*Click **here** for production status of specific part numbers.*

DS28C40 Evaluation System Lite Version

Evaluates: DS28C40

General Description

The DS28C40 evaluation system (EV system) provides the hardware and software necessary to exercise the features of the DS28C40. The EV system consists of five DS28C40 devices in a 10-pin TDFN package, a DS9121CQ+ evaluation TDFN socket board, and a DS9481P-300# USB-to-I^{2}C/1-Wire® adapter. The evaluation software runs under Windows® 10, Windows 8, and Windows 7 operating systems, both 64- and 32-bit versions. It provides a handy user interface to exercise the features of the DS28C40.

Features

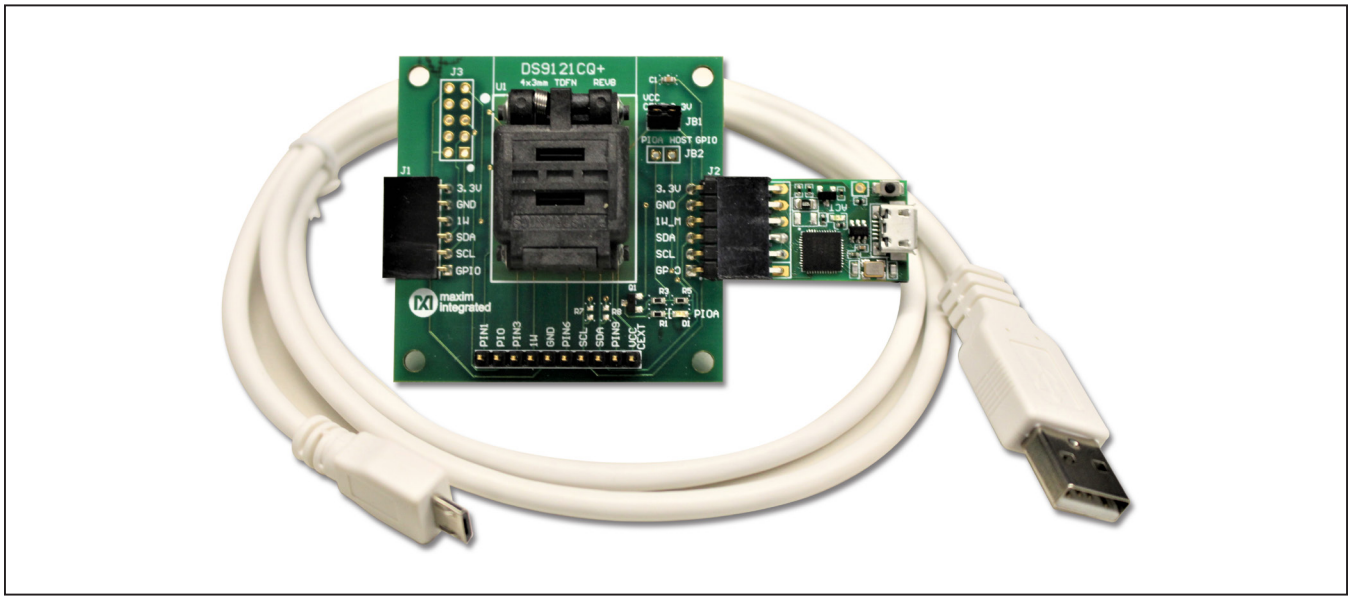
- Demonstrates the Features of the DS28C40 DeepCover Secure Authenticator
- Logs 1-Wire/I^{2}C Communication to Aid Firmware Designers Understanding of DS28C40
- 1-Wire/I^{2}C USB Adapter Creates a Virtual COM Port on Any PC
- Fully Compliant with USB Specification v2.0
- Software Runs on Windows 10, Windows 8, and Windows 7 for Both 64- and 32-Bit Versions
- 3.3V ±3% I^{2}C Operating Voltage
- Convenient On-Board Test Points, TDFN Socket
- Evaluation Software Available by Request

EV Kit Contents

QTY	DESCRIPTION
5	DS28C40Q+ DeepCover secure authenticator with (10 TDFN)
1	DS9121CQ+ socket board (10 TDFN)
1	DS9481P-300# USB to 1W/I^{2}C Adapter
1	USB Type-A to USB Mini Type-B cable

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

DS28C40 EV System with a USB Cable



DeepCover is a registered trademark of Maxim Integrated Products, Inc.
Windows is registered trademarks of Microsoft Corp.
Windows is a registered trademark and registered service mark of Microsoft Corporation.

319-100391; Rev 0; 6/19

Quick Start

This section is intended to give the DS28C40 evaluator a list of recommended equipment and instructions on how to set up the Windows-based computer for the evaluation software.

Recommended Equipment

- DS9481P-300# USB to 1W/I^{2}C Adapter
- DS9121CQ+ TDFN socket board
- DS28C40Q+ (five devices included)
- USB Type A-to-USB Micro-Type B cable (included)
- Computer with a Windows 10, Windows 8, or Windows 7 operating system (64- or 32-bit) and a spare USB 2.0 or higher port
- DS28C40 EV kit software. If needed go to the Maxim website and search for the DS28C40 EV kit. Click the **Design Resources** link. Then click the **DS28C40EVKIT Software Lite** link to download the **DS28C40_Evaluation_Kit_Lite_Version_Setup_V1_2_0.zip** file or newer version software.

Note: In the following sections, EV kit software related items are identified in **bold**. Windows operating system related items are identified in **bold and underline**.

Hardware Setup and Driver Installation Quick Start

The following steps were performed on a Windows 7 PC to setup the DS28C40 EV kit hardware/software:

1) Obtain and unpack **DS28C40_Evaluation_Kit_Lite_Version_Setup_V1_2_0.zip** file or newer version.
2) In a file viewer, double click on the **DS28C40_Evaluation_Kit_Lite_Version_Setup_V1_2_0** to begin the installation.

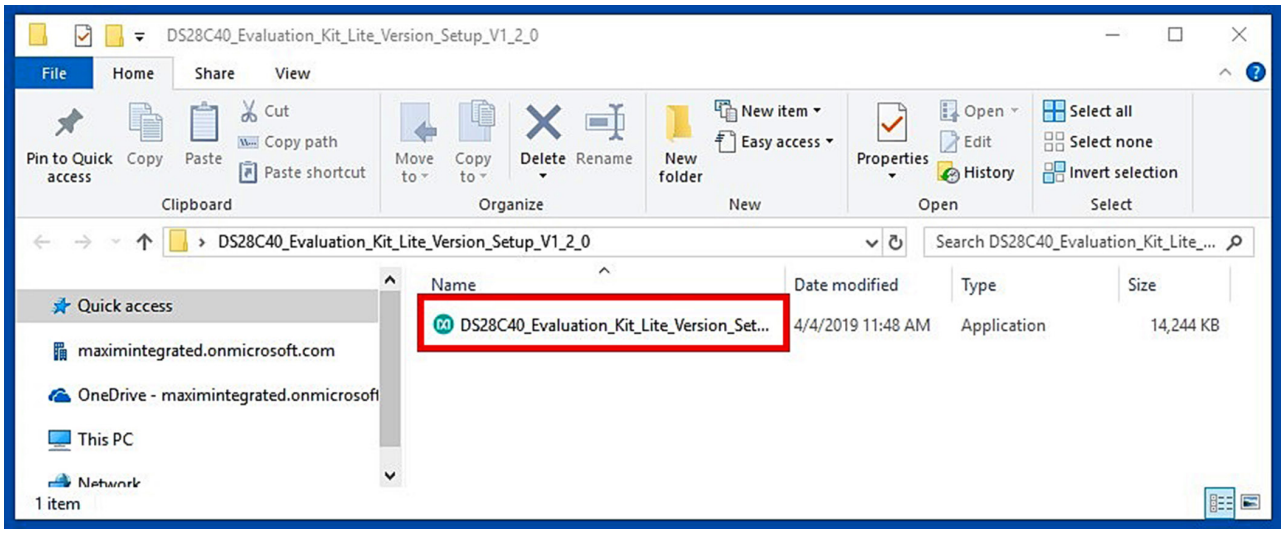


Figure 1. File Viewer

3) The setup wizard opens. Click on **Next** (Figure 2):
4) Click **Next** (Figure 3) to install to the default folder.

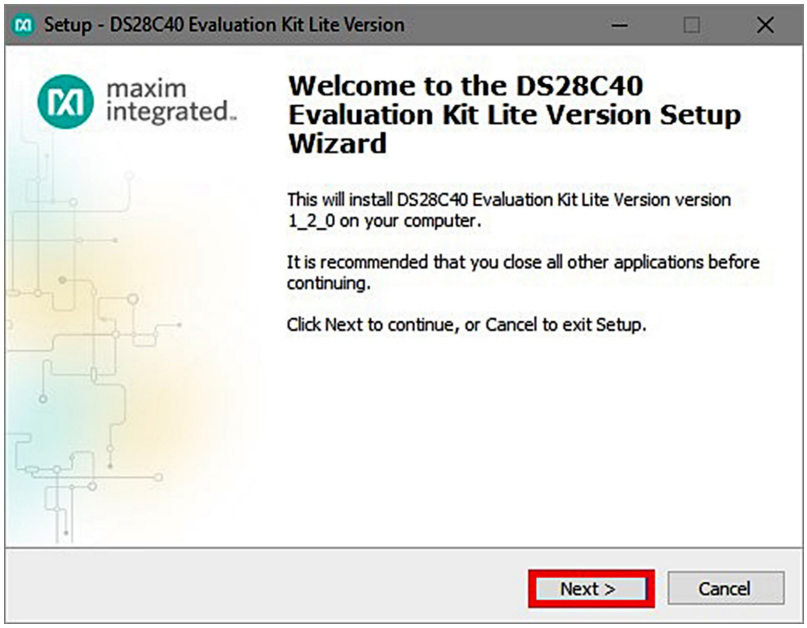


Figure 2. DS28C40 Setup Wizard

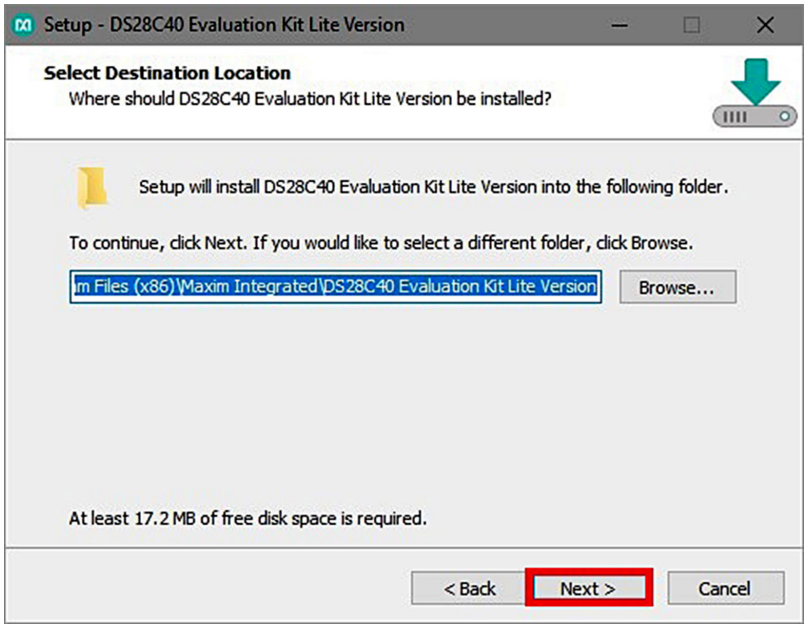


Figure 3. Install Folder Location

5) Click **Next** to install shortcuts to the default folder (Figure 4).
6) Unplug any Maxim adapter and click on **Next** (Figure 5) with the default settings checked. This action installs the DS9481P-300 driver that is needed to communicate through the USB by a virtual COM port.

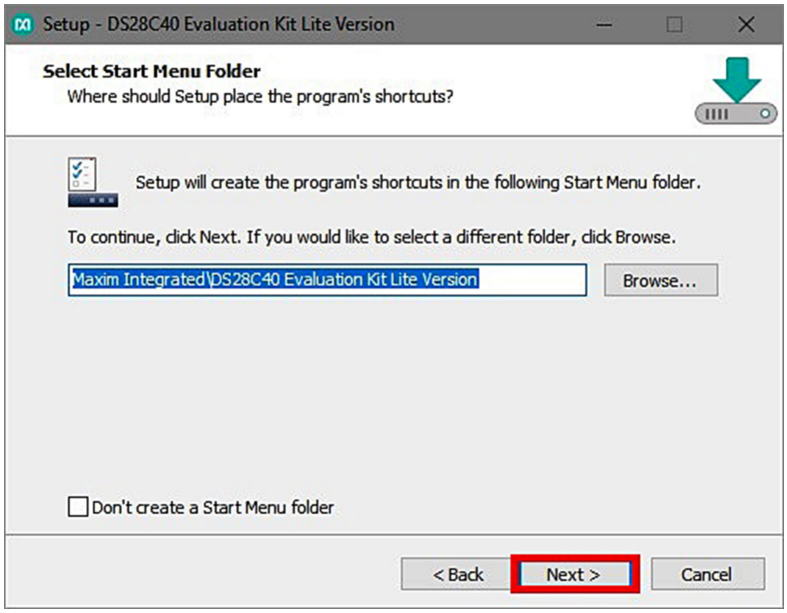


Figure 4. Program Shortcuts Location

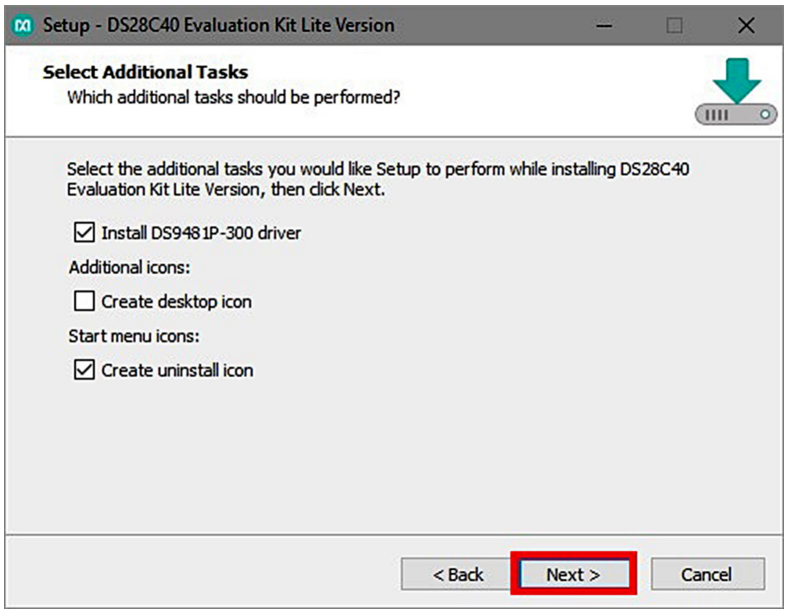


Figure 5. Select to Install the Driver

7) Next click on **Install** (Figure 6). A new window pops up to show progress of the installation.
8) Click on **Next** (Figure 7) when the **Device Driver Installation Wizard** appears.

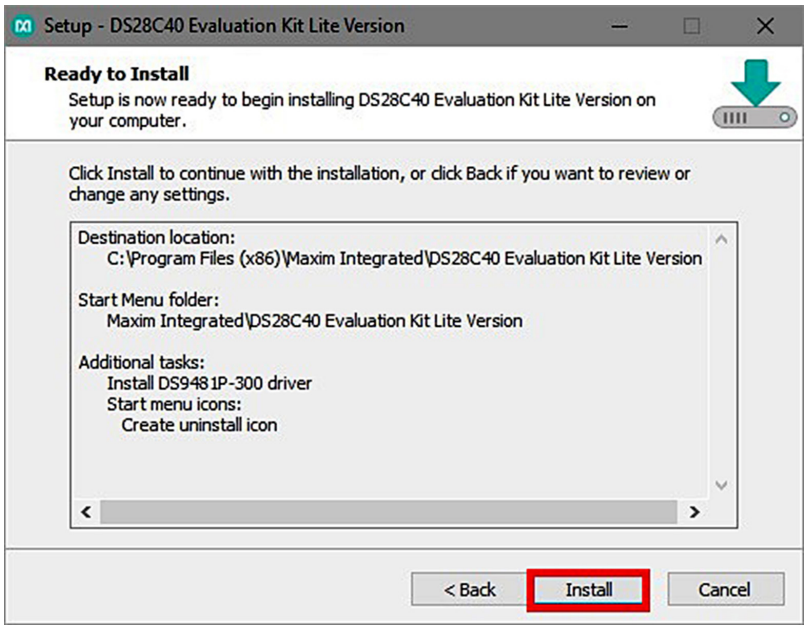


Figure 6. Ready to Install

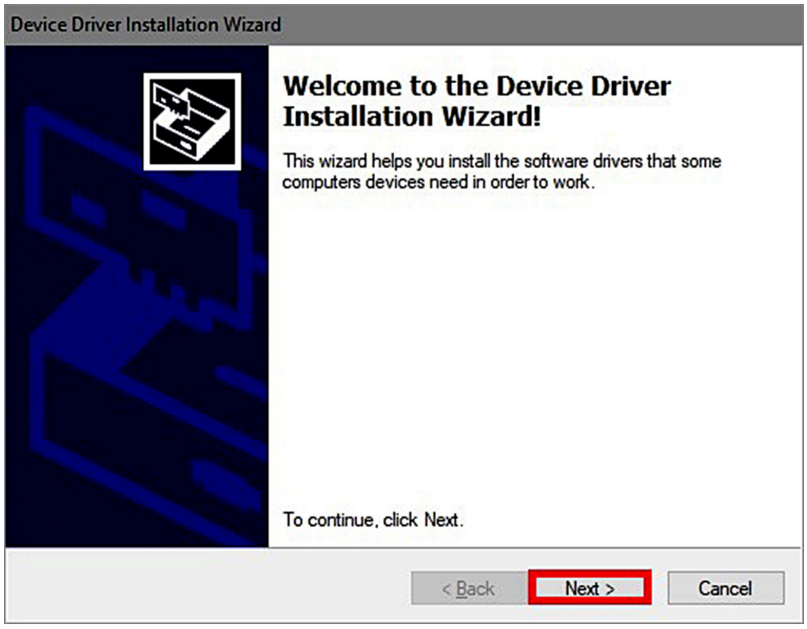


Figure 7. Device Driver

9) Click on **Finish** (Figure 8) to close the final window confirming the driver was installed correctly.

10) Now that the driver is installed, connect the hardware by doing the following:

   a) Open the socket and insert a DS28C40 into one of the cavities, as shown in Figure 9. **Note:** The plus (+) on the package must be on aligned with the top of the marker in the socket.

   b) Close the clamshell socket.

   c) Connect the DS9121CQ J2, 10-pin male plug, into the DS9481P-300#, 10-pin female socket (Figure 10).

   d) For the DS9121CQ+, insert jumper JB1 to use VCC (Figure 10).

   e) Plug-in the DS9481P-300# using USB Type-A to USB Micro Type-B cable into the PC.

Figure 8. Device Driver Installed Finished

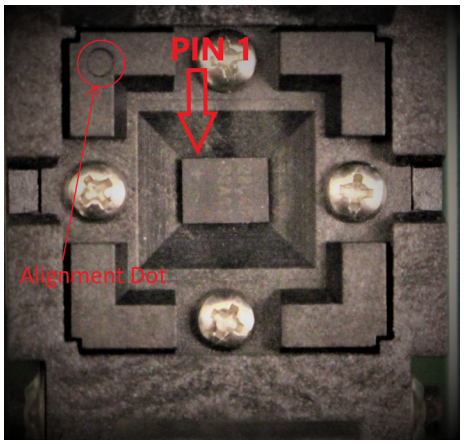


Figure 9. Orientation of the DS28C40 in the Clamshell Socket

11) Click on **Finish** (Figure 11) to close the final window confirming the software was installed correctly.

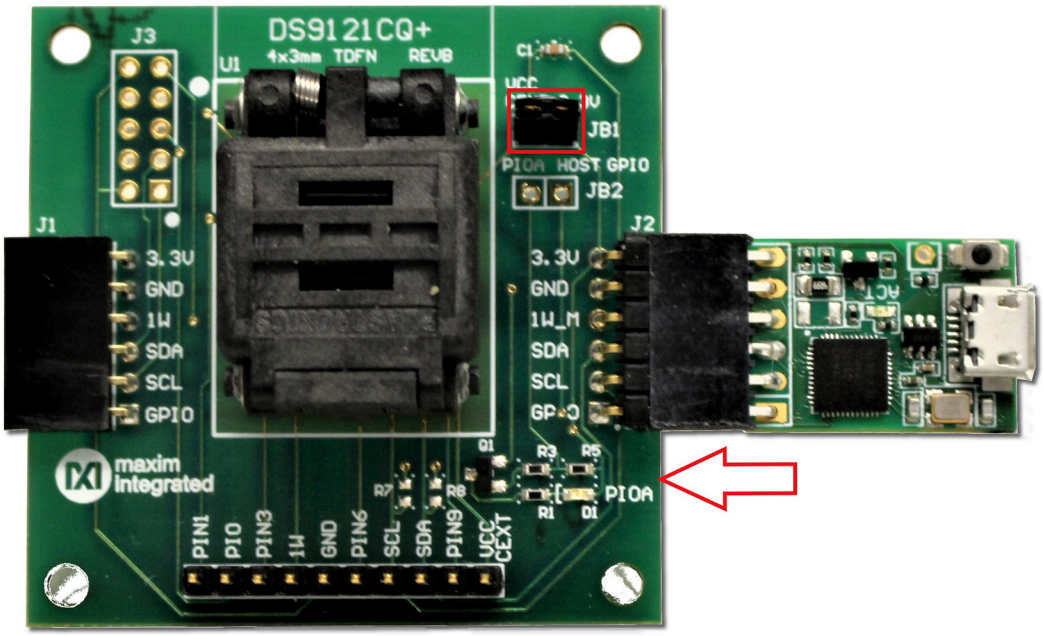


Figure 10. DS9481QA-300 and DS9121CQ

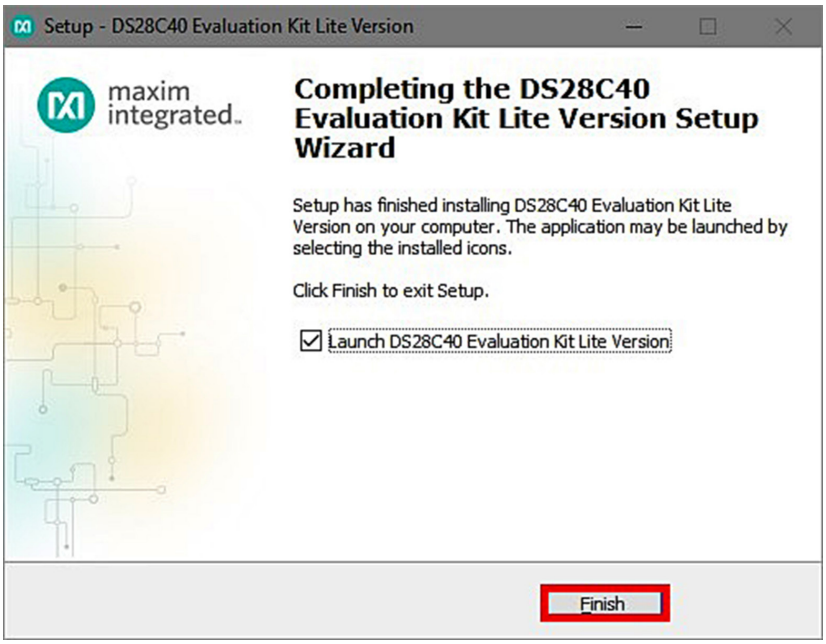


Figure 11. Software Installation Finished

12) The DS28C40 EV kit program now opens and connects to the DS9481P-300 COM port. This can be verified in the lower right corner of the window as shown in Figure 12.

Available Options

The DS28C40 EV Kit Lite Program is designed as a usage example to show step by step how to use the DS28C40 device. This version includes options to write, read, and run a compute authentication page using SHA2 or ECDSA. To access the full potential of the DS28C40, request the full version available under NDA request.

The GUI displays all the I^{2}C sequences for each step performed to assist the firmware engineer.

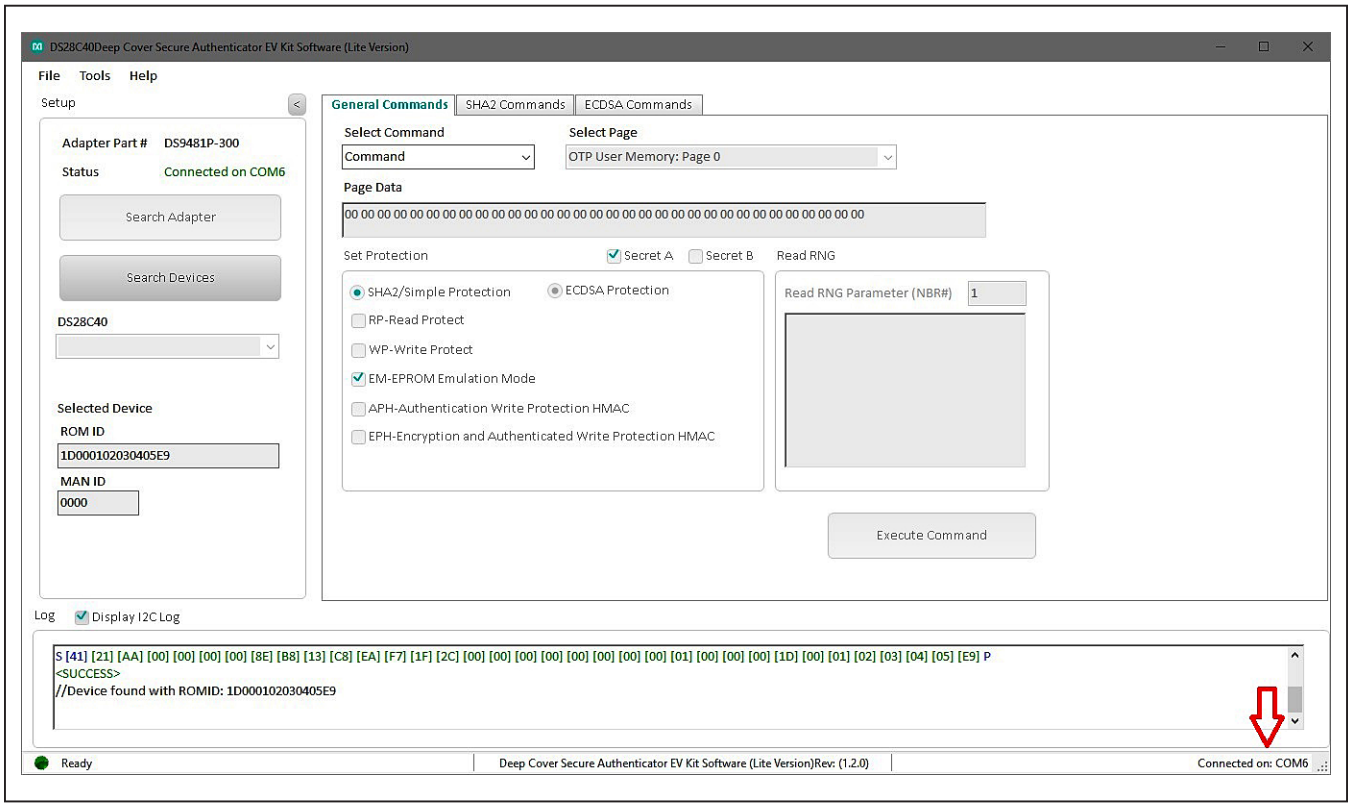


Figure 12. DS28C40 EV Kit Program (Default View upon Opening)

Usage Example—Feature Write Memory and Read Memory

1) Select the **General Commands** tab (Figure 13).
2) Select the **Write Memory** command from the combo box selection (Figure 13).

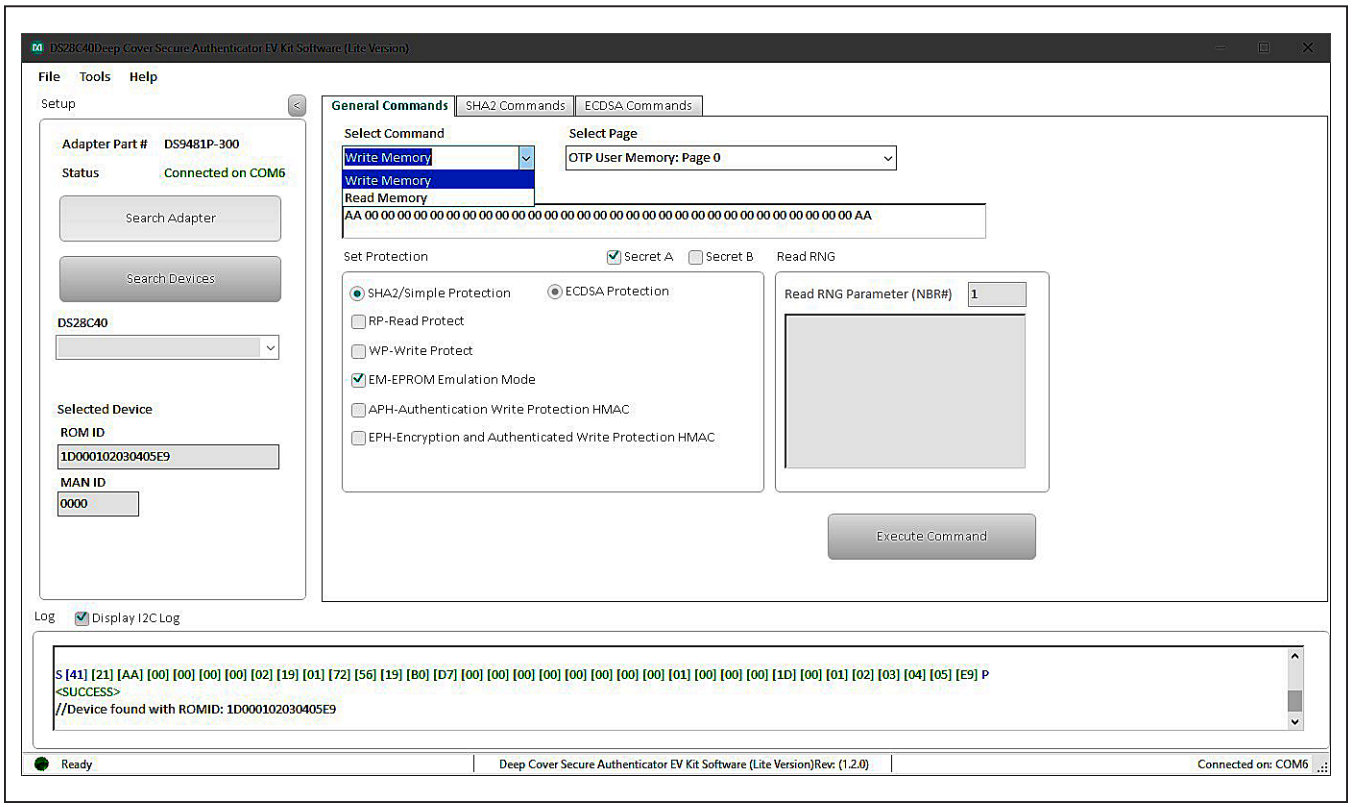


Figure 13. Selecting Command

3) Write the desired data on the **Page Data** textbox (Figure 14).

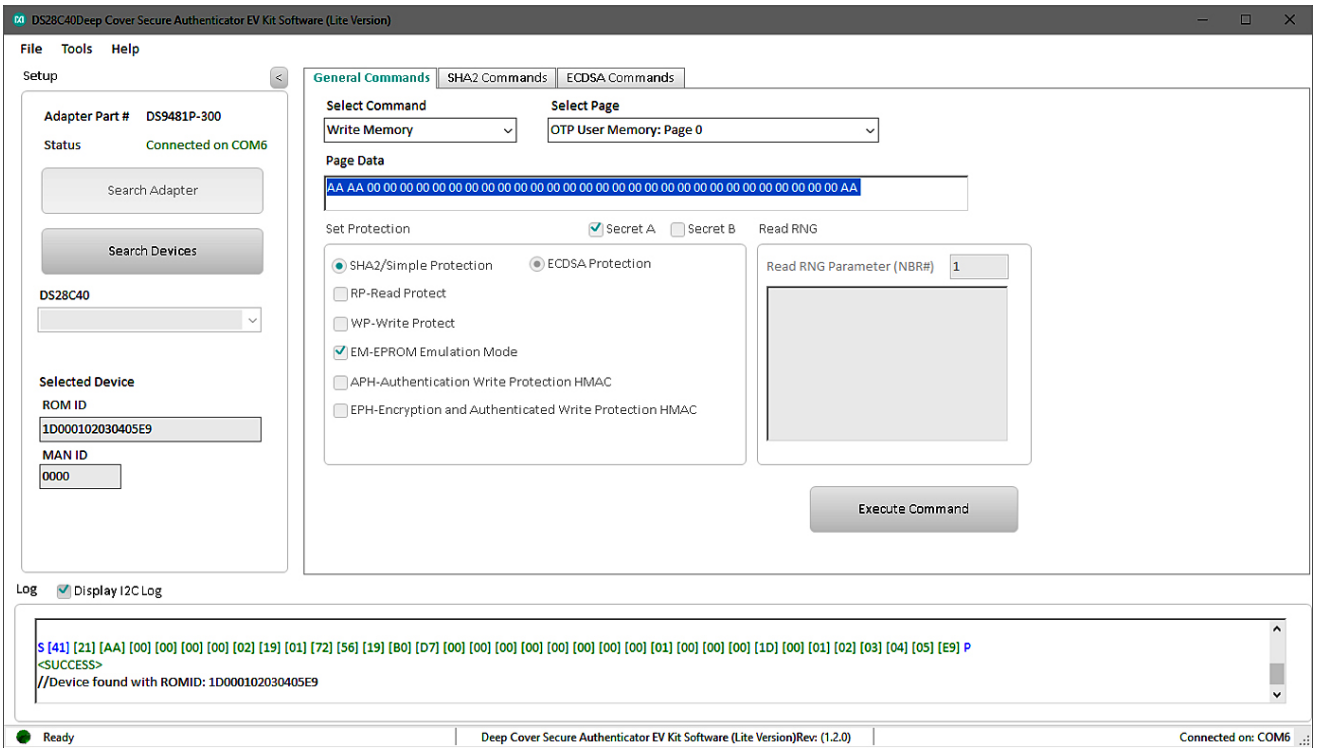


Figure 14. Write Data

4) Select the page for writing (Figure 15).

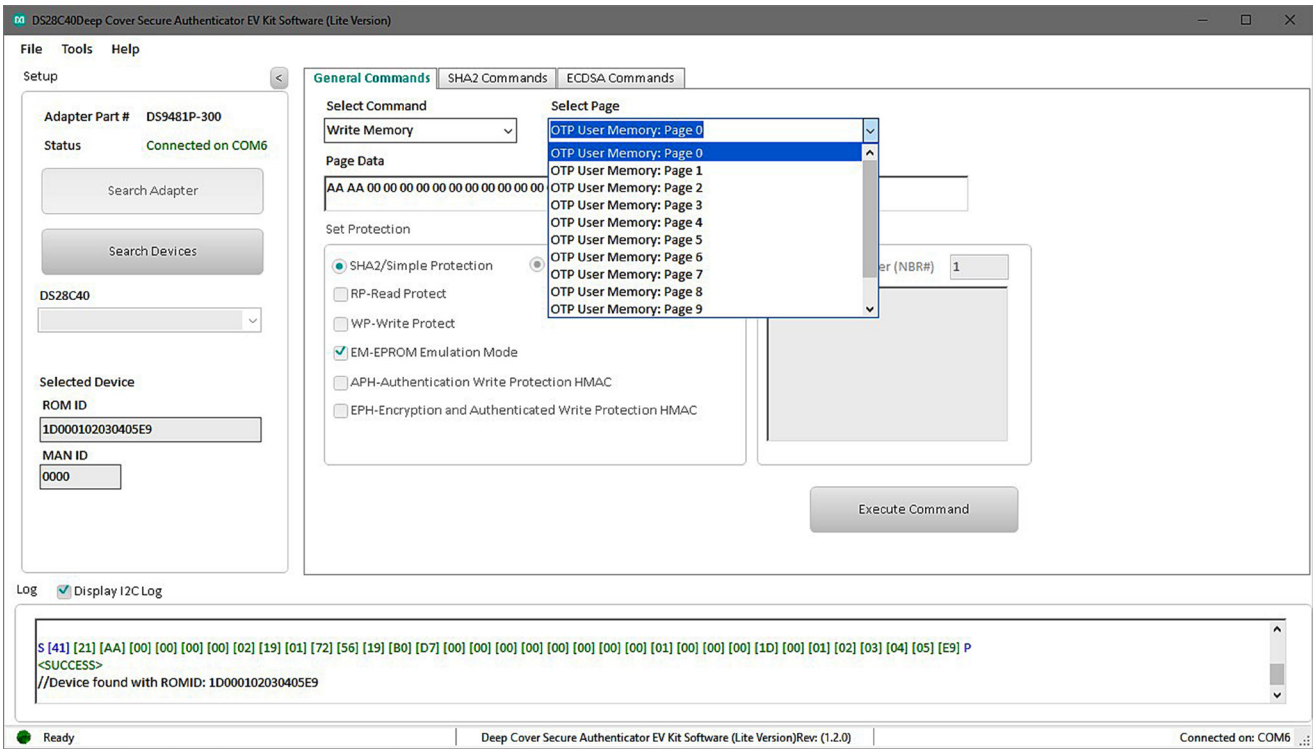


Figure 15. Select Page

5) Click the **Execute Command** button (Figure 16). The I2C communication is displayed on the **Log** window and aids to understand how the command is executed.
6) To perform a memory read, in the **General Commands** tab, select the command from the **Select Command** drop-down menu (Figure 13).
7) From the **Select Page** drop-down menu, select the desired page to read (Figure 15).
8) Click the **Execute Command** button (Figure 16).

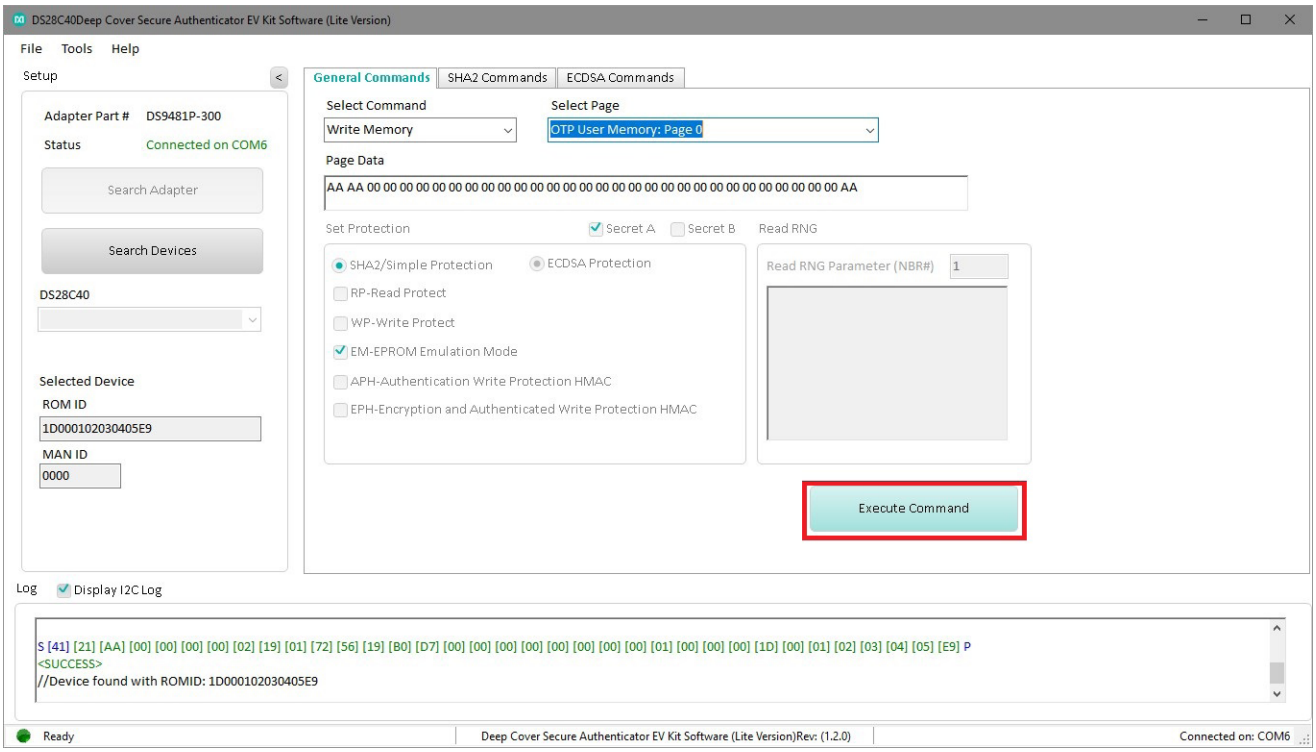


Figure 16. Execute Command

Usage Example—SHA2 Compute and Read Page Authentication

1) Under the **General Commands** tab, in the **Select Command** drop-down menu, select **Write Memory** (Figure 13).
2) Select the Secret A or B from **Select Page** drop-down menu for writing (Figure 17).
3) Write the desired secret on the **Page Data** text box and click **Execute Command** button (Figure 18).
4) Select the **SHA2 Commands** tab.
5) Select the **Compute and Read Page Authentication** command from the **Select Command** drop-down menu selection (Figure 19).

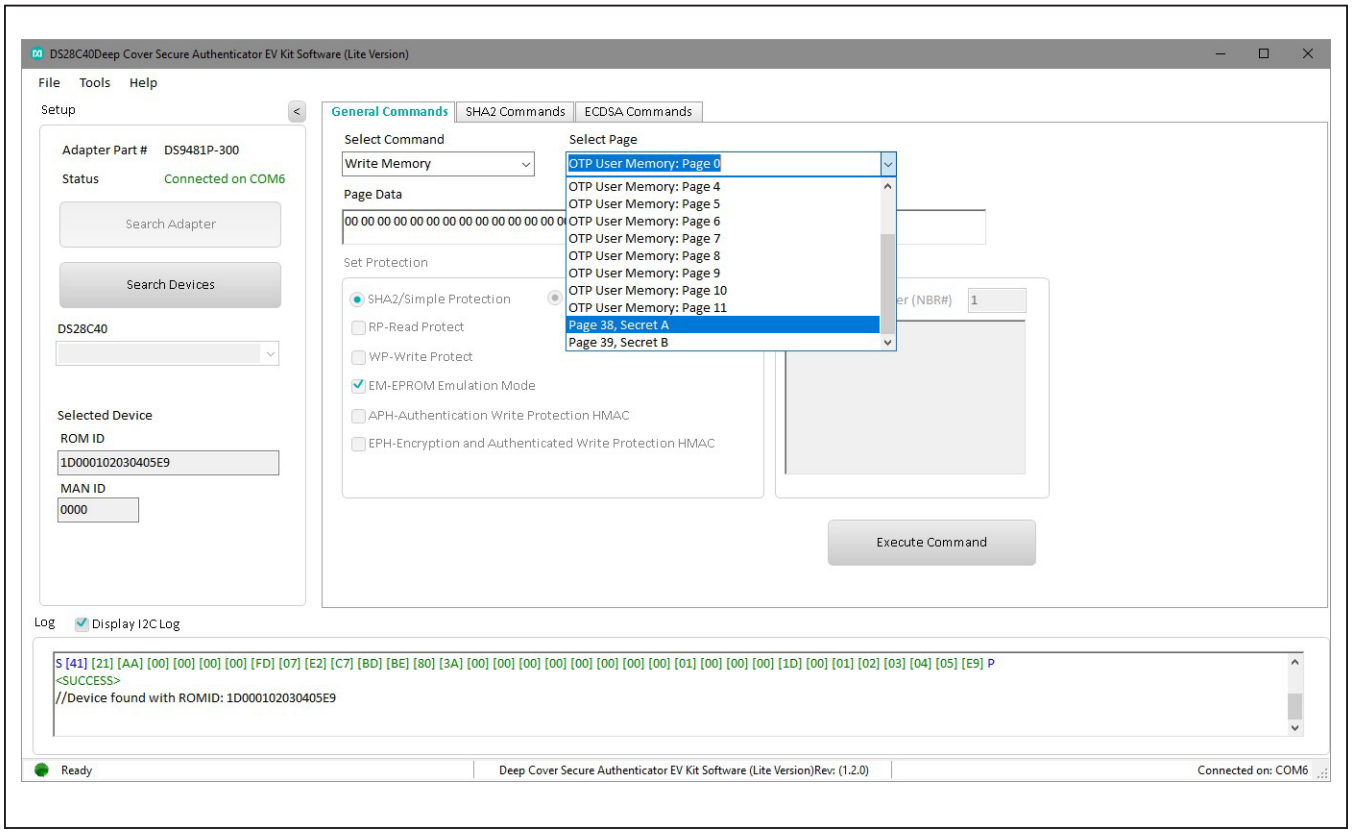


Figure 17. Selecting SHA2 Command

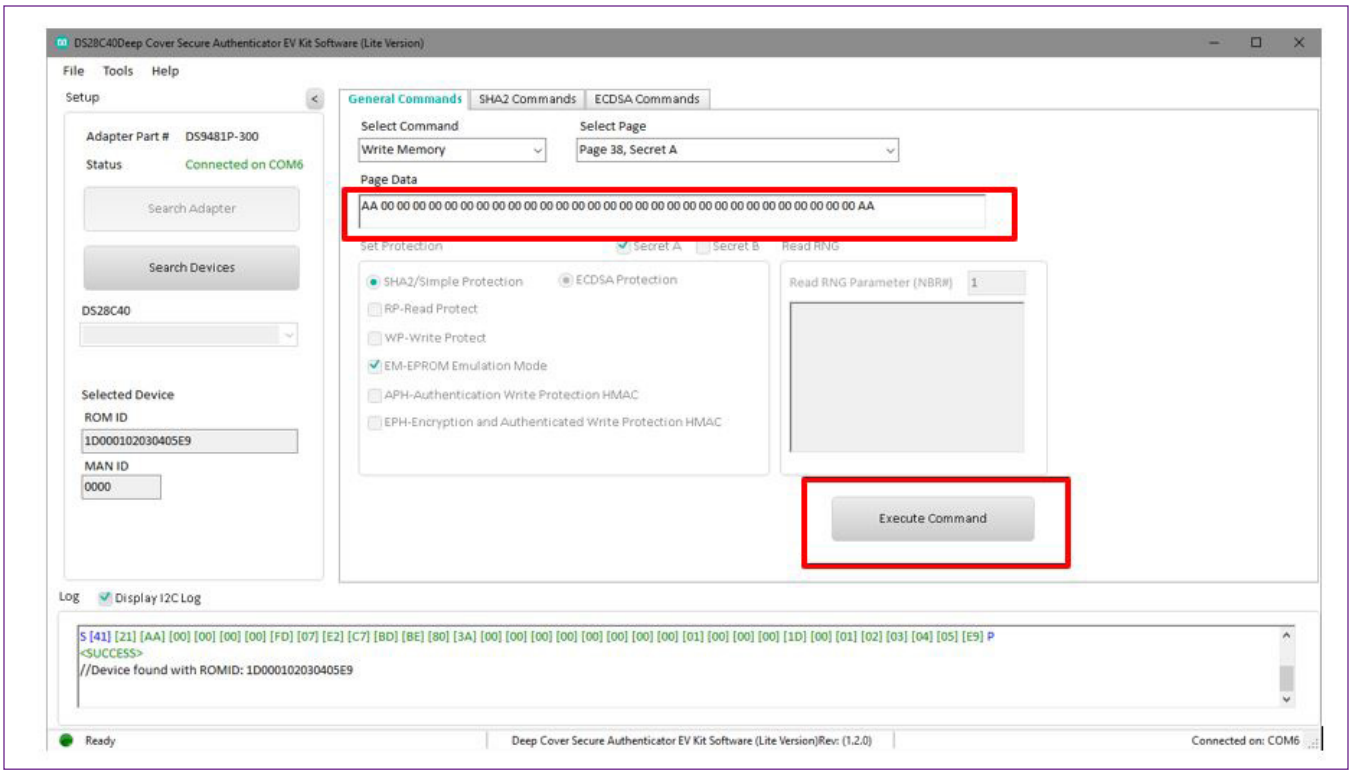


Figure 18. Selecting SHA2 Command

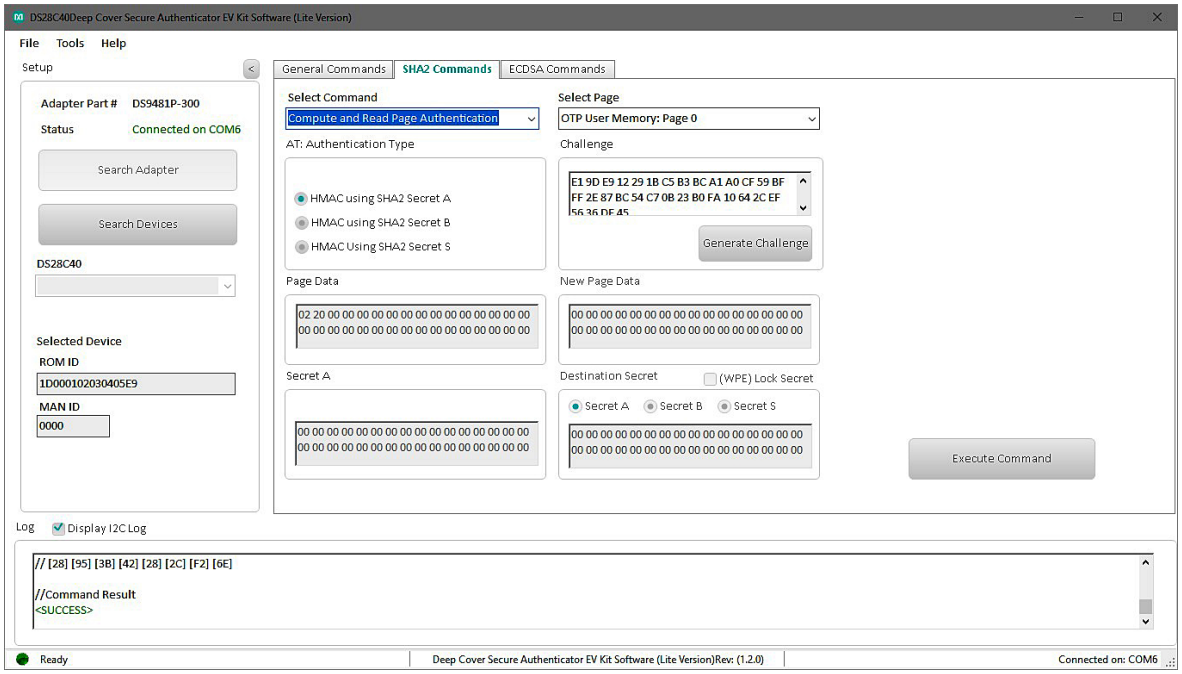


Figure 19. Selecting SHA2 Command

6) From the **Select Page** drop-down menu, select a page to execute the command (Figure 20).

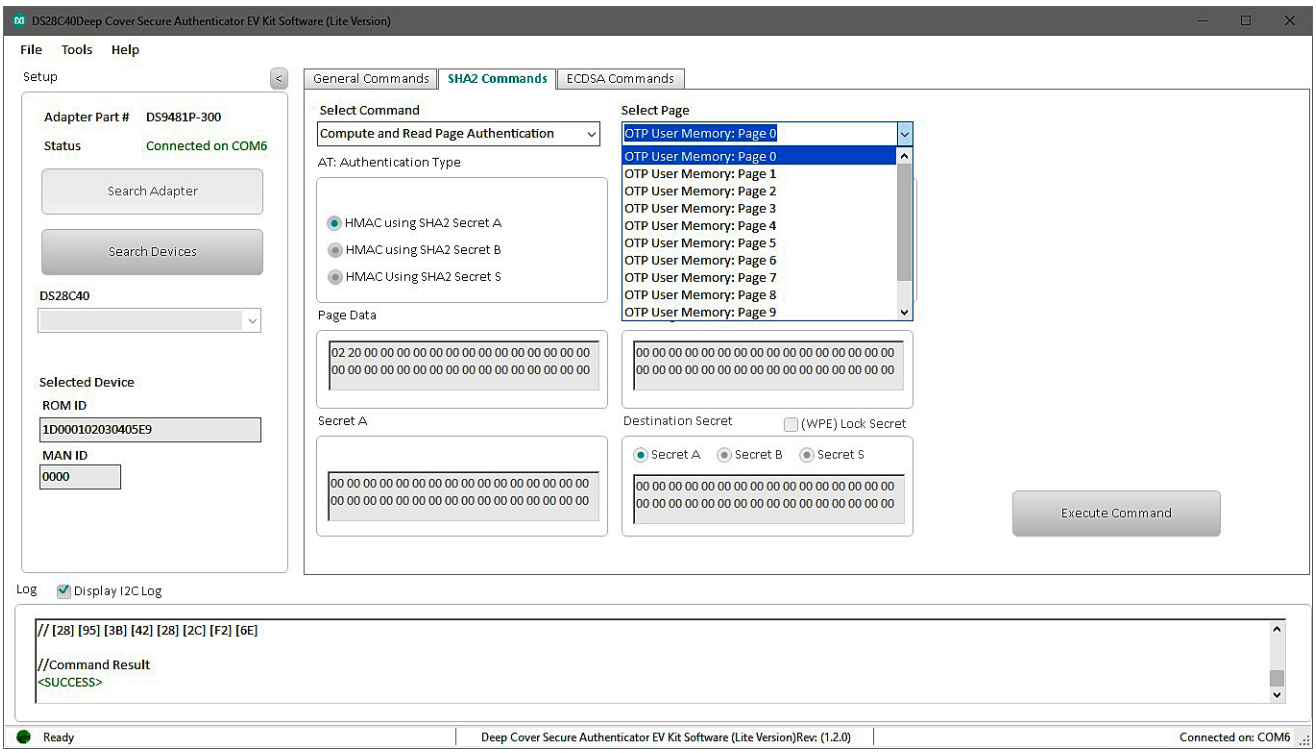


Figure 20. Select Page

7) In the **AT: Authentication Type** combo box, select a secret to compute the HMAC on selected page (Figure 21).

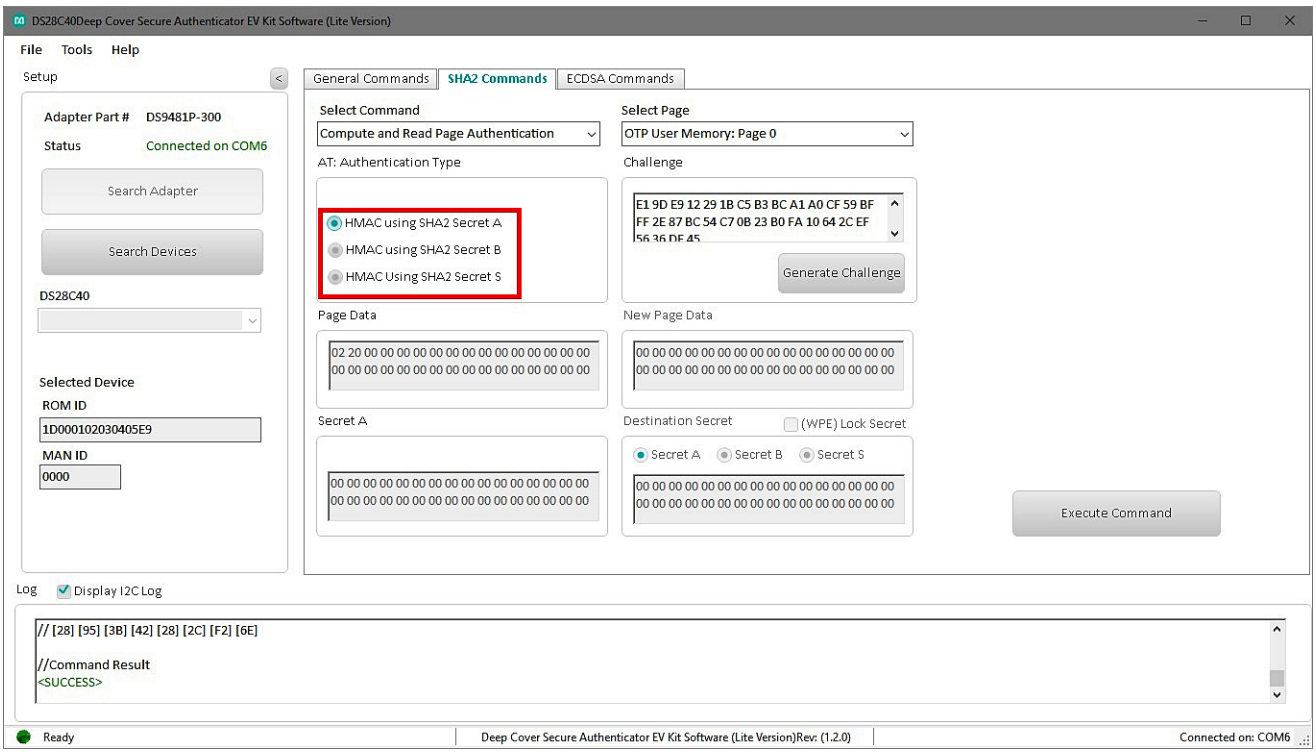


Figure 21. Select Secret

8) Click the **Generate Challenge** button to create a random challenge for command (Figure 22).

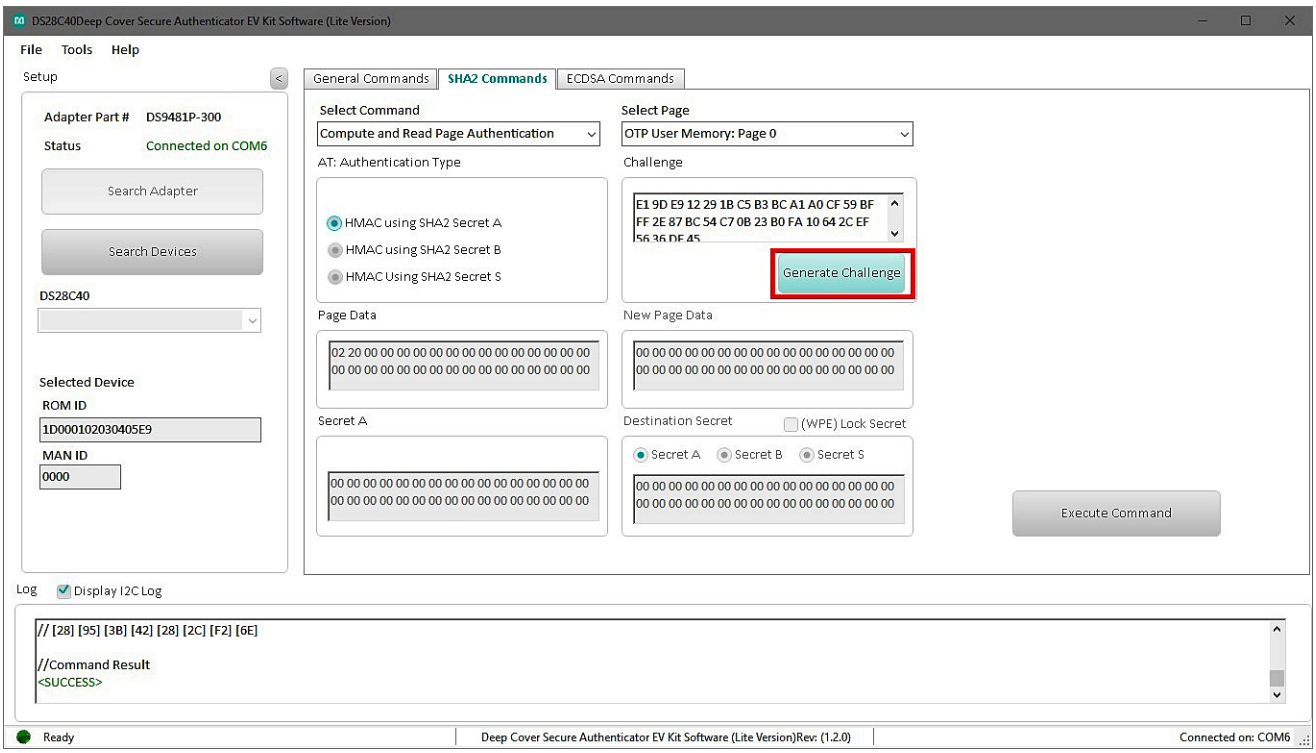


Figure 22. Generate Challenge

9) Click the **Execute Command** button to run the sequence (Figure 23). The command result is displayed on the **Log** box.

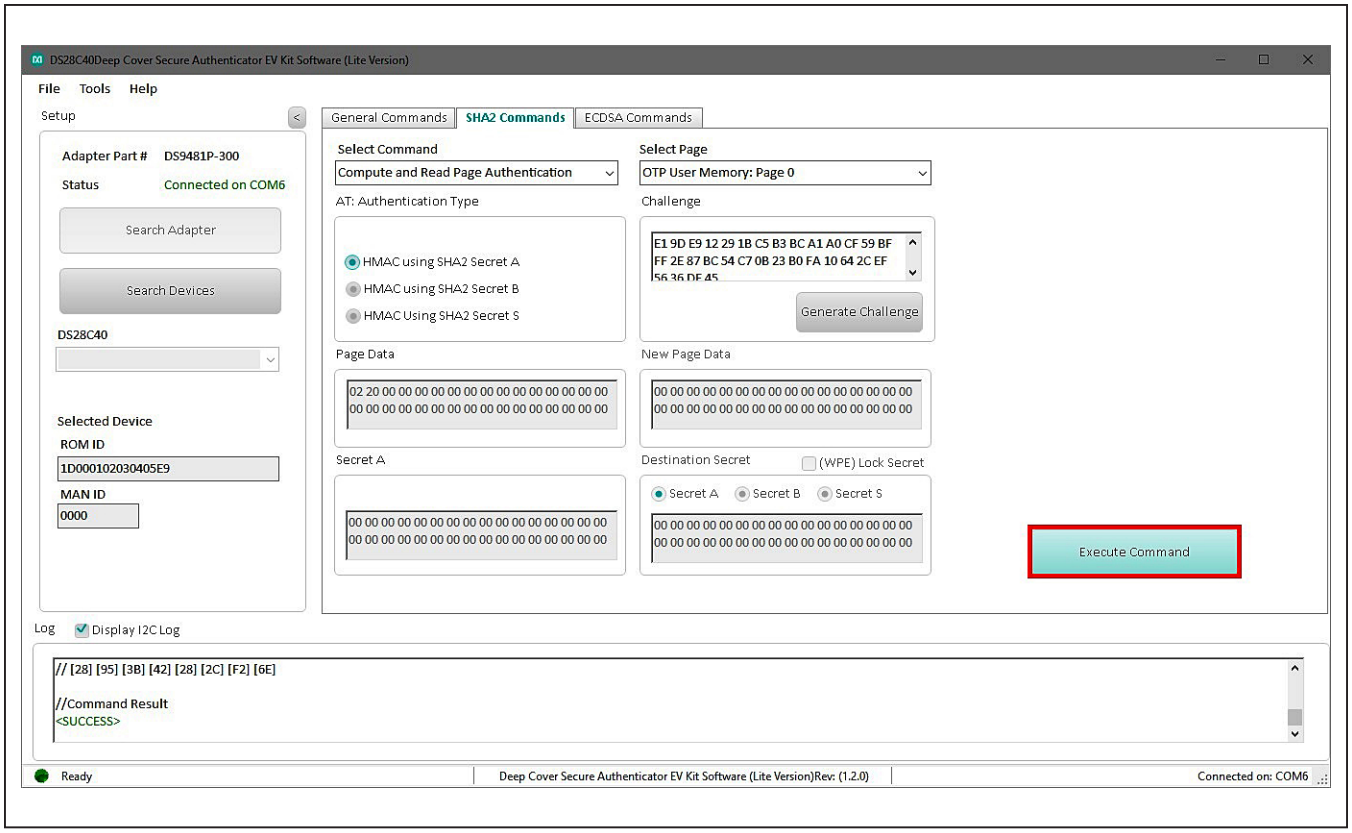


Figure 23. Execute Command

Usage Example—ECDSA Compute and Read Page Authentication

1) Select the **ECDSA Commands** tab (Figure 24).
2) From the **Select Command** drop-down menu, select the **Generate ECC-256 Key Pair** and select the desired **Public/Private Key** from the **Key Selection** combo box (Figure 24).

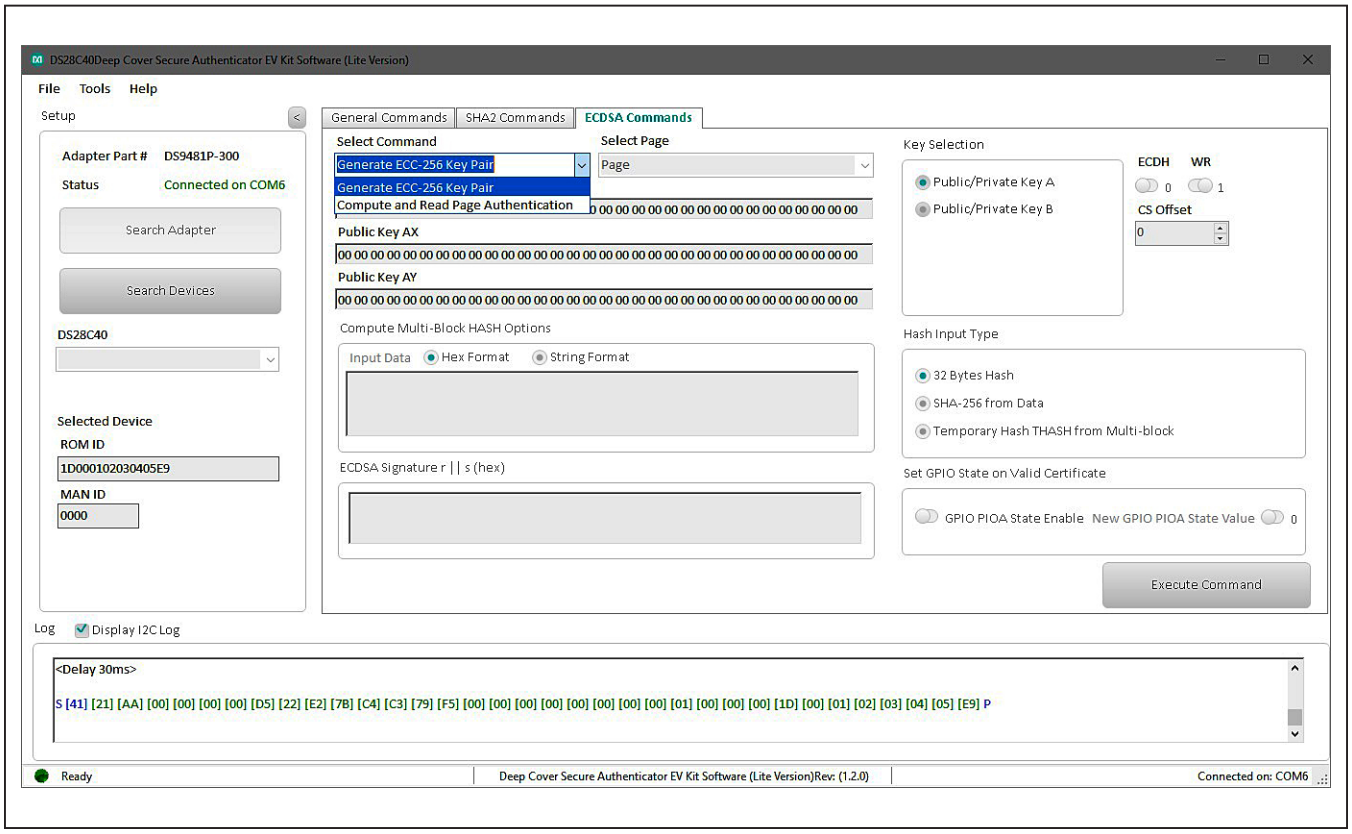


Figure 24. Generate ECC Key pair

3) Click the **Execute Command** button (Figure 25).

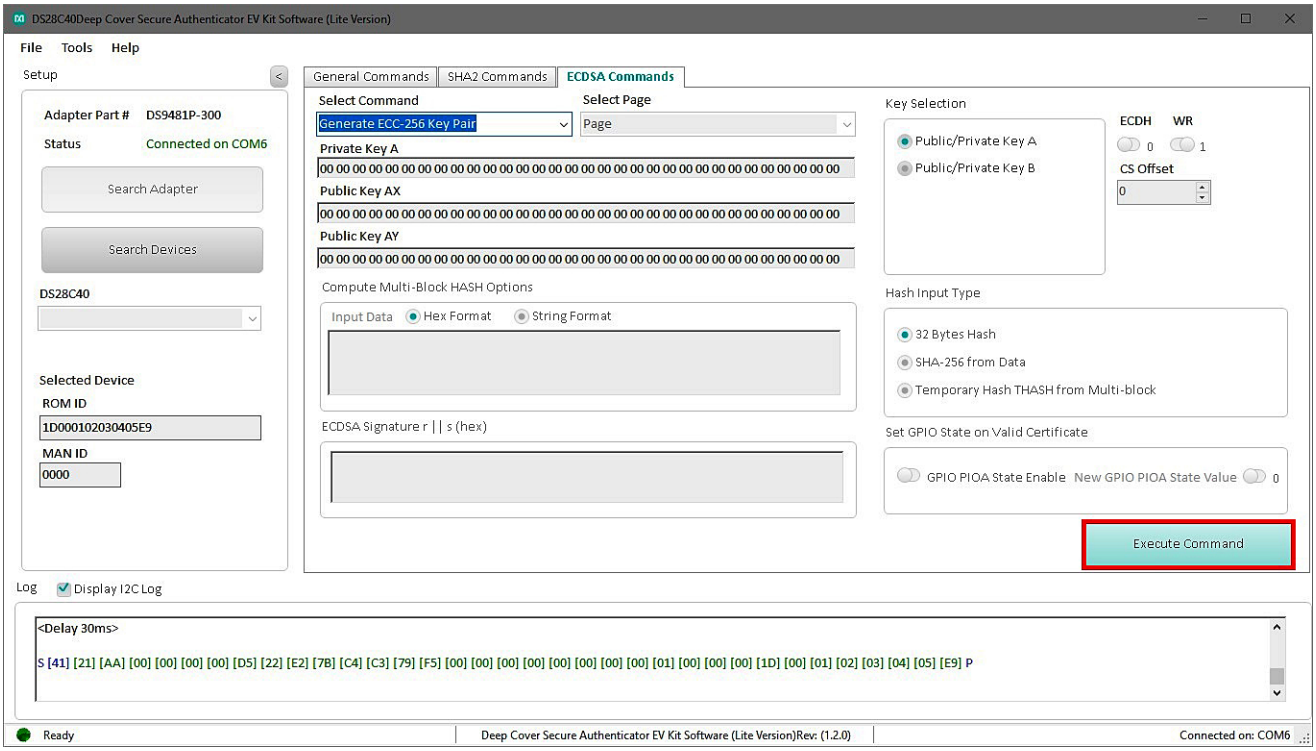


Figure 25. Execute Generate ECC Key

4) In the **Select Command** drop-down menu, select the **Compute and Read Page Authentication** command and the **Public/Private Key** from the **Key Selection** combo box (Figure 26).

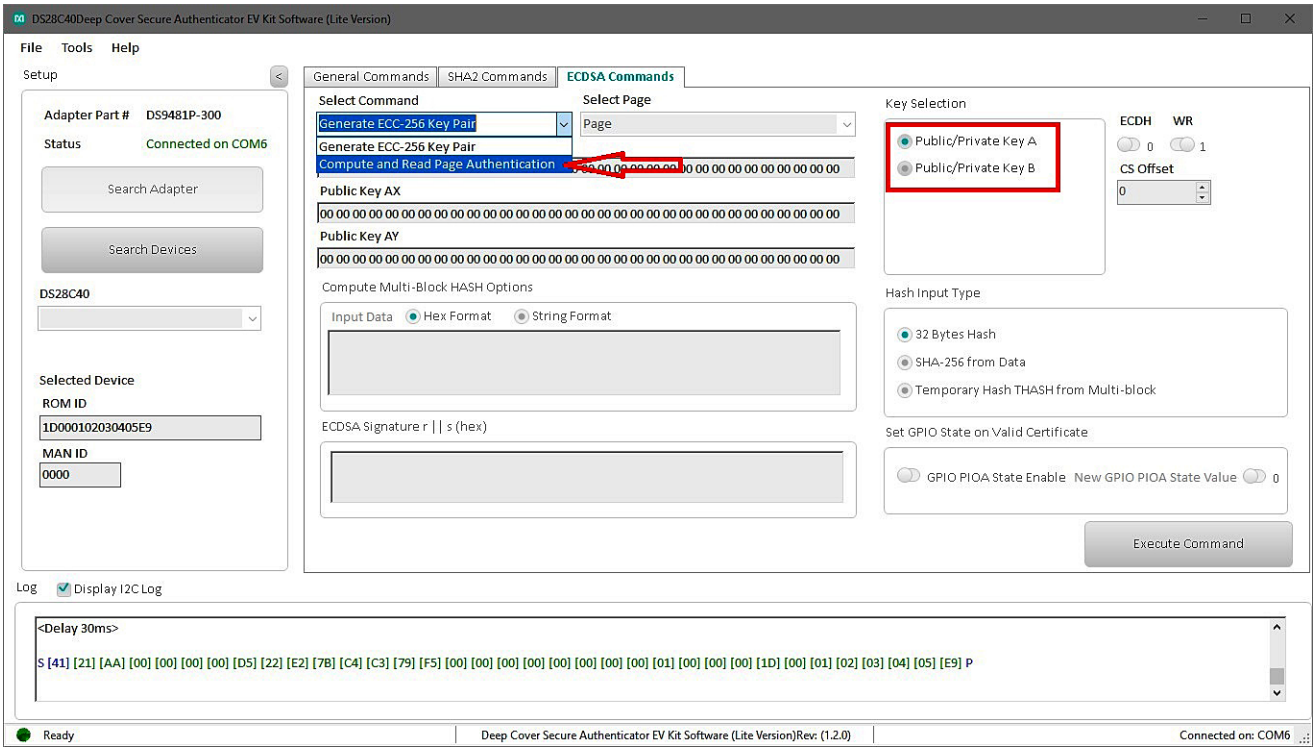


Figure 26. Selecting Command

5) From the **Select Page** drop-down menu, select the desired page and public key (Figure 27).
6) From the **AT: Authentication Type** combo box, select the private key (Figure 27).
7) Click the **Generate Challenge** button and then click **Execute Command** button to perform the sequence (Figure 28). Results are displayed in the **Log** box.

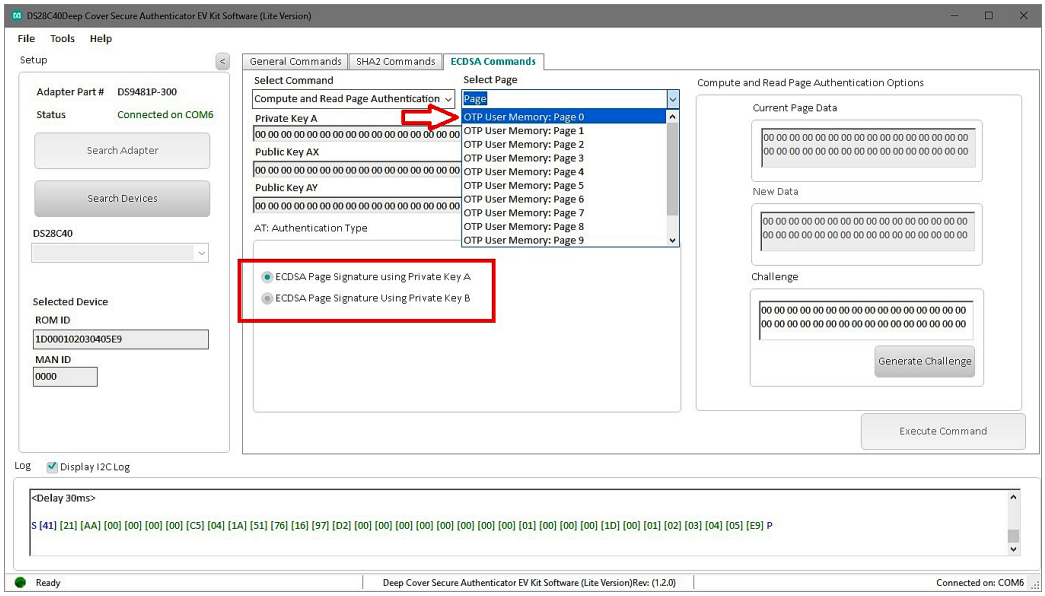


Figure 27. Selecting Page and Key

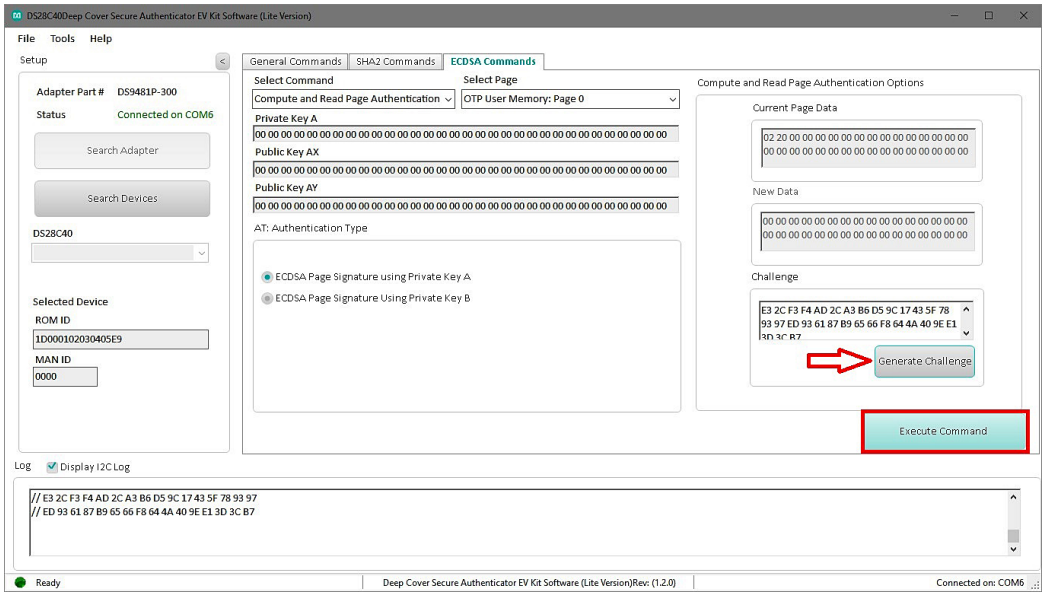


Figure 28. Execute Command

Navigating

The DS28C40 EV Kit Lite Program is divided in five sections: the top menu bar, **Setup** panel, tab control, **Log**, and the status bar.

- **Menu Bar:** Provides additional software features and information used to support the software operation.
- **Setup Panel:** Information for hardware connection and device status.
- **Command Panel:** Main section for command execution and command option selection.
- **Log:** Software communication results for all commands and software transaction. Shows the I^2C results and command's inputs and results.
- **Status Bar:** Displays the state of the software after connection the hardware necessary for operation

Connecting and Detecting Hardware

The DS28C40 EV Kit Lite Program detects automatically the required hardware on initialization. To exercise a different DS28C40, open the DS9121CQ socket and replace the device (Figure 9). Then click the **Search Device** button to detect then new DS28C40.

If, for any reason, the DS9481P-300 is not detected during the initial software load, click the **Search Adapter** button to detect and initialize the USB adapter.

Ordering Information

PART	TYPE
DS28C40EVKIT#	EV System

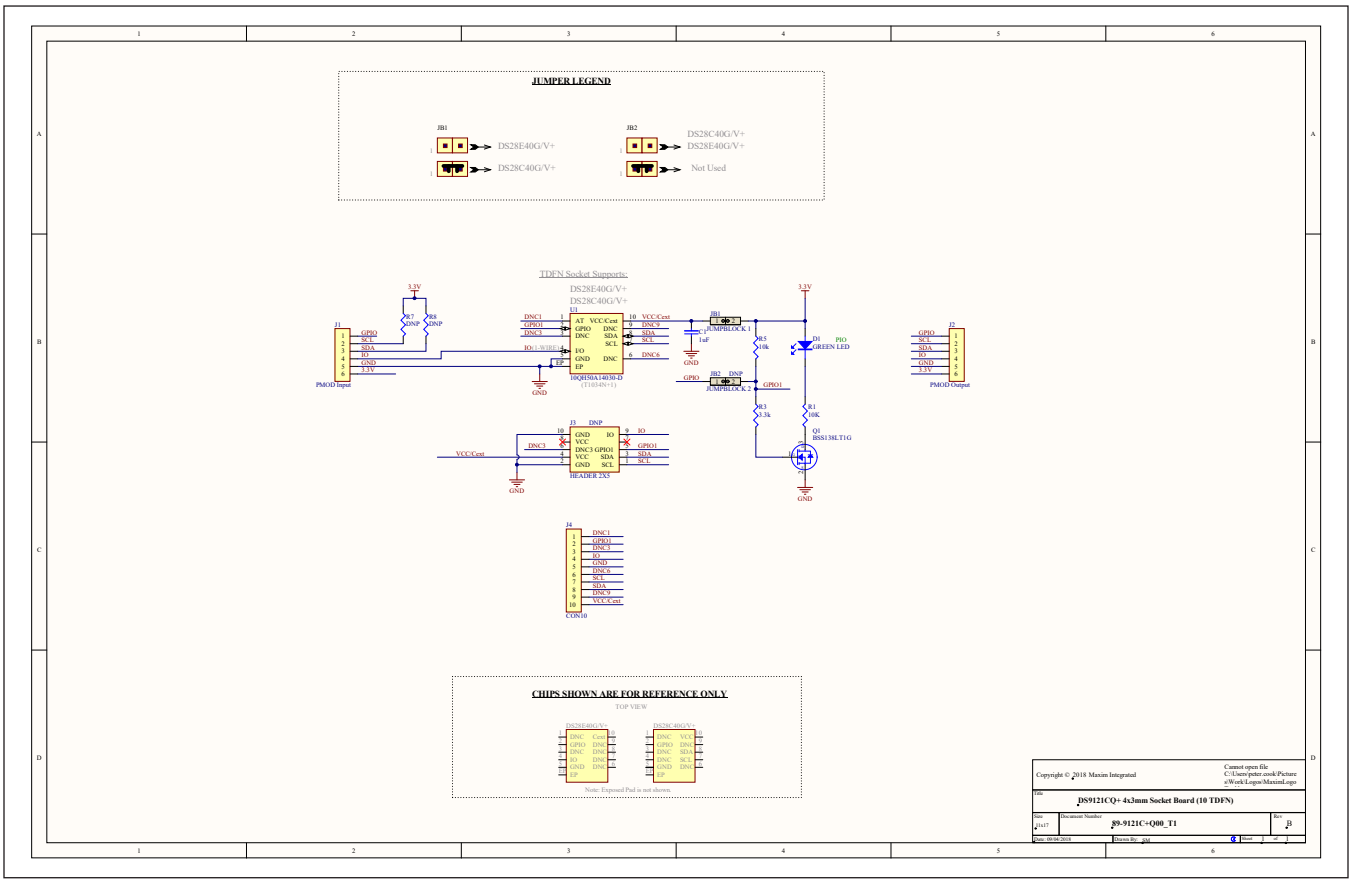
#Denotes RoHS compliance.

DS9121CQ EV Kit Bill of Materials

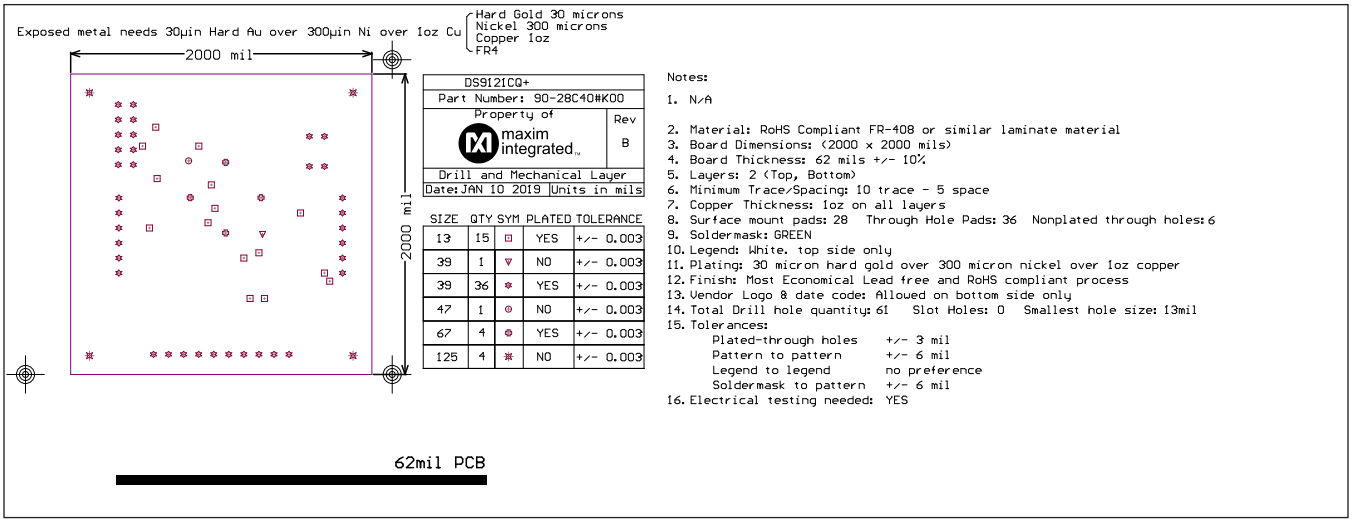
DESIGNATION	QTY	DESCRIPTION
Pack-Out	1	I2C AUTHENTICATOR AUTO, EV KIT DS28C40EVKIT#
Pack-Out	5	AUTOMOTIVE I2C AUTHENTICATOR, 6Kb DS28C40G/V+
Pack-Out	1	CABLE, USB A-TO-MICRO-B CABLE (1M) 68784-0001
Pack-Out	1	1W/I2C 4x3MM TDFN SOCKET BOARD DS9121CQ+
Pack-Out	1	BOX, BROWN, 9 3/16” X 7” X 1 1/4”
Pack-Out	1	FOAM, ANTI-STATIC PE 12X12X3.175MM
Pack-Out	2	LABEL, SATIN 1-3/4” X 1-3/8”
Pack-Out	1	2X3”, STATISHIELDING, ZIPTOP
Pack-Out	1	INSERT+, MAXIM WEB INSTRUCTION
Pack-Out	1	DS9481P-300 EVAL KIT# DS9481P-300#
Pack-Out	1	1W/I2C 4X3MM TDFN SOCKET BOARD DS9121CQ+
DS9121CQ+ PCB	1	PCB+, DS9121CQ+
J4	1	CONN HEADER VERT 10POS 2.54MM 22284103
J2	0.1	CONN+,HEADER,50PS, 100 SGL, R/A, AU TSW-150-08-G-S-RA

DESIGNATION	QTY	DESCRIPTION
J1	1	CONN+, RCPT, 100” 6POS, R/A GOLD PPPC061LGBN-RC
U1	1	SOCKET+, IC, TDFN10, 4X3MM, CLAMSHELL 10QH50A14030-D
PACK-OUT	1	LABEL BLANK THT-1-423 0.75 X 0.25
PACK-OUT	1	BAG, STATIC SHIELDZIP4X6, W/ESD LO
C1	1	CAP+, 0.1µF, 10%, 10V, X7R, 0603 C0603C104K8RACTU
D1	1	LED+,GREEN CLEAR, 3.2V,20MA,0603 598-8081-107F
JB1	0.1	HEADER 36-40 PINS (CUT TO FIT) 22-28-4363
Populate to JB1	1	SHUNT+, LP W/HANDLE 2 POS 30AU 881545-2
Q1	1	MOSFET, N-CH ENHANCEMENT BSS138LT1G
R3	1	3.3KΩ 1% RESISTOR (0603 PB FREE) ERJ-3EKF3301V
R1, R5	2	RES,10KΩ 1% 0603 ERJ-3EKF1002V

DS28C40 EV Kit Schematic

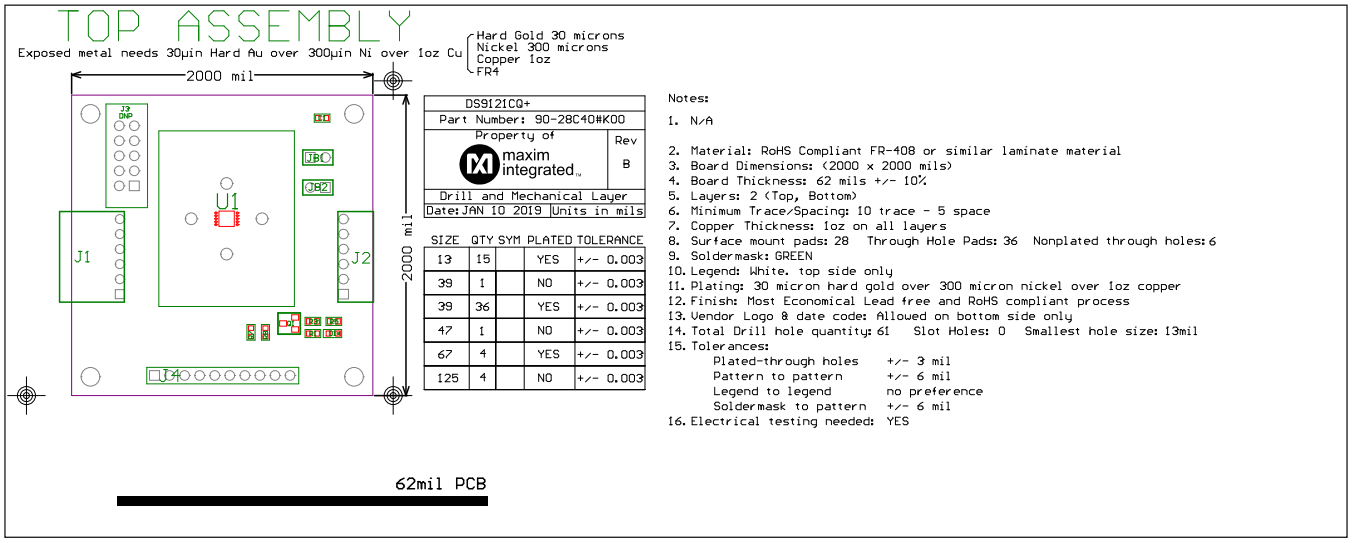


DS28C40 EV Kit PCB Layout Diagrams

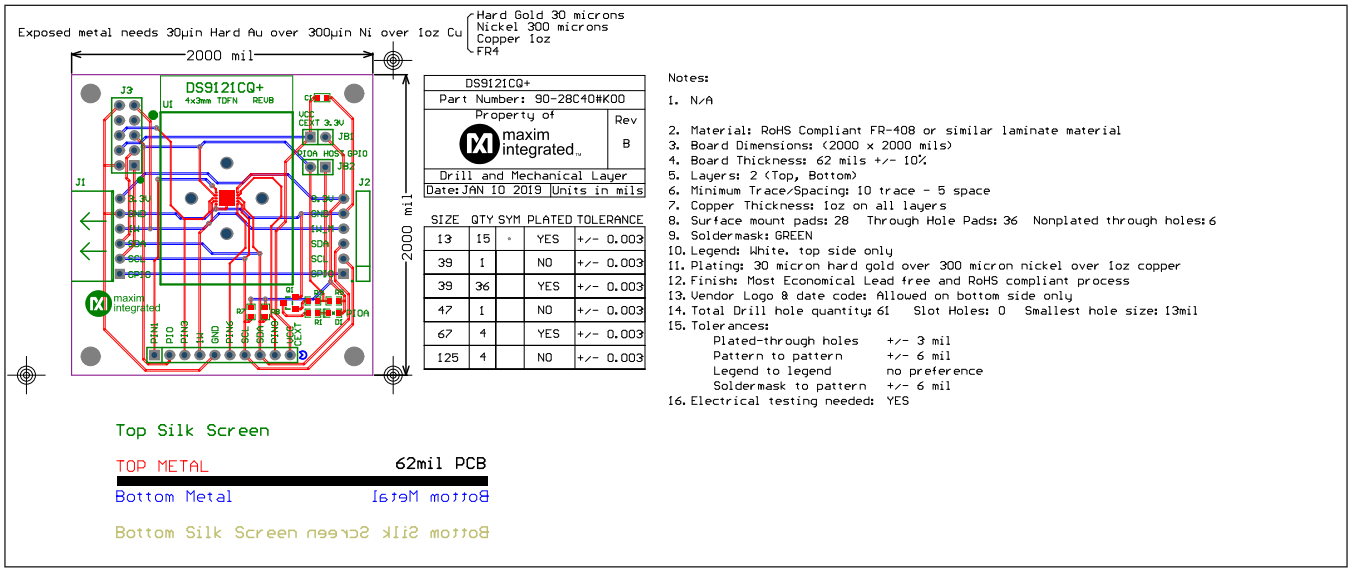


Drill and Mechanical Layer (1 of 3)

DS28C40 EV Kit PCB Layout Diagrams (continued)



Drill and Mechanical Layer (2 of 3)



Drill and Mechanical Layer (3 of 3)

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/19	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at https://www.maximintegrated.com/en/storefront/storefront.html.

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