Freescale Semiconductor
Application Note

Document Number: AN4336
Rev. 0, 07/2011

Enabling SD Interface on P1010 Reference Design Board

by *Networking and Multimedia Group*
Freescale Semiconductor, Inc.
Austin, TX

This document explains how to enable SD interface in u-boot and Linux on P1010 reference design board (RDB).

This document is prepared with respect to the following hardware and software versions (see backside of the board for the revision number):

- Hardware: P1010RDB pilot board
  (Assembly revision: 700-26374 Rev C)
- Software: QorIQ SDK 1.0.1

Contents

1 Signal Multiplexing

This table lists the P1010 signal multiplexing among IFC, SD, and USB-ULPI interfaces.

Table 1. P1010 Signal Multiplexing

Pin Number	Function 1	Function 2	Function 3	Function 4
W23	IFC_ADDR[16]	SDHC_CLK	USB_CLK	$\overline{\text{IFC\_CS}}$[2]
W21	IFC_ADDR[17]	SDHC_CMD	USB_D[0]	$\overline{\text{DMA\_DREQ}}$[1]
Y23	IFC_ADDR[18]	SDHC_DAT[0]	USB_D[1]	$\overline{\text{DMA\_DACK}}$[1]
Y22	IFC_ADDR[19]	SDHC_DAT[1]	USB_D[2]	$\overline{\text{DMA\_DDONE}}$[1]
AA23	IFC_ADDR[20]	SDHC_DAT[2]	USB_D[3]	—
Y21	IFC_ADDR[21]	SDHC_DAT[3]	USB_D[4]	—
AB23	IFC_ADDR[22]	SDHC_WP	USB_D[5]	—
AA22	IFC_ADDR[23]	SDHC_CD	USB_D[6]	—
AC23	IFC_ADDR[24]	—	USB_D[7]	—

For more information, see *P1010 QorIQ Integrated Processor Hardware Specifications*.

2 Implementing Mux Strategy

In QorIQ SDK 1.0.1, the mux strategy for P1010RDB is static by nature. The interfaces are decided at the time of power on reset (POR) depending upon the reset configuration, which means primarily the POR signals that the device samples at the time of reset. The same interfaces remain available in u-boot and Linux.

The above strategy has been implemented primarily for the boot interfaces (bus interfaces), such as SD, IFC, and USB-ULPI. For other interfaces that are multiplexed on P1010RDB, such as TDM/CAN and SPI CS0 can be configured through `hwconfig` through CPLD register writes.

This table describes the QorIQ SDK 1.0.1 muxing.

Table 2. SDK 1.0.1 Muxing

Switch Selection	Interfaces Available in u-boot and Linux								
Boot location through SW4[1]	Bus selection through SW6[1]	SD	USB-ULPI	IFC-NOR	IFC-NAND	IFC-CPLD	SPI Flash	TDM & SPI-SLIC	CAN
NAND Flash	IFC-CS0 on NAND Flash	No	No	Yes	Yes	Yes	Conf[2]	Conf	Conf
NOR Flash	IFC-CS0 on NOR Flash	No	No	Yes	Yes	Yes	Conf	Conf	Conf

Table 2. SDK 1.0.1 Muxing (continued)

Switch Selection	Interfaces Available in u-boot and Linux								
SPI Flash	IFC-CS0 on NAND Flash	No	No	Yes	Yes	Yes	Yes	No	Conf

Notes:
1. Refer to P1010RDB user's manual for the details of SW4 and SW6. Look for P1010RDB pilot board information.
2. Conf refers to "configurable" through `hwconfig` in u-boot. For more information, see *P1010RDB Board Bring-up Guide*.

The SD interface and USB-ULPI are not available in any of the boot scenarios. The SD interface is the cause of concern as USB-ULPI is a redundant interface on P1010RDB because of the UTMI availability.

The SD interface can be made available in SPI boot as the IFC or SD bus can be enabled here. By default, IFC is enabled in QorIQ SDK 1.0.1 (see Table 2).

This table lists the updated muxing if the SD bus is enabled in SPI boot.

Table 3. Updated Muxing on P1010RDB

POR Config Selected through Switches	Interfaces Available in U-Boot and Linux								
Boot location through SW4	Bus selection through SW6	SD	USB-ULPI	IFC-NOR	IFC-NAND	IFC-CPLD	SPI Flash	TDM and SPI-SLIC	CAN
NAND Flash	IFC-CS0 on NAND Flash	No	No	Yes	Yes	Yes	Conf	Conf	Conf
NOR Flash	IFC-CS0 on NOR Flash	No	No	Yes	Yes	Yes	Conf	Conf	Conf
SPI Flash	SD	Yes	No	No	No	No	Yes	No	No

NOTE

As CPLD is not available in SPI boot in revised mux strategy, the TDM, SPI SLIC, and CAN are also not available in case of SPI boot.

3 Enabling SD Interface

To enable SD interface in SPI boot on P1010RDB:

1. Perform the following updates in u-boot
   a) Modify `pmuxcr` to enable SD bus in case of SPI boot
   b) Update the corresponding static mux implementation in u-boot
2. Perform the following updates in Linux
   a) Disable IFC from device tree and kernel `defconfig`

The patch details to enable SD interface are given below. A zip file, AN4336SW.zip, containing the patches for u-boot and Linux accompanies this application note. The file can be downloaded from www.freescale.com.

3.1 U-Boot

1. Extract the u-boot code from the QorIQ SDK 1.0.1 iso
2. Apply the patch, `u-boot-p1010rdb-enabling-sd-in-spi-boot.patch`
3. Compile the u-boot using `"make"` command for SPI Flash

```
#make ARCH=powerpc
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.5.55-eglibc-2.11.55/p
owerpc-linux-gnu/bin/powerpc-linux-gnu- P1010RDB_SPIFLASH
```

4. Use the `boot_format` utility to generate the `spiimage`. For more information, see SDK manual.
5. Update the SPI Flash with the above built `spiimage`

3.2 Linux

1. Extract the Linux source code from QorIQ SDK 1.0.1 iso
2. Apply the patch, `linux-p1010rdb-enabling-sd-in-spi-boot.patch`
3. Compile Linux using `make` command

```
#make ARCH=powerpc
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.5.55-eglibc-2.11.55/p
owerpc-linux-gnu/bin/powerpc-linux-gnu-
arch/powerpc/configs/qoriq_sdk_nonsmp_defconfig
```

```
#make ARCH=powerpc
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.5.55-eglibc-2.11.55/p
owerpc-linux-gnu/bin/powerpc-linux-gnu-
```

4. Compile the `dts`

```
./sripts/dtc/dtc -f -I dts -O dtb -R 8 -S 0x3000
```

```
arc/powerpc/boot/dts/p1010rdb.dts.dts > p1010rdb.dtb.dtb
```

5. With the updated `SPI bootloader`, Linux `uImage` and `p1010rdb.dtb`, the user must be able to enable SD interface on P1010RDB.

NOTE

- The above-mentioned changes must be done only when the user specifically requires the SD interface using SPI boot.
- For all other boot methods, these patches must not be used.

4 Revision History

This table provides a revision history for this document.

Table 4. Document Revision History

Rev. Number	Date	Substantive Change(s)
0	07/2011	Initial Public Release.

How to Reach Us:

Home Page:
www.freescale.com

Web Support:
http://www.freescale.com/support

USA/Europe or Locations Not Listed:
Freescale Semiconductor, Inc.
Technical Information Center, EL516
2100 East Elliot Road
Tempe, Arizona 85284
1-800-521-6274 or
+1-480-768-2130
www.freescale.com/support

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
www.freescale.com/support

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku
Tokyo 153-0064
Japan
0120 191014 or
+81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor China Ltd.
Exchange Building 23F
No. 118 Jianguo Road
Chaoyang District
Beijing 100022
China
+86 10 5879 8000
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor
Literature Distribution Center
1-800 441-2447 or
+1-303-675-2140
Fax: +1-303-675-2150
LDCForFreescaleSemiconductor
@hibbertgroup.com

Document Number: AN4336
Rev. 0
07/2011