Demo Kit Quick-Start Guide

Instructions for Using ON Semiconductor's CMOS Image Sensor Development Kits

Introduction

Thank you for purchasing an ON Semiconductor CMOS image sensor development kit, which are USB-powered camera boards that enable easy testing and characterization of ON Semiconductor® sensors.

ON Semiconductor's sensor demonstration software, DevSuite, enables you to display images from your sensor. This software is downloaded from ON Semiconductor's website.

Follow the instructions below to assemble the kit and to download and install ON Semiconductor's DevSuite software.

Before continuing, please ensure that you meet the Hardware and Software requirements listed in Appendix A.

For issues with getting the camera to be detected or applications failing to launch, review the "Trouble Shooting Guide".

A common problem with first-time users is their PC/laptop not having the latest USB3 Chipset FW.

Do not connect your kit to your USB3 port until instructed to do so.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Demo Kit Contents

Before you begin setting up the camera, please verify the components included in your particular kit.
Please note that there are several types of kits.

Full Demo Kit contents
- ON Semiconductor development kit baseboard (Demo3)
- ON Semiconductor sensor headboard with lens
- USB3 cable, camera tripod

Headboard-only Demo Kit contents
- ON Semiconductor sensor headboard with lens

MARS and Adapter (sold separately) contents – Requires Demo3 baseboard (sold separately)
- ON Semiconductor MARS sensor (parallel or MIPI interface)
- ON Semiconductor MARS ISP (optional – parallel, MIPI, or Ethernet interface)
- ON Semiconductor MARS Adapter
  - Demo3 Adapter; for parallel interface sensor or ISP
  - Demo3-MIPI Adapter; for MIPI interface sensor or ISP
  - ETH Adapter; for Ethernet interface ISP

MARS SERDES (sold separately) contents – Requires contents listed in MARS and Adapter
- ON Semiconductor Deserializer
- ON Semiconductor Serializer
- ON Semiconductor SERDES coax cable

Note on MARS and SERDES; it is best to work with your ON Semiconductor representative to ensure you have the correct combination of Demo3, MARS Adapter, SERDES Deserializer/Serializer, and sensor or ISP/Sensor.

Note: Ensure that your Adapter interface matches the MARS or Deserializer purchased – it is printed on the headboard.

Demo Kit Assembly – Full and Headboard-only Demo Kit

1. Connect the headboard and baseboard via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the sensor headboard.
2. For a full demo kit, screw the mini-tripod into the tripod mounting block.
3. For optional auxiliary boards, refer to their User Guide.

Demo Kit Assembly – MARS Only

1. Connect the headboard and MARS Adapter via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the adapter.
2. Connect the MARS board to the Adapter via the mini-connector.
   Note; if an ISP / Sensor combination, connect the ISP (no lens) to the Adapter and then the sensor to the ISP.
3. Screw the mini-tripod into the tripod mounting block of the baseboard.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Demo Kit Assembly – MARS with SERDES

1. Connect the headboard and MARS Adapter via the 26-pin female connector located on the back of the baseboard and the 26-pin male header on the back of the adapter.
2. Connect the Deserializer to the Adapter via the mini-connector.
   Note: the connectors are matched, so it is only possible to connect the Deserializer and not the Serializer.
3. Connect the Serializer to the sensor or ISP (no lens). If ISP, connect the sensor to the ISP.
   Note: the connectors are matched, so it is only possible to connect the Serializer and not the Deserializer.
4. Connect the coax cable to the Deserializer and Serializer.
5. Screw the mini-tripod into the tripod mounting block of the baseboard.

Note; with a MARS ISP and sensor, it is possible to connect the Deserializer and Serializer between the ISP and Sensor. If this is the case, you will need to receive a specialized initialization file from your ON Semiconductor representative.

 = coax cable —— = board connector

Diagram of MARS Sensor-only with SERDES

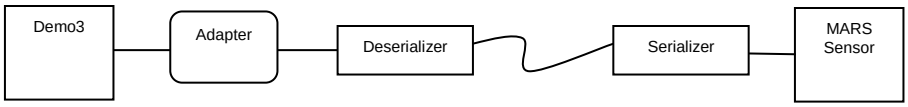
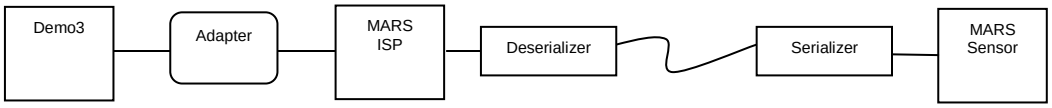


Diagram of MARS ISP and Sensor with SERDES between Adapter and ISP



Diagram of MARS ISP and Sensor with SERDES between ISP and Sensor



Note: this configuration requires a specialized initialization file from your ON Semiconductor representative.

SERDES Pairs and Associated Part Numbers

TI 914/931A	AP22022 + AP22019
TI 934/933A	AP22047 + AP22046
TI 954/953A	AP22036 + AP22035
TI 960/953A	AP22079 + AP22035
TI 972/971A	AP22075 + AP22074
MAXIM 9296B/9295A	AP22068 + AP22058
MAXIM 96706/96705	AP22021 + AP22020
MAXIM 96716/96717	AP22094 + AP22095

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Installing DevSuite – Windows OS

Download the base installer from here;
https://www.onsemi.com/pub/Collateral/DEVSUITE_SW.ZIP

Decompress the .zip and read the "Read-Me-First.doc" for information on the installation package.

To install the Software, double-click the file *setup.exe* and follow the instructions on your screen. If you have an earlier version of DevSuite on your computer, you will be prompted to uninstall it before proceeding with the new install.

Note: due to installation limitations, it is recommended to always install all Software in the same drive and location.
It is **NOT** recommended to install any Software on a Network drive.
If a previous installation does not follow these guidelines, you may need to modify your "PATH" variable to remove the previous location(s).

Starting with 6.0.12; all executable files and libraries are 64-bit and located in the "bin" or "lib" folders, all 32-bit files have been removed.

As a one-time-action; remove all previously installed sensor-specific installers and install the latest ones.

Additional Product Software Installers

Some products require a separate software installer to be downloaded, and some require an NDA.
In either case, after starting DevWare you will be prompted with instructions if an additional installer is required.

- For products that do not require an NDA, a URL to the additional installer will be displayed.
- For products that do require an NDA, you will be directed to a Web site where you can either login with your assigned credentials or request credentials. Other products require that you contact ON Semiconductor support.

Additional Support Software Installers

DevWareX requires Python to be installed for certain products in which you will be prompted to download the installer.
It is recommended that you install Python in any case though – continue reading for instructions.
Using the provided URL link, download the installer and then exit DevWareX. Run the installer and then select "Install All". When the installer completes, rerun DevWareX. Here's the URL that will be displayed:
https://www.python.org/ftp/python/3.8.2/python-3.8.2-amd64.exe

Our color tuning application SensorTune requires a Matlab Runtime library to be installed.
In these cases, you will be prompted with a URL to use to download the additional installer.
Here is that URL; download, decompress, and double-click "Install" and follow the instructions.

https://ssd.mathworks.com/supportfiles/downloads/R2019a/Release/6/deployment_files/installer/complete/win64/MATLAB_Runtime_R2019a_Update_6_win64.zip

Other OS Platforms

DevWareX can also be run on MacOS and Linux Ubuntu. Please use the following link for information and instructions;
https://aptina.atlassian.net/wiki/display/DEVS/Software+Downloads?src=contextnavpagetreemode

© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

You can now connect your kit to your USB3 port.

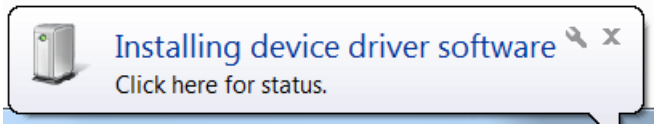
Starting Up the Software – XP Systems

Plug the kit into your computer using the USB cable provided. After a few seconds, your computer should detect new hardware and start the "Found New Hardware Wizard".

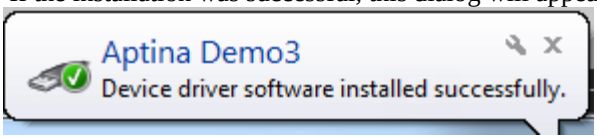
To complete the driver installation, follow the instructions in the document found via the start menu:
"All Programs > Aptina Imaging > Docs > User Guides > USB XP Driver User Guide"

Starting Up the Software – Windows7 and Windows10 Systems

Plug the kit into your computer using the USB cable provided. After a few seconds, your computer should detect new hardware and attempt to download the appropriate USB driver from the Microsoft driver server, during which this dialog should appear:



If the installation was successful, this dialog will appear:



You are now ready to Launch DevSuite – please proceed to "Launching the DevSuite Application".

If the download fails (either due to a failed Internet connection or your system's Firewall settings, or incorrect FW on the ON Semiconductor development kit baseboard), this dialog will appear:



To resolve the issue, follow the instructions in the document found via the start menu:
"All Programs > Aptina Imaging > Docs > User Guides > USB Windows7 Driver User Guide", "USB Windows8 Driver User Guide" and "USB Windows10 Driver User Guide" are found under "User Guides".

Start-up Issues

For any OS, if there is no indication of new HW being present, unplug and plug-in the USB cable.

If there is still no indication of new HW, see section "Trouble Shooting / Camera Not Found" under the 2nd dash "Outdated USB3 FW drivers on the PC".

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Launching the DevSuite Application

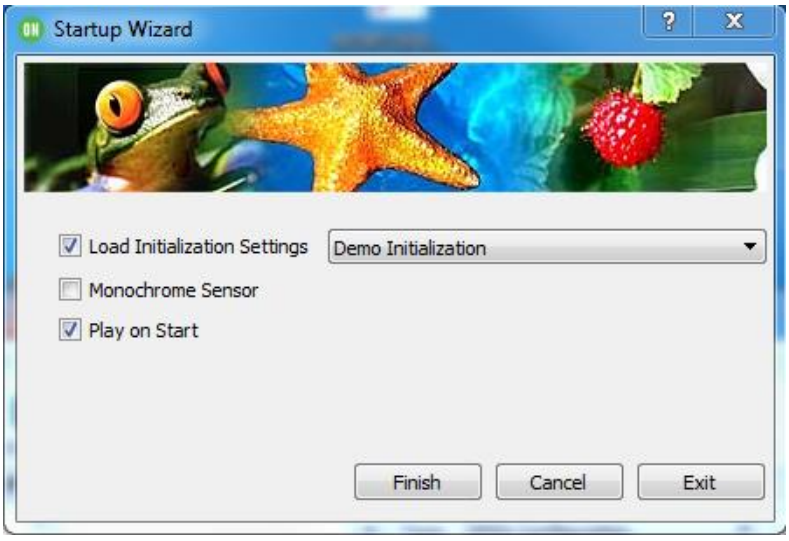
1. Go to the start menu, select “All Programs” then “Aptina Imaging” then “DevWareX.” The popup window shown in Figure 1 will display as DevWareX probes for attached devices.
   Note: as described in the “Additional Product Software Installers” section, if the files required for your attached product are not found you will be prompted with a URL to download them.

Figure 1: DevWareX Popup – Searching for Attached Devices



2. After the software has found an attached device, the DevWareX window will appear with the dialog box shown in Figure 2 on page 3; select the settings shown. (Color/monochrome sensors will also need to have the color or monochrome box checked, as appropriate.) Click “Finish.”

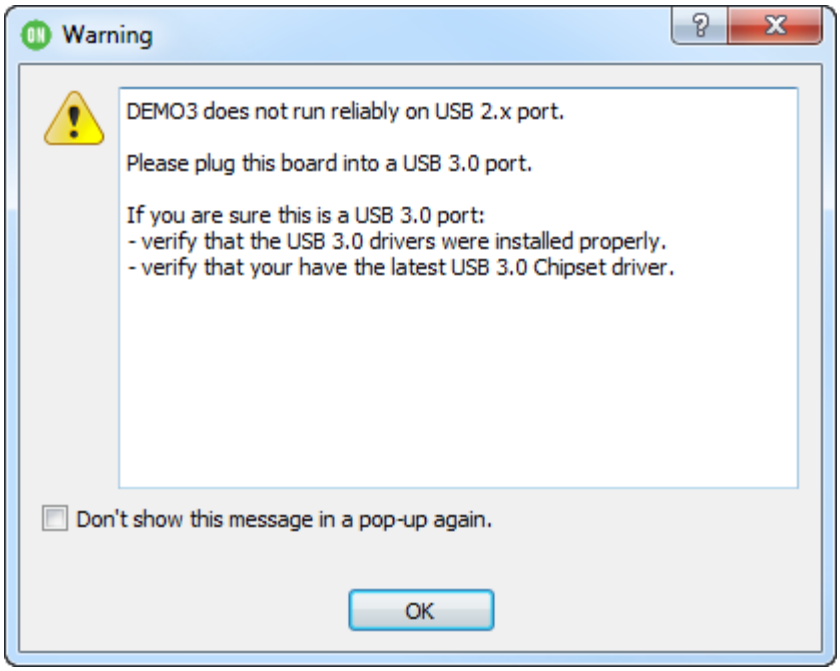
Figure 2: Startup Wizard Dialog



ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor’s production data sheet specifications.

Warning Dialog

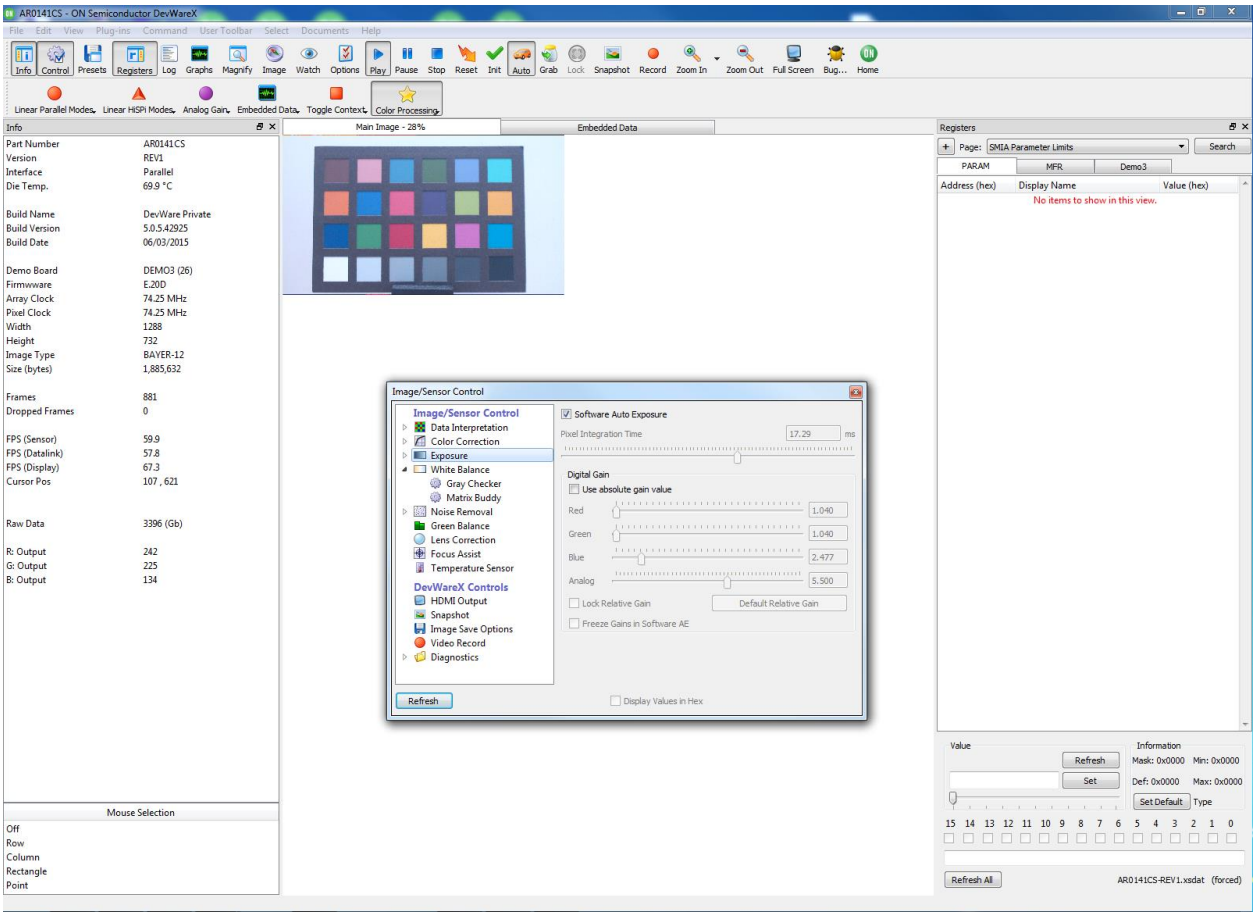
If you see the following dialog before the Startup Dialog in Figure 2;



1. Ensure you are truly connected to a USB3 port.
2. If you are, then update your USB3 Chipset FW as documented in “Trouble Shooting / Camera not found” under the 2nd dash “Outdated USB3 FW drivers on the PC”.
3. If you still see the warning, contact your ON Semiconductor representative and request a new Demo3 of Revision 7 or newer.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor’s production data sheet specifications.

Figure 3: DevWareX Main Screen



The installation is complete.

For assistance using DevWare, see the help files within the application. Users will also notice that tooltip" pop-ups" are available for many controls; simply pause the cursor over the control to read the tooltip.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Additional Applications and Resources

There are several additional DevSuite applications and resources that are useful for demonstrating and configuring sensors.

Register Wizard

This application produces register settings based on the sensor's various parameters; width/height, mode, output type, etc.

SensorTune

This application produces the Color Correct Matrix (CCM) for a sensor or ISP.

FlashTool

This application configures and produces the binary image for Flash storage of ISP and SOCs that support it.

Side-by-Side Demo

This application allows two ON Semiconductor Imaging Demo cameras to be simultaneously displayed side-by-side. It is useful for comparing differences in equal sized sensors, although dissimilar sensors may also be used. Synchronous control of both images is provided for panning, zooming and play-state. Side-by-Side can be launched via the desk-top shortcut.

Software Development Kit (SDK) - ApBase

ApBase provides an API of the main functions of DevWare and is available for users to write their own applications to interface to ON Semiconductor sensors. Information can be found via the shortcut:
Start->All Programs-> Aptina Imaging->SDK.

ApBase files are included in the General Software installer, but a stand-alone installer is available for only the API files. ApBase stand-alone; download and install the API.

AiViewer

A video viewing application is available for installation via this link.

IQWare

An image quality evaluation tool, with documentation found here.

LensTools

A stand-alone installer of the Lens Shading Correction command-line tool, available for installation via this link.

Training Videos

A set of training videos can be found via the shortcut:
Start->All Programs-> Aptina Imaging->Training->DevWare Training.

Documentation

There are various sets of documentation, including User and Development Guides, found via the Windows shortcut:
Start->All Programs->Aptina Imaging->Docs.

The documentation is also available from within DevWareX from the "Documentation" menu item.

Tools Shortcut

There are various other applications that can be found via the shortcut:
Start->All Programs-> Aptina Imaging->Tools.
Each has its own "Help" file

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Trouble Shooting

- DevWareX fails to start up.
  - Install Python as described in section "Additional Product Software Installers".
    - Found mostly in cases when the Python Anaconda package is installed.
- Applications warn of a missing entry point.
  - Ensure all SW installers are at the same version as DevWareX.
- "Camera not found"
  - If a Demo3 baseboard is attached and this error appears, there are 2 possible causes.
    - USB3 driver start-up; simple disconnect and reconnect the USB3 cable and retry.
    - Outdated USB3 FW drivers on the PC. If this is first time you've installed DevWare and/or the first time you've attached a Demo3, it is possible you need to update the USB3 FW driver on your PC.
      Do a Web search of "<Your PC manufacturer> <Your PC Model> USB3 FW driver update".
      Find a search result that either matches your PC or one for "Intel" (most common USB3 chipset).
    - Windows10; driver certification has not yet been disabled – see Appendix A.
- Demo3 won't stream data or stops streaming data
  - Ensure that you are connected to a USB3 port on your PC. This can be identified as either having a blue connector, or with a label of "SS" (for Super Speed). Some USB2 port implementations are not backward compatible to USB3.
- "Unable to identify attached device".
  - Read the "Read-Me-First.doc" from the installation package to ensure that all required files have been installed.
  - Ensure that the installation package name is matched to the sensor.
  - Another possible cause is non-working Hardware; if you already have the required SDAT file, then do the following;
    - Start DevWare and when the warning dialog appears select "No".
    - When the "Startup Choices" dialog appears, select "Sensor…" and select the SDAT that matches your sensor.
    - When the "Startup Wizard" dialog appears, unselect all check-boxes and select "Finish".
    - In the "Registers" dialog, select any page; if the values are all zero, then you have non-working Hardware.
- Image won't display / DevWare exits before displaying an image.
  - Outdated Graphics display drivers on the PC. If this is first time you've installed DevWare and/or the first time you've attached a Demo3, it is possible you need to update the Graphics driver on your PC.
    Do a Web search of "<Your PC manufacturer> <Your PC Model> Graphics driver update".
    Also, if samples\SimpleQT shows an image, then check for other graphics-based libraries installed on your PC.
- Windows 7: the USB driver can't be found, or device not recognized.
  - Run the "Hardware Update Tool" to ensure the correct version of FW is installed; see "USB Driver User Guide" for details. Accessed via: *Start->All Programs->Aptina Imaging->Docs->User Guides*
- The Frame Rate is very low.
  - The amount of data being processed is quite significant for large display sizes, especially on larger sensors. Lower the size of the displayed image.
  - Ensure that the HW and SW requirements as defined in Appendix A are met.
- Win10 and ApBaseCOM.
  - If your Matlab application can't connect to ApBaseCOM, do the following to ensure it is registered.
    - Search for "Command Prompt" from Start menu, right click on it and select "Run as administrator".
    - Navigate to the installation folder, usually "C:\Aptina Imaging\bin".
    - Enter; %SystemRoot%\system32\regsvr32 apbasecom.dll
    - A "RegSvr32" dialog will appear with "DllRegisterServer in apbasecom.dll succeeded".

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.

Reporting Bugs

If you are having issues with any of the applications, please use the “Bug” icon  on the menu bar to open “Bug Report” dialog. Your system and sensor configuration information will be filled-in automatically.
Please enter information in to “Bug Description” and “How to reproduce the bug” fields, select the “Copy to Clipboard” button, and then paste that information in to an Email using the address provided in the dialog.

If you experience a “Crash”, please follow the instruction provided via the link.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor’s production data sheet specifications.

Appendix A

Requirements

Hardware and software requirements for ON Semiconductor's development kit are detailed below.

Hardware Requirements

- In general, a desktop or laptop manufactured in 2016 or later will suffice.
- Processor i3 or better (a faster processor will improve the displayed frame rate on the PC). Advanced noise reduction, sophisticated demosaic, and high dynamic range processing are very CPU-intensive.
- Available C: disk space of at least 600Mb. Network drive installation is NOT recommended.
- Installed Memory: 8GB minimum. Available RAM at least sensor size times 40 bytes. For example 600MB available RAM for a 14MP sensor. Remember to account for RAM needed by the system and by other applications or memory-resident software when calculating total system RAM requirements.
- Compatible USB3.0 or USB3.1 host controller. Most new PCs and Laptops have Intel Integrated Chipsets, which will work with the Demo3. Use this link to review known supported systems.

Note: some USB2 port implementations are not backward compatible to the Demo3, and may cause loss of data streaming and/or poor performance. It is highly recommended that you DO NOT connect the Demo3 to a USB2 port.

- 1280 x 1024 minimum resolution. Graphics card and drivers capable of handling the images from the sensor; some graphics cards or drivers will not display images much larger than about 8MP.

Software Requirements

- Windows 7 with a minimum of Service Pack 1 or
- Windows 10 requires no Service Packs.
- The latest Chipset drivers for the USB3.0 or USB3.1 host controller.

Do a Web search of "<Your PC manufacturer> <Your PC Model> USB3 FW driver update".

- Python; for products that require it, you will be prompted with the URL for the location of where to download the installer.
- Matlab Runtime Library; DevSuite's SensorTune application requires this.

You will be prompted with the URL for the location of where to download the installer.

ON Semiconductor reserves the right to change products or specifications without notice.
© 2021 ON Semiconductor All rights reserved.
‡Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by ON Semiconductor without notice. Products are only warranted by ON Semiconductor to meet ON Semiconductor's production data sheet specifications.