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# DS28E83 Evaluation System

# Evaluates: DS28E83 and DS2476

## General Description

The DS28E83 evaluation system (EV system) provides the hardware and software necessary to exercise the features of the DS28E83. The EV system consists of five DS28E83/DS2476 devices in a 6-pin TDFN package, a DS9121AQ+ evaluation TDFN socket board, and a DS9481P-300# USB-to-I²C/1-Wire® adapter. The evaluation software runs under Windows® 10, Windows 8, and Windows 7 operating systems, both 64-bit and 32-bit versions. It provides a handy user interface to exercise the features of the DS28E83 and DS2476.

## EV Kit Contents

| QTY | DESCRIPTION |
|---|---|
| 5 | DS28E83 DeepCover Radiation Resistant 1-Wire Authenticator (6 TDFN) |
| 5 | DS2476Q+ DeepCover Secure Coprocessor (6 TDFN) |
| 2 | DS9121AQ+ Socket Board (6 TDFN) |
| 1 | DS9481P-300# USB to 1W/I²C Adapter |
| 1 | USB Type-A to Micro-USB Type-B Cable |

## Features

- Demonstrates the Features of the DS28E83 DeepCover® Radiation Resistant 1-Wire Authenticator
- Demonstrates the Features of the DS2476 DeepCover Secure Coprocessor
- 1-Wire/I²C Communication Is Logged to Aid Firmware Designers Understanding of DS28E83 and DS2476
- 1-Wire/I²C USB Adapter Creates a Virtual COM Port on Any PC
- Fully Compliant with USB Specification v2.0
- Software Runs on Windows 10, Windows 8, and Windows 7 for Both 64-Bit and 32-Bit Versions
- 3.3V ±3% 1-Wire Operating Voltage
- Convenient On-Board Test Points, TDFN Socket
- Evaluation Software Available by Request

***Ordering Information*** ***appears at end of data sheet.***

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*319-100167; Rev 0; 3/18*

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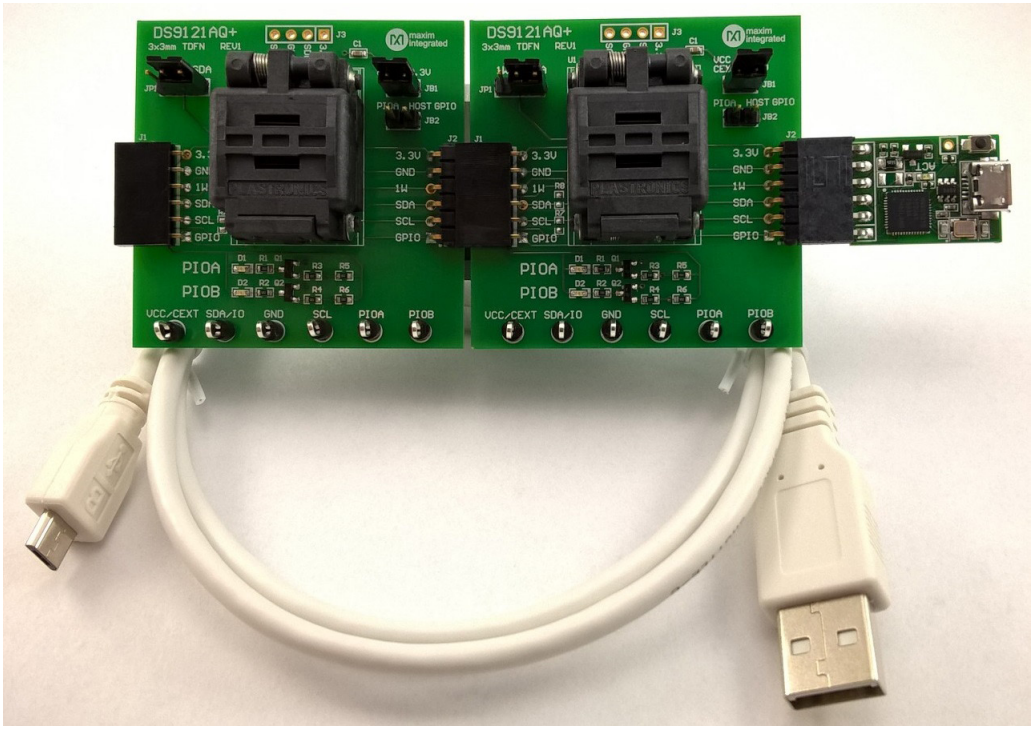
## DS28E83 EV System




## Quick Start

This section includes a list of recommended equipment and instructions on how to set up the Windows-based PC for the evaluation software.

### Required Equipment

- DS9481P-300# USB to 1-Wire/I2C adapter (included)
- DS9121AQ+ TDFN socket board (two included)
- DS28E83Q+ (five devices included)
- DS2476Q+ (five devices included)
- USB Type A to Micro-USB Type B cable (included)
- PC with a Windows 10, Windows 8, or Windows 7 operating system (64 bit or 32 bit) and a spare USB 2.0 or higher port
- Download **DS28E83 EV kit software (light version)** or request **full DS28E83 EV kit developer software**.

**Note:** In the following sections, software-related items are identified by **bolding**. Text in bold refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

## Hardware Setup and Driver Installation Quick Start

The following steps were performed on a Windows 7 PC to set up the DS28E83 EV kit hardware/software:

1) Obtain and unpack the **DS28E83_EV_Kit_Software_Setup_V1.0.0.zip** file, or the latest version.
2) In a file viewer (Figure 1), double click on **DS28E83_EV_Kit_Software_Setup_V1.0.0.exe** to begin the installation.
3) The setup wizard opens; click on **Next**, as shown in Figure 2.

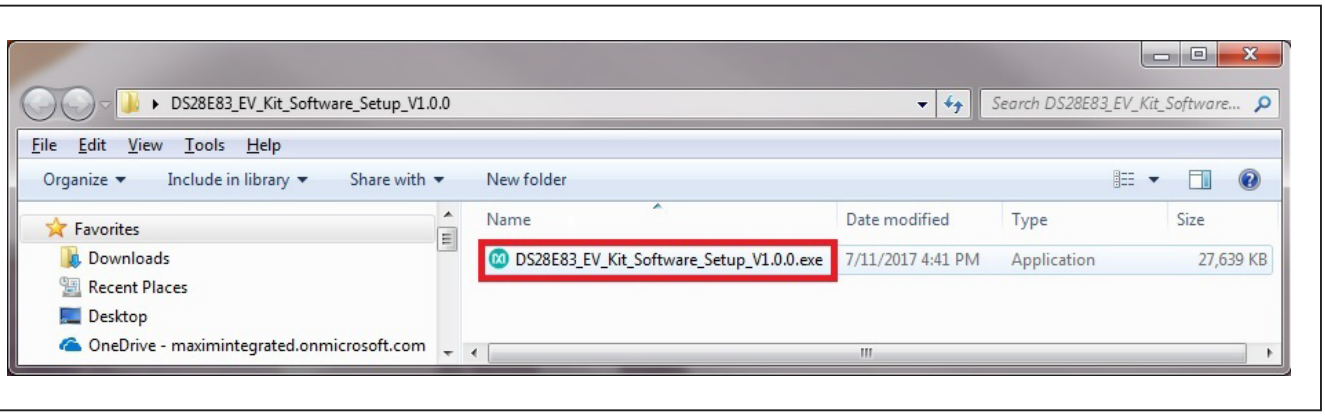



*Figure 1. File Viewer*

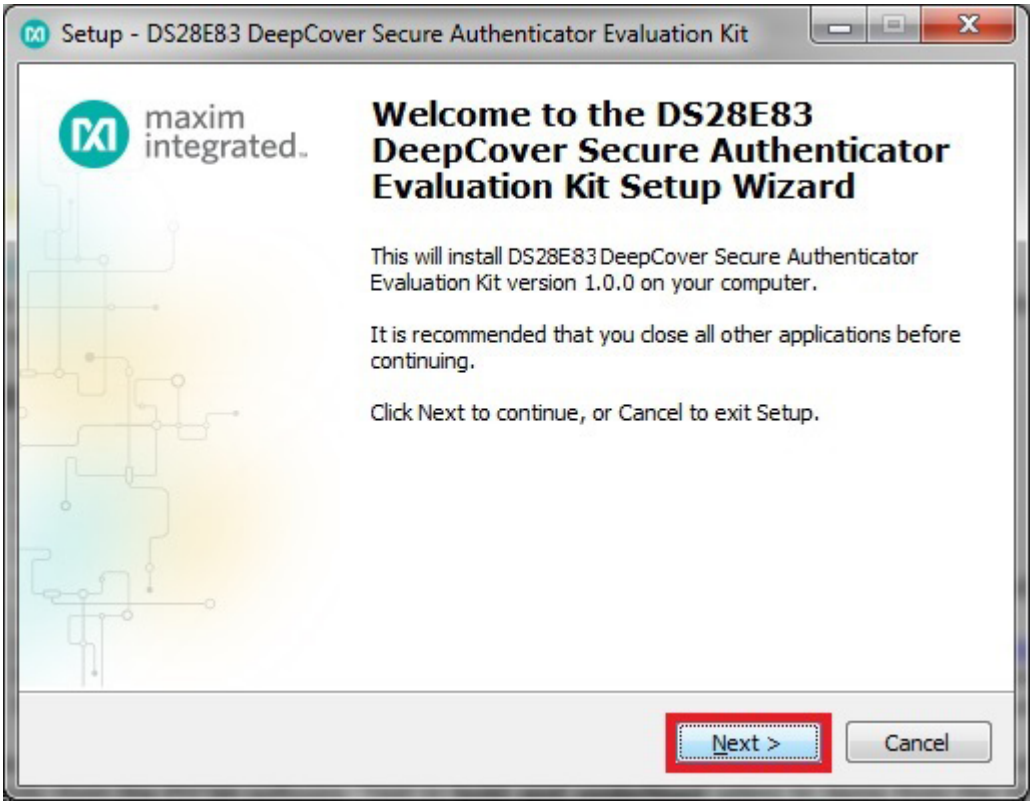



*Figure 2. DS28E83 Setup Wizard*

4) Click **Browse** to select a default folder location, and then click **Next** to install the EV kit software (Figure 3).

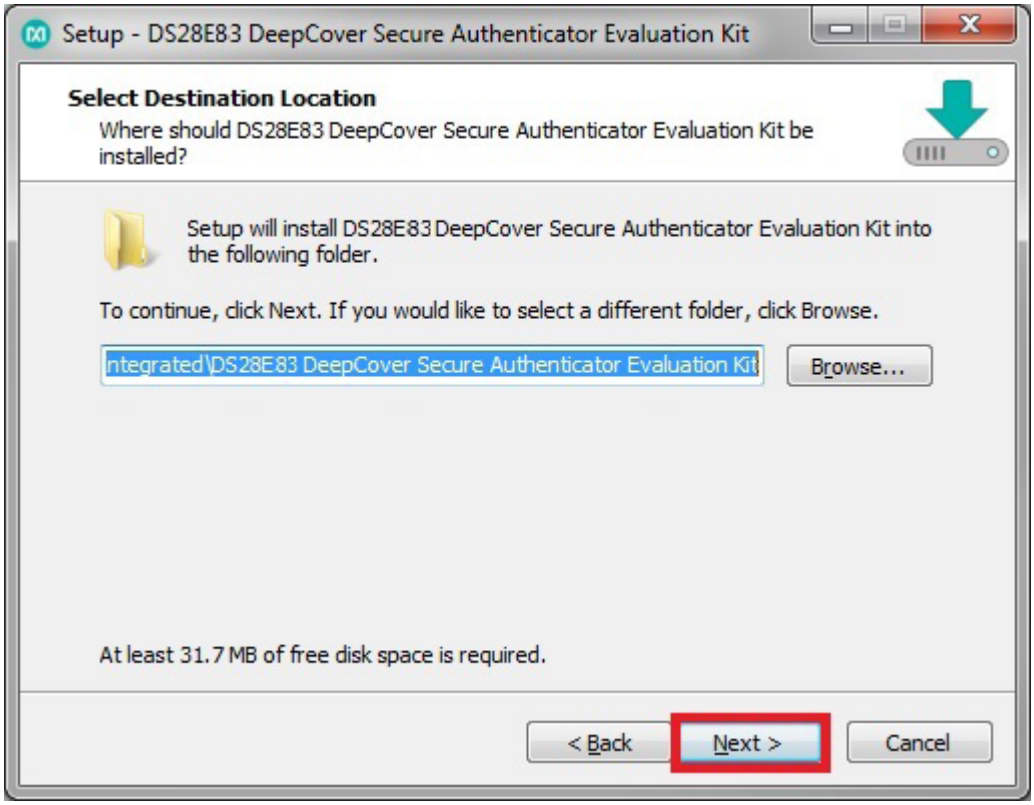



*Figure 3. Install Folder Location*

5) Click **Next** to install shortcuts to the default folder (Figure 4).

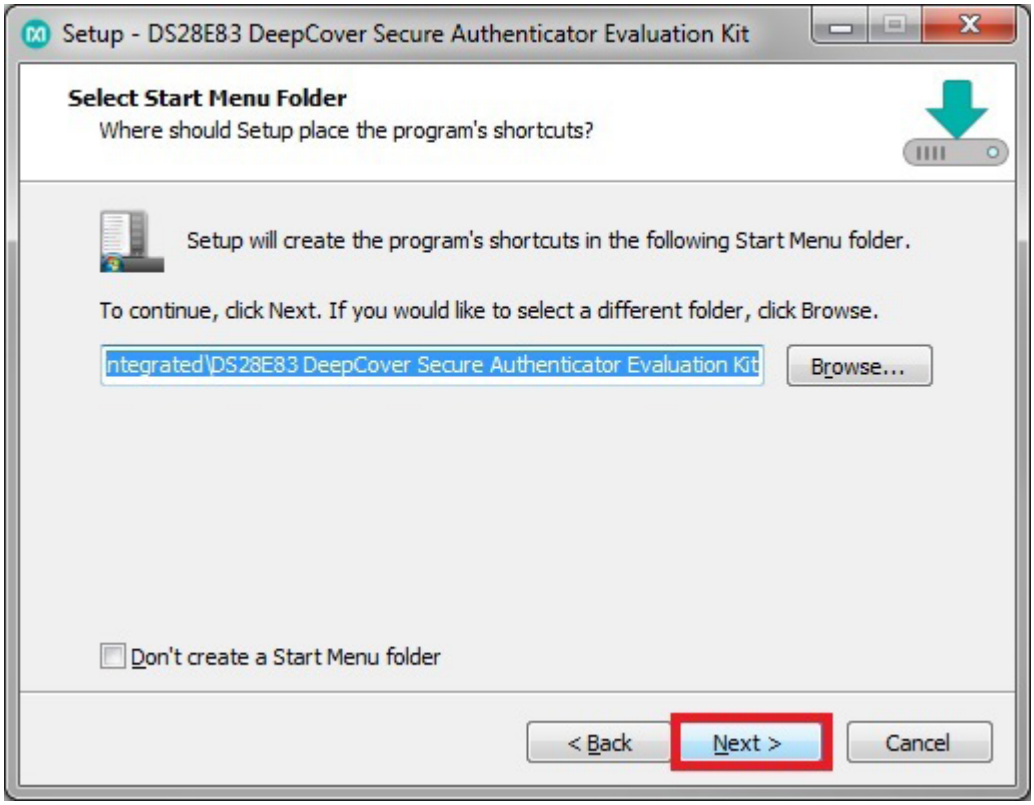



*Figure 4. Program Shortcuts Location*

6) Unplug any Maxim adapter and click on **Next**, with the default settings checked. This selects and installs the DS9481P-300# driver, which is needed to communicate through the USB via a virtual COM port (Figure 5).

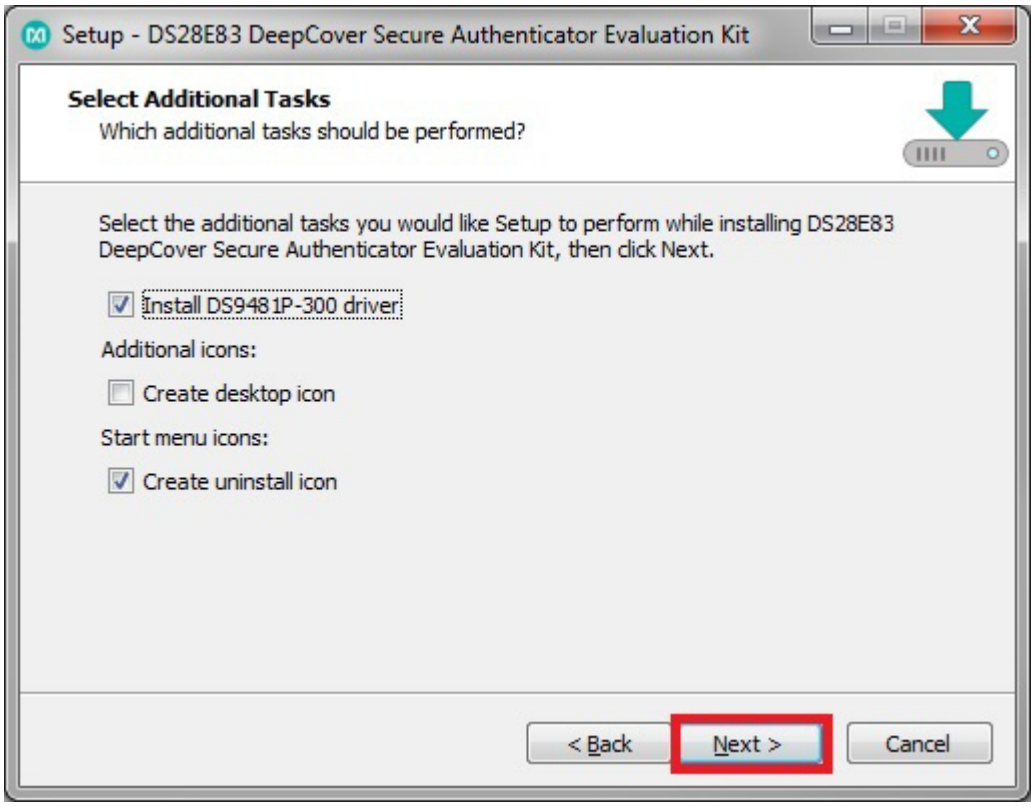



*Figure 5.Select to Install the Driver*

7) Next click on **Install**. A new window pops up to show the installing progression (Figure 6).

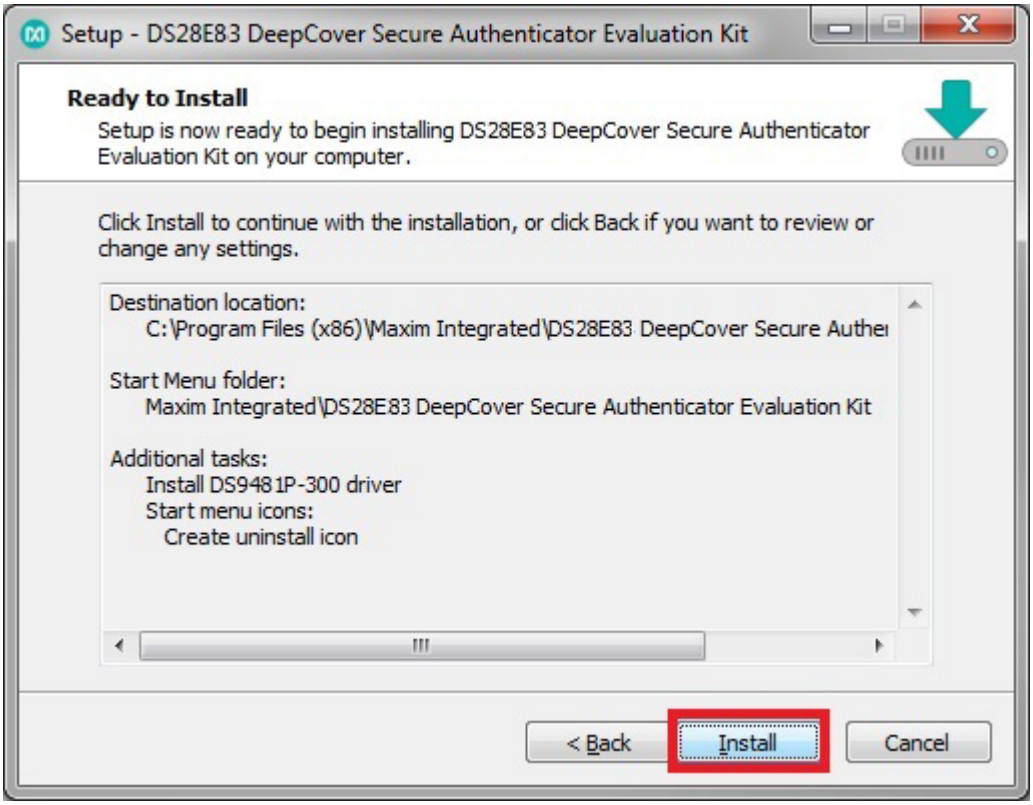



*Figure 6. Ready to Install*

8) Click on **Next** when the Device Driver Installation Wizard appears (Figure 7).

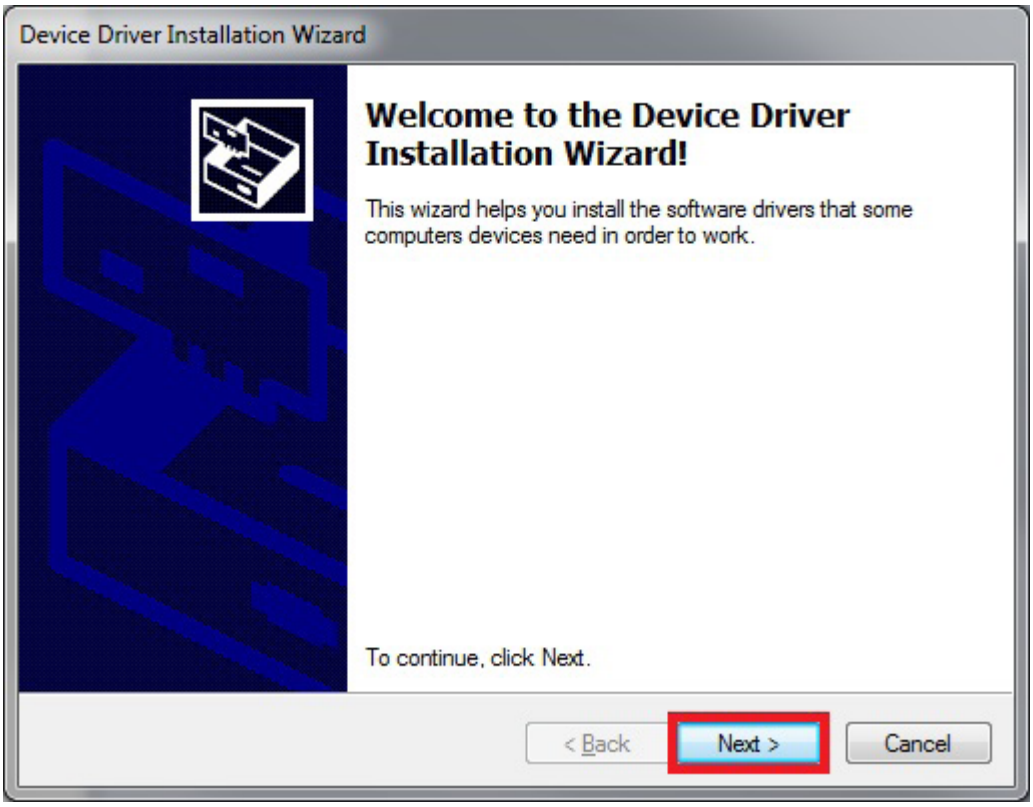



*Figure 7. Device Driver*

9) Click on **Finish** to close the final window and confirm the driver is installed correctly (Figure 8).

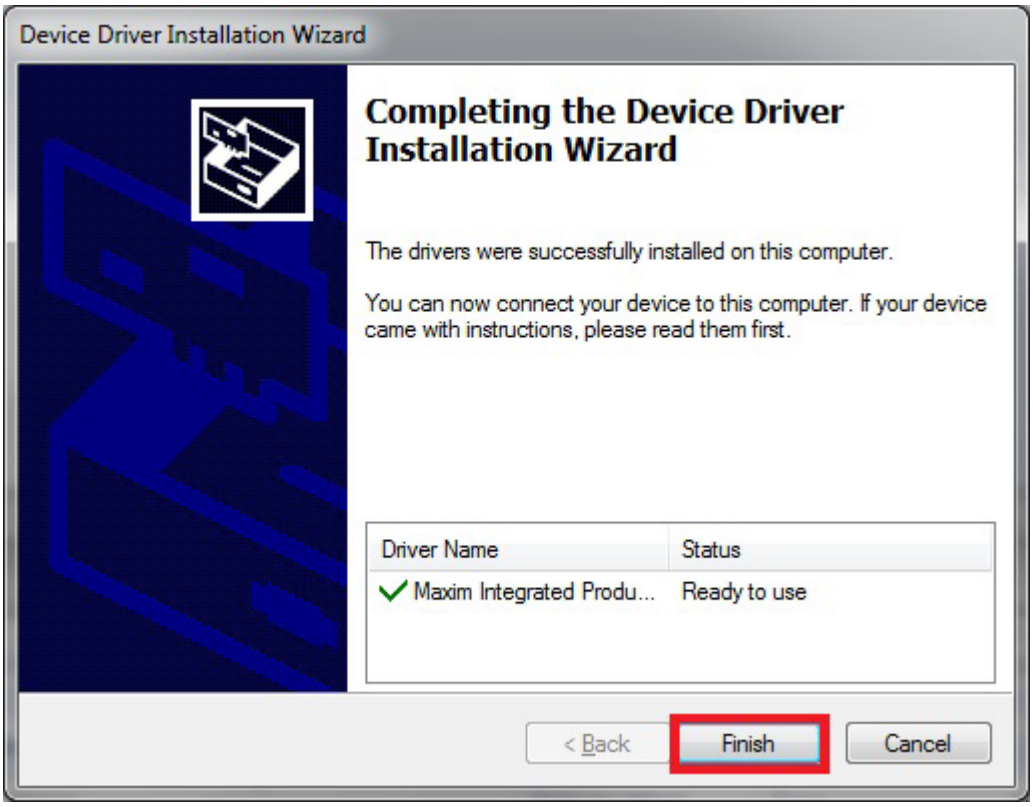



*Figure 8. Device Driver Installation Finished*

10) Plug the DS9481P-300# into the PC with both DS9121AQ+ socket boards by doing the following:
    a) (Optional—Perform only if using the coprocessor): Open the 1st socket and insert a DS2476 into one of the cavities, as shown in Figure 9. **Note:** The plus (+) on the package must be on the opposite side of the marker in the socket.
    b) Open the 2nd socket and insert a DS28E83 into one of the cavities, per the same orientation shown in Figure 9.
    c) Close both burn-in sockets.
    d) Connect the 1st DS9121AQ J2, 6-pin female socket, into the DS9481P-300#, 6-pin male plug per Figure 10.
    e) Connect the 2nd DS9121AQ J2, 6-pin female socket, into the 1st DS9121AQ J1, 6-pin male plug per Figure 10.
    f) For the 1st DS9121AQ+ socket boards that contains DS2476, configure jumpers JP1 to use SDA and JB1 to use 3.3V per Figure 10.
    g) For the 2nd DS9121AQ+ socket boards that contains DS28E83, configure jumpers JP1 to use 1W and JB1 do not install per Figure 10.
    h) Plug the DS28C83 EV kit, using a USB Type-A to Micro-USB Type-B cable, into the PC.

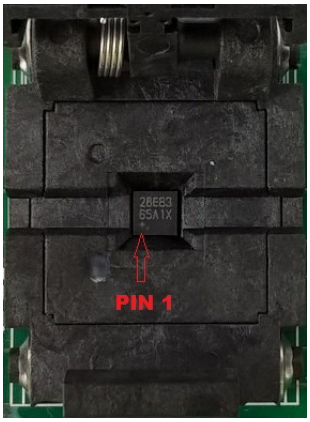



*Figure 9. Orientation of the DS28E83 and DS2476 in the Burn-In Socket*

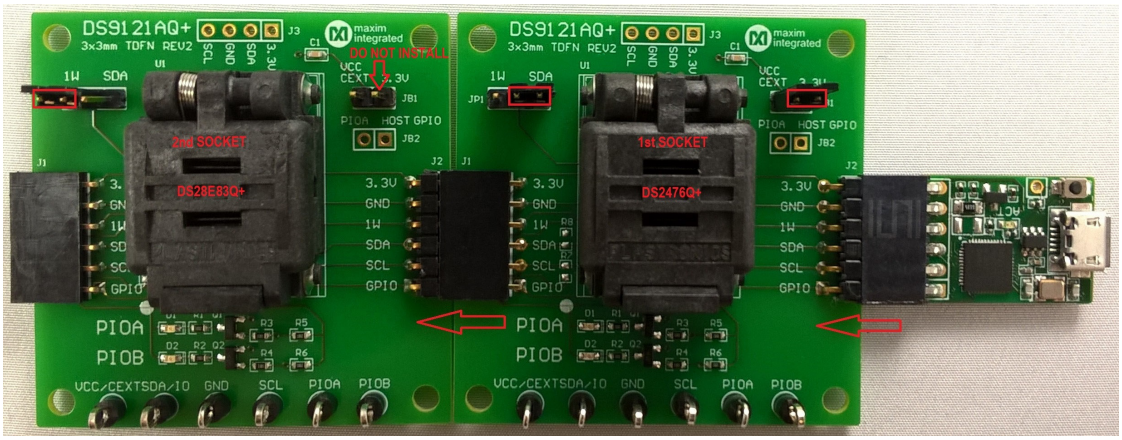



*Figure 10. DS9481QA-300# and DS9121AQ*

11) Click on **Finish** to close the final window and confirm the software is installed correctly (Figure 11).

*Figure 11. Software Installation Finished*

12) The DS28E83 EV kit program opens and automatically connects to the COM port. This can be verified in the lower right corner of the window, as shown in Figure 12.

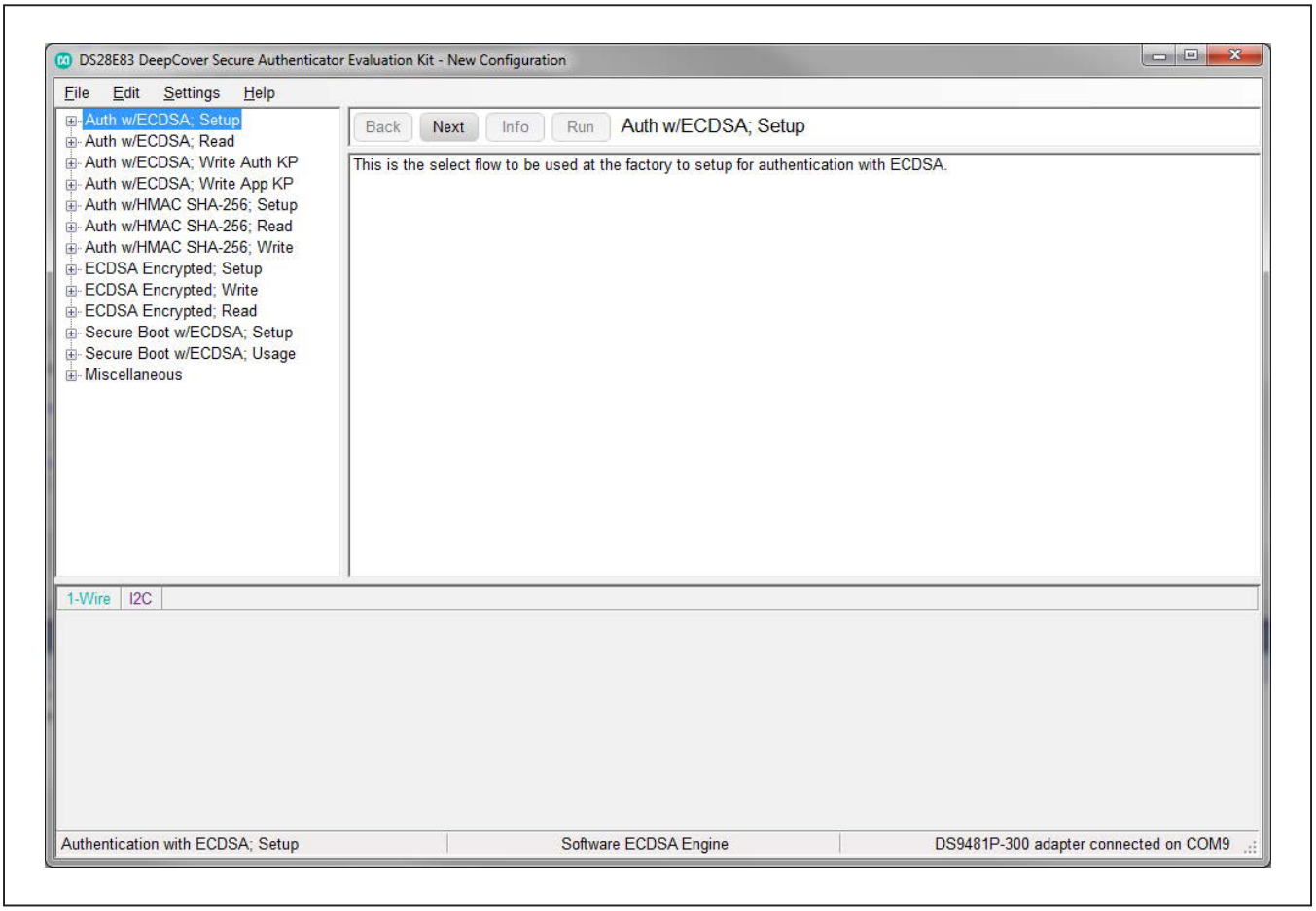



*Figure 12. DS28E83 EV Kit Program (Default View Upon Opening)*

## EV Kit Supported Functions

The DS28E83 EV kit program is designed as a usage example. It includes the ability to either use the built-in software ECDSA engine or the DS2476Q+ coprocessor as the host compute engine. The default is to use the software ECDSA engine. To use the coprocessor, go under the **Settings** menu, then **ECDSA Engine**, and select **DS28E83Q+T**. The GUI displays all the I²C and 1-Wire sequences for each step performed to assist the firmware engineer. See Table 1 for descriptions of the functions in the GUI.

## Detailed Hardware Description

The DS28E83 EV kit hardware includes the MAXQ1010 microcontroller with USB and two DS9121AQ socket adapters that are made to contain the DS28E83 device or DS2476 device. The MAXQ1010 is loaded with firmware to function as a virtual COM port that bridges UART signaling to I²C and 1-Wire. Optionally, the DS2476 functions to off load the ECDSA computations to perform signature. The DS28E83 1-Wire slave functions to perform ECDSA Public-Key signatures during authentication and contains memory space for the necessary elements.

## Table 1. GUI Setup and Usage Flows Supported

| FLOW* | DS2476 SUPPORT | DESCRIPTION |
|---|---|---|
| Auth w/ECDSA; Setup | X | Use at factory to set up ECDSA authentication. |
| Auth w/ECDSA; Read | X | Use in field to authenticate with ECDSA for a read page of memory. |
| Auth w/ECDSA; Write Auth KP | X | Change a page of memory using the Write Authority Key Pair by a write authentication with ECDSA. |
| Auth w/ECDSA; Write App KP | X | Change a page of memory using the Application Key Pair by a write authentication with ECDSA. Requires the master's certificate created with the Application Public Keys and signed by the Write Authority Private key. |
| Auth w/HMAC SHA-256; Setup | | Use at factory to setup authentication with HMAC. |
| Auth w/HMAC SHA-256; Read | | Use in field to do an authentication with HMAC for a read page(s) of memory. |
| Auth w/HMAC SHA-256; Write | | Use in field to do an authentication with HMAC for a write page of memory. |
| ECDSA Encrypted; Setup | | Use at factory to setup the host system to decrypt an encrypted page on the device. |
| ECDSA Encrypted; Write | | In the field, write an encrypted page to the device with ECDSA protected by ECH. |
| ECDSA Encrypted; Read | | In the field, read encrypted data from the device with ECDSA and decrypt with the host system. |
| Secure Boot w/ ECDSA; Setup | | Use to set up secure boot for the device in the factory. |
| Secure Boot w/ ECDSA; Usage | | Usage select flow to be applied for secure boot of the device in the field. |
| Miscellaneous | | Miscellaneous features (e.g., RNG function, ROM options, GPIO control) of the device. |

**Software supports all flows in Table 1.*

## Ordering Information

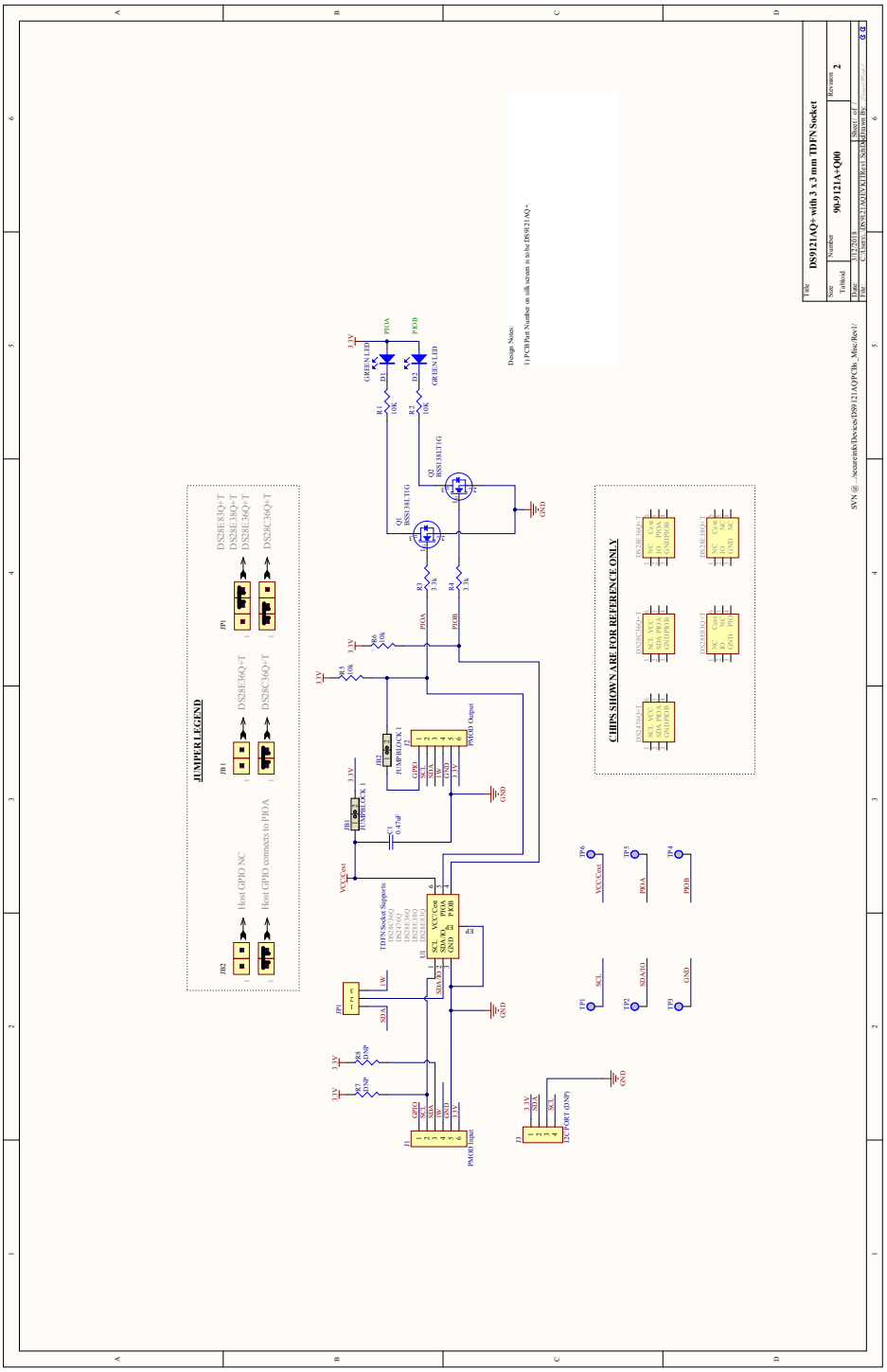
| PART | TYPE |
|---|---|
| DS28E83EVKIT# | EV Kit |

*#Denotes RoHS compliant.*

## DS9121AQ EV Kit Bill of Materials

| DESIGNATOR | QTY | DESCRIPTION | MANURACTURER | PART NO. |
|---|---|---|---|---|
| J3 | 1 | 4 Pin 100mil Female Connector | Samtec | SSQ-104-02-T-S-RA |
| R3, R4 | 2 | RES 3.3K OHM 1/10W 1% 0603 SMD | Panasonic Electronic Components | ERJ-3EKF3301V |
| R1, R2, R5, R6 | 4 | RES SMD 1K OHM 1% 1/10W 0603, RES SMD 10K OHM 1% | Panasonic Electronic Components | ERJ-3EKF1002V |
| R7, R8 | 2 | RES SMD 10K OHM 1% 1/10W 0603 | Panasonic Electronic Components | ERJ-3EKF1002V |
| C1 | 1 | CAP CER 0.47UF 16V X7R 060 | Kemet | C0603C474K4RACTU |
| Q1, Q2 | 2 | MOSFET N-CH 50V 200MA SOT-23 | ON SEMICONDUCTOR | BSS138LT1G |
| D1, D2 | 2 | LED INGAN GREEN CLEAR 0603 SMD | Dialight | 598-8081-107F |
| J1 | 1 | CONN HEADER FEMALE 6POS .1" GOLD | TE Connectivity | 9-146285-0 |
| J2 | 1 | CONN HEADER FEMALE 6POS .1" GOLD | TE Connectivity | 9-146285-0 |
| JP1 | 1 | HDR,BRKWAY,.100 3POS VERT,0.318" | Tyco Electronics | 9-146276-0 |
| U1 | 1 | TDFN,3MM,x2,CLAMSHELL,BURNIN | PLASTRONICS | 06QN10T23030 |
| JB1, JB2 | 2 | JUMPER BLOCK, .100 2POS VERT,0.318" | Tyco Electronics | 22-28-4363 |
| Pack Out | 5 | DEEPCOVER SECURE COPROCESSOR | Maxim Integrated | DS2476Q+ |
| Pack Out | 5 | 10Kb OTP DeepCover Radiation Resistant 1-Wire Authenticator | Maxim Integrated | DS28E83Q+ |
| Pack Out | 3 | SHUNT+,LP W/HANDLE 2 POS 30AU | Tyco Electronics | 881545-2 |

## DS28E83 EV Kit Schematic



## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 3/18 | Initial release | — |
| 0.1 | 9/18 | Corrected broken link | 1 |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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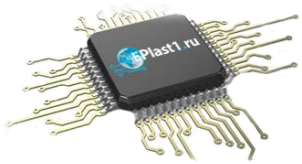


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