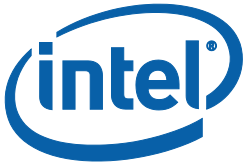


# BSP for Microsoft* Windows* 7 (WIN7 & WES7) Supporting Intel ATOM E3800 Platforms

## User Guide

***14 January 2014***

***Revision 2.01***
***Software Release version: 1.0.0 Gold#01***

**Intel Confidential**

# Contents

# Revision History

| Document Number | Revision Number | Description | Revision Date |
|---|---|---|---|
| 1 | 1.0 | Gold 1 release | 14 Jan 2014 |

# 1 Introduction

This document provides important information for installing Intel's Board Support Package (BSP) for the Windows* 7 & WES7, Release version: 1.0.0 Gold#01.

**Note:** Minor update to GPIO, I2C and SPI driver on structure definition in public driver header file from beta driver to gold driver. Recompile your applications with the latest public driver header.

# 2 Best Known Configurations

| | | |
|---|---|---|
| **Hardware Configuration** | | |
| Hardware Category | Description | Rev/Type/Source |
| CRB | Bayley Bay<br>Bakersport | FAB3 REV03<br>FAB B |
| SOC | ATOM E3800 | B3 – I : W8XF<br>B3 – D : W6XF<br>B3 – M : W7XJ |
| Display | VGA | |
| Memory | Bayley Bay: 4 GB DDR3<br>Bakersport: 2 GB DDR3 | |
| **Firmware Configuration** | | |
| CRB BIOS | BYTICRB_IA32_R_0072_11_SeC_Enable | Refer to BIOS Release |
| KSC | v03.10 | Integrated in BIOS |
| **Driver/OS Configuration** | | |
| Operating System | Win7 Ultimate SP1 / Windows Embedded Standard SP1 (7601) | |
| Graphics Driver | Beta 15_0_1055 | Refer to EMGD Release |
| GPIO Driver | 1.1.5.1020 | IO Driver release package |
| I2C Driver | 1.1.5.1020 | |
| SPI Driver | 1.1.5.1020 | |
| HS-UART Driver | 1.1.5.1020 | |
| Chipset INF | 10.0.8 | IO Driver release package |

# 3 The Ready Feature

| Area | Feature | Source | Ready* |
|---|---|---|---|
| **SIO** | General SIO feature | Win7 inbox driver | Yes |
| **USB** | General USB 2.0 feature | Win7 inbox driver | Yes |
| | General USB 3.0 feature | USB 3.0 | No |
| | USB2.0 Boot | Win7 Inbox driver | Yes |
| **SATA** | General Sata feature | Win7 Inbox driver | Yes |
| **PCIe** | General PCIe feature | Win7 Inbox driver | Yes |
| **EMGD gfx driver** | General gfx feature | | Yes |
| **High Definition Audio** | General HD Audio feature | Win7 Inbox driver | Yes |
| | HDMI Audio | Integrated in EMGD driver | No |
| **Power Management** | Power Mgmt S0 and S5 | N/A | Yes |
| | Power Mgmt Sleep S3 | | Yes |
| | Power Mgmt Hibernate S4 | | Yes |
| **GPIO Driver*** | Direction Setting | | Yes |
| | Multiplexing Setting | | Yes |
| | Level Value Setting | | Yes |
| | Pin Setting Query | | Yes |

| | | | |
|---|---|---|---|
| **I2C Driver*** | Standard Mode (100Kbps) | | Yes |
| | Fast Mode (400Kbps) | | Yes |
| **SPI Driver*** | SPI Mode 0,1,2,3 | | Yes |
| | Transfer rate from 100Kbps up to 15 Mbps | | Yes |
| **HS-UART Driver*** | Baud rate support up to 4000000 | | Yes |
| | Data size 5, 6, 7, 8-bit | | Yes |
| | Odd, even, none parity | | Yes |
| | 1, 1.5, and 2 stop bits | | Yes |
| | Hardware & No flow control & Software flow control | | Yes |
| **DMA Feature* (I2C, SPI, HS-UART)** | DMA support for I2C, SPI and HS-UART | | Yes |

Notes: Refer to next section to understand some limitation of GPIO/I2C/SPI/HS-UART/DMA feature

# 4 Interface of IO Drivers

## 4.1 GPIO Driver Interface

- GPIO Driver interface is exposed by a series of IOCTLs. A separated C header file provides the definition of the IOCTLs and a separated programming guide provides how to program with the IOCTLs.

## 4.2 I2C Driver Interface

- I2C Driver interface is exposed by a series of IOCTLs. A separated C header file provides the definition of the IOCTLs and a separated programming guide provides how to program with the IOCTLs.

- Max single transfer length is limited to 64K Bytes.
  There are total eight I2C controllers on ATOM E3000 Processor which share same one DMA engine. The big data in single transferring will cause one I2C controller occupy DMA engine for a long duration.
  Application can use multiple single transfers or IOCTL_I2C_EXECUTE_SEQUENCE interface to transfer big data.

- By default, I2C driver uses DMA to copy data between peripheral and system memory, but can set windows registry to disable DMA feature and copy data by PIO mode. Refer to BKM section to about how set the registry.

## 4.3 SPI Driver Interface

- SPI Driver interface is exposed by a series of IOCTLs. A separated C header file provides the definition of the IOCTLs and a separated programming guide provides how to program with the IOCTLs

## 4.4 HS-UART Driver Interface

- HS-UART Driver interface is exposed by standard Windows Serial Communication interface. Refer to Serial Communications in Win32 in MSDN to understand the details.
  **http://msdn.microsoft.com/en-us/library/ms810467.aspx**

- Following APIs of serial communication in Win32 are not supported in driver 1.1.5.1020. Plan to support them in next release.
  SetCommMask
  WaitCommEvent

GetCommMask

- Has no plan to support following APIs of serial communication in Win32:
  SetupComm
  SetCommBreak
  ClearCommBreak
  EscapeCommFunction (don't support parameter set to SETBREAK and CLRBREAK)

- HS-UART driver doesn't support DMA transfer with software flow control, when application uses the software flow control, the HS-UART will use PIO mode to copy data between peripheral and system memory.

- Software flow control only support maximum baud rate up to 115200.

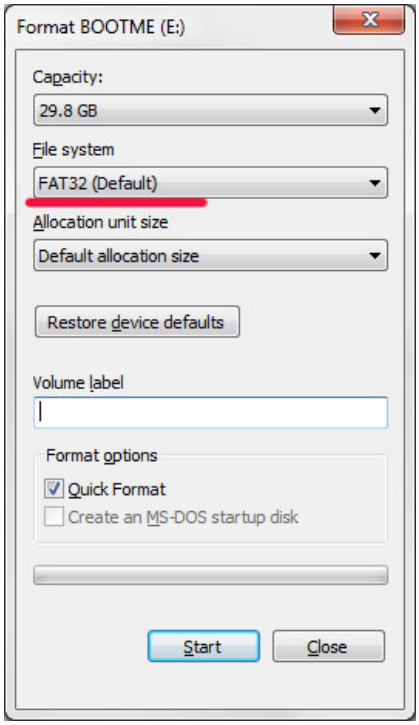
- HS-UART driver supports following standard baud rates by default:
  300,600,1200,1800,2400,3600,4800,7200,9600,19200,38400,57600,115200,
  153600,184320,230400,307200,460800,921600,3686400
  Refer to BKM to know how to set nonstandard baud rate.
  Max nonstandard baud rate is 4000000.

## 4.5 LPSS DMA Driver Interface

- LPSS DMA Driver is not exposed publicly, only I2C/SPI/HS-UART driver can access its interface.

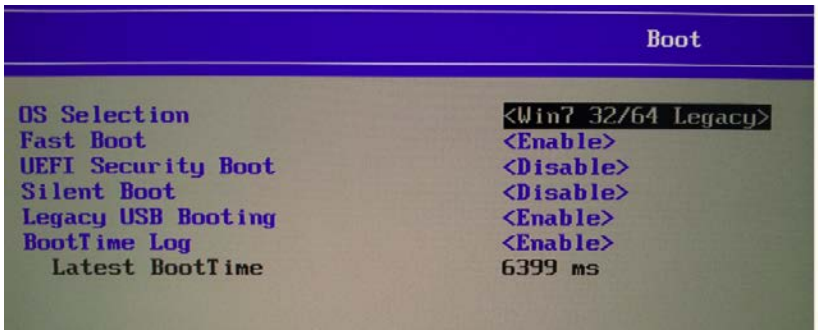
# 5 Building Win7 / WES7 BSP on ATOM E3800 Platform

1. Prepare the installation media
   a. Get a thumb drive whose capacity is larger than 8G, and format it with FAT32.

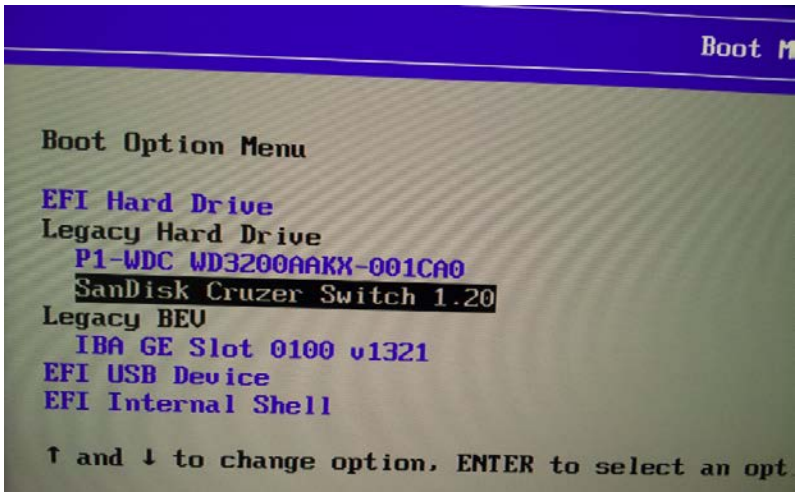



   b. Extract all files from ISO image of WES7 to thumb drive.

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 choose the right device will boot from, which contains OS image and enter.



3. OS Installation
   Install OS with Windows OS default installation steps.
   **Note:** For WES7, it require toolkit to deploy and service an image

4. ISG IO drivers installation:
   a. Execute Intel Atom E3800 Win7 IO Drivers 64Bit.msi (for Win7/ Wes7 64 Bit) or Intel Atom E3800 Win7 IO Drivers 32Bit.msi (for Win7 / Wes7 32 Bit) – (Run as administrator)
   b. Check the checkbox “Always trust software from “Intel Technology Sdn.Bhd” and click “Install”.

5. Chipset INF installation
   a. Execute the SetupChipset_10.0.8.exe installation package.

# 6 Issues Fixed

**Beta:**

1. eMMC doesn't showing up in BIOS page
2. System failed resume back after sleep (S3)
3. Hard drive cannot been detected in BIOS when using B3(W8YF) silicon on AMI 0ACCT004 BIOS.
4. LPSS driver not showing in device manager after installation - B3 (W8XF)
5. Unable to read and write on I2C_6 port on Bakersport - B3 (W8XF) silicon

**Gold#01:**

1. Fail functioning on Network card after shutdown follow by power up (PCI-E INLI SLOT-PORT 3)
   Remark: Rework is needed. Please see BKM
2. On BayTrail-I platform in Win7 with AMI Bios, USB device doesn't work after wake up by USB device from Sleep(S3)
3. Blank screen occur during uninstallation of graphic driver when using HDMI or VGA display.
4. Device with hardware ID:0F41 is showing up in both ACPI mode and PCI mode when using AMI 0ACCT006 BIOS - B3
5. Enabling xHCI mode in BIOS will cause all of the USB ports not working

# 7 Errata & Known Issues

## 7.1 Errata (Will not fix)

1. WIN7 SPI failed read and write on lower <51Kbps

   Business Impacting:
   - Low speed is not usual usage mode.

   Business Proposal:
   - Use speed > 100Kbps.

2. [WIN7] Need ISG BIOS to support USB Legacy Boot in xHCI

   Business Impacting:
   - Can't install Win7 by USB drive when it is xHCI mode

   Business Proposal:
   - Use EHCI mode to install Win7 by USB drive

## 7.2 Known issues

1. On Baytrail-I, Win7 uart driver has no support to IOCTL_SERIAL_SET_WAIT_MASK IOCTL_SERIAL_WAIT_ON_MASK

   Business Impacting:
   - Uart driver doesn't support wait mask feature. User can't use some third party term tools which uses wait mask feature, like Teraterm.
   - When OEM to develop their own application, can't use waiting mask feature.

   Business Proposal:
   - Use term like Putty which doesn't use wait mask feature
   - Wait next release to implement wait mask if wants wait mask feature to implement their own application.

2. Several USB3 Pendrive cannot be detected on Bakersport with AMI 006 BIOS

   Business Impacting:
   - Can't use several USB3 Pendrive on bakersport board
   - No issue on Bayley Bay board

   Business Proposal:
   - Use usb2 Pen driver as w/a
   - Try different USB3 Pen drives on bakersport board.
     The working Pen drives verified:

Corsair Flash Voyager USB3.0 32GB
Trancend JetFlash 760 USB3.0 64GB

3. H/W repeatly set UART2 MSR register Bit 0 to 1 and trigger unexpected interrupt repeatedly

   Business Impacting:
   - CPU usage is increase(less than 2%) because of unexpected interrupt causing by uart CTS line

   Business Proposal:
   - Should not float any CTS line of uart port. CTS should connect to RTS line. Otherwise, much more unexpected interrupt will be generated to cause high CPU usage.

4. WIN8/WIN7] One bit is wrong occasionally in SPI

   Business Impacting:
   - One bit will be wrong occasionally on SPI read. About 1 bit out of 1000 bits is corrupted
   - Only duplicated on bayley bay platform, not isuse on bakersport

   Business Proposal:
   - Under investigation, suspect caused by signal noise. Suggest to use bakersport board for now.

5. On Bayley Bay board  the CTS line of UART2 doesn't work occasionally when does duplex transfer in high speed on Win7

   Business Impacting:
   - Can’t use UART2(device id 0F0C) to transfer data in duplex way.
   - Has no issue on simplex data transfer on UART2
   - Has no issue on UART1(device id 0F0Ah) for both simplex and duplex

   Business Proposal:
   - Under investigation. Suspect caused by signal noise, OEM may not have this issue if they use their own board design.
   - Only use UART1 for duplex transfer if using bayley bay and bakersports board

6. On BayTrail-I platform, the top one USB2.0 port doesn't work in Win7

   Business Impacting:
   - Can’t use top one usb2.0 port

   Business Proposal:
   - Use other usb port as w/a

- Wait USB 3.0 driver release, all ports working with Win7 USB3.0 driver.

7. [Win7] Intermittent first byte lost when perform I2C read on B3-M and B3-D

   Business Impacting:
   - First byte is corrupted when using I2C reading on Baytrail M/D SKU
   - Not duplicated on PIO mode
   - Not duplicated on Baytrail-I SKU

   Business Proposal:
   - Investigation is ongoing, proposal to OEM to disable the DMA transfer for I2C when uses baytrail M/D sku only. Refer to BKM to how to disable DMA transfer for I2C

8. High CPU usage when transferring data with h.Speed

   Business Impacting:
   - Unexpected CPU usage(15%~20%) when transferring big data (>1 MBytes) with high baud rate on hs-uart bus
   - CPU usage is acceptable on transfer small data

   Business Proposal:
   - No w/a for this issue. wait next release to fix this issue

# 8 BKM

## 1. How to use serial port in Bayley Bay

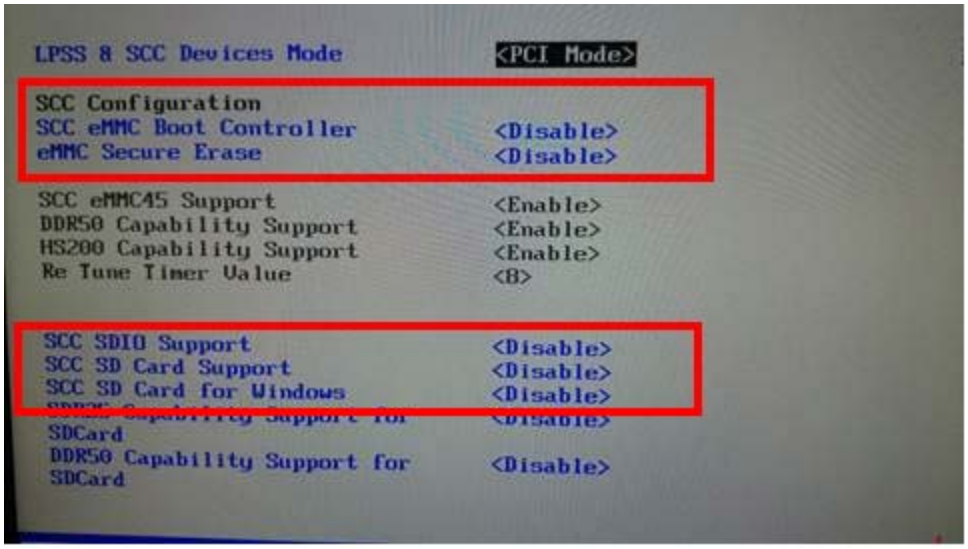
The common serial port on Bayley Bay board does not work. The actual serial port is the Micro USb port near the COM port on CRB board. You will need to use the USB cable to connect the Micro USB port in the CRB board to the USB port in the host machine (Your laptop or desktop).

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. How to solve yellow bang caused by SD/eMMC card

Now there has no available SD/eMMC controller driver on Win7 for ATOM E3800 processor. There are yellow bang in windows device manager, if insert a SD/eMMC card. In order to not confuse end user, OEM can entirely disable SD/eMMC controller in COMS set up page.



## 3. How to rework Baker Sport Fab B I2C Port 6

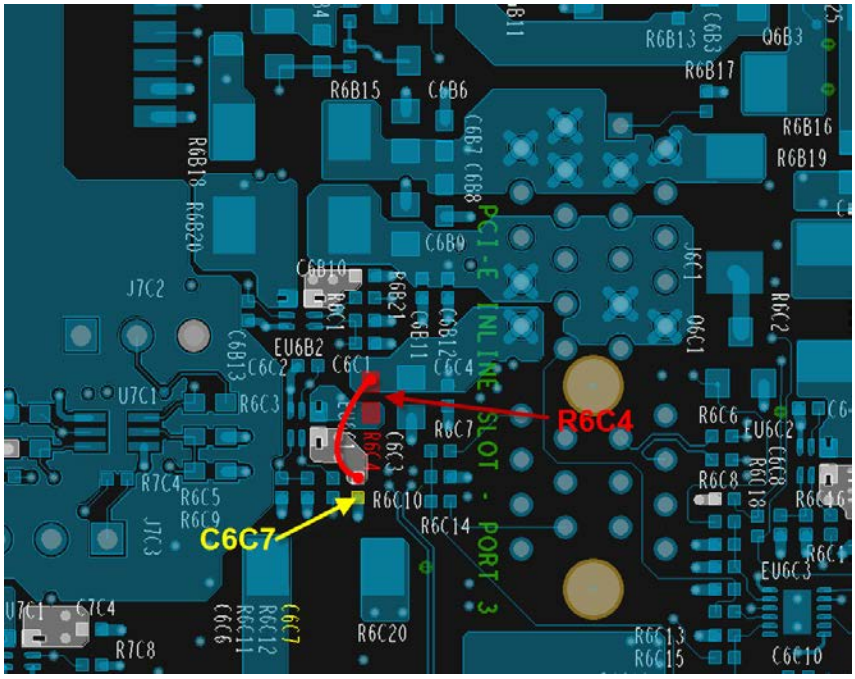
By default, Baker Sport Fab B has an issue with I2C port 6. This port fail to read and write due to incorrect resistor connection.

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

## 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 switch off the main power)

| | |
|---|---|
| Rework Steps | 1. Remove R6C4<br>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 |
| Affected Platform | Bayley Bay boards Fab 3 (ISG configured) platforms only |


R6C4
C6C7
PCI-E INLINE SLOT - PORT 3

# 5. 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.

# 6. How to create OS boot from USB device

This is general knowledge of Windows, OEM also can refer to msft website for the instruction.

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

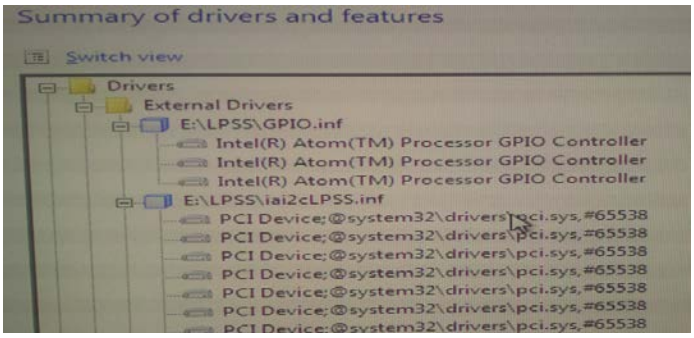
> **Note:** If you are asked to choose between **Standard Windows USB Stack** and **Bootable Windows USB Stack**, make sure only leave **Bootable Windows USB Stack** checked.

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

> **Note**: This feature is not supported on Windows 7.

# 7. How to integrate Intel I/O driver and Build installable WES7 image on Bayley Bay

1. Power up the system and boot into WES7 image.
2. In the "**Summary of drivers and features**" window, check the **Modify Drivers** check box then press next.
3. In the "Confirm drivers to install" window, browse to the folder which contains the inf and sys file. Click OK and Next.
4. Observe the External Drivers displayed as below:




5. Proceed with the installation step.

# 8. How to disable the DMA feature for I2C

There are 7 I2C controller in the ATOM E3800 processor, we use a 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 string type, there are 7 value mapped to 7 I2C controller which device ids are from 0F41 to 0F47h.

Value 0, will force dma disabled, everything will go PIO path

Value other than 0, if data length is more than that value, go DMA path; if data length is less than that value, go PIO path.

If without this registry(default way), everything will go PIO path.

# 9. How to set the baud rates of HSUART

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

```
Baud rate = (SourceClockFrequency) / (16 * divisor)
```

```
Source Clock Frequency = 50000000* PrescalerMValue /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
```

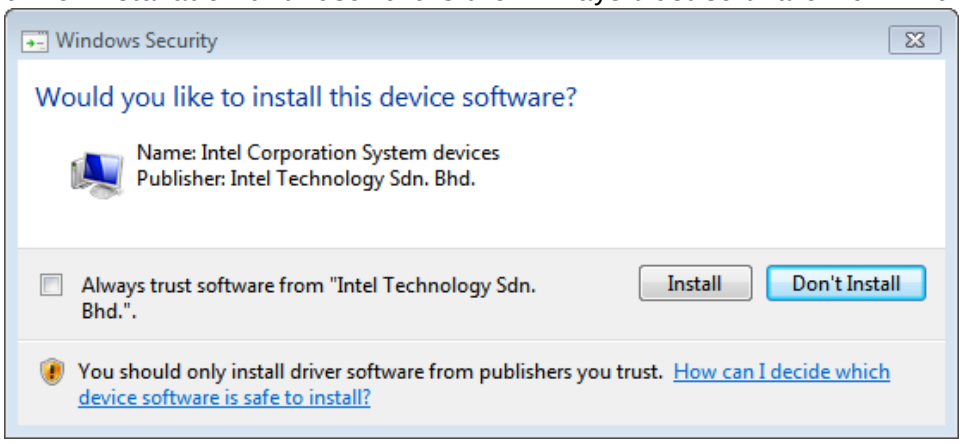
   See Section 27.2.3 Baud Rate Generator in the “Bay Trail-I SoC External Design Specification” document for details.

# 10. How to install I/O driver unattended in win7/WES7

All operations here are acquired under **administrator privileges** on windows. The OEM need to write windows batch file to complete those steps.

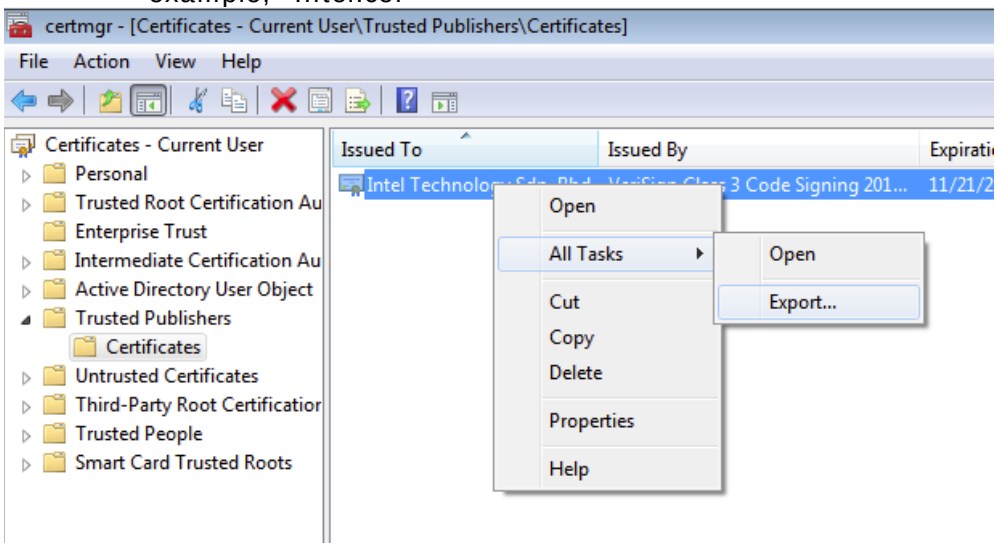
To install a driver unattended, we need depress two type prompts

1. **To depress Windows Security prompts**. This prompt will pop up for the driver installation until user clicks the “Always trust software from…” click box.




So to depress this prompt, end user need first add the “Intel Technology Sdn. Bhd.” as a trusted publish. The steps are:

1) User should first manually install our driver in one ATOM E3800 platform on win7 by click “Always trust” click box.
2) After installation, run windows tool certmgr.msc and navigate to Trusted Publishers then Certificates.
   And export the certification with name “Intel Technology Sdn. Bhd.” to local disk with DER encoded binary X.509(.CER) format. For example, “Intel.cer”




3) On all other machines which user want to install the driver unattended, user need add the certification exported in step 2) to the Windows Trusted Publisher by the command in 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

2. **To suppress Windows Installer UI**
   The driver package is Windows Installer (MSI) format, user 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

# 11. How to install I/O driver in alternative way

User can use driver installer (Intel Atom E3800 Win7 IO Drivers 32Bit.msi/ Intel Atom E3800 Win7 IO Drivers 64Bit.msi) to install I/O drivers. However, user also can get the raw driver package (the inf and sys file) in following folder after driver installation.

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
- Use Driver Package Installer (DPInst) http://msdn.microsoft.com/en-us/library/windows/hardware/ff544842(v=vs.85).aspx
- Other general way to install the driver.