Intel® Serial IO Driver

User Guide and Release Note

Braswell SoC, Windows 10 64bit

June 2015

Revision 1.3

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Revision History

Revision Number	Description	Revision Date
1.3	Fixed MUP file.	June 2015
1.2	Production Version for Win10 64 bits	June 2015
1.1	Released to support Win10 64 bits. Documentation changed only. Binaries are the same with Win8.1 64 bits version.	April 2015
1.0	Production Version - Added instruction to tune SDA hold time. - Driver .cat/.inf/.sys file name changed.	March 2015
0.95	Production Candidate - Fixed MUP file.	March 2015
0.91	Beta release - Fixed mup.xml file - Update silent install instructions in bring up guide	February 2015
0.9	Pre-Beta release - I2C controller driver filename changed to iaioi2c.inf/sys - Added Installer support - Added mup.xml support	December 2014
0.82	Update documentation	October 2014
0.81	Alpha	October 2014
0.8	Initial release	July 2014

1 *Introduction*

1.1 Purpose and Scope of Document

This document provides installation instructions and general usage of the driver as well as release information, such as release kit summary, important notes, resolved issues and known issues. This document is intended to help OEM and ODM customers setup their platform as they prepare for validation and debug.

This Intel® Serial IO Drivers support the following operating system and platform:

Operating System:

- Windows* 10 Operating System (64-bit version)

Hardware Requirements:

- Braswell

1.2 Acronyms and Terminology

Term	Description
ACPI	Advanced Configuration and Power Interface
BIOS	Basic Input/Output System
BKC	Best Known Configuration
DMA	Direct Memory Addressing
GPIO	General Purpose IO
I2C	Inter-Integrated Circuit, generically referred to as "two-wire interface"
LTR	Latency Tolerance Reporting
MMIO	Memory Mapped I/O
PIO	Programmed I/O

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2 *Release Kit Summary*

2.1 Release Kit Details

Kit Name:

Intel® Serial IO I2C, UART and GPIO Controller Drivers

Driver Version:

Intel® Serial IO I2C Controller Driver	604.10120.2654.367
Intel® Serial IO UART Controller Driver	604.10120.2653.391
Intel® Serial IO GPIO Controller Driver	604.10120.2652.361
Installer[1]	152702

Note[1]:
Please use the LPSS_X64_Threshold_install_NNNNNN.EXE installer for driver installation. The Setup.exe installer included in this driver package is to be used in conjunction with the mup.xml file. If you do not need the mup.xml, please do not use Setup.exe.

3 Driver Installation

3.1 Manual Driver Installation via INF File

Follow the steps below.

1. Copy and unzip the Intel® Serial IO Driver Kit to the platform under test

2. Locate the INF file.

    Intel® Serial IO I2C: iai2ce.inf
    Intel® Serial IO UART: iauarte.inf
    Intel® Serial IO GPIO: iagpioe.inf

3. Right click on the INF file and select 'Install' option from the menu

4. Click the 'Yes' button in the pop-up window to start installation.

3.2   Driver Installation via Installer

Follow the steps below:

1. Copy and unzip the Intel® Serial IO Driver Kit to the platform under test

2. Locate the installer .EXE file.

3. Right click on the .EXE file and select "Run as administrator" option menu. Click "Yes" button in User Account Control pop-up window.

4. You should see the welcome screen as shown below.

5. Click "Next". The installation will takes a few minutes. You will see the screen as below.

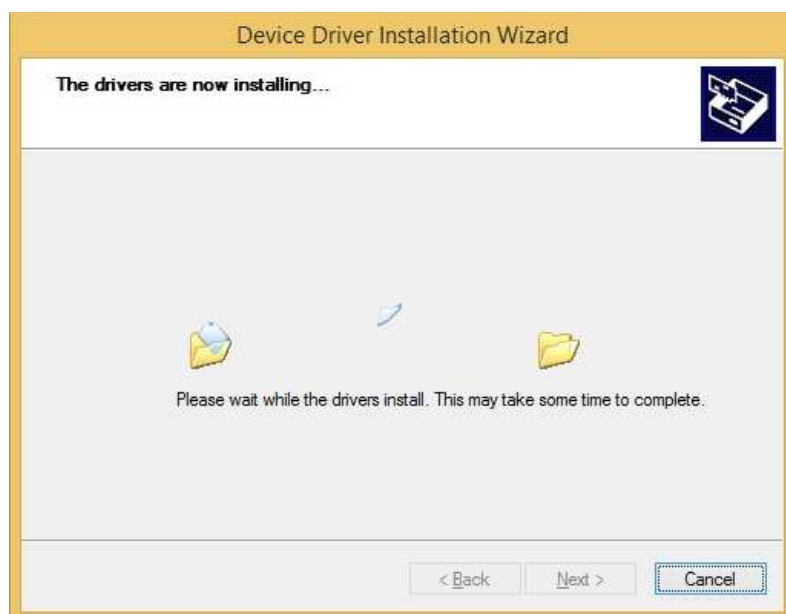6. For successful install, you will see screen as shown below.

3.3   Silent Driver Installation via Installer

Follow the steps listed below:

1. Copy and unzip the Intel® Serial IO Driver package onto the Platform under test.

2. Open a Command Prompt (cmd.exe) with administrator rights (ie. Run as Administrator). Click on 'Yes' button in User Account Control pop-up window.

3. Change the directory to where you unzipped the driver package in Step 1 above and then change to the "Driver Installer" directory.

4. Locate the installer executable file (ie: LPSS_X64_ Threshold_install_NNNNNN.EXE where the NNNNNN is the installer version number)

5. To see all available options for the Installer, run command:

   "LPSS_X64_ Threshold _install_NNNNNN.EXE /?"
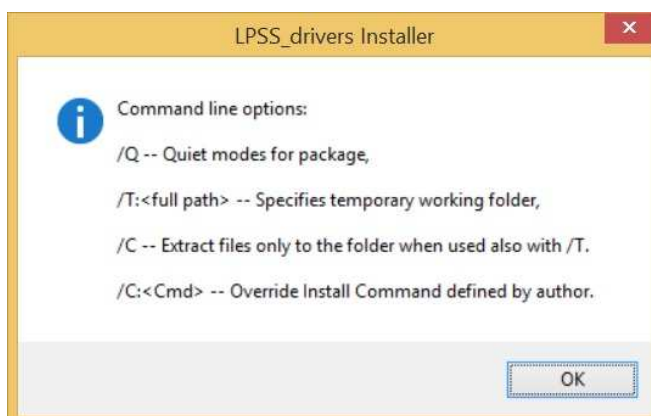
Note that only the /C:<Cmd> option will be supported. The installer executable contains Microsoft's Driver Package Installer (DPInst) version 2.1 (DPInst.exe). All the silent install commands are supported from DPInst.

6. To see the commands supported by DPInst, run:
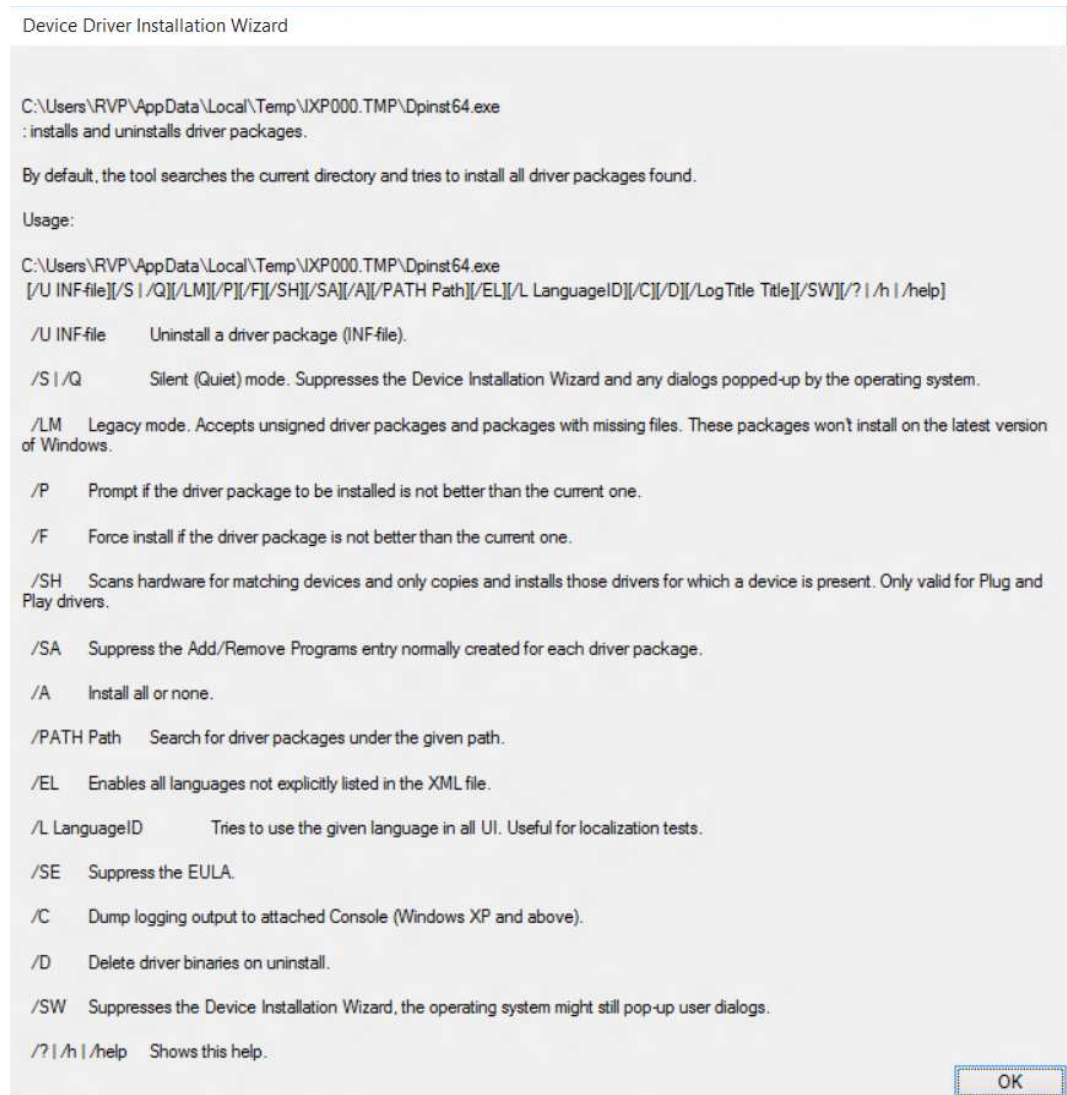
   "LPSS_X64_ Threshold _install_NNNNNN.EXE /C:"DPInst64 /?" Example as below:
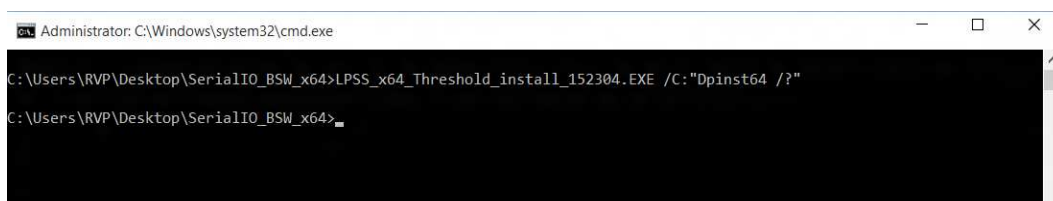
A pop-up menu will show the supported command by DPInst. Example as below:

Device Driver Installation Wizard

C:\Users\RVP\AppData\Local\Temp\IXP000.TMP\Dpinst64.exe
: installs and uninstalls driver packages.

By default, the tool searches the current directory and tries to install all driver packages found.

Usage:

C:\Users\RVP\AppData\Local\Temp\IXP000.TMP\Dpinst64.exe
[/U INF-file][/S | /Q][/LM][/P][/F][/SH][/SA][/A][/PATH Path][/EL][/L LanguageID][/C][/D][/LogTitle Title][/SW][/? | /h | /help]

/U INF-file   Uninstall a driver package (INF-file).

/S | /Q   Silent (Quiet) mode. Suppresses the Device Installation Wizard and any dialogs popped-up by the operating system.

/LM   Legacy mode. Accepts unsigned driver packages and packages with missing files. These packages won't install on the latest version of Windows.

/P   Prompt if the driver package to be installed is not better than the current one.

/F   Force install if the driver package is not better than the current one.

/SH   Scans hardware for matching devices and only copies and installs those drivers for which a device is present. Only valid for Plug and Play drivers.

/SA   Suppress the Add/Remove Programs entry normally created for each driver package.

/A   Install all or none.

/PATH Path   Search for driver packages under the given path.

/EL   Enables all languages not explicitly listed in the XML file.

/L LanguageID   Tries to use the given language in all UI. Useful for localization tests.

/SE   Suppress the EULA.

/C   Dump logging output to attached Console (Windows XP and above).

/D   Delete driver binaries on uninstall.

/SW   Suppresses the Device Installation Wizard, the operating system might still pop-up user dialogs.

/? | /h | /help   Shows this help.

OK

Note that not all command listed above are validated by Intel. Customer are advice to do their own validation.

7. Silent Installation Command example:

Tasks	Command
To install all Serial IO drivers[1]	LPSS_X64_ Threshold _install_NNNNNN.EXE /C:"DPInst64 /Q"
To see DPInst help	LPSS_X64_ Threshold _install_NNNNNN.EXE /C:"DPInst64 /?"

Note[1]: The Serial IO controllers must be enabled in BIOS setup menu for I2C, HSUART and GPIO controller.
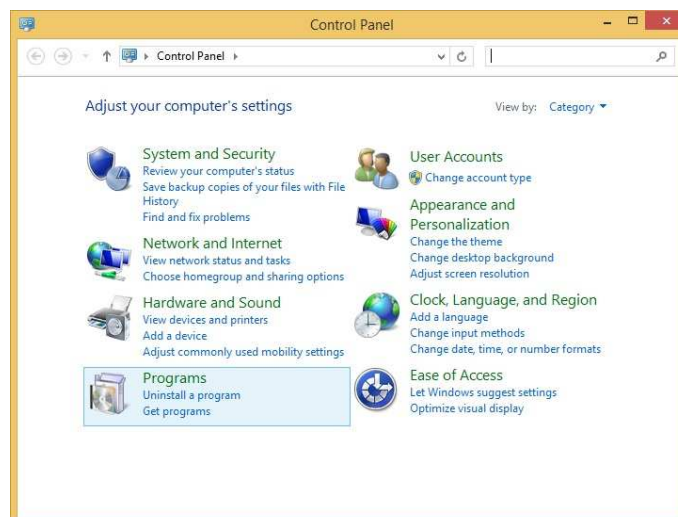
8. Restart system once installation is completed.
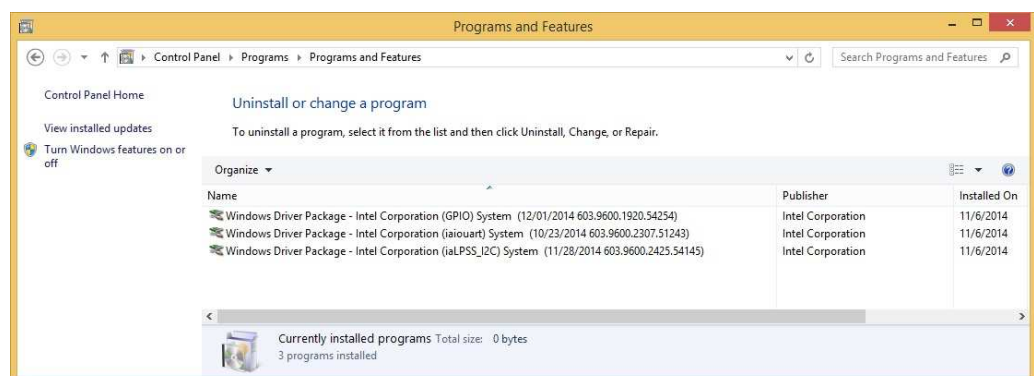
4 Driver Uninstall

4.1 Uninstalling the Driver via Control Panel

Follow the steps below.

1. Open Control Panel.

2. If the Control Panel window is shown in 'Category' view, then select "Uninstall a program" as shown below. Otherwise if the Control Panel window is shown in 'icon' view, then select "Programs and Features".

3. On the next window, select the Serial IO driver that would like to uninstall. Then, click the "uninstall" button.

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4. Click "Yes" to continue.

5. Restart your system for the change to take effect.

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5 Supported Languages

5.1 Introduction

The supported languages for the installer is as listed below.

LCID	Language	LCID	Language
0401	Arabic	0411	Japanese
0804	Chinese (Simplified)	0412	Korean
0404	Chinese (Traditional)	0413	Dutch
0405	Czech	0414	Norwegian
0406	Danish	0415	Polish
0407	German	0416	Portuguese (Brazil)
0408	Greek	0816	Portuguese (Standard)
0409	English (USA)	0419	Russian
040A	Spanish	041D	Swedish
040B	Finnish	041F	Turkish
040C	French		
040D	Hebrew		
040E	Hungarian		
0410	Italian		

6 *Changing SDA Hold Time*

6.1 Purpose

Based on Intel® Braswell External Design Specification (EDS), the SDA hold time, $t_{HD:DAT}$ is more than 0. This section is added based on special cases where the SDA hold time need to be tune such as for debug purposes. Most design do not need to tune the SDA hold time.

The Intel® Serial IO I2C driver implemented two methods for customer to modify the I2C SDA hold time. The _SHT method in system BIOS DSDT table and Windows registry key method. The Intel® I2C driver look for SDA override value in DSDT table first, follow by Windows registry. If both are not found, a default value is loaded.

In the event where the newly tuned SDA hold time value need to be permanently implemented in your system. The BIOS DSDT method is preferred.

6.2 BIOS ACPI DSDT Table

System BIOS add the _SHT method in DSDT table. Intel® I2C driver look for this value in DSDT table and write the value to "I2C SDA Hold Time Length Register (IC_SDA_HOLD)" in the Braswell SoC.

Example:

```
Device (I2C1) {
     Name (_ADR, Zero)          // _ADR: Address
     Name (_HID, "80860F41") // _HID: Hardware ID
     Name (_CID, "80860F41") // _CID: Compatible ID
     Name (_DDN, "Intel(R) I2C Controller #6 - 80860F46")
     Name (_UID, 0x06)          // _UID: Unique ID
     Name (_SHT, 0x32)          // Replace the SDA_HOLD value . . .
```

The _SHT method override the SDA hold time for all I2C modes of operation, include Standard mode (100Kb/s), Fast mode (400Kb/s), Fast Mode Plus (1Mb/s) and High-Speed mode (1.7 Mb/s)

6.3 Windows Registry Key

Alternately, the SDA hold time can be change dynamically under Windows Operating System. This provide better flexibility for debug purposes.

Follow the steps below:

1. Install the latest Intel® Serial IO I2C Driver.

2. Restart system.
3. Add the SDA hold time override value to Windows registry. User can copy the sample code below. Write to a txt file and rename the text file to .reg extension. Double click the .reg file to add the registry key to Windows.
4. After that, open Windows Device Manager, select "System devices". Right click. Then, select "Scan for hardware changes". The new SDA key in the registry will be loaded after that.

Example code:

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\iaioi2c]

; Timing override for I2C SDA hold time (All Fast Speed
"BUS_FS_SDA_1"=dword:0000000F
"BUS_FS_SDA_2"=dword:0000000F
"BUS_FS_SDA_3"=dword:0000000F
"BUS_FS_SDA_4"=dword:0000000F
"BUS_FS_SDA_5"=dword:0000000F
"BUS_FS_SDA_6"=dword:0000000F
"BUS_FS_SDA_7"=dword:0000000F
```

For the example above, it changes SDA hold time for I2C controller number 1 to number 7 for fast speed mode (FS).

To change SDA hold time for other operation mode, use the table below:

SS	Standard Speed (100Kb/s)
FS	Fast Speed (400Kb/s)
FP	Fast Mode Plus (1Mb/s)
HP	High-Speed (1.7Mb/s)

Example:

Change I2C controller no 4, high-speed mode (1.7Mb/s) SDA hold time to 0x8

```
"BUS_HP_SDA_4"=dword:00000008
```

7 Closed Issues

Issue #	Description	Resolution
5505259/ 5584421	I2C touch pad not working probably caused by interaction with GPIO driver.	Fixed in pre-beta package.
N/A	Intel® Serial IO Controller driver name shown in Microsoft Windows Device Manager is not final and subject to change in future Serial IO kit releases.	Fixed in alpha package.
N/A	Braswell A3 UART feature not enabled/verified. This feature is not recommended for validation. Refer to CDI#550213.	Fixed in alpha package.

8 *Known Issues*

Issue #	Description
n/a	

9 Limitations

#	Description
1	Intel® Serial IO Controller Driver install, uninstall, upgrade and downgrade using Microsoft devcon.exe tool is not supported.

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