAG signal	
NTRST	Connect to NTRST of LPC3250 with 0OHM to NRESET
DBGEN	Connect to DBGEN of LPC3250

TMS	Connect to TMS of LPC3250 with 10kOHM pull-up
TCK	Connect to TCK of LPC3250 with 10kOHM pull-up
TDO	Connect to TDO of LPC3250 with 10kOHM pull-up
RTCK	Connect to RTCK of LPC3250
TDI	Connect to TDI of LPC3250 with 10kOHM pull-up

NOTE:

More electrical specification of the pins please refers to the Datasheet of the LPC3250.

2.5 Interface description

The interfaces layout of the Mini3250 is shown in Figure 2.4

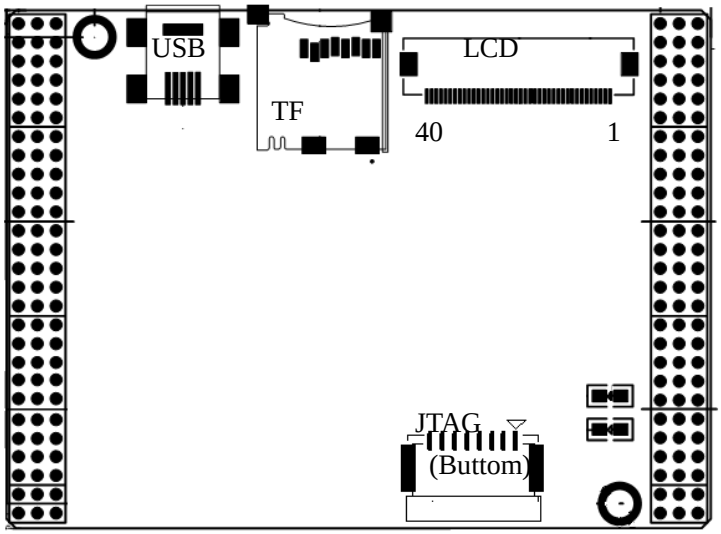


Figure 2.4 Interface Layout

2.5.1 LCD interface

Mini3250 provides a FPC connector for the LCD interface. There is an default 5V power supply on the LCD interface, user can change the power supply to 3V by change the resistance to support a different LCD. And it support the16bpp (5:5:5) and 16bpp (5:6:5) modes the LPC3250 LCD controller provides.

The LCD Interface consists of the following components:

- LCD Power
- LCD panel data
- PWM controlled backlight and LCD enable
- Touch panel signal

Table 2-3 shows a detailed mapping of the LPC3250 LCD port signals.

Table 2-3 LCD Signal Assignment

No	Signal Name	TYPE	Function
1	VDD33/VCC5	POWER	Power supply, Selected by R36 (5V) and R37 (3V)
2	VDD33/VCC5	POWER	Same as pin1
3	GND	POWER	Ground
4	GND	POWER	Ground
5	GND	POWER	Power supply(GND)
6	LCDVD19	O	LCD panel data
7	LCDVD20	O	LCD panel data.
8	LCDVD21	O	LCD panel data.
9	LCDVD22	O	LCD panel data.
10	LCDVD23	O	LCD panel data.
11	GND	POWER	Ground
12	NC	-	No connect
13	NC	-	No connect
14	LCDVD10	O	LCD panel data.
15	LCDVD11	O	LCD panel data.
16	LCDVD12	O	LCD panel data.
17	LCDVD13	O	LCD panel data.
18	LCDVD14	O	LCD panel data.
19	LCDVD15	O	LCD panel data.
20	GND	POWER	Ground
21	NC	-	No connect
22	NC	-	No connect
23	GND	POWER	Ground
24	LCDVD3	O	LCD panel data.
25	LCDVD4	O	LCD panel data.
26	LCDVD5	O	LCD panel data.
27	LCDVD6	O	LCD panel data.
28	LCDVD7	O	LCD panel data.
29	GND	POWER	Ground
30	LCDPWR	O	LCD panel power enable
31	NC	-	No connect
32	PWM_OUT1	O	Back Light control
33	LCDEN	O	TFT data enable output
34	VSYNC	O	Vertical synchronization pulse
35	HSYNC	O	Horizontal synchronization pulse
36	LCDCLK	O	LCD panel clock
37	TSXM	I/O	Touch screen X minus

38	TSXP	I/O	Touch screen X plus
39	TSYM	I/O	Touch screen Y minus
40	TSYP	I/O	Touch screen Y plus

2.5.2 MicroSD card interface

Mini3250 owns a standard MicroSD card socket with plug detection design. MicroSD card interface connects with the SD/MMC card interface of CPU directly. The detection signal uses the GPIO_01 of CPU.

Table 2-4 MicroSD card socket Pin Description

Pin name	Type	Description
MS_SCLK	Output	MicroSD card clock output with 10kOHM pull-up
MS_BS	Input	MicroSD card command input with 10kOHM pull-up
MS_DIO[3:0]	Output	MicroSD card data lines with 10kOHM pull-up
GPIO_01	Input	Detection signal with 200kOHM pull-up

The function description of the Mini3250 MicroSD card socket is shown as figure 2.5.

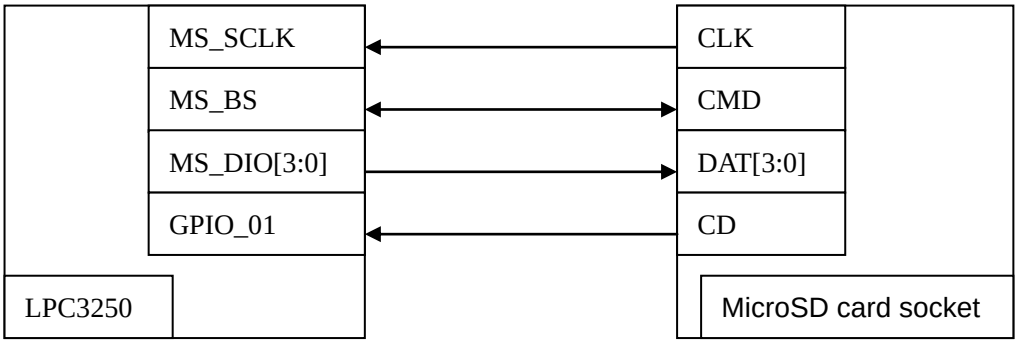


Figure 2.5 Function description

2.5.3 USB interface

The Mini3250 provides a USB OTG interface with a Mini-AB OTG connector. The signals of the connector connect to LPC3250 through the OTG ATX from NXP (ISP 1301). The USB DATA pins are ESD protected. The USB_VBUS signal is connected to a current-limited power-distribution switch (TPS2045) output pin.

2.5.4 JTAG interface (Optional)

JTAG Connector of Mini3250 provides a JTAG connection interface to the LPC3250. Table 2-5 provides a detailed list of the signals at the JTAG connector. You should cross reference this with your JTAG probe to ensure compatibility.

Table 2-5 JTAG Signal Assignment

Pin No.	Signal Name	Type	Function
1	TMS	input	Test mode select input with 10k pull-up.
2	TDO	output	Test data output with 10k pull-up.
3	TDI	input	Test data input with 10k pull-up.

4	TCK	input	Test clock input with 10k pull-up.
5	NTRST	input	Test Reset.
6	NRESET	output	System reset.
7	GND	Power	Ground.
8	VDD33	Power	Power

2.6 Introduction of Circuit Module

2.6.1 Mini3250 memory mapping

The memory mapping of the Mini3250 is shown as table 2-6.

Table 2-6 Mini3250 memory mapping

Start address	End address	Device	CS	note
0x0000 0000	0x7FFF FFFF	IROM or IRAM	CPU Internal Memories	-
0x8000 0000	0x9FFF FFFF	SDRAM	EMC_DYSC0	32bit width
0xA000 0000	0xBFFF FFFF	-	EMC_DYSC1	-
0xC000 0000	0xDFFF FFFF	RESERVED	RESERVED	RESERVED
0xE000 0000	0XE0FF FFFF	NORFLASH	EMC_CS0	8bit width
0XE100 0000	0XE1FF FFFF	-	EMC_CS1	-
0XE200 0000	0XE2FF FFFF	-	EMC_CS2	-
0XE300 0000	0XE3FF FFFF	-	EMC_CS3	-
0XE400 0000	0xFFFF FFFF	RESERVED	RESERVER	-

2.6.2 SDRAM

The Mini3250 SDRAM configured for 32-bit access using two 16-bit wide RAM chips at U3 and U4.

The LPC3250 is capable of addressing a single RAM bank located at memory address 0x8000 0000 and extending to 0x9FFF FFFF via the /DYCS0 signal. But the permissible SDRAM memory access ranges of Mini3250 supplies for on-board memory are 64Mbytes, from Lower Memory Address 0x80000000 to Upper Memory Address 0x83FF FFFF.

The second SDRAM memory bank located on /DYSC1 is not used on the Mini3250. Accesses to this region of memory should not be performed.

The function description of the Mini3250 SDRAM is shown as figure 2.6, more information please refer to the schematic of the Mini3250.

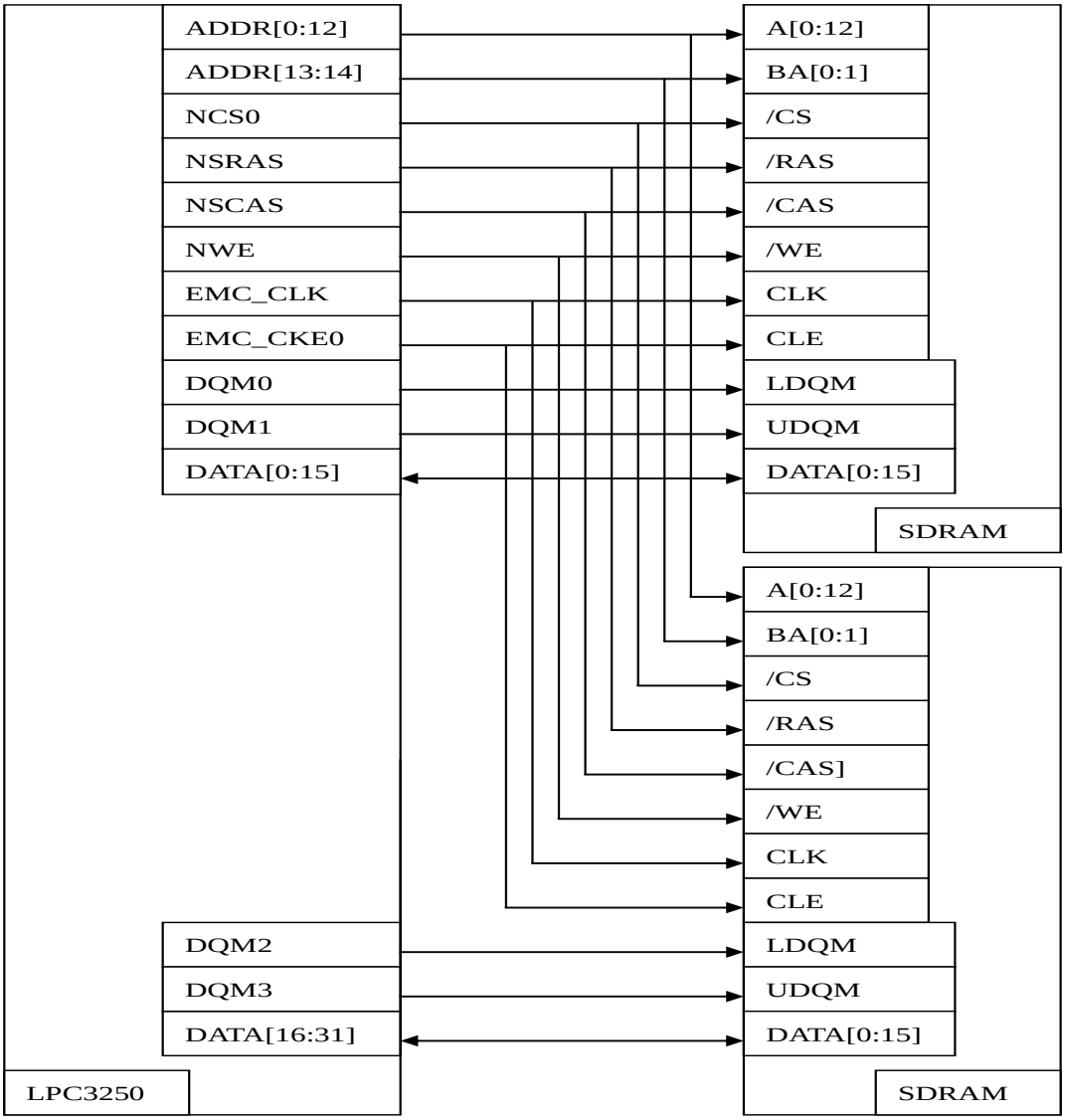


Figure 2.6 SDRAM Function

2.6.3 NANDFLASH

The NAND memory is comprised of a single 128MB chip located at U5 and is interfaced via the LPC3250 NAND memory bus.

The function description of the Mini3250 NANDFLASH is shown as figure 2.7, more information please refer to the schematic of the Mini3250.

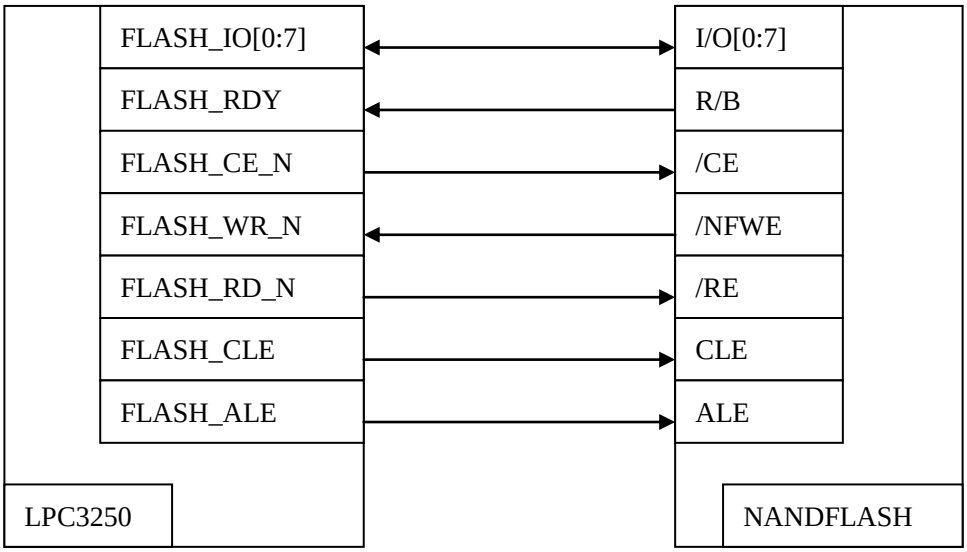


Figure 2.7 NANDFLASH function

2.6.4 NORFLASH

The NORFLASH memory is comprised of a single 2MB to 16MB chip located at U13. The function description for the NORFLASH circuit module is shown as figure 2.8.

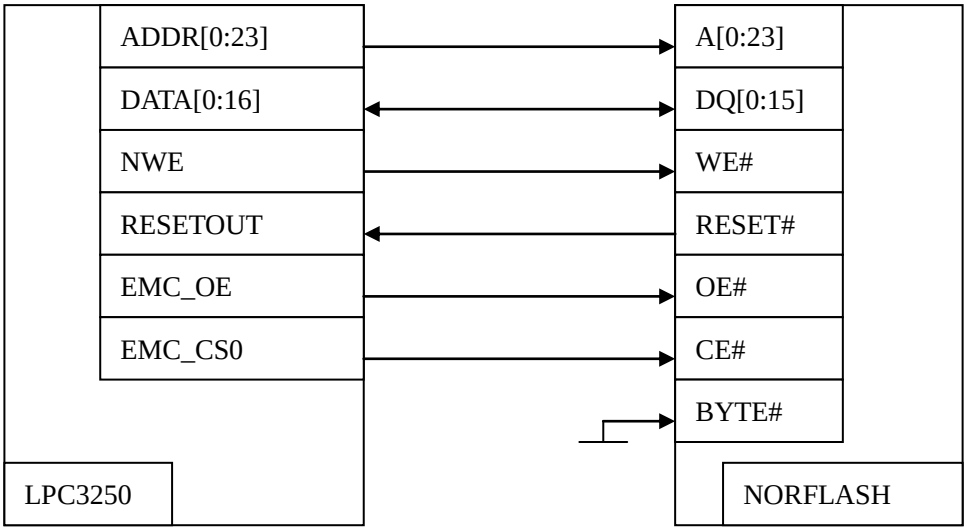


Figure 2.8 NORFLASH function

2.6.5 LED

There are two LEDs in the Mini3250, D1 is used for the power indication and D2 is provided for development purposes. The LED's status is show as table 2-7

Table 2-7 LED's status

STATUS	ON	OFF
D1	Mini3250 Power ON	Mini3250 Power OFF
D2	GPO_01 in low level	GPO_01 in high level

The location of the User LED and the function description is shown as Figure 2.9.

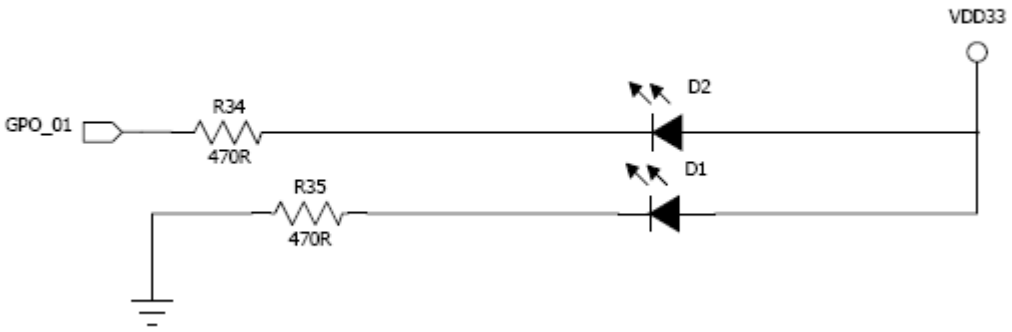


Figure 2.9 Location of the User LED

Chapter 3 Mini3250 software system for Linux

General NANDFLASH Partition

Start Addr	End Addr	Size	Name
0x0000 0000	0x000C 0000	0x000C 0000	S1L
0x000C 0000	0x0018 0000	0x000C 0000	U-Boot
0x0018 0000	0x001C 0000	0x0004 0000	U-Boot Parameter
0x001C 0000	0x005C 0000	0x0040 0000	Kernel
0x005C 0000	0x0800 0000	0x07A4 0000	Filesystem

3.1 Bootloader

Bootloader for Mini3250 Linux system includes two parts, one is Stage 1 Loader, and the other is Uboot.

The Stage 1 Loader (S1L) is a robust third level boot loader written by NXP Semiconductor to simplify and enhance the LPC3250 booting procedure. The S1L is feature rich with the ability to configure clocking, virtual memory mapping, data and instruction caches, the ability to access NAND flash, and the ability to boot applications/images from the NAND flash, SD Card, or serial port to name a few of the features the S1L provides.

Mini3250 adapt Uboot as the Bootloader for Linux. Uboot is a general free open source boot program that supports many kinds of processors; it is similar to BIOS on PC but much more powerful. Uboot supports features like booting from Ethernet and loading various kernels to NANDFLASH. Uboot is free open source code software based on GPL.

3.2 Linux Kernel

If user need add or delete some character is respectively to or from kernel, or increase certained hardware support to kernel. To modify the drive compiled into kernel, user need recompile the kernel. The following steps will describe how to generate the kener image for the MINI3250 with the Linux develop kit in the supplied CD.

3.2.1 Generate Kernel Image

The supplied CD provide the Linux develp kit for the Mini3250, user can use it to coustomilize the system and generate the kernel image.

1> Uncompress Linux kernel package

The name of kernel source pack is “linux-2.6.27.8_mini3250.tar.bz2”. Execute the following command to unzip bz2 pack.

```
tar zxvf linux-2.6.27.8_mini3250.tar.bz2 –C /home/mini3250/
```

Caution: file name may vary with the version upgrade, please check it a gainst the file name appearing in supplied CD.

2> Load default configurations

In order that user could fast configure kernel, root folder of kernel source code provides four default configuration files:

mini3250_480x272_mouse_config //for 4.3 inch LCD, use mouse in QT
mini3250_480x272_touch_config //for 4.3 inch LCD, use touch screen in QT
mini3250_800x480_mouse_config //for 7.0 inch LCD, use mouse in QT
mini3250_800x480_touch_config //for 7.0 inch LCD, use mouse in QT

Enter kernel source code folder generated, exute “make menuconfig” command to configure the properties.

```
Cd /home/mini3250/linux-2.6.27.8
make menuconfig
```

After that, you will get into the Linux kernel configuration. Shown as figure 3.1.

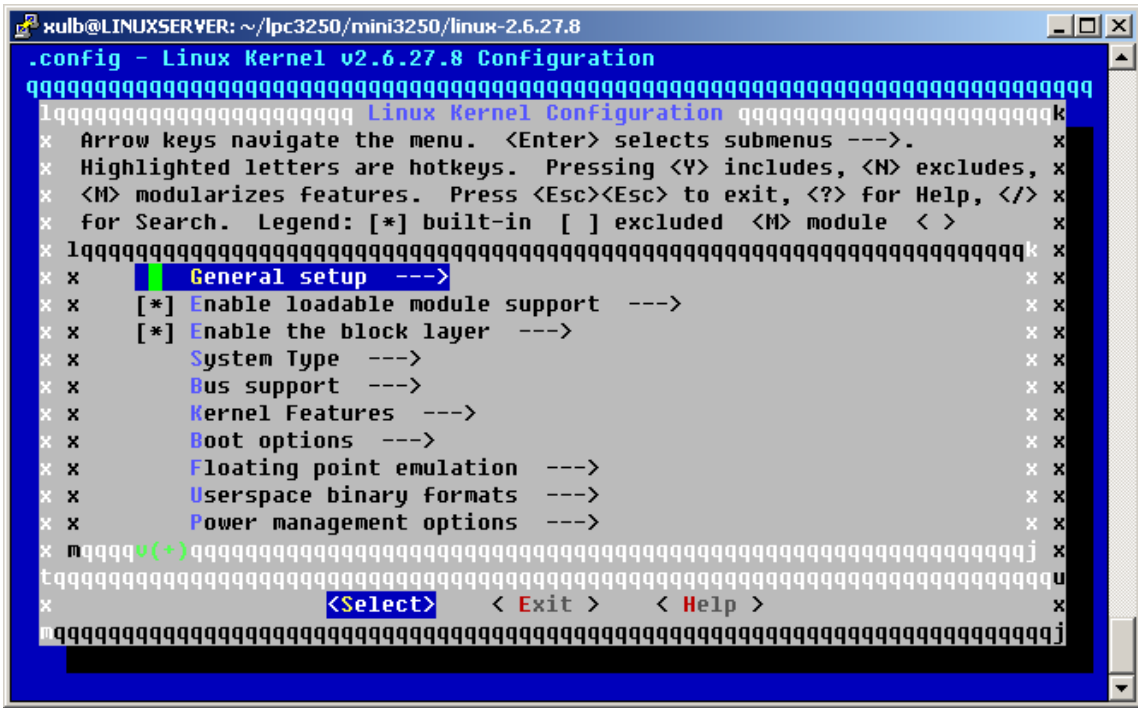


Figure 3.1

Enter “Load an Alternate Configuration File” configurations: shown as figure 3.2.

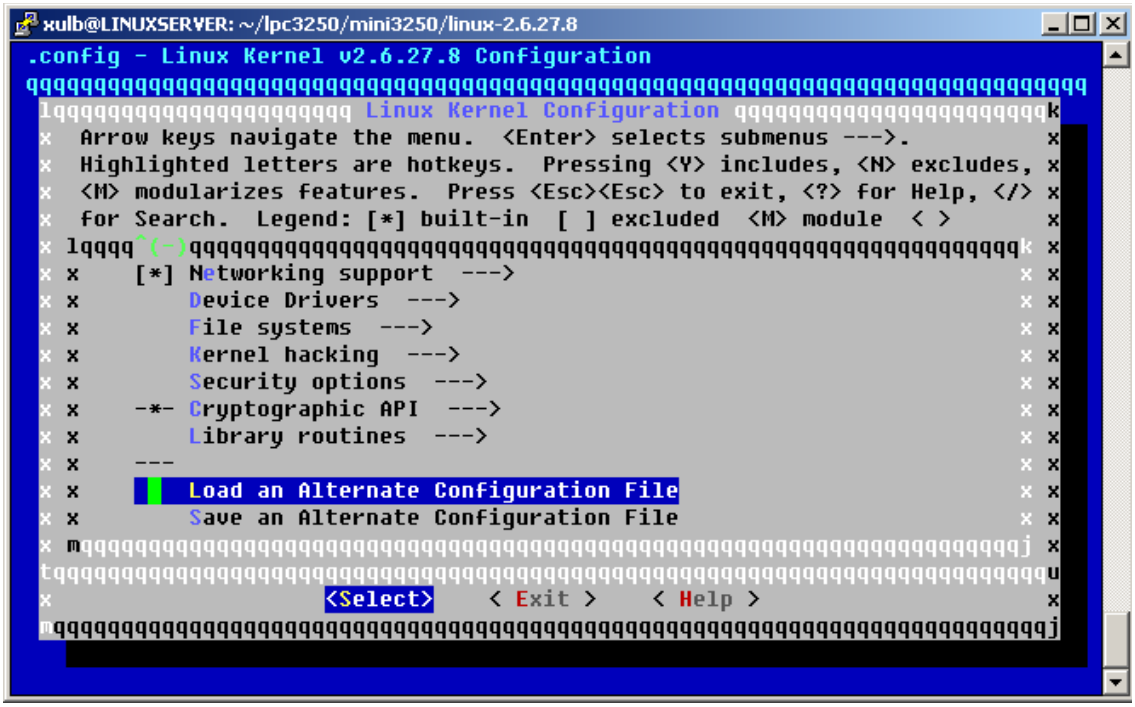


Figure 3.2

Enter configuration file names such as Mini3250_800480_mouse.cfg and press “Enter”, shown as figure 3.3.

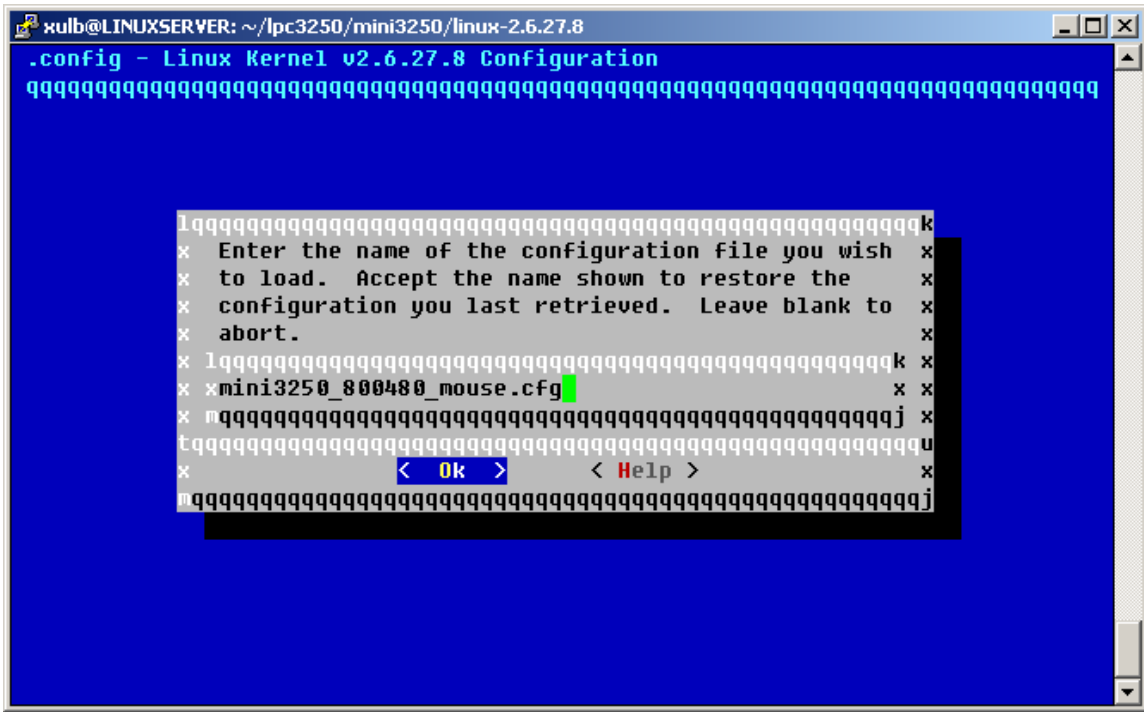


Figure 3.3

while in main menu, select <Exit> to exit and save the settings.

3> Compile image

After loading configuration file, save settings and exit, then exute “make uImage” command to

generate uImage kernel.

Caution:

Compiling kernel requires compiler ver. Arm-linux-gcc-4.3.2 version. Pleas e install the Cross compile tools to your PC before you compile the kernel.

Make uImage

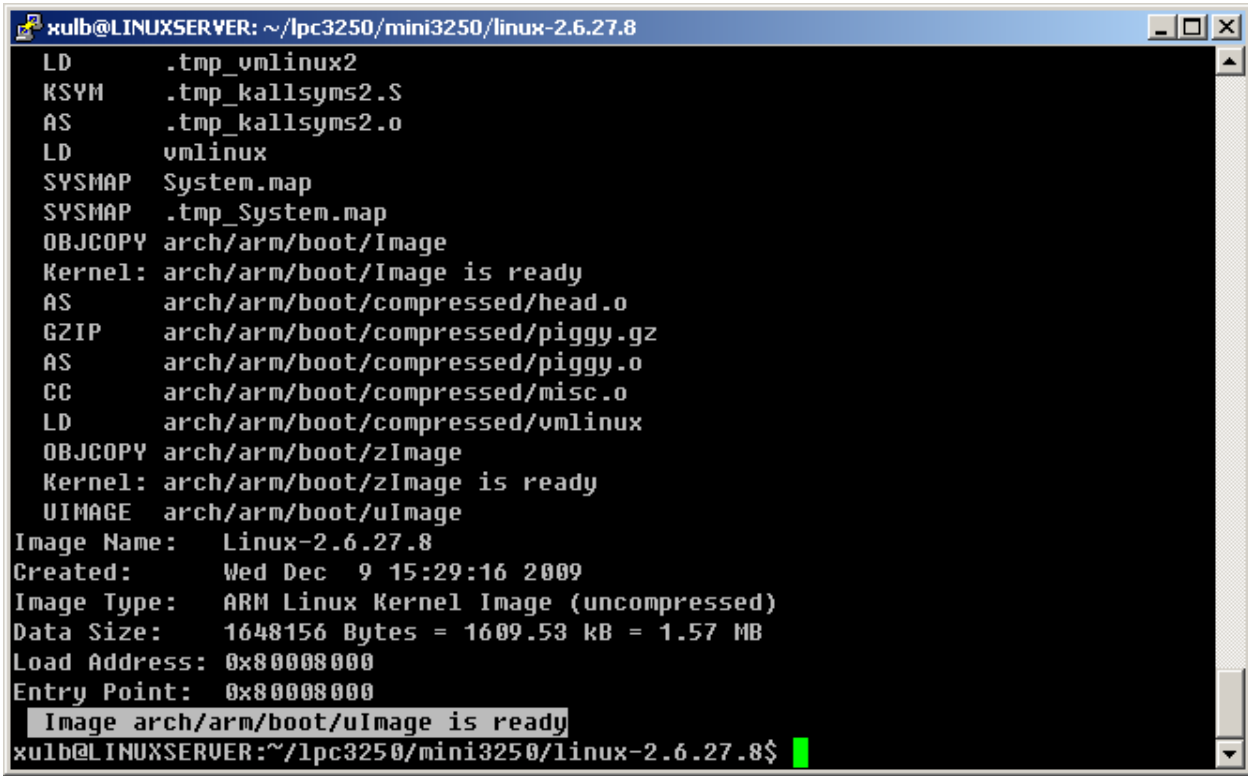


Figure 3.4

Image file is generated at “arch/arm/boot” under kernel source code pack folder, the kernel image uImage that Uboot uses is generated.

3.2.2 Custom Linux kernel for Mini3250

Above steps configure and compile kernel using default files, in effect, Linux kernel has quite a number of configuration options. The following sections will describe some options in form of figures, in order to help you learn kernel configurations as soon as possible, so as to customize your own kernel.

Run “make menuconfig”, enter kernel configuration main menu:

Table 3-1

function	PATH	Option
LED	System Type->LPC32XX Implementtations	[] Enable a 1Hz LED heartbeat tick rate on the Phytec LPC3250
MII/RMII	System Type->LPC32XX chip components	[] Check to enable MII support or leave disabled for RMII support
UART	System Type->LPC32XX chip	[] Enable UART5

	components-> Standard UARTS	[] Enable UART3 [] Enable UART4 [] Enable UART6
HSUART	System Type->LPC32XX chip components-> High speed UARTS	[] Enable high speed UART1 [] Enable high speed UART2 [] Enable high speed UART7
I2C	System Type->LPC32XX chip components->I2C interfaces	[] Enable I2C0 [] Enable I2C1 []Enable the USB OTG I2C peripheral
SPI/SSP	System Type->LPC32XX chip components->SSP/SPI interface	[] Enable SSP0 for SPI0 mode
MicroSD card	Device Drivers->SD/MMC support	<*>SD/MMC block device driver [] use bounce buffer for simple hosts
LCD	Graphics support	<*> Support for frame buffer devices <*> LCD framebuffer support
LCD Size	System Type -→ LPC32XX Implementations -→	LCD module revisions (X) Select 4.3 inch LCD 480X272 Timll
LOGO	Graphics support-> bootup logo	[*] standard 224-color linux logo [*] standard black and white linux logo [*] standard 16-color linux logo [*] Disable cursor when logo display
USB mouse	Device Drivers-> input device support	<*>USB supoort <*> Support for Host-side USB <*> OHCI HCD support <*> Event interface <*> USB Human Interface Devices (full HID) support [*] HID input layer support
TOUCH	Device Drivers-> input device support	<*> Touchscreen interface <*> Event interface [*] touchscreens <*> LPC32XX touchscreen controller
USB Disk	Device Drivers-> USB support	[*] legacy /proc/scsi support <*> SCSI disk support <*> USB Mass Storage support
Buttons	Device Drivers ---> Input device support --->Keyboards --->	<*> Devkit3250 Buttons support
LED/BEEP	Device Drivers ---> Input device support --->Keyboards --->	<*> Devkit3250 GPIO device support

Note

Because UART4 and UART7 conflict with LCD driver, please disable item below when enable UART4 or UART7.

```
Device Drivers  --->
    Graphics support  --->
    <*> Support for frame buffer devices  --->
        < >  ARM PrimeCell PL110 support
```

Note: When using mini3250_xxx_mouse_config, please disable items below, because all input events will affect mouse event. So just only keep mouse input event.

```
Device Drivers  --->
    Input device support  --->
        < >  Touchscreen interface
        [ ]  Touchscreens  --->
        [*]  Keyboards  --->
          < >  Devkit3250 Buttons support
```

Chapter 4 Update image to Mini3250

This chapter mainly descripte how to update the Bootloader, kernel and the filesystem image to Mini3250.

4.1 Burn Stage 1 Loader

4.1.1 Hardware requement

In order to download the Stage 1 Loader to Mini3250, user need to extend the UART5 and starup mode of Mini3250.

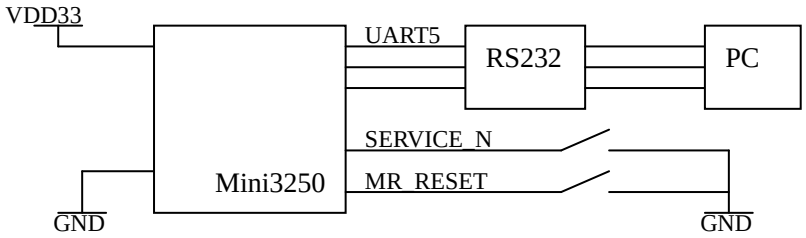


Figure 4.1

The pin need to expand are show as table 4-1.

Table 4-1

Pin	function
VDD33	Power supply
GND	Ground
U5_RX	UART receive
U5_TX	UART send
SERVER_N	Start up mode select
MR_RESET	System reset

4.1.2 Enviroment setting

Burnning the Stage 1 Loader to the Mini3250, the English Version Windows XP operating system is needed, if your PC was installed the other vesion Windows XP system, please follow the steps to set PC language enviroment.

1> Open the “area and language option” form the control pannal.
2> Select “advance” option, and then change the language to “English(USA)”.
3> At last press the “OK” button and reset the PC.

4.1.3 Download the Stage 1 Loader to Mini3250

The follow steps will show you how to download the Stage 1 Loader to Mini3250.

1> Copy LPC3250 loader folder to your PC directory, the path doesn't allow to contain any Chinese characters.
2> Run LPC3250 loader.exe application.select the restore.bin [CD:\Image] to download to the Mini3250.
3> Click the button to select the communication serial port.
4> Enable the terminal mode, if sucessul, it will output the imformation in the terminal output window.
5> Click the button to transmit the bin file to the Mini3250.see frame 5.

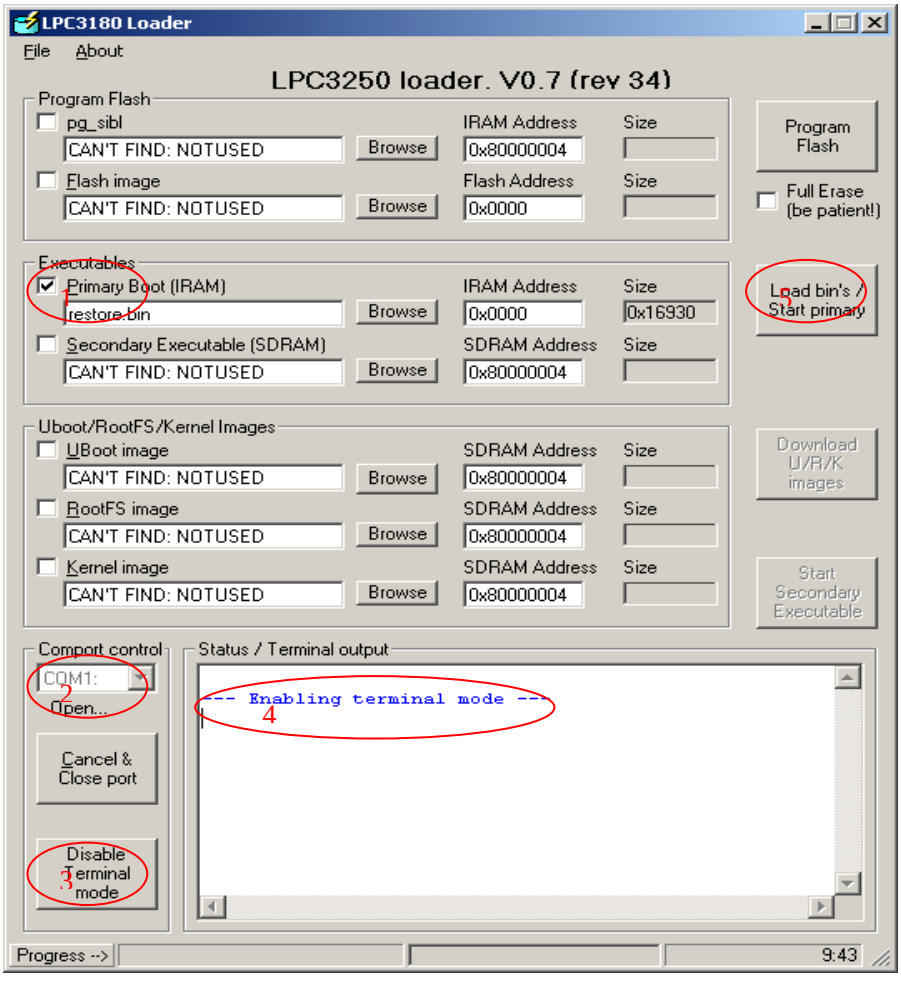
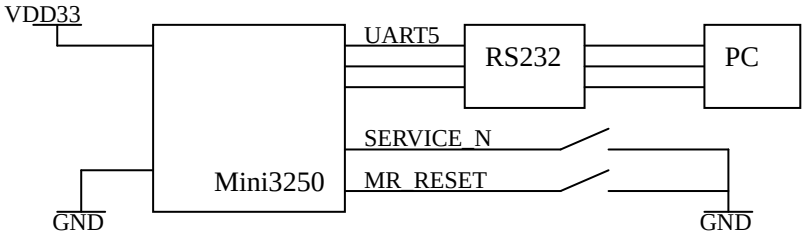


Figure 4.3

6> Driver the SERVER_N pin to low level and then driver the MR_RESET pin to low level to reset the Mini3250.



After the reset, the system will start up from the UART5 and begin to download the application to Mini3250 from the PC, then you can release SERVER_N to high level. Figure 4.4 show the download progress.

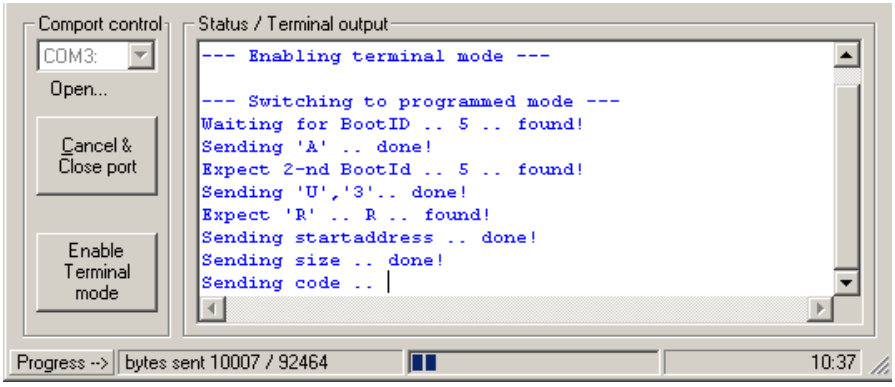


Figure 4.4

7> After download finish. The teminal outopt window will output the writing information.

```
Writing kickstart ICR page 0
Writing kickstart data...
Writing stage 1 application size info...
Writing stage 1 application...
Marking bootloader blocks as reserved...
Kickstart and stage 1 update complete
```

NOTE: Make sure the path of LPC3250_Loader.exe ***doesn't contain any Chinese character****, other wise, it won't run normally.*

4.2 Update Uboot

There two way to update the Uboot to the Mini3250, one is throught UART5 serial port. And the other is through SD card. Both of the two ways need to burn the Stage 1 Loader to Mini3250 first.

4.2.1 Update Uboot through UART5

Update the Uboot to the Mini3250, the hardware connection show as figure 4.1. and then follow the steps to download the Uboot to Mini3250 and burn it to NANDFLASH.

1> Run Tera Term Pro.exe in the host PC.

2> Click the “serial port …” from the ”set up“submenu to configure the serial port communication paramter to “com1 115200 8n1n ”. and than click OK button.

3> In order to get into the Stage 1 Loader command line, please set GPI_02 or GPI_08 or GPI_09 to low level, and then reset Mini3250, then terminal will show prompt “TIMLL3250>”.

4> Input the the follow command to download the u-boot.bin to Mini3250 SDRAM.

```
TIMLL3250>load term raw 0x83fc0000 0x83fc0000    //download the Uboot from PC thought UART5
```

5> After that the Tera Term Pro will prompt “Starting terminal download, send break to stop”. Please click the “send file ” from the “file” submenu of the tera term to send the “u-boot.bin” to the Mini3250.

*NOTE: when sending the u-boot.bin to the Mini3250, the **binary** protocol mus t be selected to transport the image, you can select the binary option in the send file dialog.*

6> After the transmit complete. Please send an break to the Mini3250 by click the “send break ” from the “control ” submenu of the tera term.

7> After download successes please Input the follow comand to write the Uboot to NANDFLASH from SDRAM.

```
TIMLL3250>erase 6 6 1                    //erase the nandflash except the stagel lodaer area
TIMLL3250>write 0x83fc0000 384 320 0     //write the Uboot to Mini3250 NANDFLASH
```

NOTE: Try “help <command>” for command usage, for example: help erase.

4.2.2 Update Uboot through MicroSD card

Updating the kernel image through MicroSD card, the hardware requirement is show as figure 4.1. The UART5 is optional as the UART5 just use for printing the imformation during update process. The follow steps will show you how to update the Uboot through MicroSD card.

1> Copy the **u-boot.bin** to the root directory of the MicroSD card.
2> Insert the MicroSD card to the MicroSD card slot and then reset Mini3250.
3> After Mini3250 detects the MicroSD card and the u-boot.bin in the MicroSD card, it will update the u-boot.bin to the NANDFLASH automatically.

```
Loading bootloader to SDRAM from SD card ....
success
Starting block erase
U-Boot update complete
```

```
Loading kernel to SDRAM from SD card ....
File in SD root directory doesn't exist
Loading Filesystem to SDRAM from SD card ....
File in SD root directory doesn't exist
Running Bootloader from NANDFLASH
```

4.3 Update Linux Kenel

In this version of Uboot, we provide two way to update kernel, one is throught netwrok (TFTP server), and the other is through the MicroSD card, user can select one of them to update the kernel image if it is necessary.

4.3.1 Update Kernel througt Network (TFTP server)

In order to download the Linux kernel by network, User should expand the Ethernet module and UART5 serial moudle for Mini3250. shown as figure 4.5.

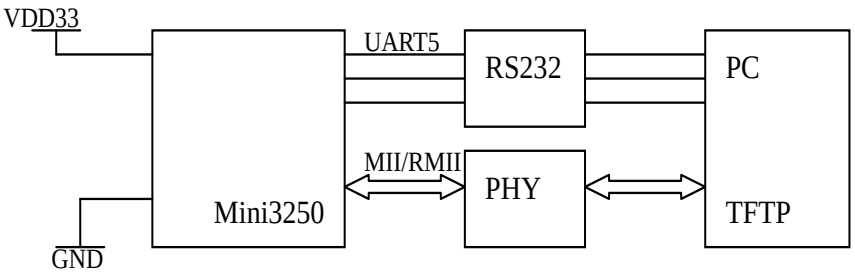


Figure 4.5

The follow steps will describe how to download the kernel image through TFTP server.

1> Run serial communicating tool (i.e: hyper teminater under Windows XP or minicom under the Linux opeating system) on you developing platform, and set the communication paramter to “com1 115200 8n1”.
2> Install the TFTP server to your develop platform. Make sure there is uImage kernel file in the folder where tftp server is provided on PC. power on Mini3250 and then press the “SPACE” key to get into the Uboot command line atfter the terminate prompt the “press any key to ….”
3> Input the follow command in the Uboot command line to set the kernel start enviroment.(note; the ip address of the TFTP server and Mini3250 must in the same segment)

```
setenv bootfile uImage
setenv fileaddr 80100000
```

```
setenv serverip 192.192.192.163
setenv ipaddr 192.192.192.205
setenv gatewayip 192.192.192.101
setenv bootcmd 'nboot 80100000 0 1c0000;bootm'
```

4> Input the follow command in the Uboot command line to download the kernel to the SDRAM

```
tftp 80100000 192.192.192.163:uImage
```

5> After the downlod complete,please input the follow command to burn it to the NANDFLASH.

```
nand erase 1c0000 400000
nand unlock 1c0000 400000
nand write 80100000 1c0000 400000
nand lock 1c0000 400000
```

4.3.2 Update Kernel througt MicroSD Card

Updating the kernel image through MicroSD card, the hardware requirement is show as figure 4.1. the UART5 is optional as the UART5 just use for printing the imformation during update process. The follow steps will show you how to update the Uboot through MicroSD card .

1> Copy the **uImage** to the root directory of the MicroSD card.
2> Copy the loadme_kernel.bin to the root directory of the MicroSD card and then rename it to **loadme.bin**.
3> Set SERVER_N pin to high level.
4> Insert the MicroSD card to the MicroSD card slot and then power up Mini3250.
5> After the Mini3250 detects the MicroSD card and the uImage in the MicroSD card, it will update the uImage to the NANDFLASH automatically.
6> Remove MicroSD card and reset.

```
Loading bootloader to SDRAM from SD card ....
File in SD root directory doesn't exist
Loading kernel to SDRAM from SD card ....
success
Loading Filesystem to SDRAM from SD card ....
File in SD root directory doesn't exist
Running Bootloader from Block device


U-Boot 1.3.3 (Jun 13 2010 - 15:10:33)

DRAM:  64 MB
NAND:  128 MiB
In:    serial
Out:   serial
```

```
Err:    serial
Hit any key to stop autoboot:  0

NAND erase: device 0 offset 0x1c0000, size 0x400000
Erasing at 0x5a0000 -- 100% complete.
OK

NAND write: device 0 offset 0x1c0000, size 0x400000
 4194304 bytes written: OK

Loading from NAND 128MiB 3,3V 8-bit, offset 0x1c0000
    Image Name:    Linux-2.6.27.8
    Image Type:    ARM Linux Kernel Image (uncompressed)
    Data Size:     1697112 Bytes =  1.6 MB
    Load Address: 80008000
    Entry Point:  80008000
```

4.4 Update JFFS2 filesystem

When the file system in flash is damaged, file system of flash is to be updated for some reason, user can update it by downloading the filesystem through TFTP server or mounting root file system of PC using NFS. The hardware requemet are show as figure 4.1.

Generate JFFS2 image for 2k page size NANDFLASH

```
mkfs.jffs2 -r rootfs_dir -o rootfs_image.jffs2 -e 0x20000 -s 0x800 --pad=0x1e80000 -n –v
```

Parameter:

--pad Define the size of filesystem image. It should be block aligned and match with nand write.jffs2

If the file system you want to download is bigger than 60MB, please refer to the "4.4.2 Update firesystem through the NFS server" to update the file system.

4.4.1 Update the JFFS2 filesystem through Network

There two way to update the file system to FLASH through network, one is through TFTP server, and the other is through NFS.

<1> through TFTP server

The operation of downloading the JFFS2 filesystem image to Mini3250 through TFTP server is almost the same as downloading the Linux kernel to Mini3250, after the hardware connection and environment setting, please follow the steps to update the JFFS2 system through the TFTP server:

1> Input the follow command in the Uboot command line to download the kernel to the SDRAM

```
tftp 0x81000000 192.192.192.163:rootfs_image.jffs2
```

2> After the downlod complete,please input the follow command to burn the filesystem to the NANDFLASH.

```
nand erase 5c0000 3a80000
nand write.jffs2 81000000 5c0000 1e80000
```

<2> through NFS server.

Update the filesystem throught the NFS require installing the NFS to the host PC.

Run following command when U-Boot startup to set U-Boot environment parameter:

```
setenv bootargs 'console=ttyS0,115200n81 root=/dev/nfs rw nfsroot=<nfs server
ip>:/home/nfs/nfs2440-III ip=<local ip>:<nfs server ip>:<gateway ip>:255.255.255.0::eth0:off'
```

After booting, system will mount nfs and enter console terminal.

After Mini3250 start up and mount the NFS, please enter the follow command to update the special filesystem to the NANDFLASH. The default pack of Mini3250-nfs includes several kinds of GUI graph interfaces.

```
flash_eraseall /dev/mtd3                    //erase the filesystem partition
mount -t jffs2 /dev/mtdbloclk3 /mnt
tar xzvf mini3250-qtopia-xxxxx.tar.gz -C /mnt
//xxxxx stand for the touch or mouse. It correspond to the different GUI graph interfaces.
```

4.4.2 Update filesystem through MicroSD Card

Updating the filesystem image through MicroSD card, the hardware requeiament is show as figure 4.1. the UART5 is optional as the UART5 just use for printing the imformation during update process. The follow steps will show you how to update the Uboot through MicroSD card.

1> Copy rootfs_image.jffs2 to the root directory of MicroSD card.
2> Copy loadme_fs.bin to the root directory of MicroSD card.
3> Rename rootfs_image.jffs2 to **fs**, and loadme_fs.bin to **loadme.bin**.
4> Set SERVER_N pin at high level.
5> Insert the MicroSD card to the MicroSD card slot and then power up Mini3250.
6> After the Mini3250 detects the MicroSD card and the fs in the MicroSD card, it will download the filesystem to the sdram automatically.
7> Then system will run loadme.bin. It copies fs from sdram to NANDFLASH.
8> Remove MicroSD card and reset after nand write complete.

```
Loading bootloader to SDRAM from SD card ....
File in SD root directory doesn't exist
```

```
Loading kernel to SDRAM from SD card ....
File in SD root directory doesn't exist
Loading Filesystem to SDRAM from SD card ....
success
Running Bootloader from Block device



U-Boot 1.3.3 (Jun 13 2010 - 15:37:30)

DRAM:   64 MB
NAND:   128 MiB
In:     serial
Out:    serial
Err:    serial
Hit any key to stop autoboot:  0

NAND erase: device 0 offset 0x5c0000, size 0x7a40000
Erasing at 0x7fe0000 -- 100% complete.
OK

NAND write: device 0 offset 0x5c0000, size 0x1e80000

Writing data at 0x243f800 -- 100% complete.
 31981568 bytes written: OK

Loading from NAND 128MiB 3,3V 8-bit, offset 0x1c0000
    Image Name:    Linux-2.6.27.8
    Image Type:    ARM Linux Kernel Image (uncompressed)
    Data Size:     1697112 Bytes =  1.6 MB
    Load Address: 80008000
    Entry Point:   80008000
```

4.5 Customize Your Own loadme.bin

“loadme.bin” is used mainly used to update image to NANDFLASH from MicroSD card.

Now, we will tell you how to build your own loadme.bin to update your own image.
Extract u-boot-1.3.3_loadme.tar.bz2 in CD “source\u-boot-1.3.3_loadme.tar.bz2”.

```
tar -jvxf u-boot-1.3.3_loadme.tar.bz2 –C /home
cd /home/u-boot-1.3.3_loadme
```

Open configration file

```
vi include/configs/phy3250.h
```

The only parameter you need to modify is:

```
#define CONFIG_BOOTCOMMAND   "nand erase 5c0000;nand write.jffs2 81000000 5c0000 1e80000;nboot 80100000 0 1c0000;bootm"
```

That is the command system will run when u-boot startup.

Before u-boot startup, the system automatically copy below files(if exist) to the specific address in SDRAM. Meanwhile, after complete copy u-boot.bin, system burns it into NANDFLASH immediately, so loadme.bin doesn't need to burn u-boot.bin, it's task is to burn uImage or fs.

Filename(MicroSD)	Copy to Addr(SDRAM)
u-boot.bin	0x83FC 0000
uImage	0x8010 0000
fs	0x8100 0000

Then we can split the CONFIG_BOOTCOMMAND string into 3 command string.

```
#define CONFIG_BOOTCOMMAND   "nand erase 5c0000;nand write.jffs2 81000000 5c0000 1e80000;nboot 80100000 0 1c0000;bootm"

① nand erase 5c0000                          # erase area from 0x5c0000 to the end of NANDFLASH
② nand write.jffs2 81000000 5c0000 1e80000   # write the image fs to NANDFLASH
③ nboot 80100000 0 1c0000;bootm              # read uImage in NANDFLASH and boot
```

Please take attention to the command *nand write.jffs2*, The format is:

```
nand write.jffs2 81000000 5c0000 <filesize>
```

But how do we know the filesize? It's defined by command *mkfs.jffs2* when you create jffs2 filesystem:

```
./mkfs.jffs2 -r /home/nfs/nfs3250-III -o timll3250.jffs2 -e 0x20000 --pad=0x1e80000 -s 0x800 -n
```

The parameter "--pad" is the filesize of your jffs2 filesystem image.

Fill your own CONFIG_BOOTCOMMAND string, save the file. Then type command below.

```
make phy3250_config
make
mv u-boot.bin loadme.bin
```

Chapter 5 Linux Application Development Guide

5.1 Hardware Connection

Connect UART5 port of Mini3250 and serial port of PC with serial cable provided with product.

5.2 Hyper Terminal Configuratin

Open hyper terminal program on PC, and set parameter as below:
115200 Bits-per-second
8 Data Bits
No Parity
1 Stop Bit
No Flow Control

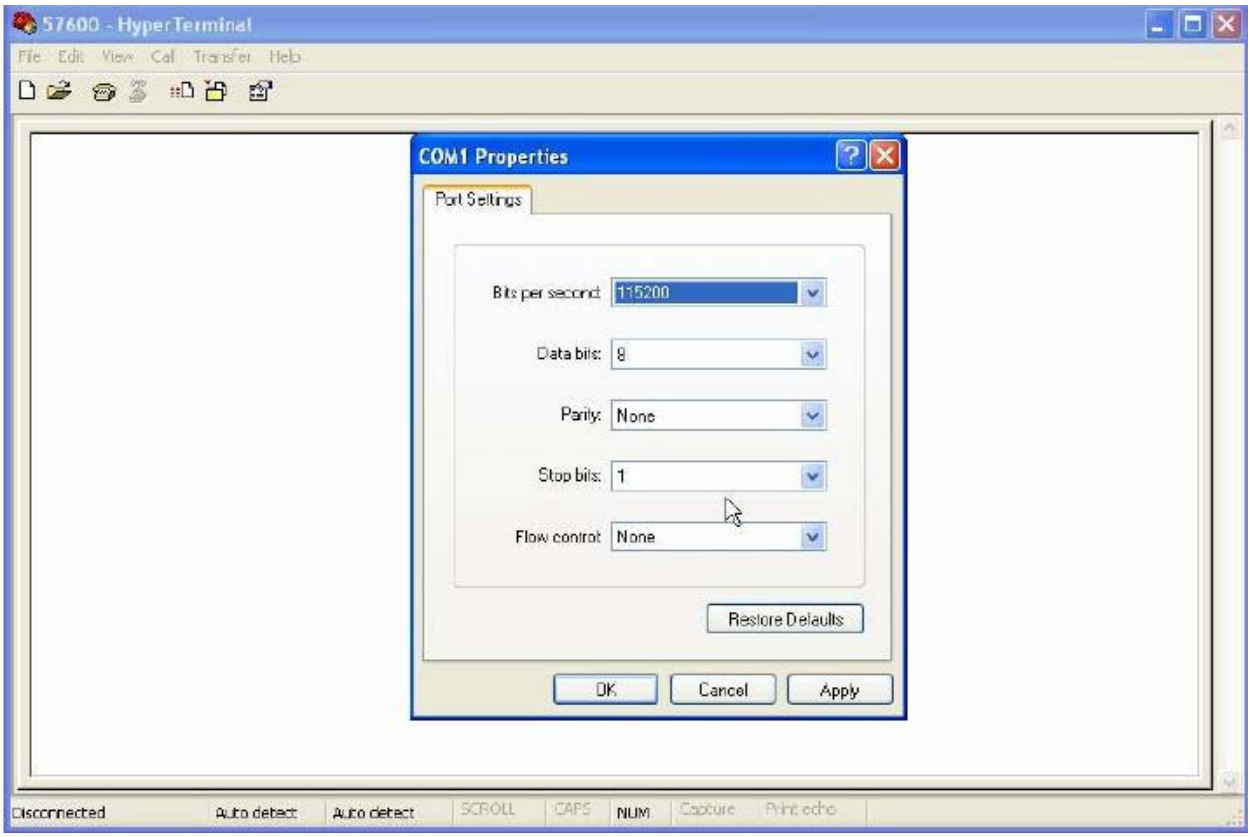


Figure 5.1.1 Hyper Terminal Parameter Configuration

Power up the device and boot information will show in hyper terminal.

5.2 Linux Software Usage

5.2.1 Command rz Receiving File from PC

Type Linux command “rz” in shell mode.

```
[root@bit /]# rz
```

Click right-button of mouse, choose “send file”, then pop-up a diagram, choose the file you want to send. Click button “Send”, certain seconds later, the file will exist in your current directory.

5.2.2 Command tftp Receiving File From TFTP Server

Type Linux command “tftp” in shell mode:

```
[root@bit /]# tftp -r <filename> -g <tftp server ip>
```

Eg: tftp -r myfile -g 192.192.192.105

5.2.3 Using USB Disk

Connect USB disk and Mini3250 with the usb cable provided with product. Then terminal wil show:

```
scsi 1:0:0:0: Direct-Access     ChipsBnk SD/MMCReader     4081 PQ: 0 ANSI: 2
sd 1:0:0:0: [sda] 1990656 512-byte hardware sectors (1019 MB)
sd 1:0:0:0: [sda] Write Protect is off
sd 1:0:0:0: [sda] Assuming drive cache: write through
sd 1:0:0:0: [sda] 1990656 512-byte hardware sectors (1019 MB)
sd 1:0:0:0: [sda] Write Protect is off
sd 1:0:0:0: [sda] Assuming drive cache: write through
 sda: sda1
sd 1:0:0:0: [sda] Attached SCSI removable disk
```

Type command as below to mount the device.

```
[root@bit /]# mount –t vfat /dev/sda1 /mnt
```

Then the content in your USB disk will exist in directory /mnt.

5.2.4 Using MicroSD Card

Insert MicroSD card in Mini3250 slot, then terminal will show:

```
[root@bit /]# mmc0: host does not support reading read-only switch. assuming write-enable.
mmc0: new SD card at address 0007
mmcblk0: mmc0:0007 SD2GB 1931264KiB
 mmcblk0: p1
```

Type command as below.

```
[root@bit /]# mount –t vfat /dev/mmcblk0p1 /mnt
```

Then the content in your MicroSD will exist in directory /mnt.

5.2.5 Terminate Program

Terminate current running program with Ctrl+C. Else, terminate background program with command “kill”, for example as below.

```
[root@bit /]# ps
  PID   Uid     VmSize Stat Command
    1 root         540 S    init
    2 root             SW< [kthreadd]
    3 root             SW< [ksoftirqd/0]
```

```
    4 root                SW< [events/0]
  258 root                SW< [spi_lpc32xx.0]
  316 root                SW< [rpciod/0]
  329 root      476 S < /sbin/udevd --daemon
  353 bin       272 S     /sbin/portmap
  369 root      168 S     /usr/sbin/telnetd -l /bin/login
  371 root      740 S     -sh
  372 root      376 S     /usr/sbin/boa
  376 root      656 R     ps
[root@bit /]# kill 353
```

Then run command “ps”, and the portmap program disappears.

5.2.6 Set System Time

Refer to command “date” help information.

```
[root@bit /]# date --help
BusyBox v1.00 (2005.04.24-17:33+0000) multi-call binary

Usage: date [OPTION]... [MMDDhhmm[[CC]YY][.ss]] [+FORMAT]

Displays the current time in the given FORMAT, or sets the system date.

Options:
        -R              Outputs RFC-822 compliant date string
        -d STRING       Displays time described by STRING, not `now'
        -I[TIMESPEC]    Outputs an ISO-8601 compliant date/time string.
                        TIMESPEC=`date' (or missing) for date only,
                        `hours', `minutes', or `seconds' for date and,
                        time to the indicated precision.
        -s              Sets time described by STRING
        -r FILE         Displays the last modification time of FILE
        -u              Prints or sets Coordinated Universal Time
```

For example, set time to 2010-6-12 13:12, you should run command below.

```
[root@bit /]# date -s 061213122010
Sat Jun 12 13:12:00 UTC 2010
```

If you want to store the time you set into rtc module, please run below command.

```
[root@bit /]# hwclock –w
```

5.2.7 Button Test (Devkit3250)

```
[root@bit /]# cd app/
[root@bit /app]# ./button
```

Then press KEY1(GPI_01) KEY2(GPI_02) KEY3(GPI_08) KEY4(GPI_09)

```
type = 1        , code = 65
type = 1        , code = 66
```

```
type = 1            , code = 67
type = 1            , code = 68
```

65/66/67/68 is the key code we set in driver. User can redefine the key code by editing file below.
drivers/input/keyboard/buttons/buttons_devkit3250.c
buttons_info_tab[] =

```
{
    {
        IRQ_GPI_01, 0, INP_STATE_GPI_01, 0, 'A', "Key1"
    },
    {
        IRQ_GPI_02, 0, INP_STATE_GPI_02, 0, 'B', "Key2"
    },
    {
        IRQ_GPI_08, 0, INP_STATE_GPI_08, 0, 'C', "Key3"
    },
    {
        IRQ_GPI_09, 0, INP_STATE_GPI_09, 0, 'D', "Key4"
    },
};
```

5.2.8 Uart Test (Devkit3250)

Device node of uarts register in Linux system:

```
/dev/ttyS0   ->   Uart5
/dev/ttyS1   ->   Uart3
/dev/ttyS2   ->   Uart4
/dev/ttyS3   ->   Uart6 (IrDA)
/dev/ttyTX0 ->   Uart1
/dev/ttyTX1 ->   Uart2
/dev/ttyTX2 ->   Uart7
/dev/ ttySCMA0     -> Uart8 (Devkit3250 SPI extend)
/dev/ ttySCMA1     -> Uart9 (Devkit3250 SPI extend)
```

Run command below

```
[root@bit /app]# ./com   -d /dev/ttyS1
SEND: 1234567890
SEND: 1234567890
```

Connet the RX and TX pin of Uart3 with jumper, rerun the command.

```
[root@bit /app]# ./com   -d /dev/ttyS1
SEND: 1234567890
RECV: 1234567890
```

Notes:

Pin	Discription
2	RX
3	TX

5.2.9 EEPROM Test (Devkit3250)

```
[root@bit /app]# ./eeprom
eeprom write [0x000010]: hello Embest!
eeprom read [0x000010]: hello Embest!
dump buff_rd:
00000: 68   65   6c   6c   6f   20   45   6d
0x008: 62   65   73   74   21   00   00   00
```

5.2.10 Led & Beep Test (Devkit3250)

```
[root@bit /app]# ./led
gpio opened
Input key command
        'a' -> beep on
        'b' -> beep off
        'c' -> led on
        'd' -> led off
#?a
key = 97(user)
b
key = 98(user)
c
key = 99(user)
d
key = 100(user)
gpio released
^C
[root@bit /app]#
```

5.2.11 Audio Test (Devkit3250)

```
[root@bit /app]# madplay music.mp3
```

Notes:

The application source are in directory: ***CD\source\application***