

Changing the i.MX35 NAND Flash Model for Windows Embedded CE 6.0

by *Multimedia Applications Division*
Freescale Semiconductor, Inc.
Austin, TX

This document describes how to include a new NAND Flash model in custom design using the i.MX35 and Windows Embedded CE 6.0.

1 Introduction

Frequently, new i.MX hardware designs use different components than those used on Freescale development tools. Most of these custom boards include several components that are not 100% compatible with Freescale's BSP. In general, memory suppliers often promote changes on their product portfolio. Therefore, memories such as DDR, NAND Flash and NOR Flash are often replaced by models that are not supported by the Freescale's BSP drivers. This document provides a guidance to include a new NAND Flash model to Freescale's BSP.

Contents

1. Introduction	1
2. Implementation	2
2.1. NAND Flash Parameter Definitions	2
2.2. Inclusion of New NAND Flash Model	3
2.3. Configuring the Environment	5
3. Revision History	8

Figure 1 shows the driver architecture of WinCE 6.0 and Eboot on NAND Flash implementation.

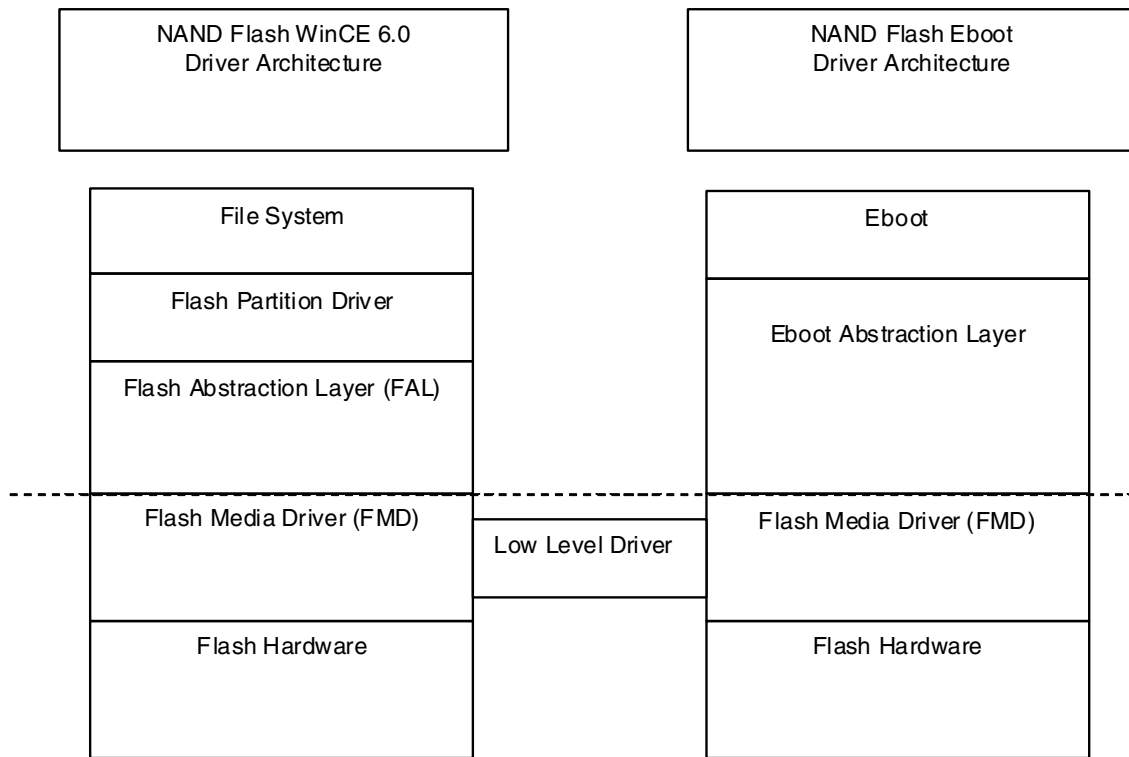


Figure 1. Driver Architecture of WinCE 6.0 and Eboot on NAND Flash Implementation

WinCE 6.0 and Eboot share the same low level driver on NAND Flash implementation. When a new memory model is incorporated, all the changes have to be included under Flash Media Driver Layer. After building this layer, both Eboot and NK images of WinCE 6.0 support the new Flash memory.

2 Implementation

2.1 NAND Flash Parameter Definitions

The following parameter definitions are configured when a new NAND Flash is added. These parameter definitions are available in the NAND Flash specification.

- NAND MARKER — Manufacturer's ID code
- NAND DEVICE ID — Device ID code
- NAND BLOCK COUNT — Total number of blocks in the Flash
- NAND PAGE COUNT — Total number of pages in the Flash
- NAND PAGE SIZE — Size of each page
- NAND SPARE SIZE — Total size of spare area in one page
- NAND BUS WIDTH — Size of the data bus

2.2 Inclusion of New NAND Flash Model

The following steps show how to include a new NAND Flash model by modifying the Flash Media Driver (FMD) files.

NOTE

Ensure that the i.MX35 BSP1.5 is installed on Visual Studio 2005.

1. Extract the following information from the NAND Flash specification. For more information, see [Section 2.1, “NAND Flash Parameter Definitions.”](#)
 - NAND MARKER
 - NAND DEVICE ID
 - NAND BLOCK COUNT
 - NAND PAGE COUNT
 - NAND PAGE SIZE
 - NAND SPARE SIZE
 - NAND BUS WIDTH
2. Create a new header file using the information given below, name it as the NAND Flash part number (for example, `K9LAG08U0M.h`) and store this file in the following path:

`\WINCE600\PLATFORM\COMMON\SRC\SOC\COMMON_FSL_V2_PDK1_5\NAND\INC\`

The empty values marked with X's and arrows are those that should be filled with the information extracted from the NAND Flash specification.

```
#ifndef __K9LAG08U0M_H__ → __Header File Name_H__
#define __K9LAG08U0M_H__ → __Header File Name_H__

// NAND Flash Chip CMD
#define CMD_READID          (0x90)          // Read ID
#define CMD_READ            (0x00)          // Read data 1st cycle
#define CMD_READ2           (0x30)          // Read data 2nd cycle
#define CMD_RESET           (0xFF)          // Reset
#define CMD_ERASE           (0x60)          // Erase setup
#define CMD_ERASE2          (0xD0)          // Erase
#define CMD_WRITE           (0x80)          // Sequential data input
#define CMD_WRITE2          (0x10)          // Program
#define CMD_STATUS          (0x70)          // Read status

// NAND Flash Chip Size
#define NAND_BLOCK_CNT      (XXXX) → NAND BLOCK COUNT
#define NAND_PAGE_CNT      (XXX) → NAND PAGE COUNT
#define NAND_PAGE_SIZE     (XXXX) → NAND PAGE SIZE
#define NAND_SPARE_SIZE    (XX) → NAND SPARE SIZE
#define NAND_BUS_WIDTH     (X) → BUS WIDTH

// NAND Flash Chip
#define NAND_NUM_OF_CS      (1)

// NAND Flash Chip ID
#define NAND_MAKER_CODE     (0xXX) → NAND MARKER
#define NAND_DEVICE_CODE   (0xXX) → NAND DEVICE ID
#define NAND_ID_CODE        ((NAND_DEVICE_CODE << 8) | NAND_MAKER_CODE)
```

```
// NAND Flash Chip Operation Status
#define NAND_STATUS_ERROR_BIT    (0)        // Status Bit0 indicates error
#define NAND_STATUS_BUSY_BIT     (6)        // Status Bit6 indicates busy

// SWAP BBI
#define BBI_MAIN_ADDR            (464)     //Bad block info address offset
#define BBI_NUM                  (1)
BYTE    BBMarkPage[1] = {127};
#endif
```

3. Modify the header file `nandbsp.h`, located at

`\WINCE600\PLATFORM\iMX35-3DS-PDK1_5\SRC\COMMON\NANDFMD\nandbsp.h`. **Add the `nandbsp.h` file. The modified example must be as shown below. The changes are shown in bold.**

```
//
// Copyright (c) Microsoft Corporation. All rights reserved.
//
//
// Use of this source code is subject to the terms of the Microsoft end-user
// license agreement (EULA) under which you licensed this SOFTWARE PRODUCT.
// If you did not accept the terms of the EULA, you are not authorized to use
// this source code. For a copy of the EULA, please see the LICENSE.RTF on your
// install media.
//
//-----
//
// Copyright (C) 2007-2008, Freescale Semiconductor, Inc. All Rights Reserved.
// THIS SOURCE CODE, AND ITS USE AND DISTRIBUTION, IS SUBJECT TO THE TERMS
// AND CONDITIONS OF THE APPLICABLE LICENSE AGREEMENT
//
//-----
//
// File: nandbsp.h
//
// Contains definitions for FMD impletation of the SoC NAND flash controller
// and NAND memory device.
//
//-----
#ifndef __NANDBSP_H__
#define __NANDBSP_H__

#ifdef BSP_NAND_K9LBG08U0M
#include "K9LBG08U0M.h"
#else ifdef BSP_NAND_K9LAG08U0M
#include "K9LAG08U0M.h"
#endif
#endif // __NANDBSP_H__
```

4. Edit the source file located at

`\WINCE600\PLATFORM\iMX35-3DS-PDK1_5\SRC\COMMON\NANDFMD\sources`. **This file contains definitions, of which `INCLUDE` must be selected on `nandbsp.h` file. Based on the same memory model example, the file must include the following lines of code. The changes are shown in bold.**

```
!if 0
Copyright (C) 2007-2008, Freescale Semiconductor, Inc. All Rights Reserved.
```

```

THIS SOURCE CODE, AND ITS USE AND DISTRIBUTION, IS SUBJECT TO THE TERMS
AND CONDITIONS OF THE APPLICABLE LICENSE AGREEMENT
!endif

TARGETNAME=nandfmd_lib
TARGETTYPE=LIBRARY
RELEASETYPE=PLATFORM
SYNCHRONIZE_BLOCK=1

WINCEOEM=1
WINCECPU=1
NOMIPS16CODE=1

INCLUDES=\
    $(INCLUDES); \
    $(PLATFORMROOT)\common\src\soc\$(COMMONSOCDIR)\nand\inc

!IF "$(BSP_NAND_K9LAG08U0M)" == "1" → Environment variable to select the memory to be
used. This has to be named the same as in the nandbsp.h definition just added.
CDEFINES=$(CDEFINES) -DBSP_NAND_K9LAG08U0M → Modify the last part with the name model
just added on the nandbsp.h file.
!ENDIF → End of IF definition

!IF "$(BSP_NAND_K9LBG08U0M)" == "1"
CDEFINES=$(CDEFINES) -DBSP_NAND_K9LBG08U0M
!ENDIF
SOURCES=nandbsp.cpp

```

2.3 Configuring the Environment

To configure the environment, follow the steps given below:

1. Add the new NAND Flash model environment variable to the project.
 - a) On Platform builder, click Build > Properties > Configuration Properties > Environment > New...

Figure 2 shows how to add an environment variable to a project.

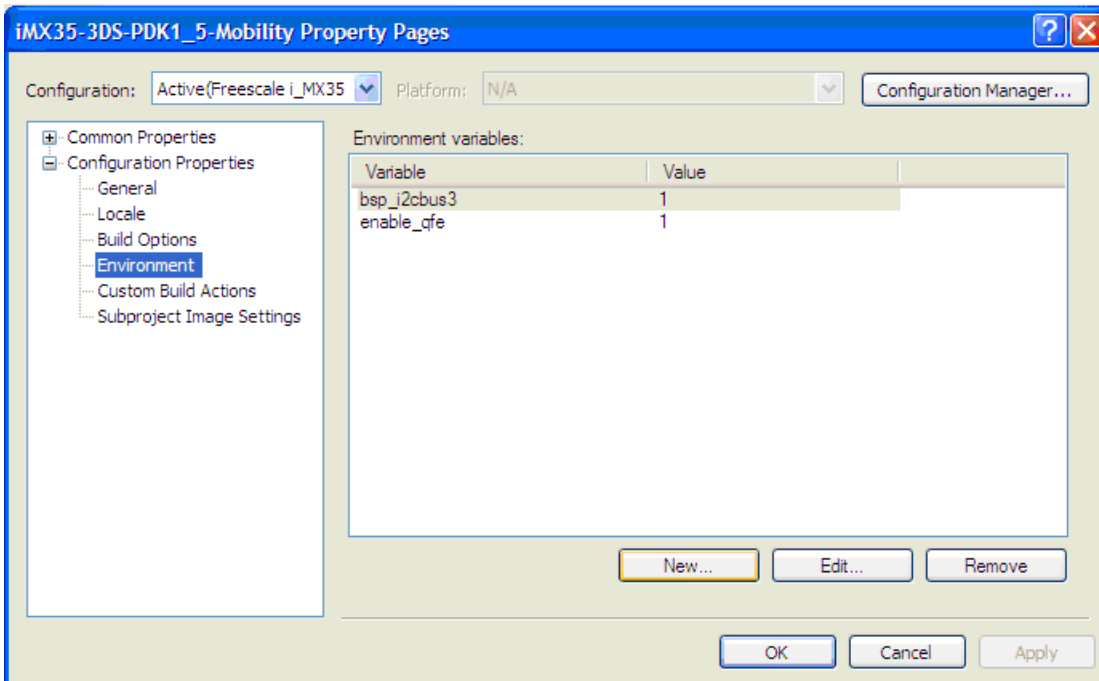


Figure 2. Adding Environment Variable to the Project

- b) In the Variable name field, enter the variable defined in the source file which was modified in step 4 of Section 2.2, “Inclusion of New NAND Flash Model.” In the example as shown in Figure 3, the Variable name field is BSP_NAND_K9LAG08U0M. The Variable value field must be equal to one.

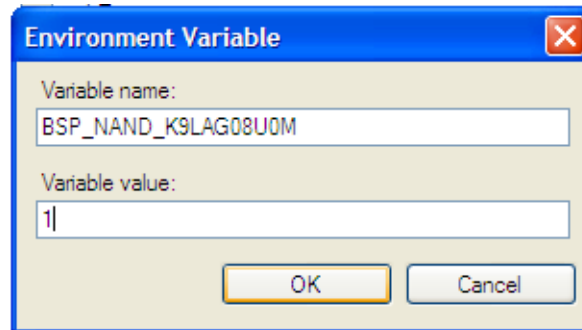


Figure 3. Entering Variable Name and Variable Value

2. Build the project within the FMD changes.

On platform builder, click Build > Advanced Build Commands > Build Current BSP and Sub projects as shown in [Figure 4](#). This process builds the image and also the boot loader as both share the same driver.

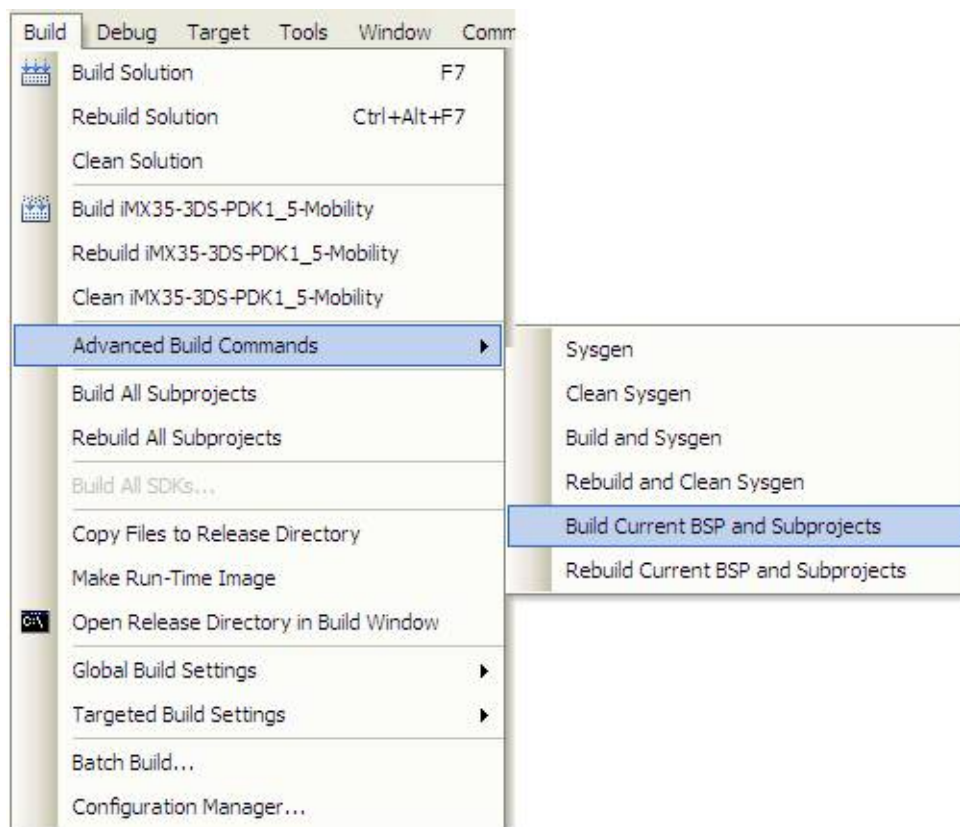


Figure 4. Building a Project

NOTE

To download the Boot Loader and an image into a blank NAND Flash, see Chapter 5 and 6 of *i.MX35 PDK 1.5 Windows Embedded CE 6.0 User Guide document*. This document provides guidelines to program the design through the ATK application.

3 Revision History

Table 1 provides a revision history for this application note.

Table 1. Document Revision History

Rev. Number	Date	Substantive Change(s)
0	01/2010	Initial release.

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

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

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.

Freescale and the Freescale logo are trademarks or registered trademarks of Freescale Semiconductor, Inc. in the U.S. and other countries. All other product or service names are the property of their respective owners. ARM is the registered trademark of ARM Limited. ARMnnn is the trademark of ARM Limited.

© Freescale Semiconductor, Inc., 2010. All rights reserved.

