BSP for Microsoft* Windows* 10 IoT Core 32-bit on Intel® Atom™ processor E3800 Product Family

Release Notes

December 2015

Gold Release
Revision 001

Contents

Revision History

Revision Number	Description	Revision Date
001	BSP for Microsoft* Windows* 10 IoT Core 32-bit on Intel® Atom™ processor Product Family – Gold Release	December 2015

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1.0   Introduction

1.1   Scope of Document

This release notes document the GPIO, I^{2}C*, SPI, HSUART Driver Binary Packages for the Microsoft* Windows* 10 IoT Core 32-bit operating system. This document also includes information of the IoT Core Inbox drivers for Windows 10 that have been validated on the Intel® Atom™ E3800 processor. The driver interfaces, limitations, and known issues are also covered.

This document is intended for OEMs and ODMs that are enabling IoT Core (formerly known as Athens) drivers with the Intel® Atom™ E3800 processor, Intel® Celeron® Processor N2XXX, and Intel® Celeron® Processor J1XXX.

1.2   System Requirements

The following operating system is supported:

- Microsoft Windows 10 IoT Core 32-bit operating system

1.3   Acronyms and Terminology

Term	Description
API	Application Programming Interface
ATAPI	ATA Packet Interface
BSP	Board Support Package
CRB	Customer Reference Board
DMA	Direct Memory Access
GPIO	General Purpose Input/Output
HSUART	High Speed Universal Asynchronous Receiver/Transmitter
I^{2}C*	Inter-Integrated Circuit*
I/O	Input/Output
IOCTL	Input/Output Control
MSDN*	Microsoft Developer Network
OS	Operating System
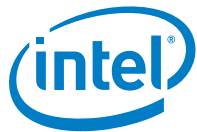
Term	Description
PIO Mode	Programmed I/O Mode
SATA	Serial ATA
SPI	Serial Peripheral Interface
USB	Universal Serial Bus

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2.0 Release Summary

2.1 Release Details

- Driver Version   (GPIO, I²C*): 1.1.1.1004
- Driver Version (HSUART, SPI): 1.1.1.1008 **New
- Released on December 2015.

2.2 Release Contents

The contents of this release include:

- Intel® Processor Windows* 10 IoT Core I/O Drivers 32-bit Driver Installer
- "Intel Processor Windows 10 IoT Core I/O Drivers 32-bit.cab" archive contains the following drivers for your system:
  - Intel® Atom™/Celeron®/Pentium® Processor UART Host Controller
  - Intel® Atom™/Celeron®/Pentium® Processor I²C Controller
  - Intel® Atom™/Celeron®/Pentium® Processor SPI Controller
  - Intel® Atom™/Celeron®/Pentium® Processor GPIO Controller
- Intel® Processor Windows 10 IoT Core I/O Drivers Release Notes
- Intel® Processor Windows 10 IoT Core I/O Drivers User's Guide
- Intel Software License Agreement

2.3 The Ready Feature

Area	Feature	Source	Ready[1]
USB	General USB 2.0 feature	Windows* 10 IoT Core Inbox driver	Yes
	General USB 3.0 feature	Windows 10 IoT Core Inbox driver	Yes
	USB2.0 Boot	Windows 10 IoT Core Inbox driver	Yes
SATA	General SATA feature	Windows 10 IoT Core Inbox driver	Yes
PCIe*	General PCIe feature	Windows 10 IoT Core Inbox driver	Yes
Intel® High Definition Audio	General HD Audio feature	Windows 10 IoT Core Inbox driver	Yes
	Intel® Display Audio	Integrated in Intel® Embedded Media and Graphics Driver	Yes
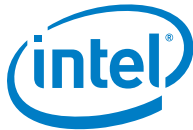
Area	Feature	Source	Ready[1]
Power Management	Power Mgmt S0 and S5	N/A	Yes
	Power Mgmt Sleep S3	Intel	Yes
	Power Mgmt Hibernate S4	Intel	Yes
GPIO Driver[1]	Direction Setting	Intel	Yes
	Multiplexing Setting		Yes
	Level Value Setting		Yes
	Pin Setting Query		Yes
I^{2}C* Driver[1]	Standard Mode (100 Kbps)	Intel	Yes
	Fast Mode (400 Kbps)		Yes
SPI Driver[1]	SPI Mode 0,1,2,3	Intel	Yes
	Transfer rate from 100 Kbps up to 15 Mbps		Yes
HSUART Driver[1]	Baud rate support up to 4000000	Intel	Yes
	Data size 5, 6, 7, 8-bit		Yes
	Odd, even, none parity	Intel	Yes
	1, 1.5, and 2 stop bits		Yes
	Hardware, no flow control and software flow control		Yes
DMA Feature[1] (I^{2}C*, SPI, and HSUART)	DMA support for I2C, SPI and HSUART	Windows 10 IoT Core Inbox driver	Yes
SD2	SD* and SDHC* cards	Windows 10 IoT Core Inbox driver	Yes
	Class 2,4,6, and 10		Yes
	1-bit and 4-bit bus mode		Yes
	FAT32, exFAT filesystem		Yes
	ADMA Transfer mode		Yes

Area	Feature	Source	Ready[1]
SD2 (Cont.)	IoT Core OS Boot	Windows 10 IoT Core Inbox driver	Yes
eMMC*	Version 4.5 Storage	Windows 10 IoT Core Inbox driver	Yes
	IoT Core OS Boot		Yes

Note: Feature Highlights and Limitations for the limitations of GPIO, I^2C*, SPI, and HSUART features.

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3.0 *Best Known Configuration*

The following is a list of software tools required to create and deploy Windows* 10 IoT Core operating system with custom drivers on the hardware:

- Windows 10 RTM (Build 10586 or better) x86 or x64 (Windows* 8.1 latest version also works but not recommended)

- Visual Studio* Professional 2015 : 14.0.23107.0 D14REL

- Visual Studio Tools for Universal Windows Apps : 14.0.23121.00 D14OOB

- Windows IoT Core Packages : 10.0.10586

- Windows Software Development Kit – SDK Windows 10.0.10586

- Windows Driver Kit – WDK Windows 10.0. 10586

- Windows Assessment and Deployment Kit – ADK Windows 10.0.10586

- Download Visual Studio and Windows development tool kits from https://msdn.microsoft.com/en-us/windows/hardware/dn913721.aspx

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4.0   *What's New in this Release*

The update release of I/O drivers that work for the Windows* 10 IoT Core operating system are as follows:

- SPI* (Fixed a HLK issue)

- GPIO

- I^2C*

- HSUART

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5.0   *Feature Highlights and Limitations*

5.1   GPIO Driver

Refer to the following for details on the GPIO driver:

https://msdn.microsoft.com/en-us/library/windows/hardware/hh439456(v=vs.85).aspx

The GPIO driver interface is exposed by a series of IOCTLs.

The Driver Binary Package consists of these files:

- `iaiogpio.inf`
- `iaiogpio.sys`
- `iaiogpio.cat`

The following are the enabled features:

- Supports GPIO multiplexing setting.
- Supports GPIO setting query – queries multiplexing information on GPIO pins.
- Supports GPIO direction setting – configures the selected GPIO pin as an input or output pin.
- Supports GPIO read pin – reads the input pin's level value.
- Supports GPIO write pin – configures an output pin's level as high or low.
- Supports `GpioClx` DDI.

Limitations:

- No known limitation

5.2   I^{2}C* Driver

Refer to the following for details on the I2C* driver:

https://msdn.microsoft.com/en-us/library/windows/hardware/hh450906(v=vs.85).aspx

There are seven I^{2}C controllers on the Intel® Atom™ E3800 processor, Intel® Celeron® Processor N2XXX, and Intel® Celeron® Processor J1XXX, which share the same DMA engine. Hence, transferring large amounts of data can cause one I^{2}C controller to occupy the DMA engine for a long duration.

By default, the I^{2}C driver uses DMA to copy data between peripherals and system memory. However, the Windows* registry can be set to disable the DMA feature and copy data with the PIO mode. Refer to the "Software Driver BKMs" section in the *BSP for Microsoft* Windows* 10 IoT Core 32-bit on Intel® Atom™ Processor E3800 Product Family User Guide*, Doc # 333573-001US, on how to configure the registry to control the DMA feature.

The Driver Binary Package consists of these files:

- `iaioi2c.inf`
- `iaioi2c.sys`
- `iaioi2c.cat`

The following are the enabled features:

- Supports 7-bit address Mode
- Supports Standard Mode (100 Kbps)
- Supports Fast Mode (400 Kbps)
- Supports polling of I/O data transfer

Limitations:

- The maximum single transfer size is limited to 64 KBs. Multiple transfers are required for data size more than 64 KB.

5.3   SPI Driver

Refer to the following for details on the SPI driver:

https://msdn.microsoft.com/en-us/library/windows/hardware/hh450906(v=vs.85).aspx

The SPI driver interface is exposed by a series of IOCTLs.

The Driver Binary Package consists of these files:

- `iaiospi.inf`
- `iaiospi.sys`
- `iaiospi.cat`

The following are the enabled features:

- Supports SPI modes 0, 1, 2, 3.
- Supports a minimum transfer rate of 100 kbps and a maximum rate of 15 Mbps.
- Supports polling of I/O data transfer (Read/Write).
- DMA data transfer.

Limitations:

- No known limitation

5.4   HSUART Driver

The HSUART Driver interface is exposed by the standard Windows serial communication interface. Refer to the following for details on serial communications in Microsoft* Win32:
http://msdn.microsoft.com/en-us/library/ms810467.aspx

The following APIs of serial communication in Win32 are supported in the driver release:

- `SetCommMask`

- `WaitCommEvent`

- `GetCommMask`

Note: The `SERIAL_EV_PERR, SERIAL_EV_RX80FULL, SERIAL_EV_EVENT1,` and `SERIAL_EV_EVENT2` serial masks used in the preceding three functions are not supported. Others are supported.

Intel has no plan to support the following APIs of serial communication in Win32:

- `SetupComm`

- `SetCommBreak`

- `ClearCommBreak`

- `EscapeCommFunction` (no support for parameters set to **SETBREAK** and **CLRBREAK**)

The Driver Binary Package consists of these files:

- `iaiouart.inf`

- `iaiouart.sys`

- `iaiouart.cat`

For details on the Driver Interface Header, refer to:
 http://msdn.microsoft.com/en-us/library/ms810467.aspx

The following are the enabled features:

- Supports baud rates of 300 – 921600, up to 3686400 by default as specified in the "*Intel® Atom™ processor E3800 Product Family Datasheet*" Doc# 538136, Section 27.2.3 Baud Rate Generator. To set baud rates of 1M, 2M, 3M, and 4M, refer to the "Software Driver BKMs" section in the *BSP for Microsoft* Windows* 10 IoT Core 32-bit on Intel® Atom™ processor E3800 Product Family User Guide*", Doc # 333574.

- Supports data sizes of 5, 6, 7, and 8-bit.

- Supports none, odd, and even parity.

- Supports 1, 1.5, and 2 stop bits.

- Supports "Hardware", "No" flow control and software flow control.

- Supports Serial Device Control Requests (IOCTLs) defined by Microsoft for serial controllers in Windows. Refer to the following Limitations section for IOCTLs that will be enabled in the Gold release.

Limitations:

- The HSUART driver doesn't support DMA transfer with software flow control. When an application uses the software flow control, the HSUART will use the PIO mode to copy data between peripherals and system memory.

- Software flow control only supports a maximum baud rate of 115,200. It is recommended to use hardware flow control for high-baud-rate data transfers.

- When using 1.5 stop bits, the data size can only be supported up to 5-bits.

- The following are IOCTLs that are not supported in the driver:
  - `IOCTL_SERIAL_XOFF_COUNTER`
  - `IOCTL_SERIAL_LSRMST_INSERT`
  - `IOCTL_SERIAL_SET_BREAK_ON`
  - `IOCTL_SERIAL_SET_BREAK_OFF`

5.5 Errata, Closed Issues, and Known Issues

5.5.1 Errata

| Issue #	Description	Impact	Recommendation
4995468	Windows 10 Athens: Intel SSD 535 240 GB/480 GB not detected as storage drive.	Failed to detect Intel SSD as additional drive other than main/OS drive.	Disable DevSleep feature in BIOS. Refer to Bay Trail-I BIOS Writer's Guide Addendum.

5.5.2 Closed Issues

Issue #	Description	Impact	Recommendation
N/A			

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5.5.3 Known Issues

Issue #	Description	Impact	Recommendation
4995469	Windows 10 Athens: Jerky sound happen on audio playback	Jerky sound happen on audio playback for audio format MP3, WMA & WAV, on silicon Z8CE.	Will not fix. Use silicon other than Z8CE.

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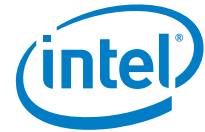
6.0   *Hardware and Software Compatibility*

This release is compatible with the following hardware and software, respectively:

- Intel® Atom™ E3800 Product Family
- Intel® Celeron® Processor N2807/N2930/J1900 Release

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