

# **BSP for Microsoft Windows\* 7 (WIN7, WES7 & POSReady 7) 32 & 64 bit for Intel® Atom™ Processor E3800 Product Family**

**User Guide**

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***May 2015***

***For  
Maintenance Release 3.0  
Revision 6.0***

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## ***Revision History***

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<b>Revision Number</b>	<b>Description</b>	<b>Revision Date</b>
6.0	Updated for Windows 7 Maintenance Release 3	May 2015
5.0	Updated for Windows 7 Maintenance Release 2	March 2015
4.0	Updated for Windows 7 Maintenance Release 1	September 2014
3.0	Added Windows Embedded POSReady 7	May 2014
2.0	Update USB3 BKM and known issues for Gold 2 release	Mar 2014
1.0	Update release for Windows 7 Gold 1.0 release	Jan 2014



# 1 Introduction

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## 1.1 Scope of document

This document consists User Guide about Intel developed GPIO, I<sup>2</sup>C, SPI, HS-UART, and USB3.0 XHCI driver for Windows\* 7, Windows Embedded Standard 7 and Windows Embedded POSReady 7.

You will find the steps to build the Windows BSP, platform and driver software best known methods.

This document is intended for OEMs and ODMs that are enabling Win7 and WES7 drivers with Intel® Atom E3800 processor, Intel® Celeron® Processor N2XXX and Intel® Celeron® Processor J1XXX.

**Note:** To update the GPIO, I<sup>2</sup>C and SPI drivers on structure definition in public driver header file from beta driver to gold driver, recompile your applications with the latest public driver header.

## 1.2 System Requirements

The following Operating Systems are supported:

- Windows\* 7 Operating System (32-bit and 64-bit versions)
- Windows\* Embedded Standard 7 Operating System (32-bit and 64-bit versions)
- Windows\* Embedded POSReady 7 Operating System (32-bit and 64-bit versions)

## 1.3 Acronyms and Terminology

Term	Description
BSOD	Blue Screen of Death (Stop Error)
GPIO	General Purpose Input/output
I <sup>2</sup> C	Inter-Integrated Circuit
HS-UART	High Speed Universal Asynchronous Receiver/Transmitter
SPI	Serial Peripheral Interface
SUT	System Under Test

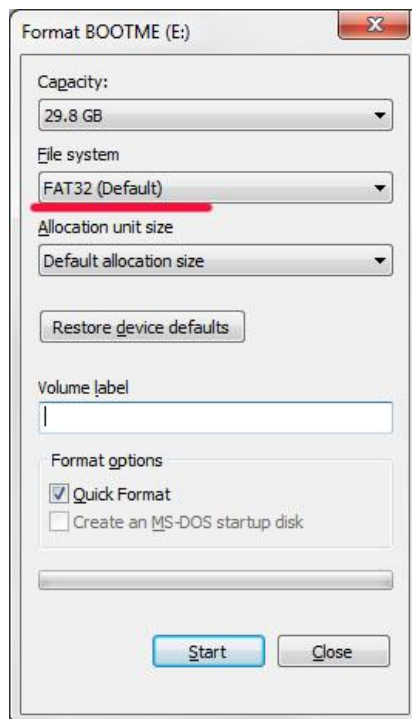
## 2 User Guide

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### 2.1 Building Windows BSP

The content of this section covers Windows 7, Windows Embedded Standard 7 and Windows Embedded POSReady 7.

1. Prepare the installation media
  - a. Get a thumb drive which the capacity is between 8GB - 32GB, and format it with FAT32.



- b. Extract all files from ISO image of WIN7/WES7/POSReady 7 to thumb drive.

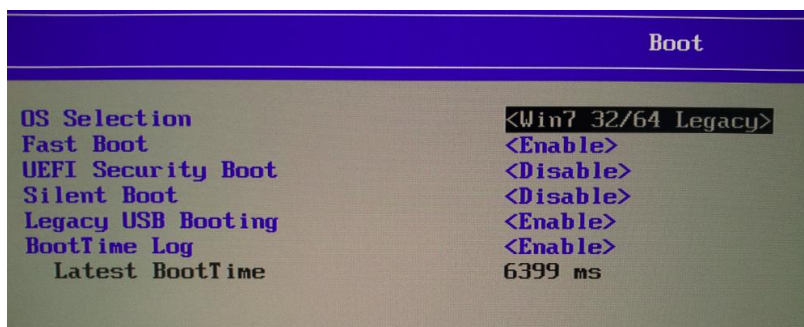


## 2. BIOS Setup for installation

- a. In BIOS setting, enter into "Device Manager -> System Setup -> Boot, and follow with below setting:

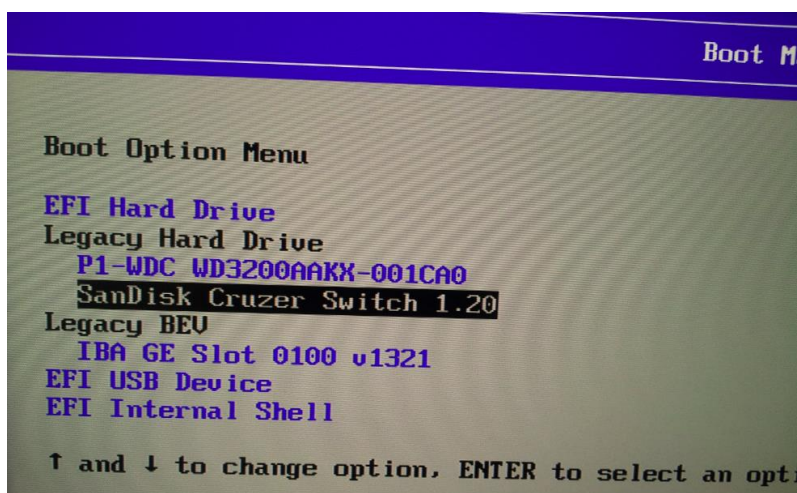
- OS Selection: Win7 32/64 Legacy
- Legacy USB Booting: Enable

Then press "F4" and commit changes and Exit.



- b. Enter into "Boot Manager" -> then SELECT the option to boot from the drive or device which contains OS image and ENTER.

Note: Please DO NOT use EFI USB boot since Win 7 is using legacy mode.





3. OS Installation
  - a. Install OS with Windows OS default installation steps.
4. Intel IO drivers installation:
  - a. For Windows7 64-bit or WES7 64-bit, install the Microsoft Hotfix KB2732471 (<http://support.microsoft.com/kb/2732471>)  
**Remark:** This hotfix is only required for SD driver. It is not needed to be installed for Win7/WES7 (64-bit) if SD driver is not used.
  - b. Execute Intel Processor Win7 IO Drivers 32Bit.msi or Intel Processor Win7 IO Drivers 64-bit.msi.  
**Note:** Run as administrator.
  - c. Check the checkbox "Always trust software from Intel Technology Sdn.Bhd." and click **Install**.
5. Chipset INF installation
  - a. Execute the SetupChipset\_10.0.13.exe installation package.



## 2.2 Platform BKM's

The following are recommended platform rework to enable the supported Windows 7 IO drivers on Intel customer reference boards. This is not an exhaustive list of platform rework.

### 2.2.1 How to rework Bakersport Fab B USB3.0 Port

By default, Bakersport Fab B has an issue with USB3.0 port. This port fails to read several types of USB3.0 thumb drive and couldn't achieve USB3.0 performance.

Remark: Patriot Memory 64GB and EDGE DiskGo 32GB Thumb Drive are not recommended to be used in EHCI mode.

Affected Platform	Bakersport boards (PBA# <b>G72250-200 Rev 02) (Fab B)</b>
Rework Steps	1) Un-stuff choke on L8A2 2) Stuff R8A4 and R8A3 (0 ohms)

### 2.2.2 How to rework Bakersport Fab B I<sup>2</sup>C Port 6

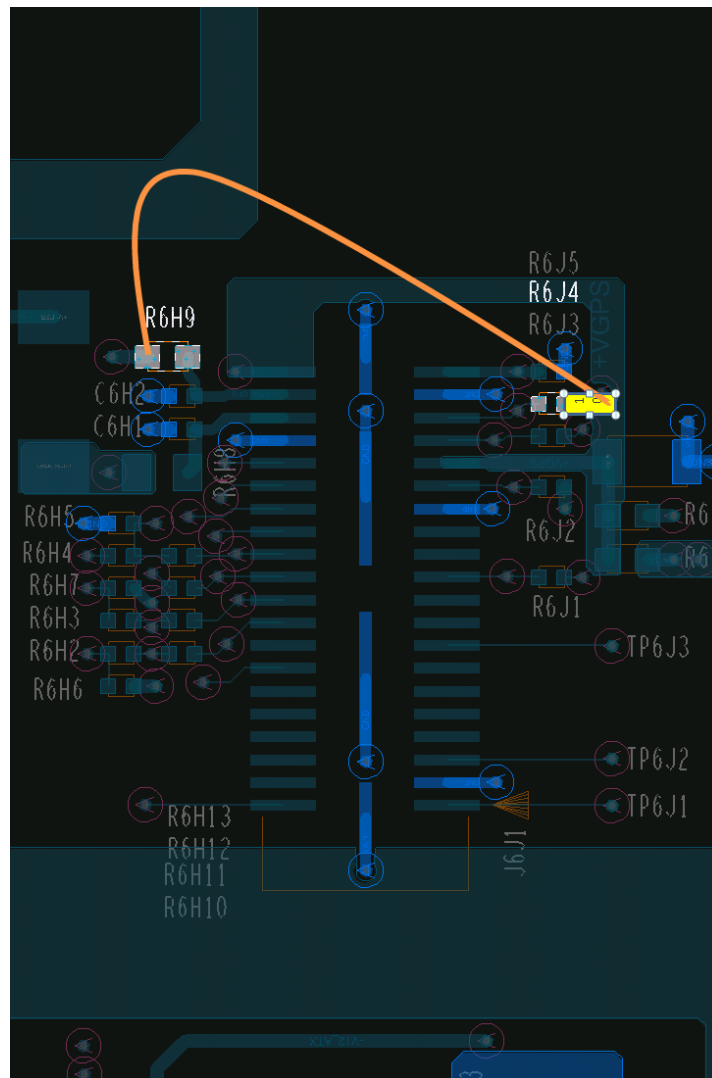
By default, Bakersport Fab B has an issue with I<sup>2</sup>C port 6. This port fail to read and write due to incorrect resistor connection.

Affected Platform	Bakersport boards (PBA# <b>G72250-200 Rev 02) (Fab B)</b>
Rework Steps	1) UnStuff R5H9, R5H12, R5H8, R5H10 2) Stuff R5H4 (22 ohms) 3) Stuff R5H3 (22 ohms)

### 2.2.3 How to rework UART in Bakersport and Bayley Bay

By default, Bakersport Fab B has an issue with I<sup>2</sup>C port 6. This port fail to read and write due to incorrect resistor connection.

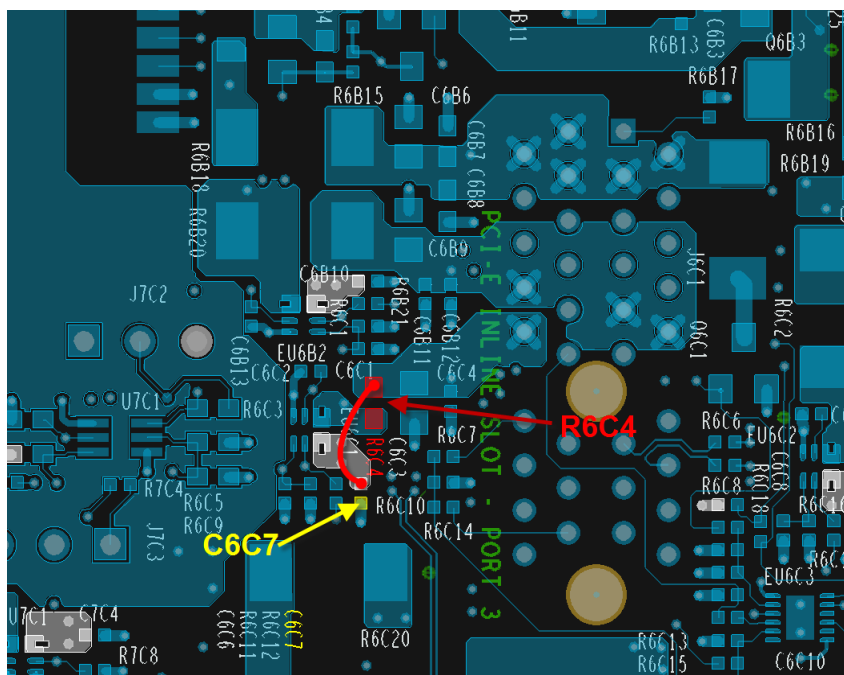
Rework Steps	<p>1) Place a 10K resistor followed by a 28 AWG wire from R6J4 to R6H9</p> <p>See below rework layout, yellow box is the 10K PU resistor followed by orange wire to R6H9</p>
Affected Platform	<p>Bakersport boards (PBA# <b>G72250-200 Rev 02) (Fab B)</b></p> <p>Bayley Bay boards Fab 3 (IOTG configured) platforms only</p>



## 2.2.4 How to Rework Bayley Bay Fab 3 PCI-E INLI Slot-Port 3

By default, Bayley Bay Fab 03 has an issue with PCI-E Slot 3. This PCIe slot fail to detect network card after shutdown follow by power up (without switching off the main power).

Affected Platform	Bayley Bay boards Fab 3 (IOTG configured) platforms only
Rework Steps	1. Remove R6C4 2. Add jumper wire from C6C7 to R6C4 as shown below.
Reasons for the rework:	NIC cards don't get recognized in Windows while the jumper block (J7C2) is configured to Desktop mode, pins [1-2]. Failure mode occurs in PCIE Slot3



## 2.2.5 How to use Serial Port in Bayley Bay

The common serial port on Bayley Bay board does not work. The actual serial port is the Micro USB port near the COM port on CRB board. You will need to use the USB cable to connect the Micro USB port in the CRB board to the USB port in the host machine (Your laptop or desktop).

You need install a driver in host machine from this link

<http://www.ftdichip.com/FTDrivers.htm> .

Then you will have a virtual COM port in host machine to communicate with Bayley Bay board.



## 2.3 Software Driver BKM's

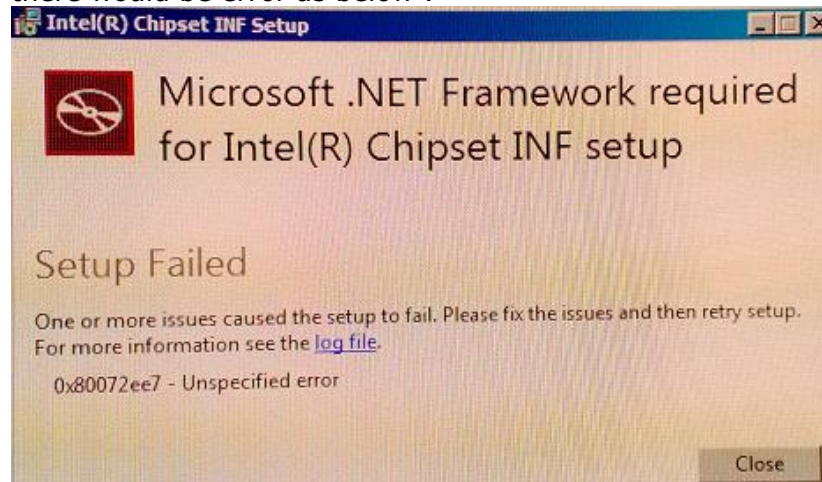
### 2.3.1 How to Enable Hibernation in WES7

By default, the hibernation is disabled in WES7. To enable it, start the Windows Command Prompt and type "powercfg /h on" to enable the hibernation.

### 2.3.2 How to Create OS Boot from USB Device for WES 7

The following are generic steps for enabling OS boot on Windows. You may refer to Microsoft website for more instructions.

1. Prepare the setup environment: Connect USB Flash Device which you wish to deploy the WES 7 image to the USB port and connect the storage device which contain WES 7 image.
2. Power up the system and boot into WES 7 image.
3. Select **Build an Image**. Accept the license terms and conditions. Followed by select do not use a template, choose a language, and then click Next.
4. In the select the packages window to include in your image page, click "**Feature Packages**" to expand the branch, then click "**Embedded Enabling Features**", and then select "**Bootable Windows USB Stack**".
5. Add any other additional drivers/packages that you may need.
  - To install chipset INF, .NET is requested when installing the WES , else there would be error as below :



6. Click on **Resolve Dependencies** and try to resolve all the dependency issues.



**Note:** If you are asked to choose between **Standard Windows USB Stack** and **Bootable Windows USB Stack**, make sure only leave **Bootable Windows USB Stack** checked.

7. On the drive-selection screen, select the partition you wish to install to.
8. Click next and wait installation to complete.

### 2.3.3 How to Disable the DMA Feature for I<sup>2</sup>C

There are 7 I<sup>2</sup>C controllers in the Intel® Atom™ E3800 processor and these controllers use the windows registry to control the DMA feature.

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\iaioi2c\Parameters]
```

```
"ForceDma"="0,0,0,0,0,0,0"
```

ForceDma is a string type and there are 7 value mapped to the 7 I<sup>2</sup>C controllers which are device IDs are from 0F41 to 0F47h.

Value 0, will force DMA to disable, and I<sup>2</sup>C data will be read/write in PIO mode.

Value other than 0, if data length is more than the specified value, I<sup>2</sup>C data will be read/write in DMA mode; if data length is less than the specified value, I<sup>2</sup>C data will read/write in PIO mode.

By default, without any registry settings, I<sup>2</sup>C will use PIO mode.



### 2.3.4 How to Set the Baud Rates of HS-UART

1. The baud rate is calculated based on the following method:

$$\text{Baud rate} = (\text{SourceClockFrequency}) / (16 * \text{divisor})$$

$$\text{Source Clock Frequency} = 50000000 * \text{PrescalerMValue} / \text{PrescalerNValue} * 2$$

For example, to set baud rate to 1M:

Set PrescalerMValue = 64

Set PrescalerNValue = 100

SourceClockFrequency = 64,000,000

You can customize the value of SourceClockFrequency, PrescalerMValue and PrescalerNValue from windows registry. You will need to reboot the system after setting these values.

2. To support baud rate between 230,400 and 3,686,400, create and change the following registry setting:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\iaiouart\Parameters]
;High speed source clock, M and N prescalers
"HSUartSourceClockFrequency"=dword:01c1f8f8
"HSUartPrescalerMValue"=dword:00003fff
"HSUartPrescalerNValue"=dword:00006c80
```

3. To support baud rate between 300 and 115200, change the following registry setting

For Low speed source clock, M and N prescalers:

```
"UartSourceClockFrequency"=dword:001c2000
"UartPrescalerMValue"=dword:0000025a
"UartPrescalerNValue"=dword:00007fff
```

See Section 27.2.3 Baud Rate Generator in the "Bay Trail-I SoC External Design Specification" document for details.

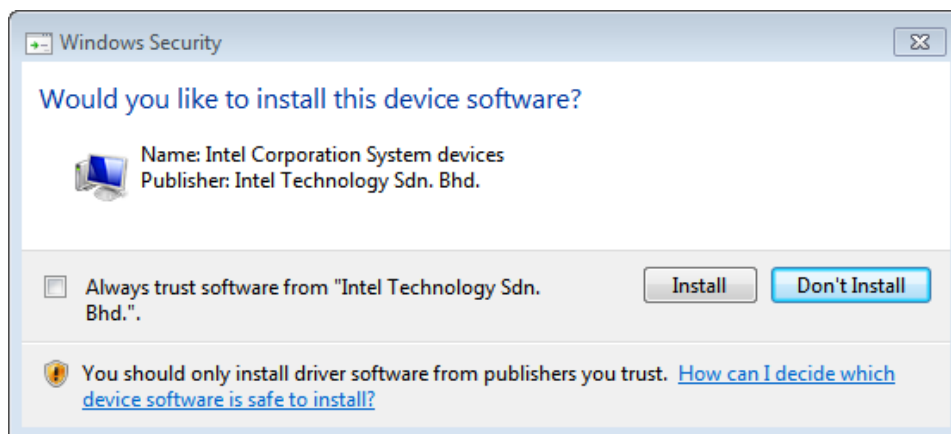


### 2.3.5 How to Install I/O Driver Unattended in Windows 7

All operations mentioned below require **administrator privileges** in Windows 7 and Windows Embedded Standard 7 (WES7). You will need to write a windows batch file to complete these steps.

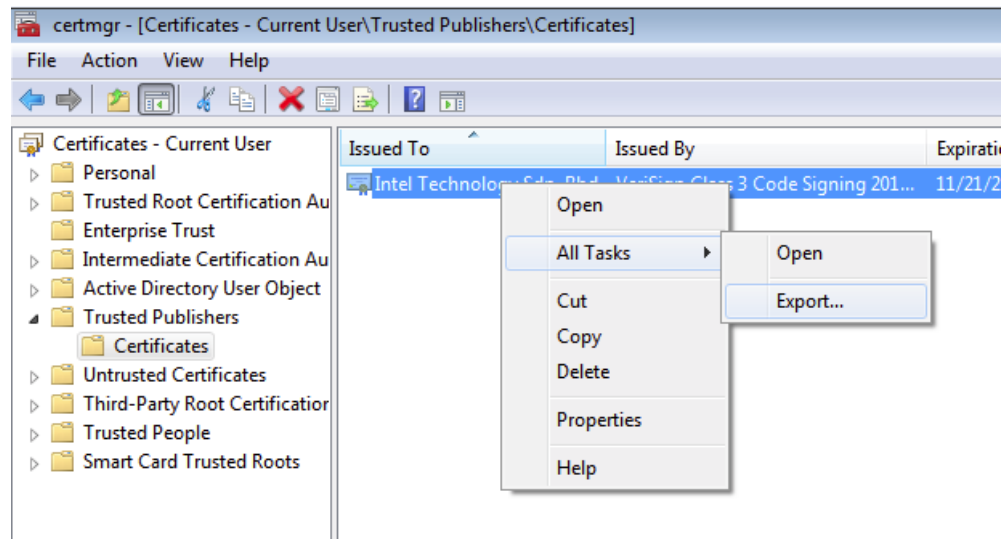
#### Suppress the Windows Security prompt

1. This prompt will pop up every time during driver installation until user clicks the "Always trust software from..." click box.



To suppress this prompt, you need to first add the "Intel Technology Sdn. Bhd." as a trusted publisher.

- a) Manually install Intel IO driver on Windows 7 and select the "Always trust software from Intel Technology Sdn. Bhd." click box.
- b) After installation, run Windows tool **certmgr.msc** and navigate to **Trusted Publishers** then **Certificates**.
- c) Export the certificate with the name "Intel Technology Sdn. Bhd." to your local disk with DER encoded binary X.509(.CER) format. For example, "Intel.cer"



- d) On your other Windows platform where you intend to install the driver unattended, add the exported certificate to the Windows Trusted Publisher. Run the following command with administrator privileges:
- `certmgr.exe -add intel.cer -c -s -r localMachine TrustedPublisher`
  - User can obtain *certmgr.exe* from Windows SDK. Refer to MSDN [Certificate Manager Tool](#)

### Suppress the Windows Installer prompt

Intel IO driver package is in Windows Installer (MSI) format so you can use the *msiexec.exe* to install it in unattended mode. For example, run this command in administrator privileges:

```
msiexec /i "Intel Atom E3800 Win7 IO Drivers 32Bit.msi" /passive
```

To uninstall it:

```
msiexec /x "Intel Atom E3800 Win7 IO Drivers 32Bit.msi" /passive
```

### Unattended uninstallation when .msi file is not present.

Create a bat file with following command. Run the bat file as administrator.

```
wmic product where name="xxxxxx" call uninstall
```

**Note:** "xxxxxx" refers to the application name. For example: Intel Atom E3800 Win7 IO Drivers 32bit



### 2.3.6 How to Install I/O Driver Using INF or SYS File

By default, you can run the Intel driver .msi installer package to install the I/O drivers. Alternatively, you can also install by retrieving the raw driver package (the inf and sys file) in following folder after driver installation and install the driver using PnPUtil or Windows DP Installer.

For 64 bit driver: [Program Files]\Intel\Intel Atom E3800 Win7 IO Drivers 64bit.

For 32 bit driver: [Program Files]\Intel\Intel Atom E3800 Win7 IO Drivers 32bit.

Then the user also can custom their own installation directly based on driver package files, for example:

- Use PnPUtil tool to install driver by inf file [http://msdn.microsoft.com/en-us/library/windows/hardware/ff550423\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff550423(v=vs.85).aspx)
- Use Driver Package Installer (DPIInst) [http://msdn.microsoft.com/en-us/library/windows/hardware/ff544842\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff544842(v=vs.85).aspx)

### 2.3.7 How to Install USB3.0 Driver into System

**Note:** For more details of the USB 3.0, Please refer to the USB 3.0 "Bring up Guide.pdf" which is available for download in VIP.

1. Connect PS2/USB keyboard and mouse onto your system
2. Boot into Windows 7 with the below BIOS configuration:

Go to "Device Manager" -> System Setup -> Boot -> set OS selection to "Win7 32/64 Legacy" -> commit changes and exit

Go to "Device Manager" -> System Setup -> South Cluster Configuration -> USB Configuration -> Change XHCI mode to <smart Auto>

3. Boot system into windows and install the USB3.0 driver.
4. After installation is completed, go to **Device Manager** to ensure that the below USB3.0 devices are shown under Universal Serial Bus Controllers. Observe that the device should not have a yellow bang.
  - Intel® USB 3.0 eXtensible Host Controller
  - Intel® USB 3.0 Root Hub



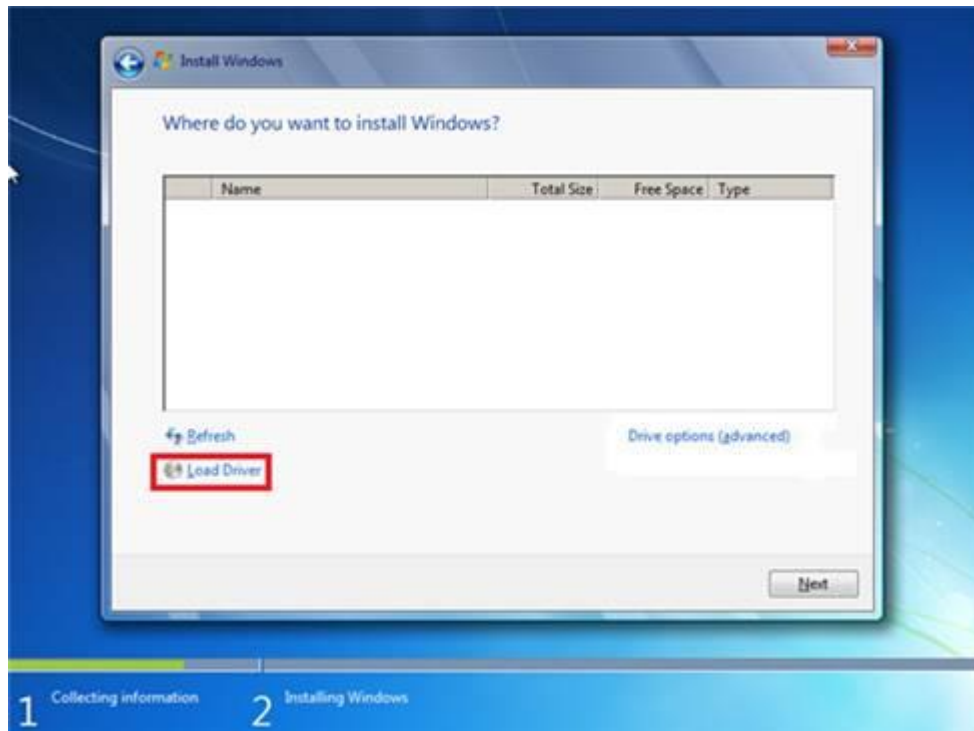
### 2.3.8 How to Install Windows 7 32-bit into SD and eMMC storage devices

#### Manual driver file extraction:

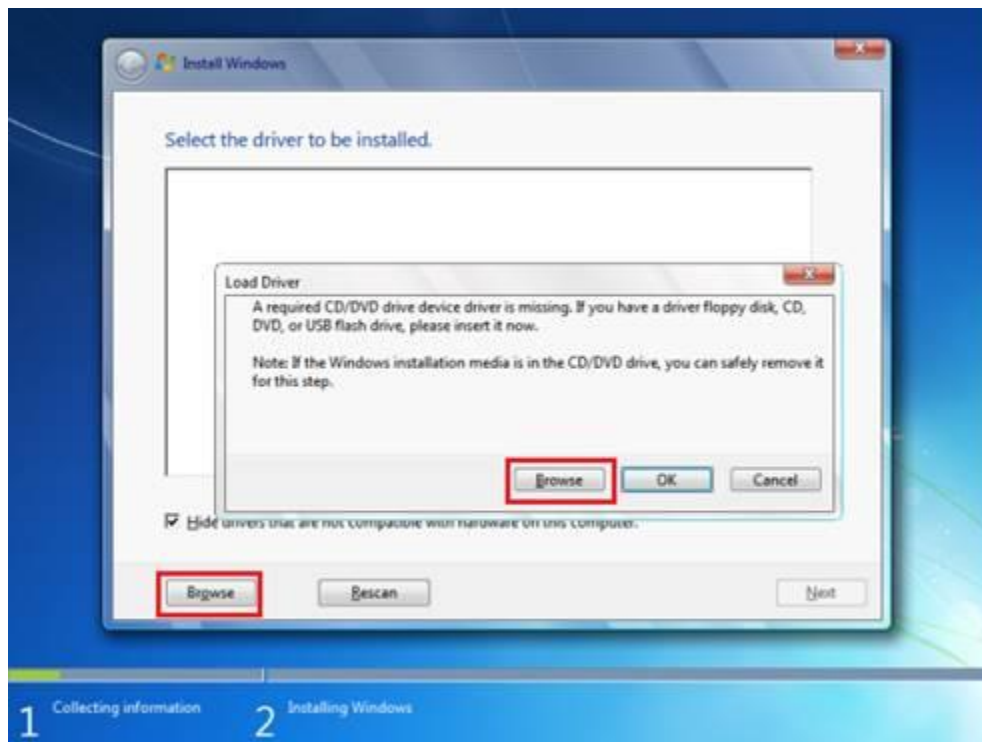
- 1 Download Intel IO drivers setup.
- 2 Extract drivers from .exe using tools such as 7zip. Note: eMMC and SD card have same driver files.
- 3 Open iaiosd.inf file in notepad and change last value in line with "EMMCBoot" from 0x00 to 0x01, example:
  1. From this: [iaioeMMCBoot\_Services\_AddReg]
  2. HKLM,"System\CurrentControlSet\Services\iaiosd\Parameters\Device", "EMMCBoot", %REG\_DWORD%, 0x00
  3. To this: [iaioeMMCBoot\_Services\_AddReg]
  4. HKLM,"System\CurrentControlSet\Services\iaiosd\Parameters\Device", "EMMCBoot", %REG\_DWORD%, 0x01
- 4 Copy eMMC/SD driver files (e.g iaiosd.\*) to any removable media (e.g Windows installation USB).

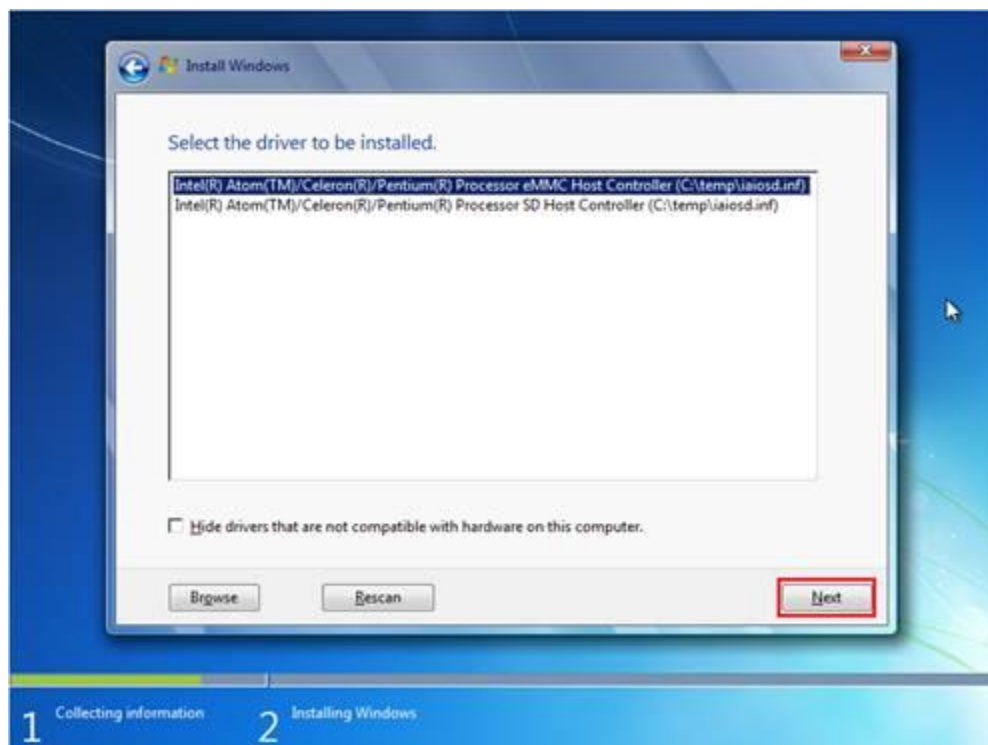
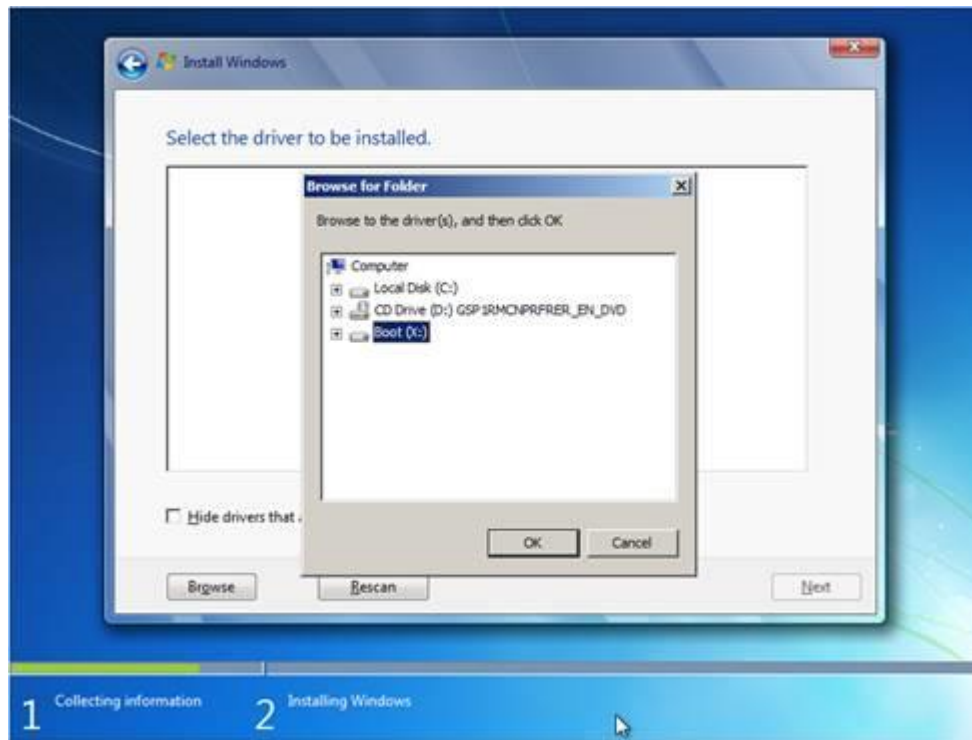
#### Installation:

- Prepare a bootable Windows installation USB.
- Copy eMMC/SD driver to a folder on Windows installation USB.
- Boot System from USB
- Continue until you reach below screen

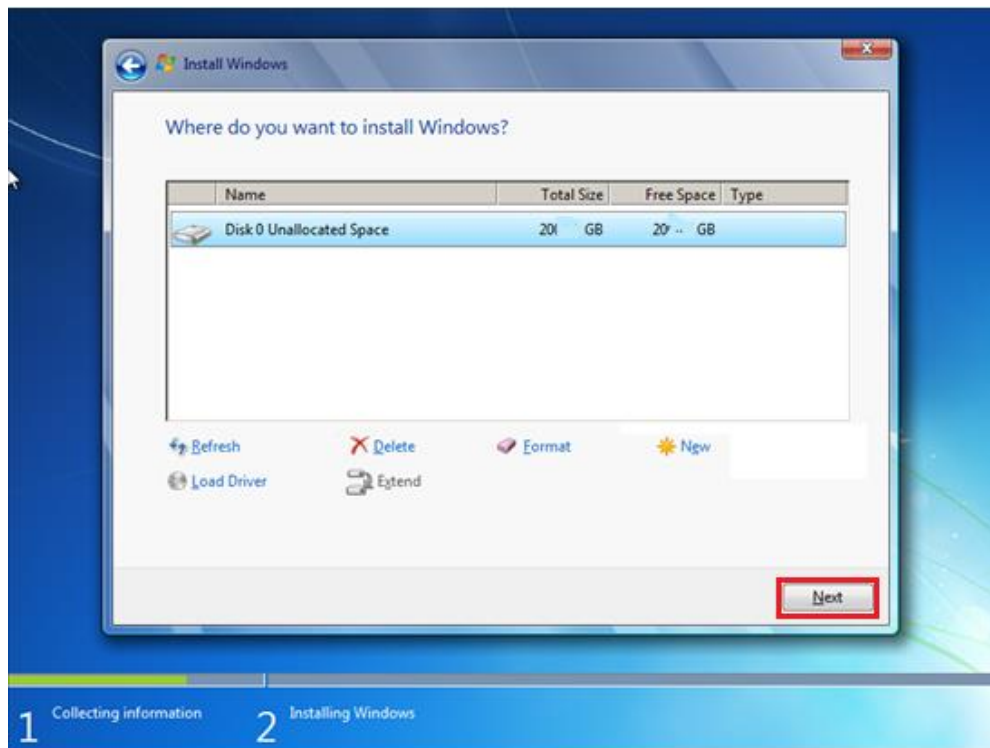


- Select "Load Driver" and Browse to the folder where you have copied eMMC/SD card driver files.





- Select eMMC Host Controller driver (first option) & Press/Click Next



- eMMC card will be shown as Unallocated Space. You may delete/create new partitions or let Windows decide
- Click Next
- 
- Windows 7 setup will start copying files to eMMC and continue with rest of installation.

### 2.3.9 How to Install Windows 7 64-bit into SD and eMMC storage devices

#### Tools Required:

- Windows 7 64bit SP1 ISO image file
- An USB pendrive with Windows 7 64bit SP1 installer inside. (suggest 4GB and above)
- An external hard drive with free space more than 10GB
- A modified storport.sys file.
- A workstation with different OS (prefer Linux)
- A Baytrail test station with SD card, eMMC card and hard drive plug in.
- Latest LPSS driver with SD & eMMC boot support.
- Windows update file: Windows6.1-KB2732471-v2-x64.msu ([Link](#))

#### Stage 1: Preparing a modified storport.sys file (on SUT)

1. Install Windows 7 64bit SP1 on Bayley Bay or Bakersport hard drive.
2. Install latest LPSS driver.



3. Install windows update: Windows6.1-KB2732471-v2-x64.msu
4. Reboot the system.
5. Once OS load, navigate to C:\Windows\System32\drivers.
6. Locate storport.sys and copy it out.
  - For convenient also copy files in this folder: C:\Program Files (x86)\Intel\Intel Processor Win7 IO Drivers 64Bit\iaiosd\.

## Stage 2: Inject storport.sys into Windows 7 64Bit SP1 installer (on workstation)

1. On external hard drive (E:\ or it may be other drive letter), create a folder call wim (E:\wim) and another folder call temp (E:\temp).
2. Open Windows 7 64bit SP1 ISO file, extract files: **boot.wim & install.wim** to directory: E:\wim.
3. Now, hit Start Menu, launched **Command Prompt** with administrator privileges.
4. Mount boot.wim 1 image with write permissions.

```
C:\windows\system32>dism /mount-Wim /WimFile:E:\wim\boot.wim /Index:1 /MountDir:E:\temp
```

5. Open a Windows Explorer window and navigate to **E:\wim\mount\Windows\System32\drivers.**
6. Locate and replace the existing **storport.sys** file with the one grabbed in **Stage 1.**
7. Unmount and commit the boot.wim 1 image.

```
C:\windows\system32>dism /Unmount-Wim /MountDir:E:\temp /Commit
```

8. Again, mount boot.wim 2 image with write permissions.

```
C:\windows\system32>dism /mount-Wim /WimFile:E:\wim\boot.wim /Index:2 /MountDir:E:\temp
```

9. Open a Windows Explorer window and navigate to **E:\wim\mount\Windows\System32\drivers.**
10. Locate and replace the existing **storport.sys** file with the one grabbed in **Stage 1.**
11. Unmount and commit the boot.wim 2 image.

```
C:\windows\system32>dism /Unmount-Wim /MountDir:E:\temp /Commit
```

12. For **install.wim**, mount the WIM image with write permissions:

```
C:\windows\system32>dism /mount-Wim /WimFile:E:\wim\install.wim /Index:4 /MountDir:E:\temp
```

Index 4, is in the case for Windows 7 Ultimate Edition 64Bit. In case you need other edition of Windows 7, kindly run following command:

```
C:\Windows\System32>dism /Get-WimInfo /WimFile:E:\wim\install.wim
```



And select correspondent index number.

13. Once the mounting process done, **unplug the external hard drive without closing the current command prompt.**
14. Plug in the external hard drive to a **Linux system as a superuser** and navigate to **<external hard drive>:\wim\mount\Windows\System32\drivers.**
15. Locate and replace the existing **storport.sys** file with the one grabbed in **Stage 1.**
16. Unplug the external hard disk and plug it back to the workstation.
17. Unmount and commit the install.wim image.

```
C:\windows\system32>dism /Unmount-Wim /MountDir:E:\temp  
/Commit
```

18. Done for injecting storport.sys into Windows 7 64Bit SP1 installer.
19. Replace the boot.wim and install.wim in the USB pendrive with Windows 7 64Bit installer in folder: **<USB pendrive>:\sources\**
20. The installer is ready to use.

### **Stage 3: Install Windows 7 64Bit SP1 on SD or eMMC card.**

1. Copy the **iaiosd** folder grabbed in **Stage 1** into the installer pendrive.
2. Plug in SD or eMMC card into Bayley Bay or Bakersport.
3. Plug in the installer pendrive into Bayley Bay or Bakersport.
4. Power up the SUT and boot into installer pendrive.
5. Perform any necessary operation until hard drive selection page.
6. Notice no drive/partition is showing up in this page.
7. Click on **Load drivers** button and navigate to the **iaiosd** folder in the installer pendrive.
8. Select correspondent driver for SD or eMMC card.
9. Notice the disk drive for SD or eMMC card is showing up.
10. Select the drive and perform OS installation as usual.