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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/I²C Adapter
1	USB Type-A to Micro-USB Type-B Cable

Features

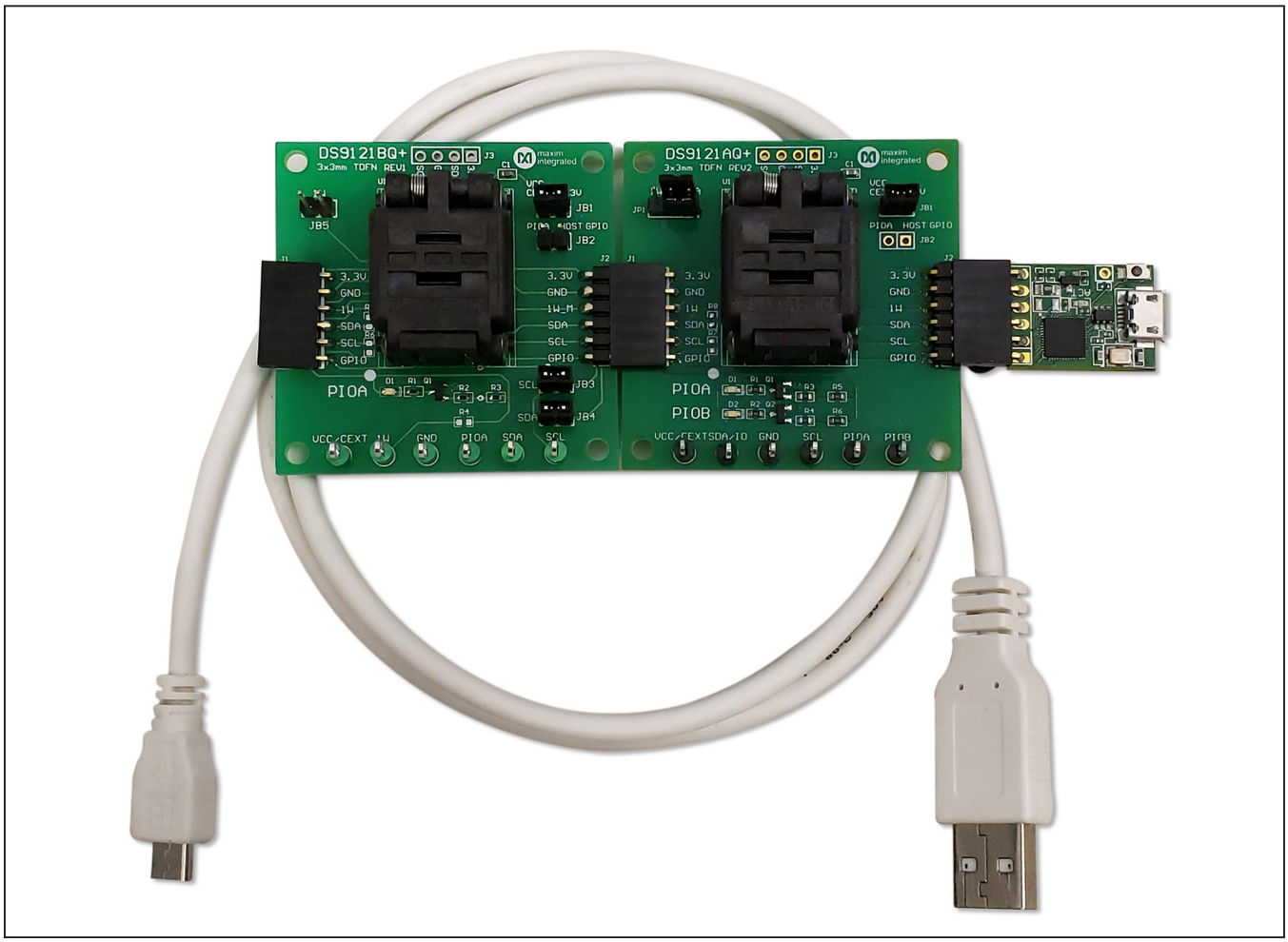
- Demonstrates the Features of the DS28C39 DeepCover® ECDSA Authenticator
- Demonstrates the Features of the DS2476 DeepCover Secure Coprocessor
- I²C Communication Is Logged to Aid Firmware Designers Understanding of DS28C39 and DS2476
- I²C USB Adapter Creates a Virtual COM Port on Any PC
- Fully Compliant 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.*

319-100395; Rev 0; 8/19

maxim integrated™

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).

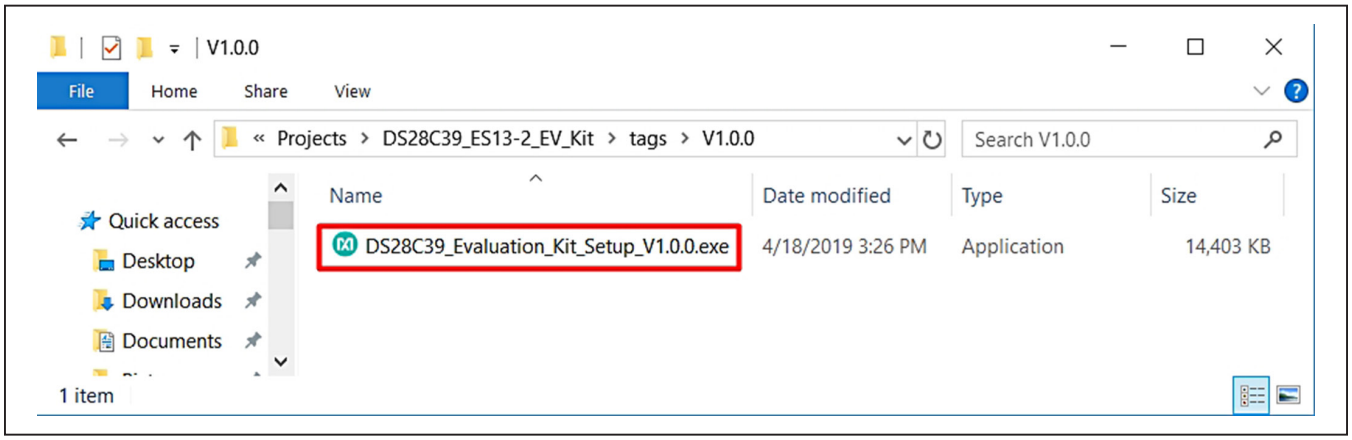


Figure 1. File Viewer

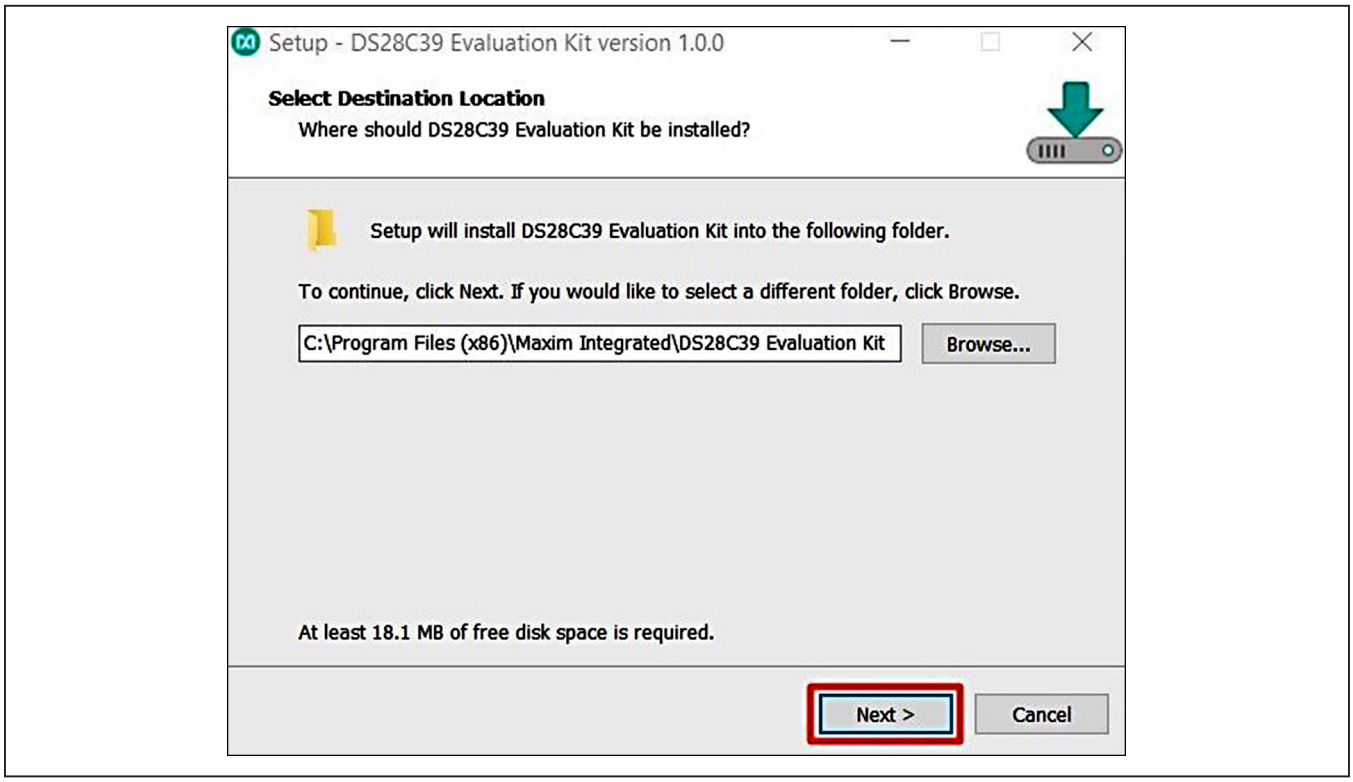


Figure 2. Install Folder Location

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

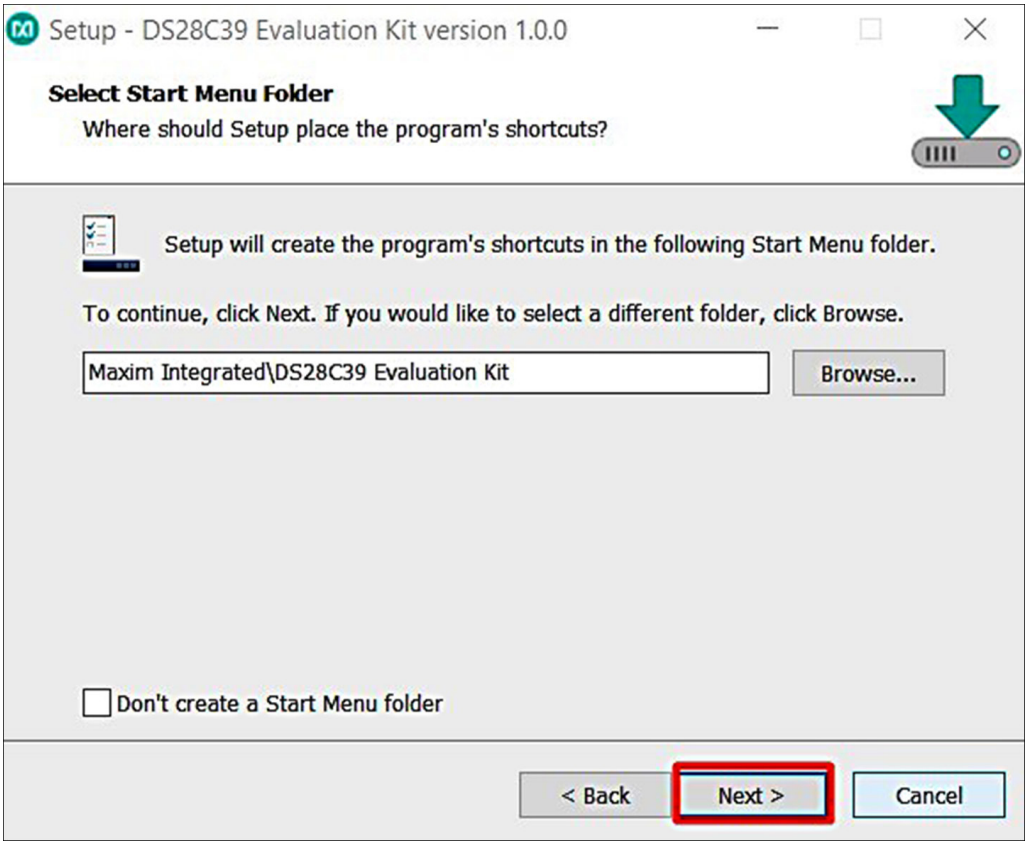


Figure 3. Program Shortcuts Location

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).

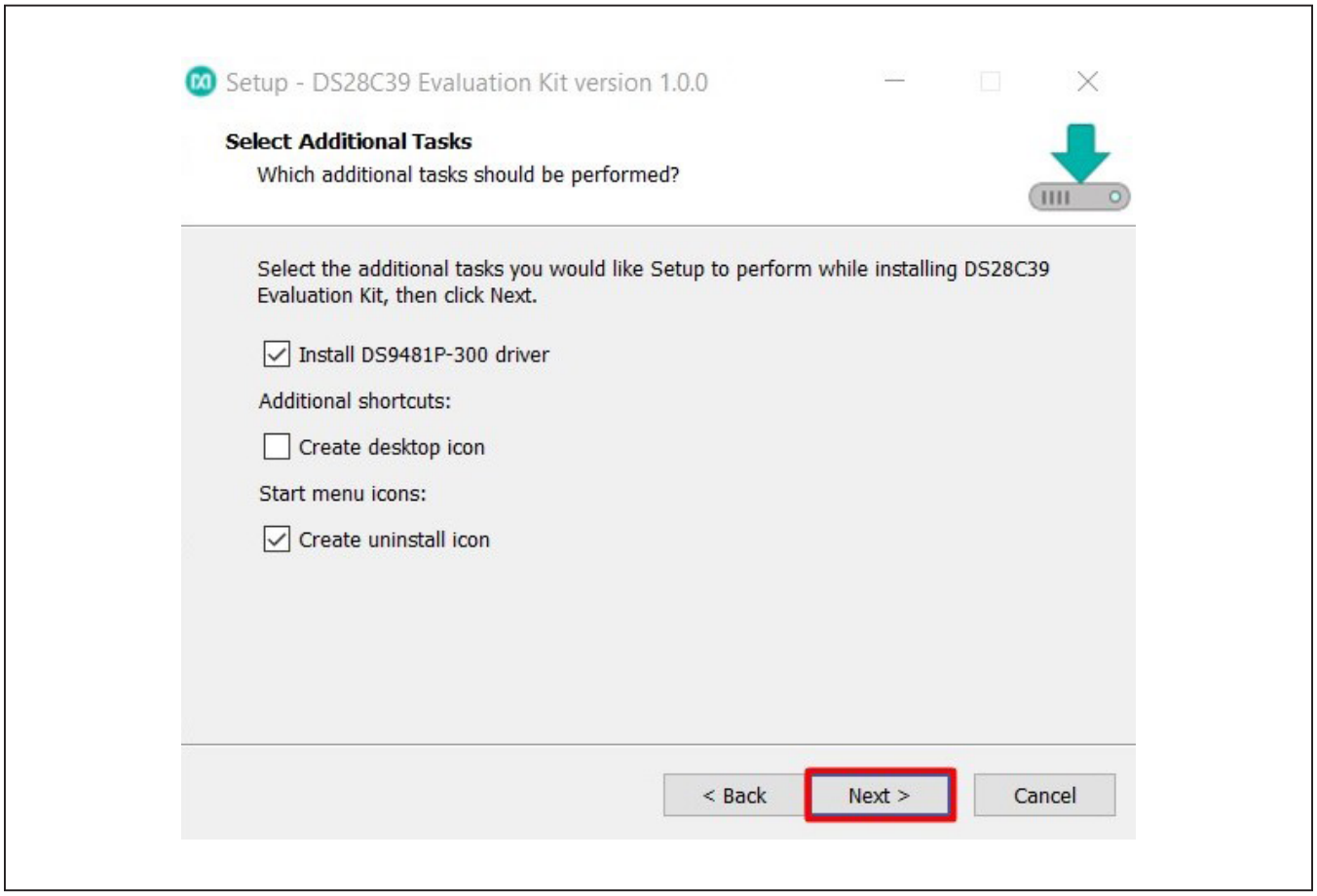


Figure 4. Select to Install the Driver

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

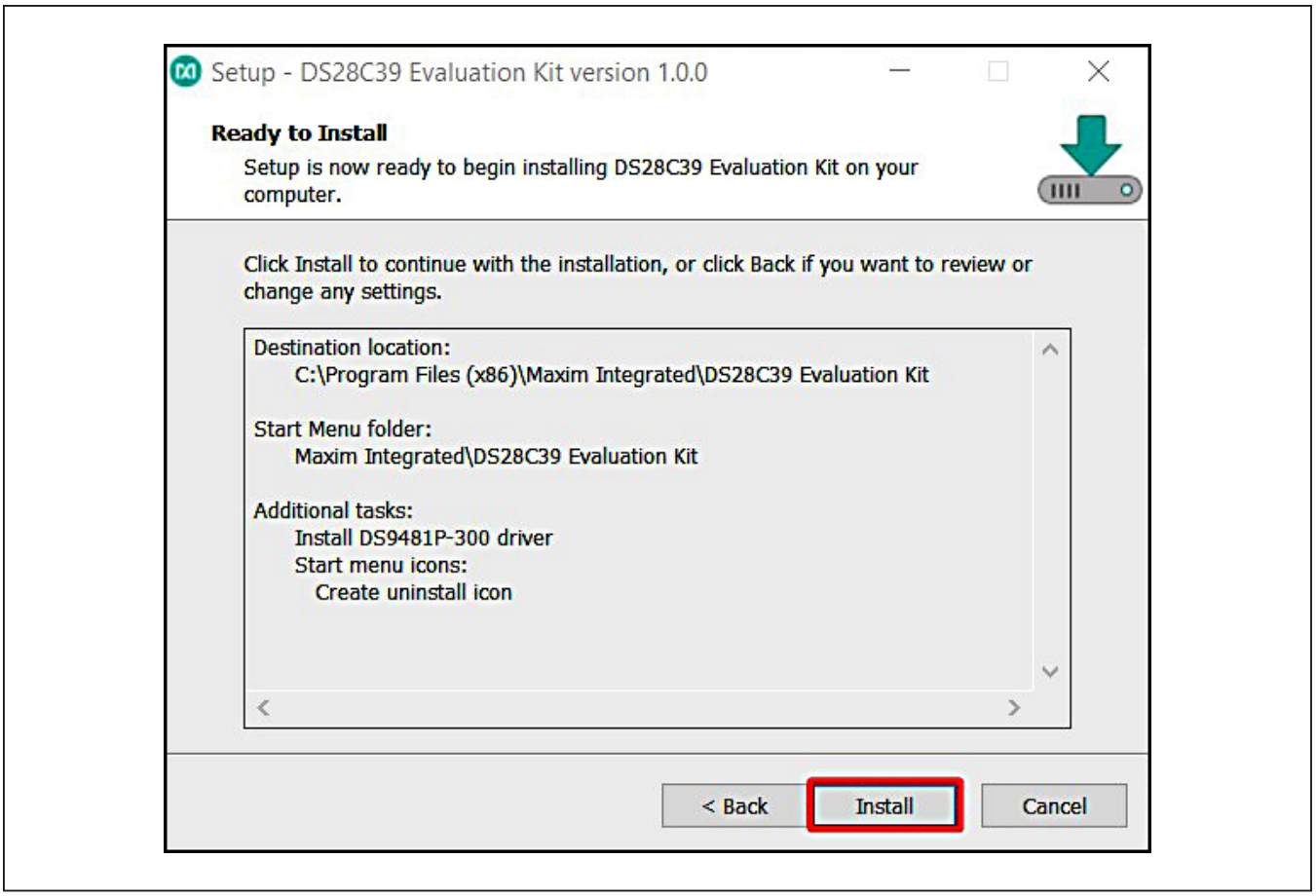


Figure 5. Ready to Install

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

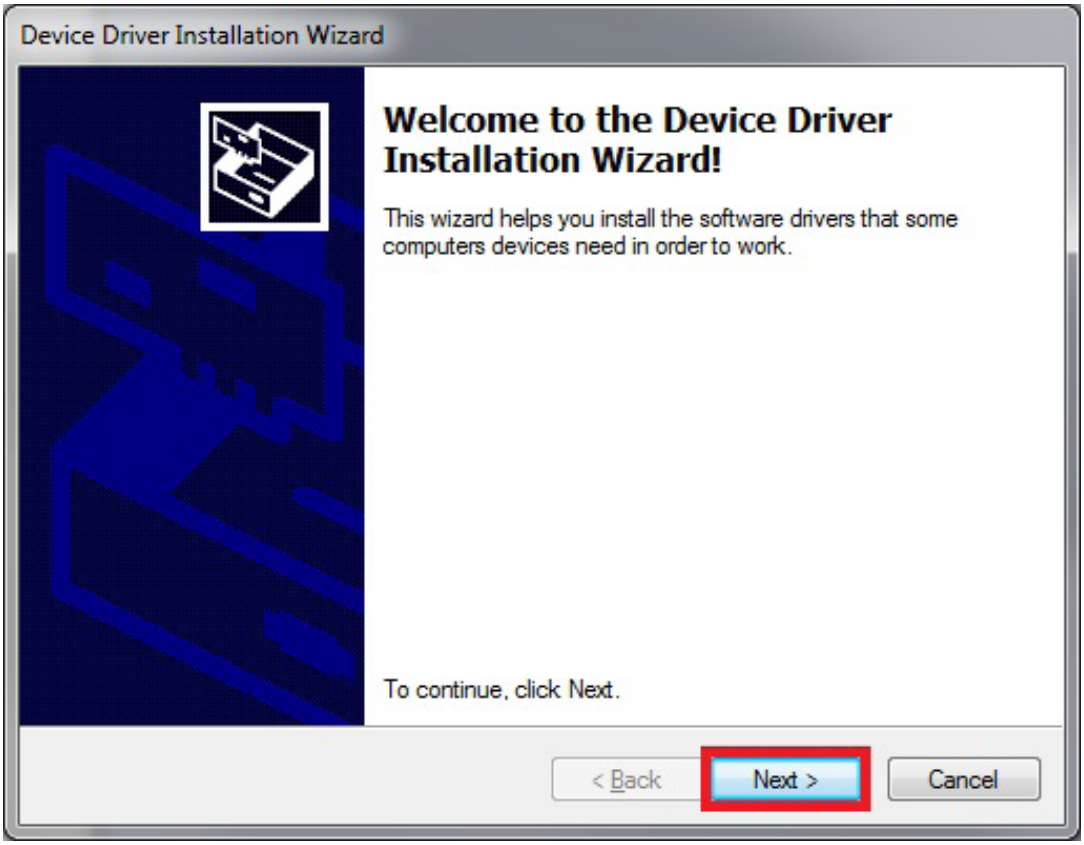


Figure 6. Device Driver

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

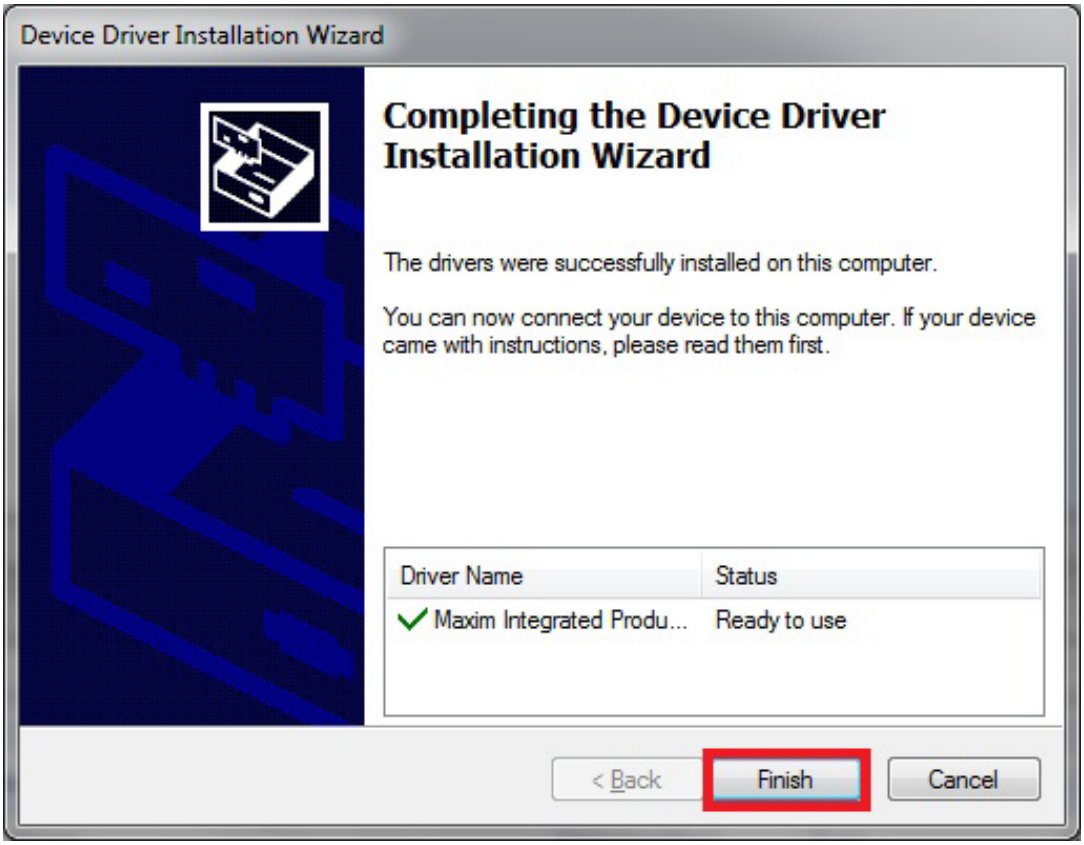


Figure 7. Device Driver Installation Finished

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 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.

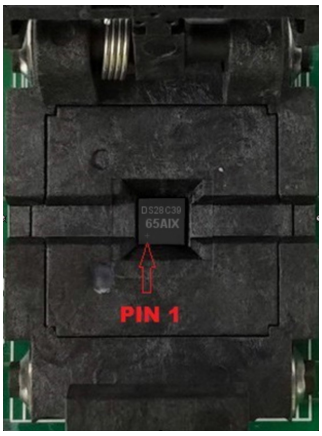


Figure 8. Orientation of the DS28C39 and DS2476 in the Burn-In Socket

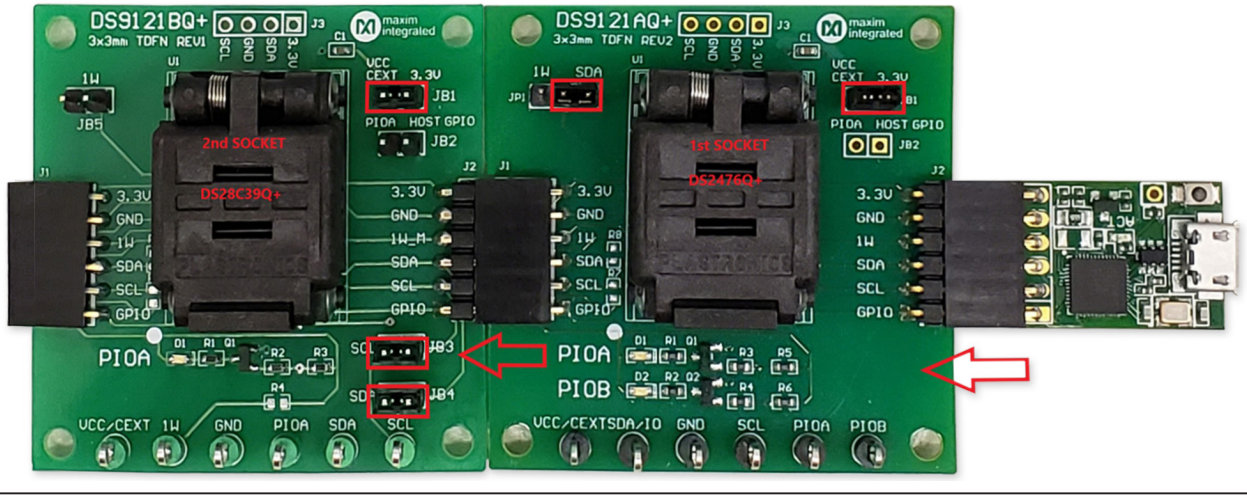


Figure 9. DS9481QA-300#, DS9121AQ, and DS9121BQ

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

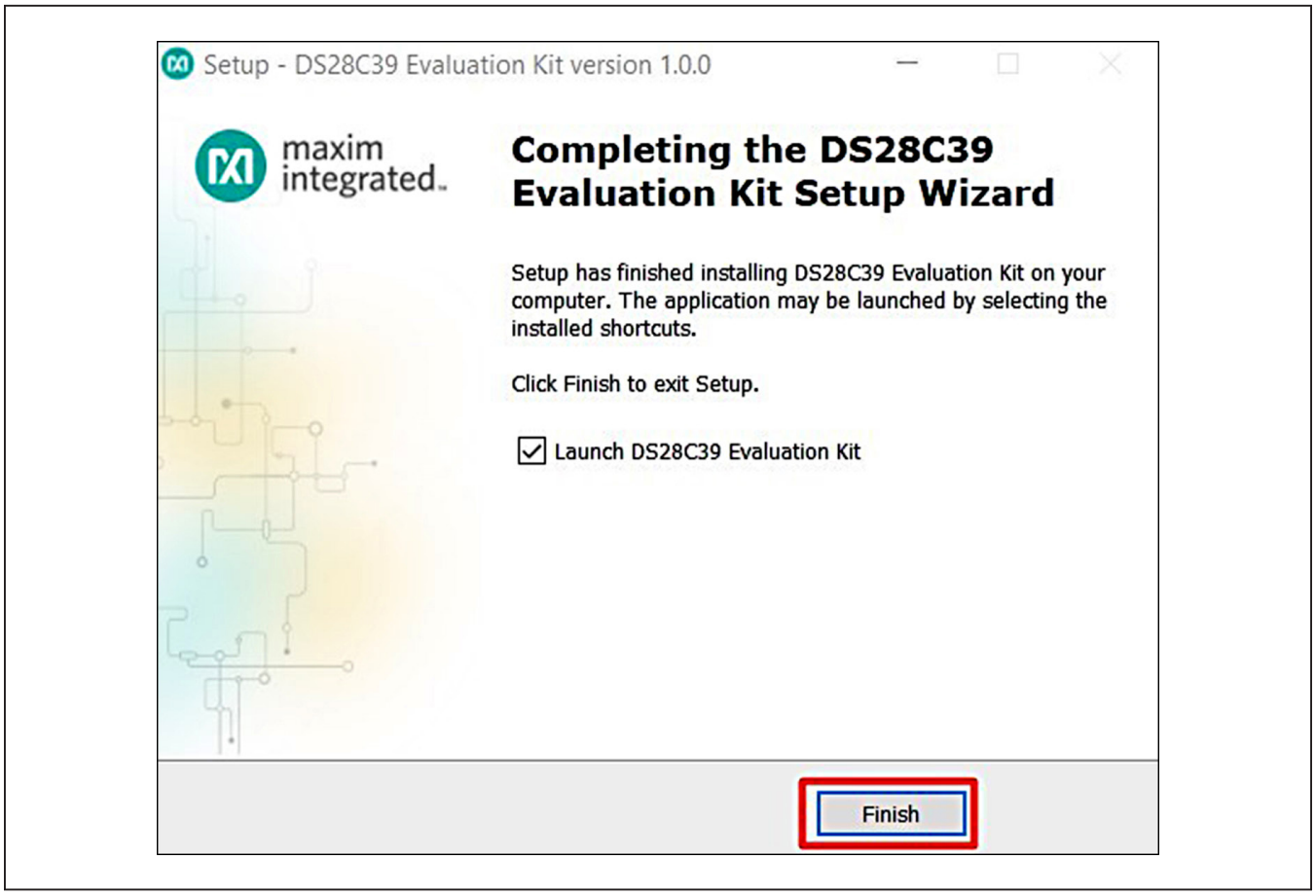


Figure 10. Software Installation Finished

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.

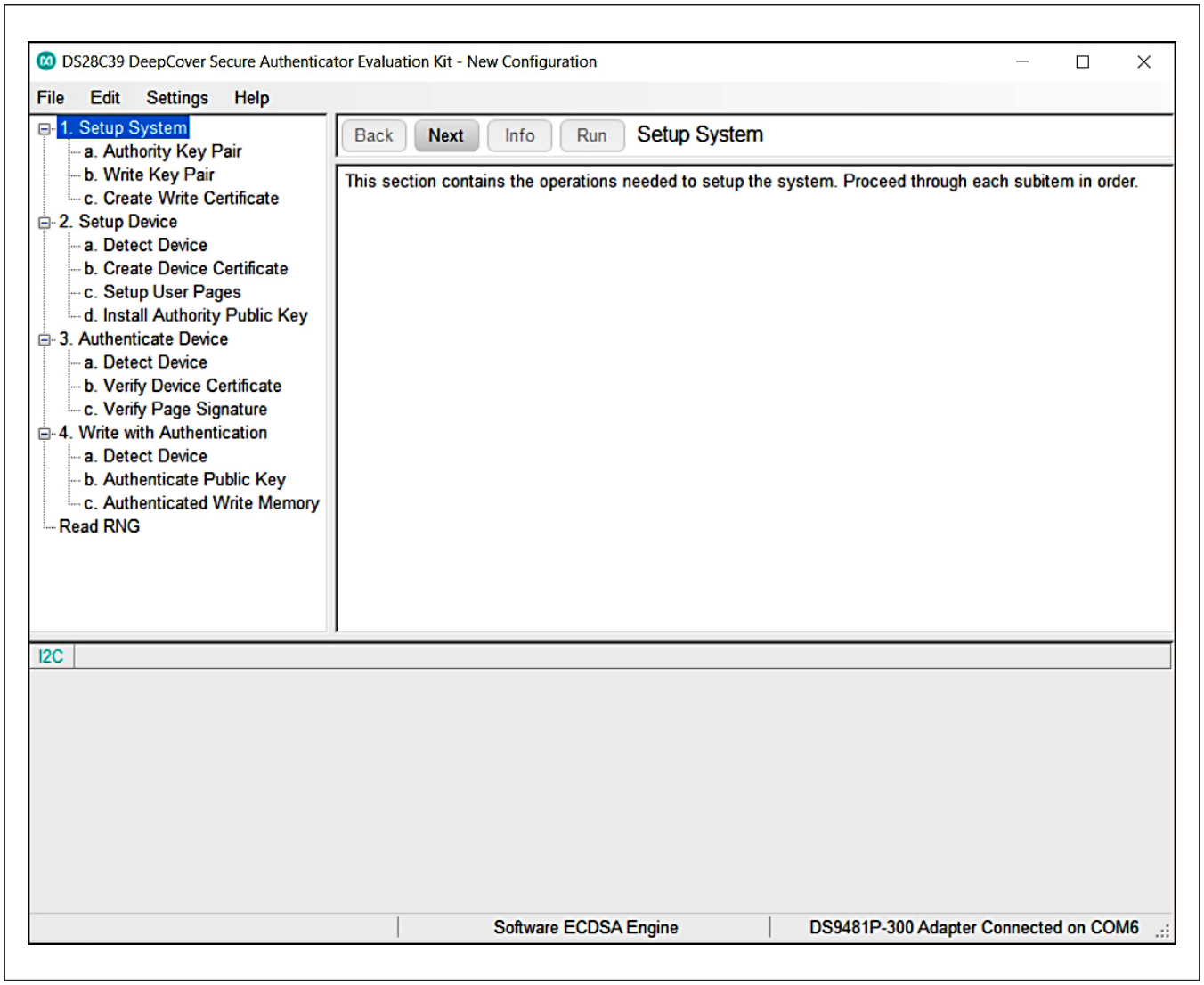


Figure 11. DS28C39 EV Kit Program (Default View Upon Opening)

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.

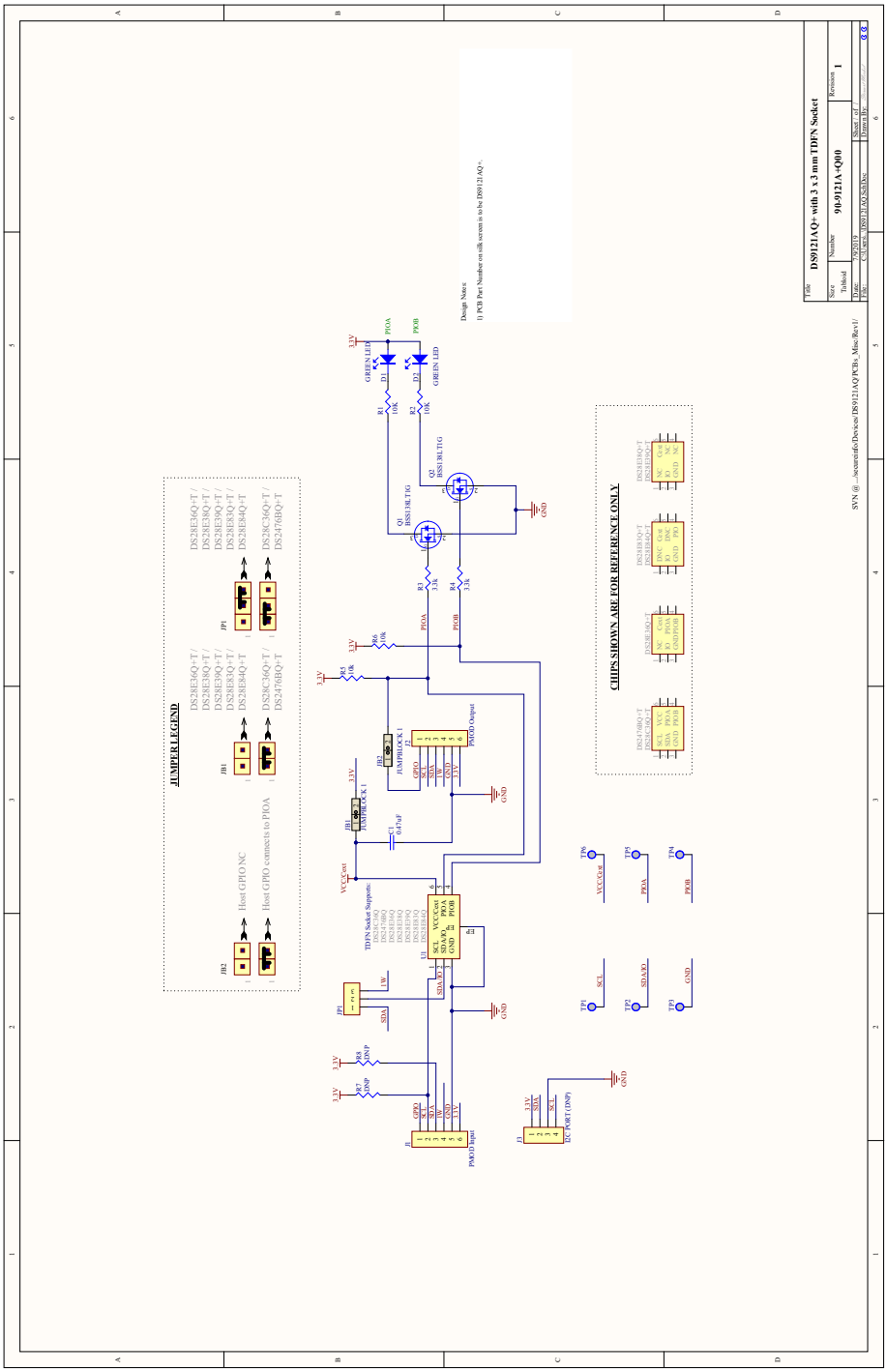
DS28C39 EV Kit Bill of Materials

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	

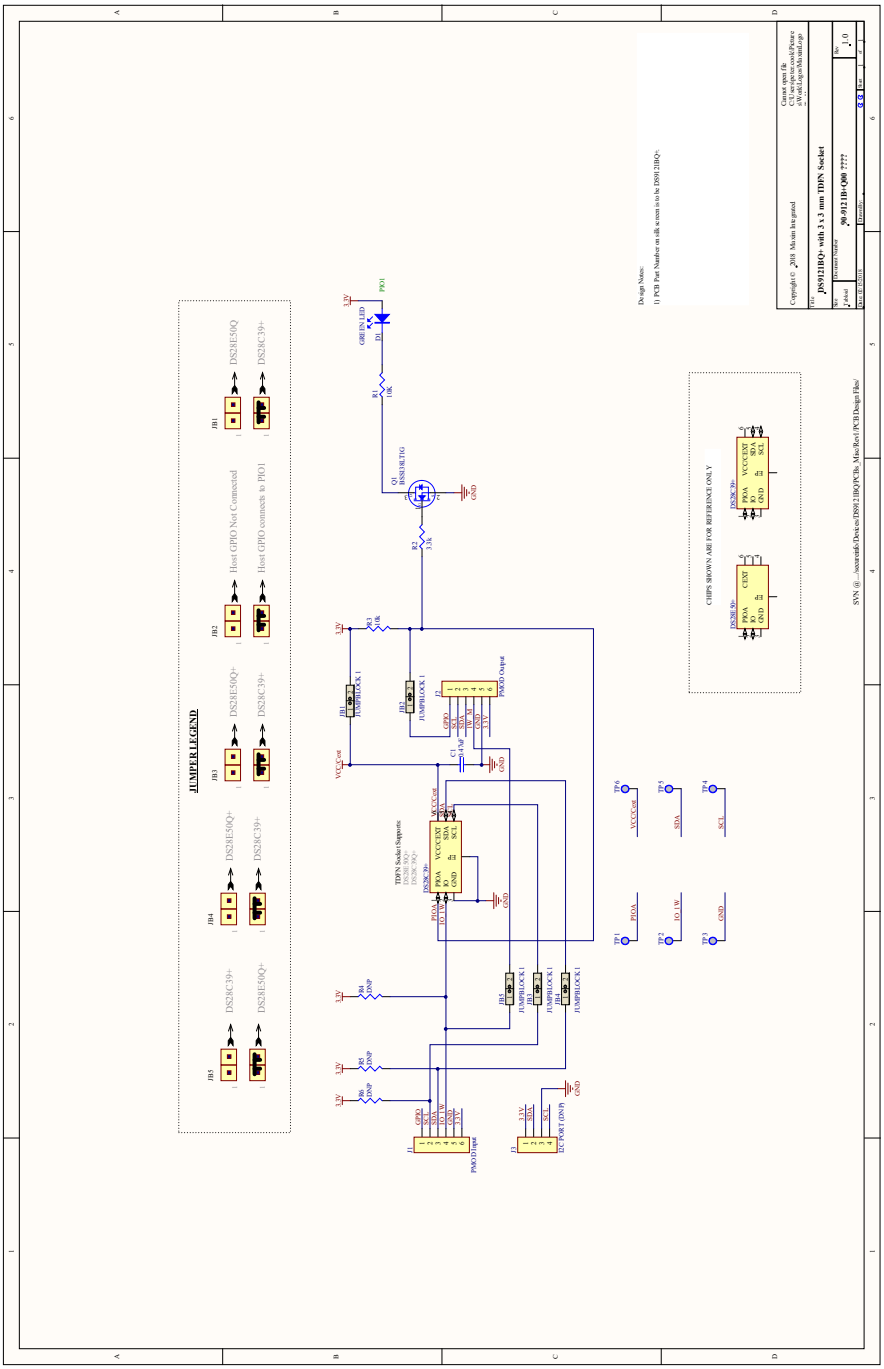
DS28C39 EV Kit Bill of Materials (continued)

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)



Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/19	Initial release	—

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