

Click [here](#) for production status of specific part numbers.

DS28C39 Evaluation System

Evaluates: DS28C39 and DS2476

General Description

The DS28C39 evaluation system (EV system) provides the hardware and software necessary to exercise the features of the DS28C39. The EV system consists of five DS28C39/DS2476 devices in a 6-pin TDFN package, a DS9121AQ+ evaluation TDFN socket board, a DS9121BQ+ 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 DS28C39 and DS2476.

EV Kit Contents

| QTY | DESCRIPTION |
|-----|---|
| 5 | DS28C39 DeepCover ECDSA Authenticator (6 TDFN) |
| 5 | DS2476BQ+ DeepCover Secure Coprocessor (6 TDFN) |
| 1 | DS9121AQ+ Socket Board (6 TDFN) |
| 1 | DS9121BQ+ Socket Board (6 TDFN) |
| 1 | DS9481P-300# USB to 1W/I ² C Adapter |
| 1 | USB Type-A to Micro-USB Type-B Cable |

Features

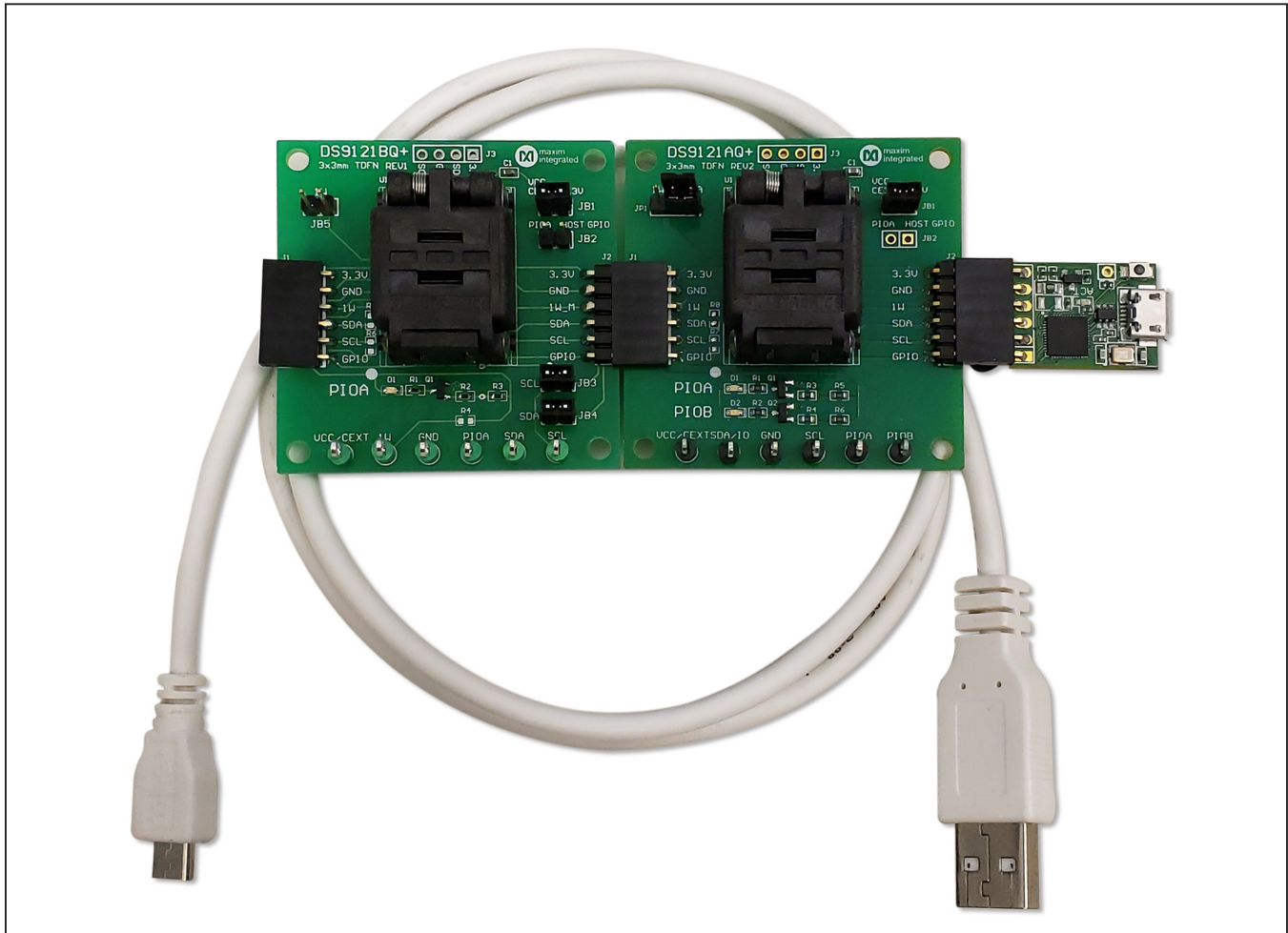
- Demonstrates the Features of the DS28C39 DeepCover[®] ECDSA Authenticator
- Demonstrates the Features of the DS2476 DeepCover Secure Coprocessor
- I²C Communication Is Logged to Aid Firmware Designers Understanding of DS28C39 and DS2476
- I²C USB Adapter Creates a Virtual COM Port on Any PC
- Fully 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 ±10% I²C Operating Voltage
- Convenient On-Board Test Points, TDFN Socket
- Evaluation Software Available by Request

Ordering Information appears at end of data sheet.

1-Wire and DeepCover are registered trademarks of Maxim Integrated Products, Inc.

Windows is a registered trademark and registered service mark of Microsoft Corporation.

DS28C39 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 (one included)
- DS9121BQ+ TDFN socket board (one included)
- DS28C39Q+ (five devices included)
- DS2476BQ+ (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 [DS28C39 EV kit software \(light version\)](#) or request [full DS28C39 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 DS28C39 EV kit hardware/software:

- 1) Obtain and unpack the **DS28C39 Evaluation Kit Setup V1.0.0.zip** file, or the latest version.
- 2) In a file viewer (Figure 1), double click on **DS28C39 Evaluation Kit Setup V1.0.0.exe** to begin the installation.
- 3) Click **Browse** to select a default folder location, and then click **Next** to install the EV kit software (Figure 2).

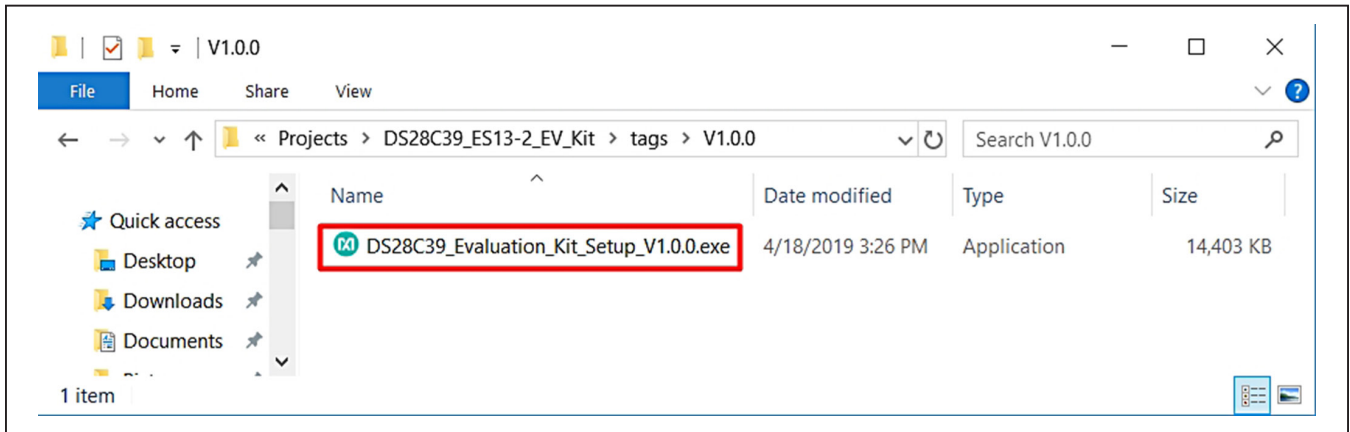


Figure 1. File Viewer

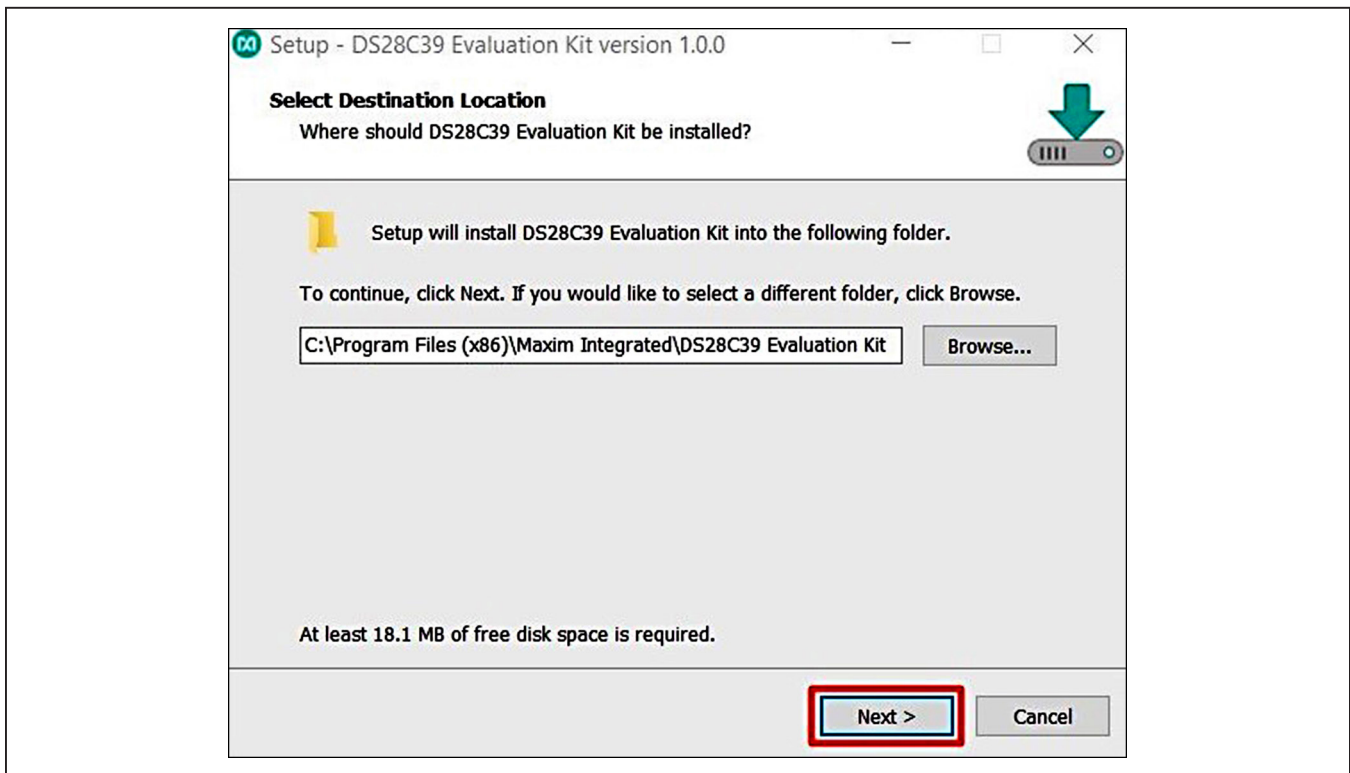


Figure 2. Install Folder Location

4) Click **Next** to install shortcuts to the default folder (Figure 3).

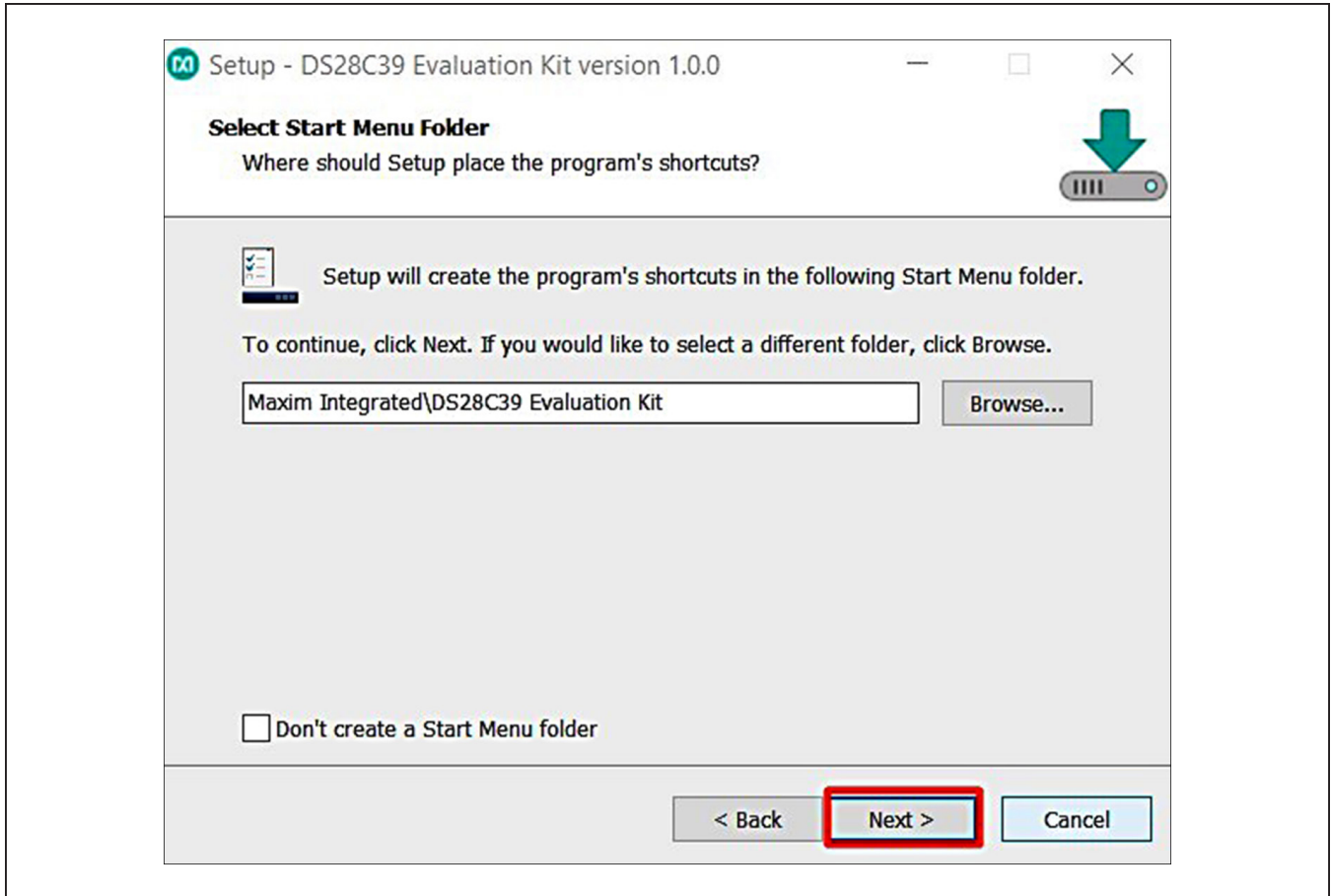


Figure 3. Program Shortcuts Location

- 5) 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 4).

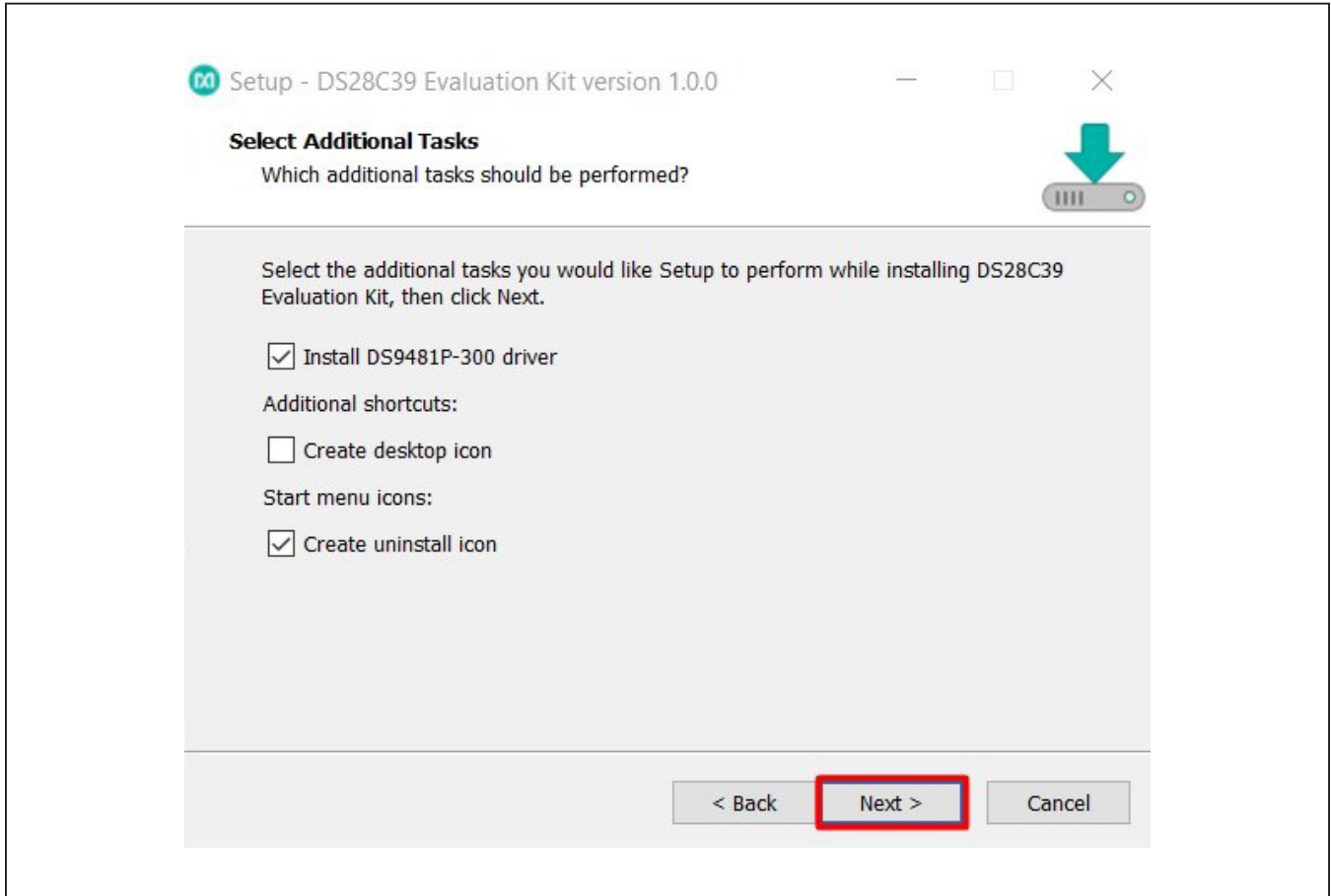


Figure 4. Select to Install the Driver

6) Next click on **Install**. A new window pops up to show the installing progression ([Figure 5](#)).

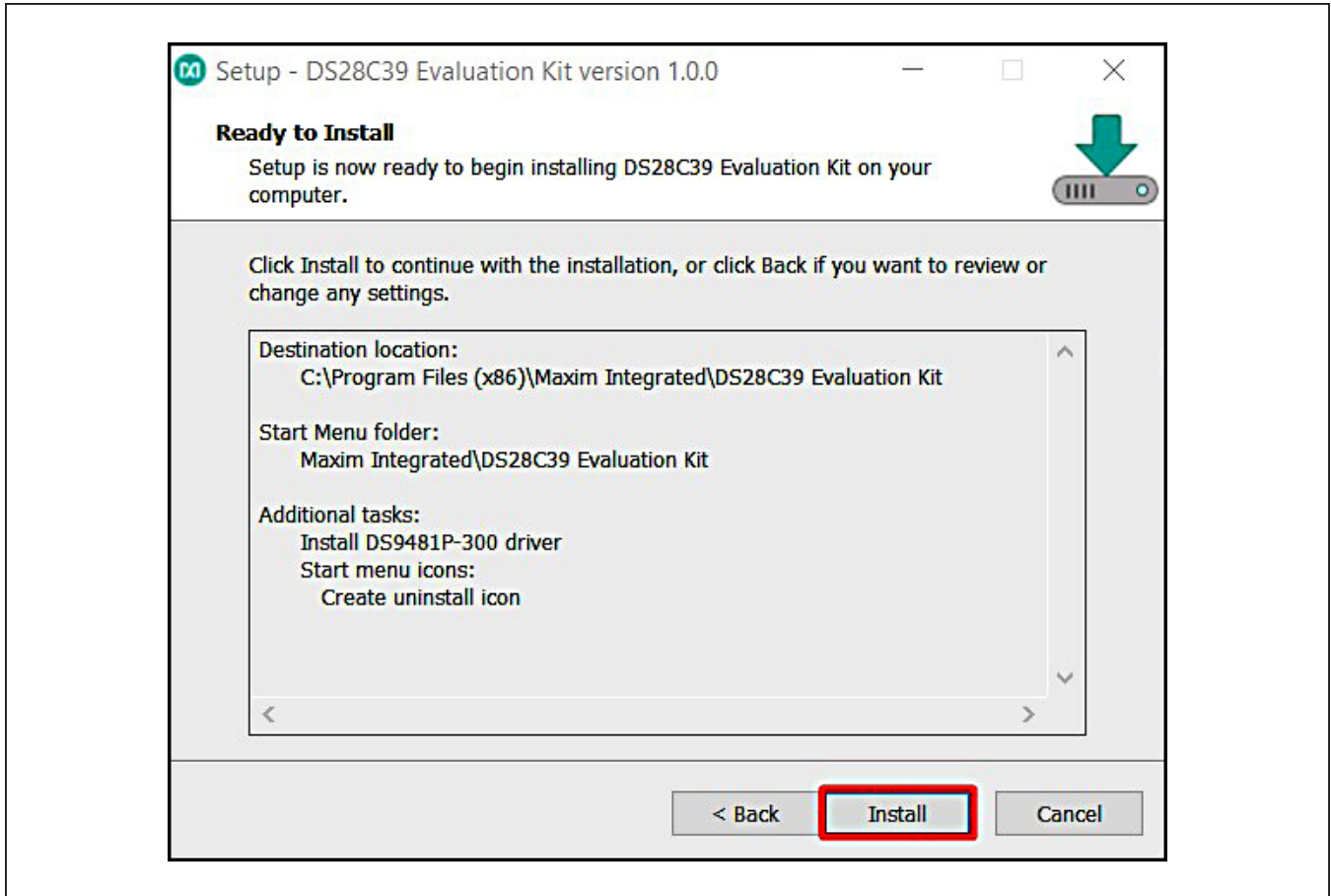


Figure 5. Ready to Install

7) Click on **Next** when the Device Driver Installation Wizard appears (Figure 6).

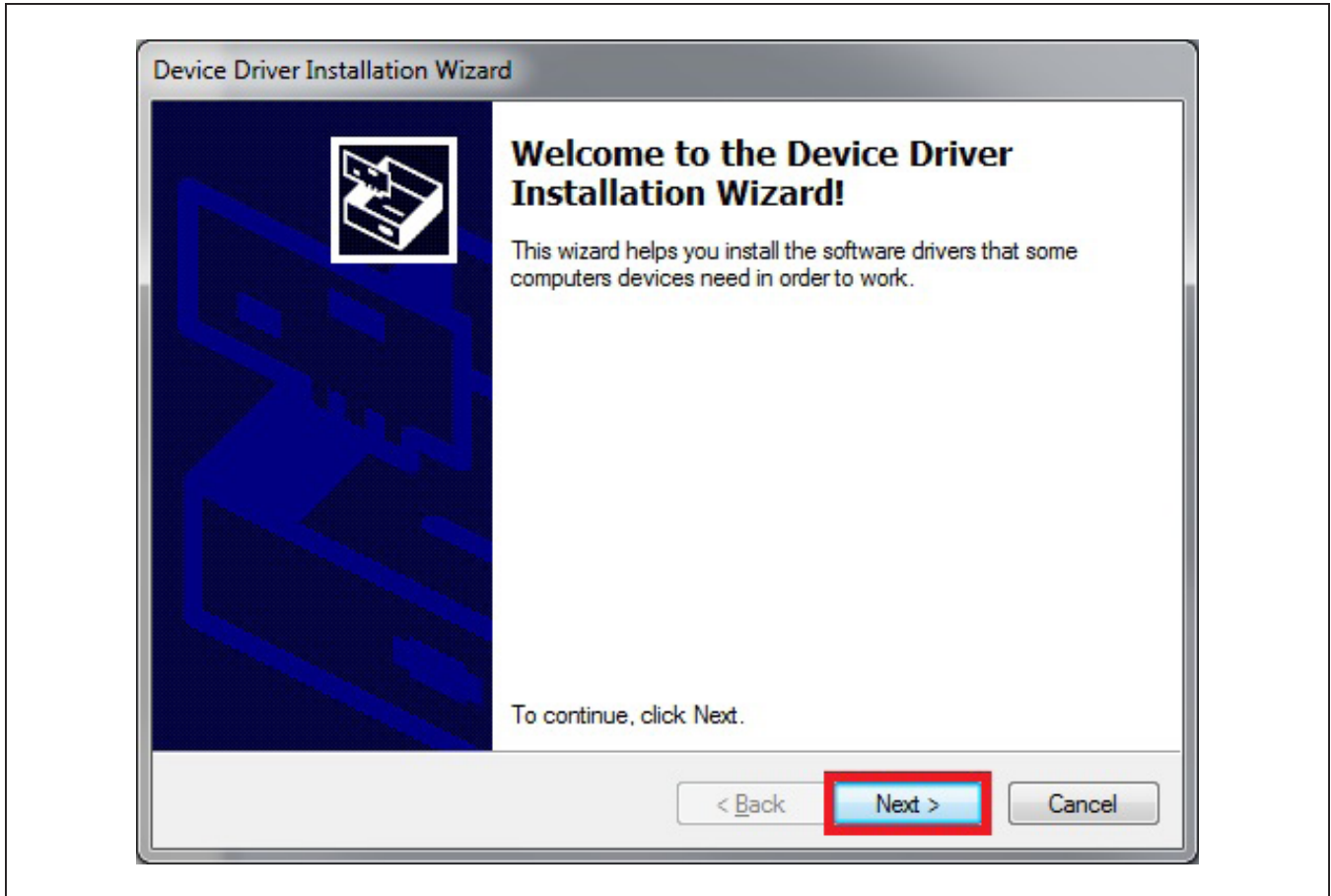


Figure 6. Device Driver

8) Click on **Finish** to close the final window and confirm the driver is installed correctly (Figure 7).

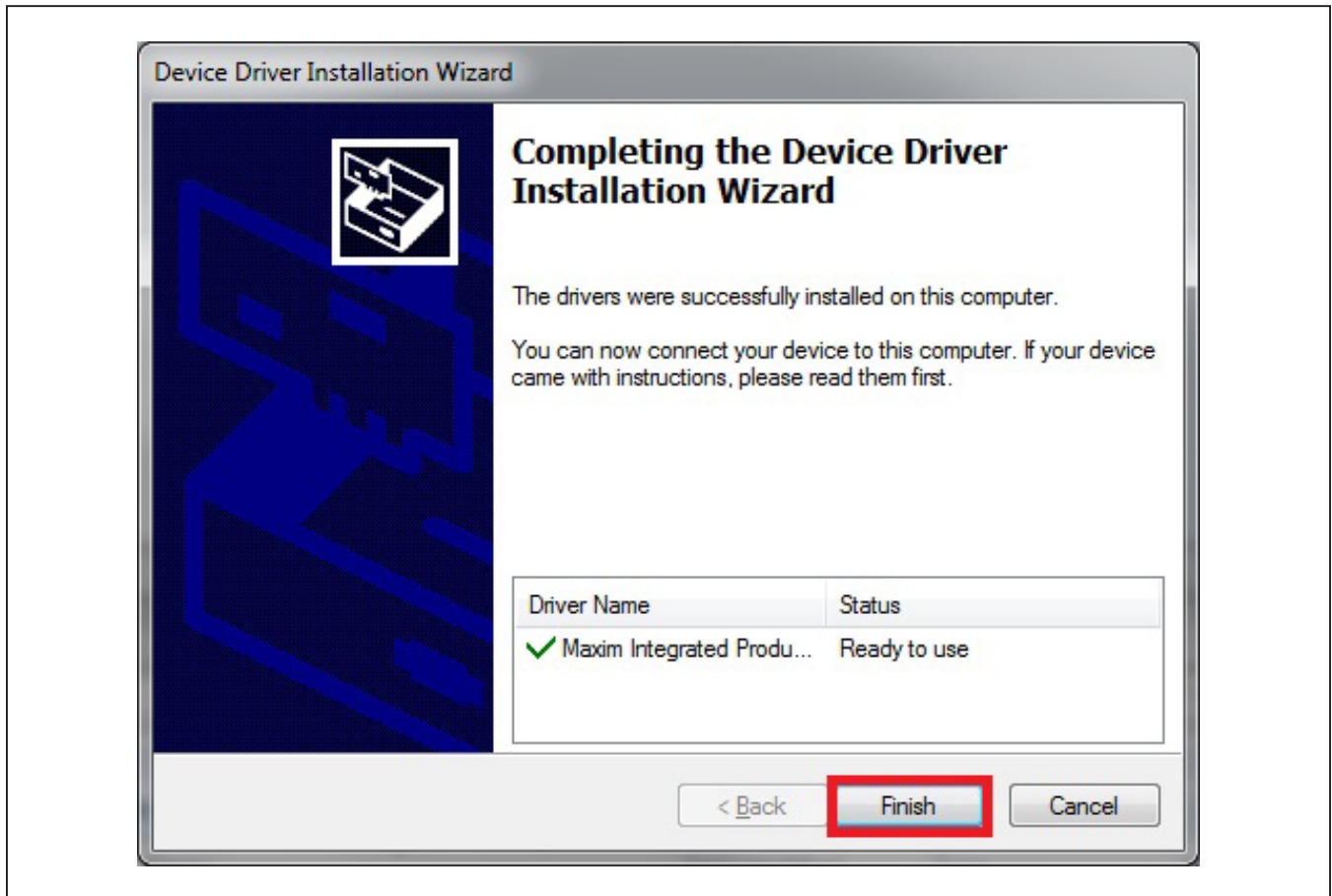


Figure 7. Device Driver Installation Finished

DS28C39 Evaluation System

Evaluates: DS28C39 and DS2476

- 9) Plug the DS9481P-300# into the PC with both DS9121AQ+ and DS9121BQ+ socket boards by doing the following:
 - a) (Optional—Perform only if using the coprocessor): Open the DS9121AQ+ socket and insert a DS2476 into the cavity, as shown in [Figure 8](#). **Note:** The plus (+) on the package must be be on the opposite side of the marker in the socket.
 - b) Open the DS9121BQ+ socket and insert a DS28C39 into the cavity, per the same orientation shown in [Figure 8](#).
 - c) Close both burn-in sockets.
 - d) Connect the DS9121AQ+ J2, 6-pin male plug, to the DS9481P-300#, 6-pin female socket, per [Figure 9](#).
 - e) Connect the DS9121AQ+ J1, 6-pin female socket, to the DS9121BQ+ J2, 6-pin male plug per [Figure 9](#).
 - f) For the DS9121AQ+ boards that contain DS2476, configure jumpers JP1 to use SDA and JB1 to use 3.3V per [Figure 9](#).
 - g) For the DS9121BQ+ board that contain DS28C39, configure jumpers JB3 to use SCL, JB4 to use SDA, and JB1 to use 3.3V per [Figure 9](#).
 - h) Plug the DS9481P-300#, using a USB Type-A to Micro-USB Type-B cable, into the PC.

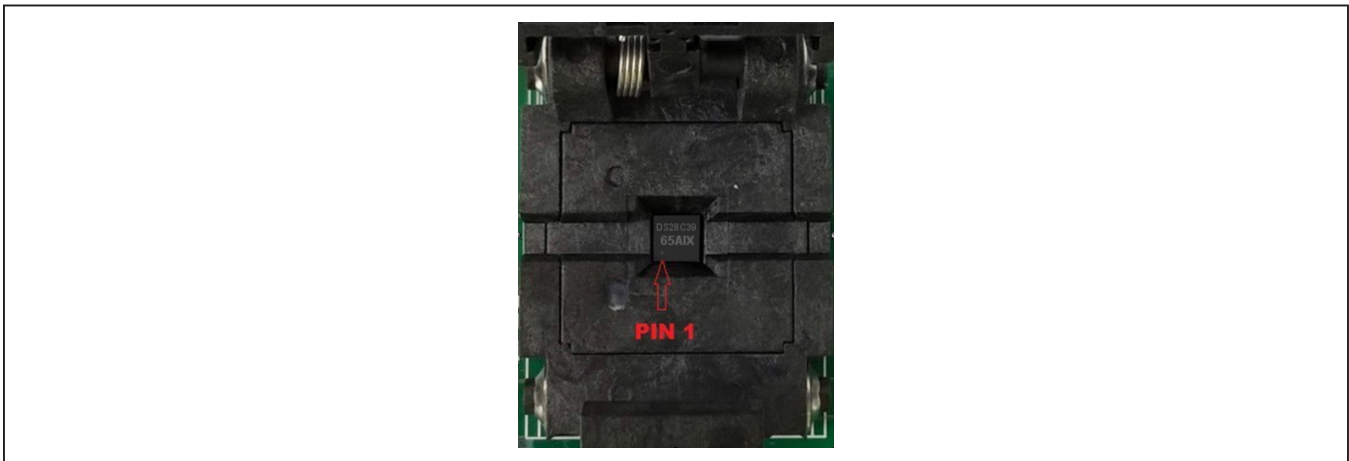


Figure 8. Orientation of the DS28C39 and DS2476 in the Burn-In Socket

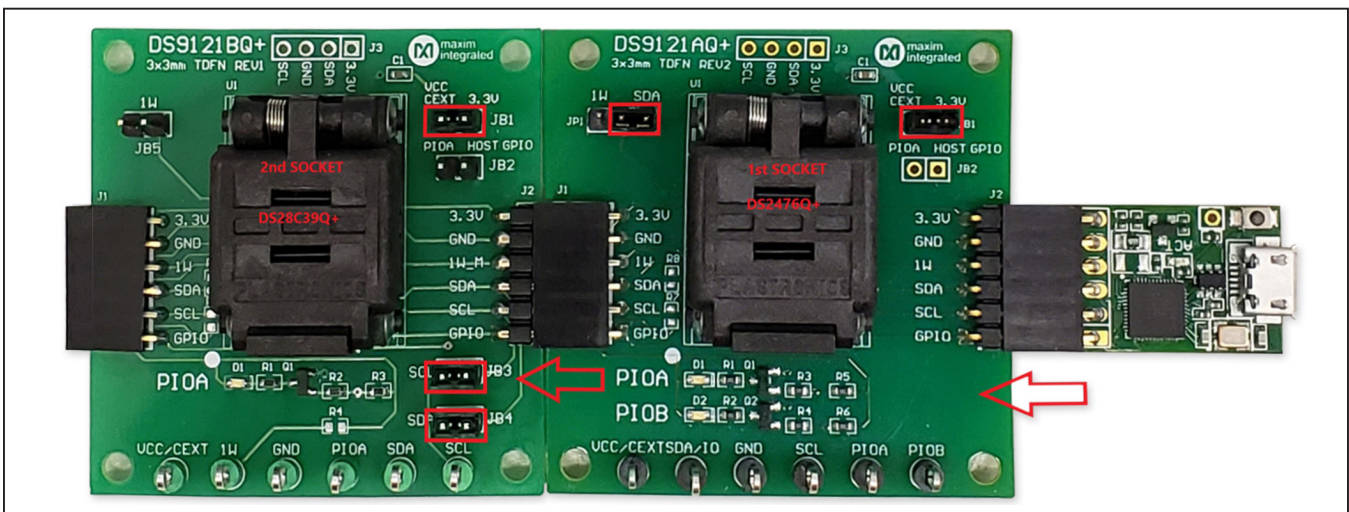


Figure 9. DS9481QA-300#, DS9121AQ, and DS9121BQ

10) Click on **Finish** to close the final window and confirm the software is installed correctly (Figure 10).

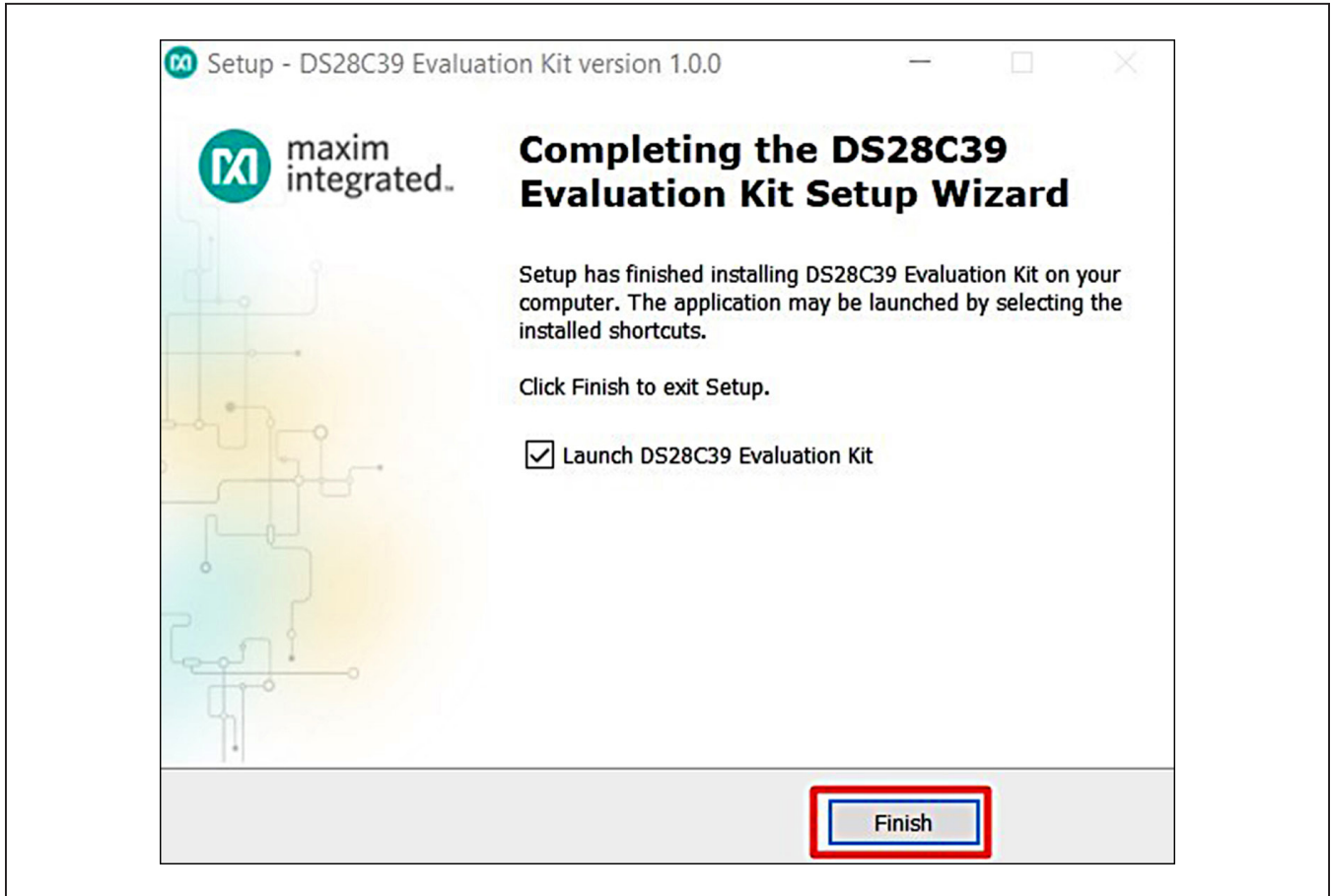


Figure 10. Software Installation Finished

11) The DS28C39 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 11](#).

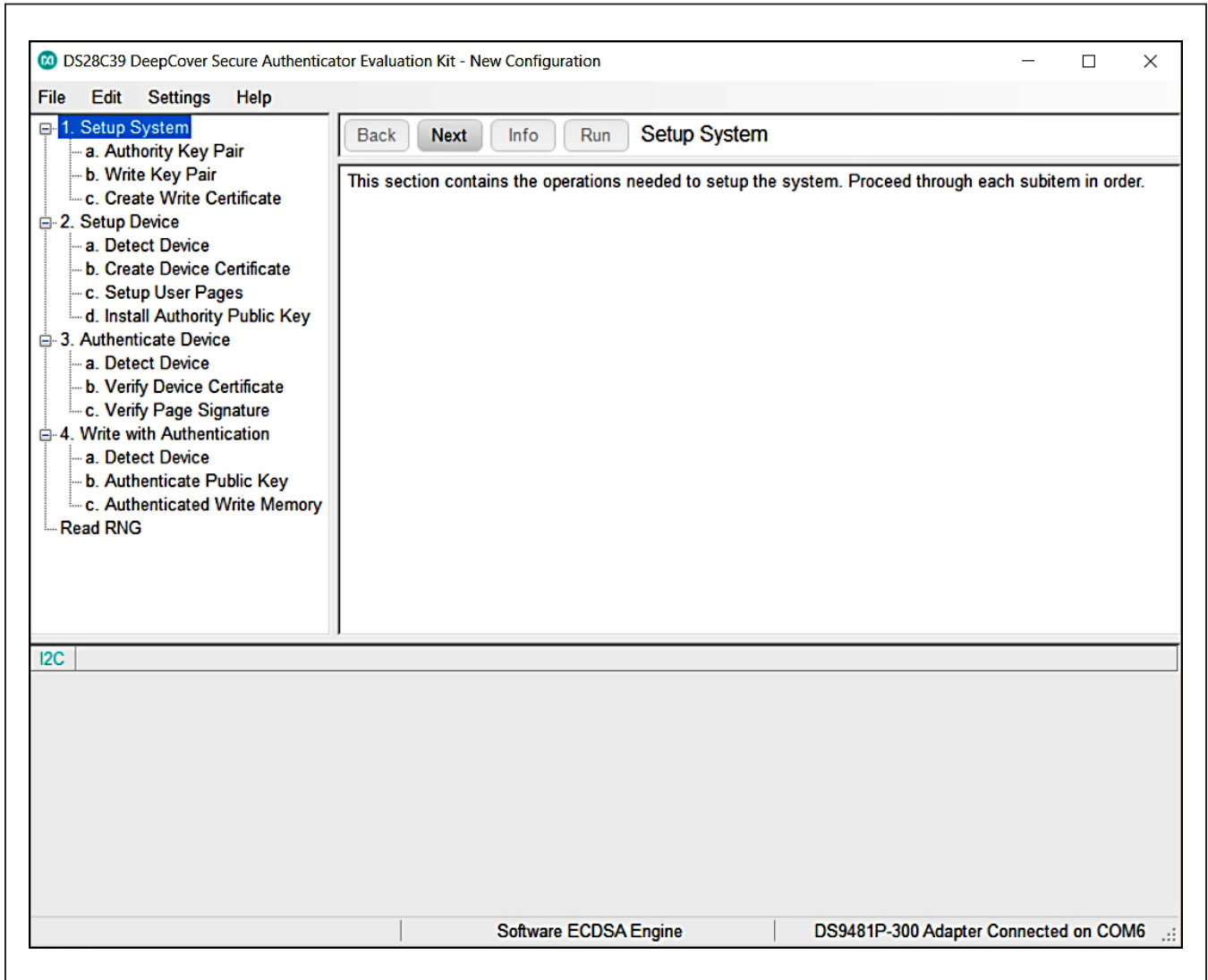


Figure 11. DS28C39 EV Kit Program (Default View Upon Opening)

EV Kit Supported Functions

The DS28C39 EV kit program is designed as a usage example. It includes the ability to either use the built-in software ECDSA engine or the DS2476BQ+ 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 **DS2476**. The GUI displays all the I²C 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 DS28C39 EV kit hardware includes the MAXQ1010 microcontroller with USB and two socket adapters, DS9121AQ and DS9121BQ, which are made to contain the DS2476 device or DS28C39 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 I²C computations to perform signature. The DS28C39 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 |
|---------------------------|----------------|--|
| Set Up System | | This is an example to perform at a provisioning authority. This contains the operations needed to set up the system Authority Key pair, Write Key pair, and the Write Certificate. |
| Set Up Device | | At a provisioning authority (e.g., a secure server at an equipment manufacturer), this contains the operations needed to set up the DS28C39 device. |
| Authenticate Device | X | This is an example to be used to authenticate with ECDSA for a read page of memory of the DS28C39 device. |
| Write with Authentication | | This is an example to change a page of memory to the DS28C39 device with authentication using ECDSA. |
| Read RNG | | Performs the operations to generate a random number from the DS28C39 device. This is a FIPS/NIST compliant true random number generator (TRNG). |

*Software supports all flows in Table 1.

Ordering Information

| PART | TYPE |
|---------------|--------|
| DS28C39EVKIT# | EV Kit |

#Denotes RoHS compliant.

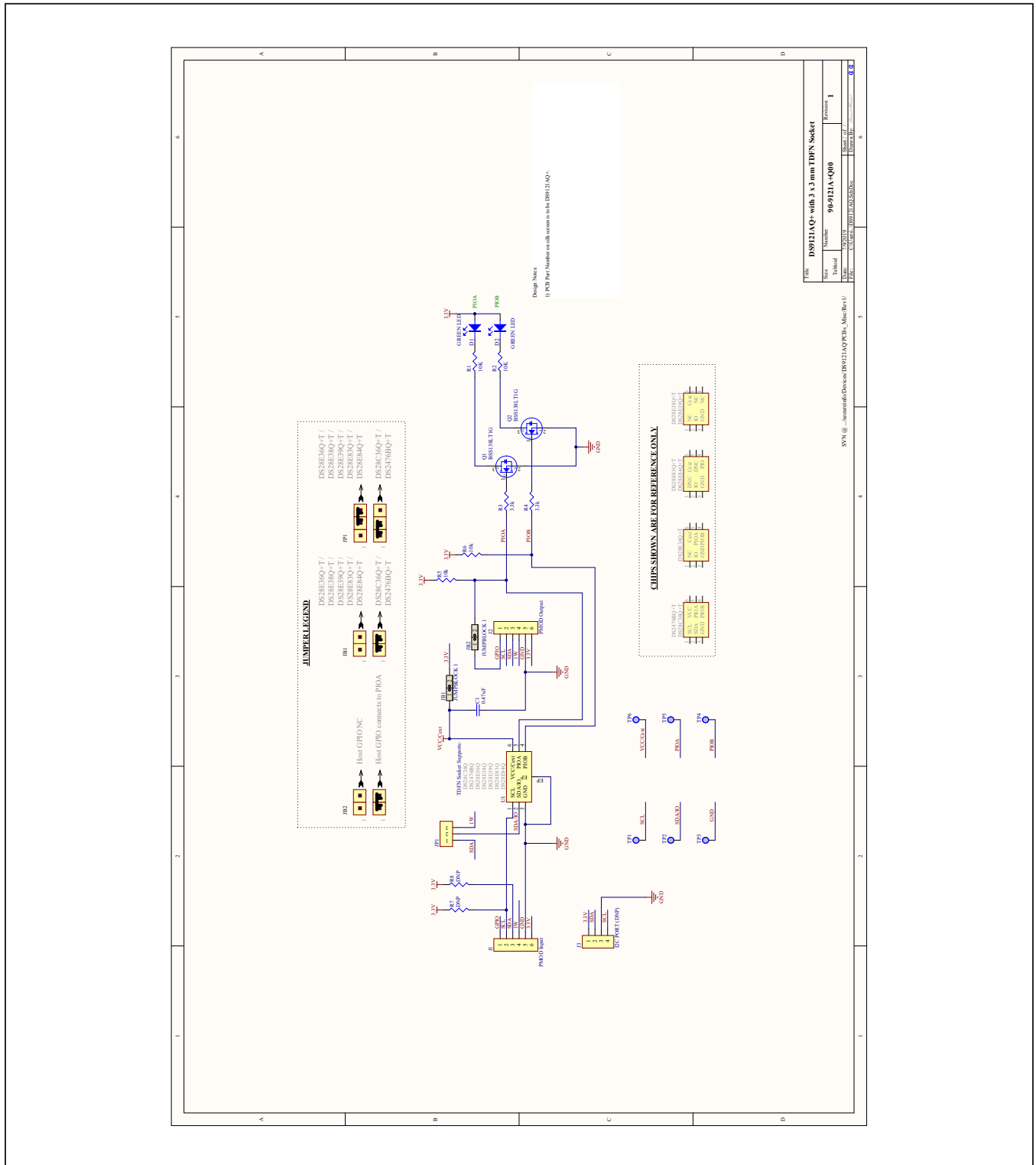
DS28C39 EV Kit Bill of Materials

| COMPONENT | DESCRIPTION | QTY | DESIGNATOR |
|-----------------|------------------------------------|-----|---|
| DS28C39Q+U | DS28C39Q+U | 5 | PACK-OUT |
| DS2476BQ+U | DS2476BQ+ | 5 | PACK-OUT |
| EH0802 | CABLE,USB A-TO-MICRO-B CABLE (1M) | 1 | PACK-OUT |
| DS9121BQ#_T1 | DS9121BQ#_T1 | 1 | PACK-OUT |
| 89-9121A+Q00_T1 | 89-9121A+Q00_T1 | 1 | PACK-OUT |
| 89-9481P#300_T1 | 89-9481P#300_T1 | 1 | PACK-OUT |
| EPCBDS9121AQ | PCB+,90-9121A+Q00 (DS9121Q+) | 1 | PCB |
| EH1056 | CONN+,HEADER,50PS,.100 SGL,R/A,AU | 6 | J2 -6P |
| EH1499 | CONN+,FEMALE,6POS,.100",R/A,GOLD | 1 | J1 |
| EH0400 | PC MOUNT TEST POINTS, BLACK | 6 | VCC/CEXTSDA/IO, GND, SCL, PIOA, PIOB |
| EH1104+ | SOCKET+,IC TDFN,3MM,3x2,CLAMSHELL | 1 | U1 |
| ECM0581 | CAP+,0.47uF,10%,16V,X7R,0603 | 1 | C1 |
| ED0950 | LED+,GREEN CLEAR,3.2V,20mA,0603 | 2 | D1, D2 |
| EH1108 | CONN+,HDR,BRKWAY,40POS VERT,0.318" | 3 | JP1 -3P |
| EH0072 | HEADER 36-40 PINS (CUT TO FIT) | 2 | JB1 -2P |
| EH1106+ | SHUNT+,LP W/HANDLE 2 POS 30AU | 2 | PACK-OUT |
| EQ0745 | MOSFET+,N-CH ENHANCEMENT | 2 | Q1, Q2 |
| ER0106033301 | RES#,3.3K OHM,1%,0603 | 2 | R3, R4 |
| ER0106031002 | RES,10K OHM,1%,0603 | 4 | R1, R2, R5, R6 |
| EPCBDS9121BQ | PCB+, DS9121BQ# | 1 | |
| EH1056 | CONN+,HEADER,50PS,.100 SGL,R/A,AU | 6 | J2 -6P |
| EH1499 | CONN+,FEMALE,6POS,.100",R/A,GOLD | 1 | J1 |
| EH0400 | PC MOUNT TEST POINTS, BLACK | 6 | TP1-TP6 |
| EH1104+ | SOCKET+,IC TDFN,3MM,3x2,CLAMSHELL | 1 | U1 |
| ECM0581 | CAP+,0.47uF,10%,16V,X7R,0603 | 1 | C1 |
| ED0950 | LED+,GREEN CLEAR,3.2V,20mA,0603 | 1 | D1 |
| EH0072 | HEADER 36-40 PINS (CUT TO FIT) | 10 | JB1 -2P, JB2 -2P, JB3 -2P, BJ4 -2P, JB5 |
| EQ0745 | MOSFET+,N-CH ENHANCEMENT | 1 | Q1 |
| ER0106033301 | RES#,3.3K OHM,1%,0603 | 1 | R2 |
| ER0106031002 | RES,10K OHM,1%,0603 | 2 | R1,R3 |
| EPCBDS9481P-300 | PCB+,DS9481P-300# | 1 | |

DS28C39 EV Kit Bill of Materials (continued)

| COMPONENT | DESCRIPTION | QTY | DESIGNATOR |
|---------------|-------------------------------------|-----|-----------------------------|
| EC1065 | CAP+,1uF,20%,6.3V,X5R,0402 | 7 | C1, C2, C4, C7 C9, C11, C12 |
| EC1458B | CAP+,0.1uF,10%,6.3V,X5R,0402 | 3 | C3, C8, C13 |
| EC0976 | CAP+,10pF,5%,50V,C0G,0603 | 2 | C5, C6 |
| ECM0081 | CAP+,10pF,5%,50V,C0G,0402 | 1 | C10 |
| EH1498 | CONN+,RCPT STD MICRO USB TYPE B | 1 | CN1 |
| ED1021 | LED+,ORANGE,1.9V,5mA,0603 | 1 | D1 |
| EL1804 | FER BEAD+,220 OHM,2.2A,0603 | 2 | FB1, FB2 |
| EH1716 | SOCKET+,0.1",6 POS,FEMALE,R/A,TH | 1 | J1 |
| EQ0219 | 2N7002 MOSFET, SOT-23 | 1 | Q1 |
| EQ1054 | MOSFET+,P-CHANNEL,20V,3.9A,SOT-23 | 1 | Q2 |
| ER05060310R0 | RES#,10 OHM,5%,0603 | 1 | R1 |
| ER0504021501 | RES#,1.5K OHM,5%,0402 | 1 | R2 |
| ER0104021003 | RES#,100K OHM,1%,0402 | 3 | R3, R6, R7 |
| ER0104023242 | RES#,32.4K OHM,1%,0402 | 1 | R4 |
| ER0504024701 | RES#,4.7K OHM,5%,0402 | 1 | R5 |
| ER0504021001 | RES#,1K OHM,5%,0402 | 1 | R8 |
| ER0504022201 | RES#,2.2K OHM,5%,0402 | 1 | R9 |
| ER0104024990 | RES#,499 OHM,1%,0402 | 1 | R10 |
| ER0108054R99 | RES#,4.99 OHM,1%,0805 | 1 | R11 |
| ER0504026800 | RES#,680 OHM,5%,0402 | 1 | R12 |
| ER0104021741 | RES#,1.74K OHM,1%,0402 | 2 | R13, R14 |
| EH1032 | FUSE+,PTC,RESETTABLE,0.12A,30V,1206 | 1 | RT1 |
| EH1359 | SWITCH#,TACTILE,SPST-NO,.05A,,SMD | 1 | S1 |
| MAXQ1010-A01+ | MAXQ1010-A01+ | 1 | U1 |
| MAX8891EXK33+ | MAX8891EXK33+ | 1 | U2 |
| MAX3207EAUT+ | MAX3207EAUT+ | 1 | U3 |
| MAX9140AAXK+ | MAX9140AAXK+ | 1 | U4 |
| MAX13204EALT+ | MAX13204EALT+ | 1 | U5 |
| EX0586 | XTAL+,12MHz,50ppm,10pF,4-SMD | 1 | X1 |

DS28C39 EV Kit Schematic



DS28C39 EV Kit Schematic (continued)

