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## DS28E50 Evaluation Kit

Evaluates: DS28E50 and DS2477

### General Description

The DS28E50 evaluation kit (EV kit) provides the hardware and software necessary to exercise the features of the DS28E50 and DS2477. The EV system consists of five DS28E50 and DS2477 devices in a 6-pin TDFN package, two DS9121BQ+ evaluation TDFN socket boards, and a DS9481P-300# USB-to-I<sup>2</sup>C/1-Wire<sup>®</sup> adapter. The evaluation software runs on Windows<sup>®</sup> 10 and Windows 7 operating systems. It provides a handy user interface to exercise the features of the DS28E50 and DS2477. Note that the evaluation software described herein is the lite version that is downloadable from Maxim's website. To request the full developer version, click the link at the top of the page.

### Features

- Demonstrates the Features of the DS28E50 DeepCover<sup>®</sup> SHA3 1-Wire Authenticator
- Demonstrates the Features of the DS2477 DeepCover SHA3 Secure Coprocessor
- 1-Wire Communication Is Logged to Aid Firmware Designers Understanding of DS28E50 and DS2477
- 1-Wire/I<sup>2</sup>C USB Adapter Creates a Virtual COM Port on Any PC
- Fully Compliant with USB Specification v2.0
- Software Runs on Windows 10 and Windows 7
- Convenient On-Board Test Points, TDFN Socket

### EV Kit Contents

QTY	DESCRIPTION
5	DS28E50Q+ DeepCover SHA3 1-Wire Authenticator
5	DS2477Q+ DeepCover SHA3 Secure Coprocessor
2	DS9121BQ+ TDFN Socket Board
1	DS9481P-300# USB to 1-Wire/I <sup>2</sup> C Adapter
1	USB Type-A to Micro-USB Type-B Cable

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

### Quick Start

#### Required Equipment

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

- DS9481P-300# USB to 1-Wire/I<sup>2</sup>C adapter (included)
- DS9121BQ+ TDFN socket board (two included)
- DS28E50Q+ (five devices included)
- DS2477Q+ (five devices included)
- USB Type A to Micro-USB Type B cable (included)
- PC with a Windows 10 or Windows 7 operating system and a spare USB 2.0 or higher port
- Download DS28E50 EV kit software (lite version) or request full DS28E50 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.

Ordering Information appears at end of data sheet.

### Hardware Setup and Driver Installation Quick Start

The following steps were performed on a Windows 10 PC to set up the DS28E50 EV kit hardware/software:

- 1) Obtain and unpack the **DS28E50EVkit\_Lite.zip file**, or the latest version.
- 2) Unplug any Maxim adapters before installing software.
- 3) The DS9481P-300# driver is required to communicate through the USB via a virtual COM port. If DS9481 device driver is not installed:
  - a) Open folder **DS9481\_driver\_Installer** (Figure 1).
  - b) Run **dpinst.exe** (Figure 2).
  - c) Click **Next** on the Device Driver Installation Wizard window (Figure 3).
  - d) Click **Finish** on the Device Driver Installation Wizard window (Figure 4).
- 4) Plug in the DS9481 adapter.

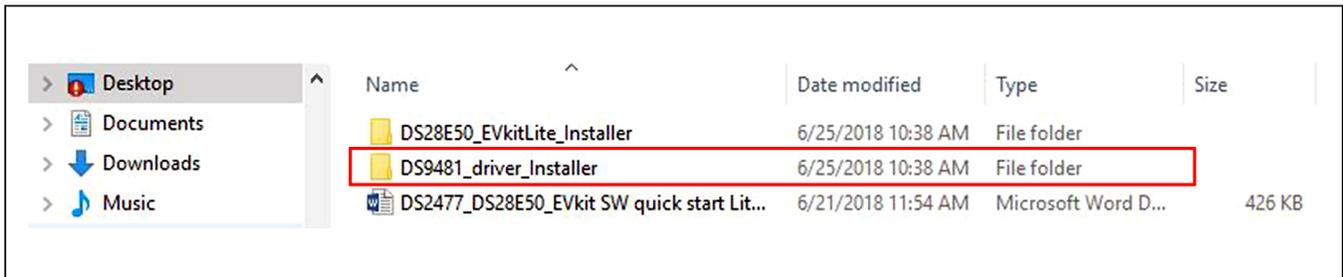


Figure 1. File Viewer with DS28E50 Installer and DS9481 Device Driver Installer

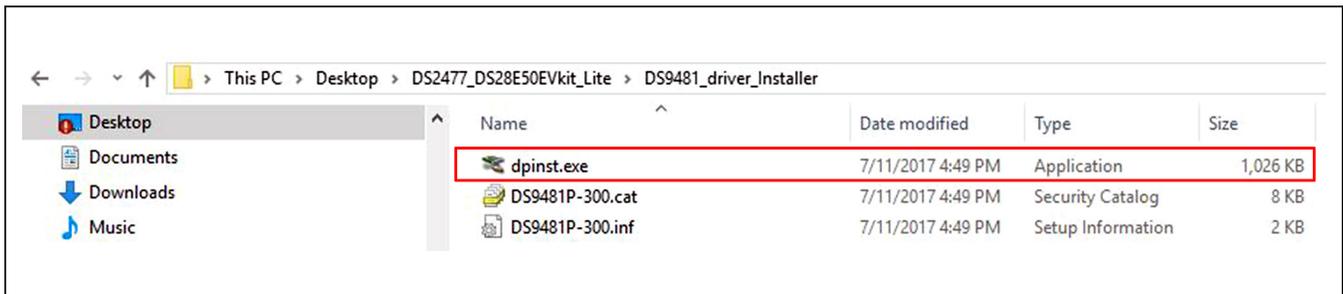


Figure 2. File Viewer with DS9481 Device Driver Installation File

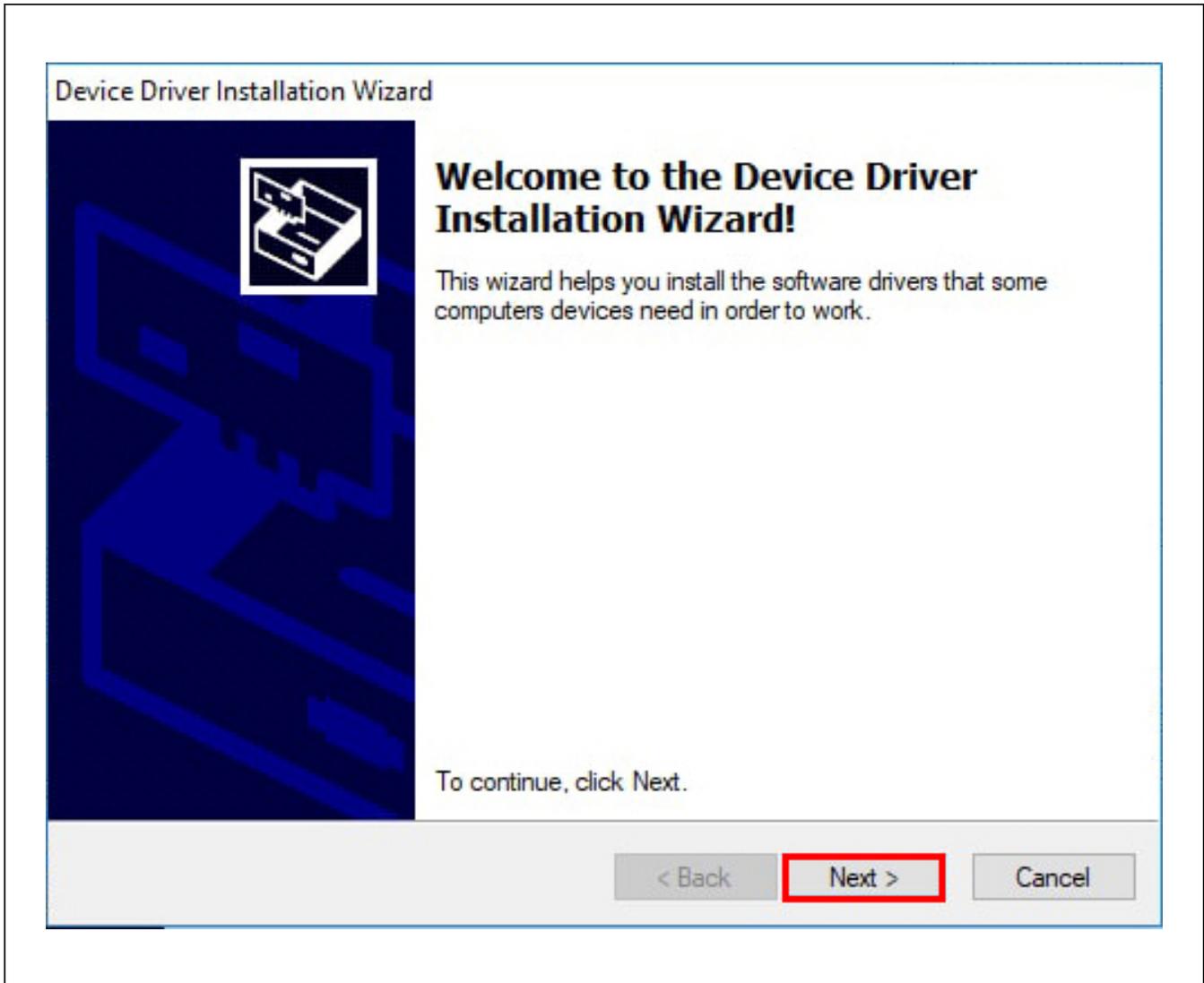


Figure 3. DS9481 Device Driver Installation Wizard

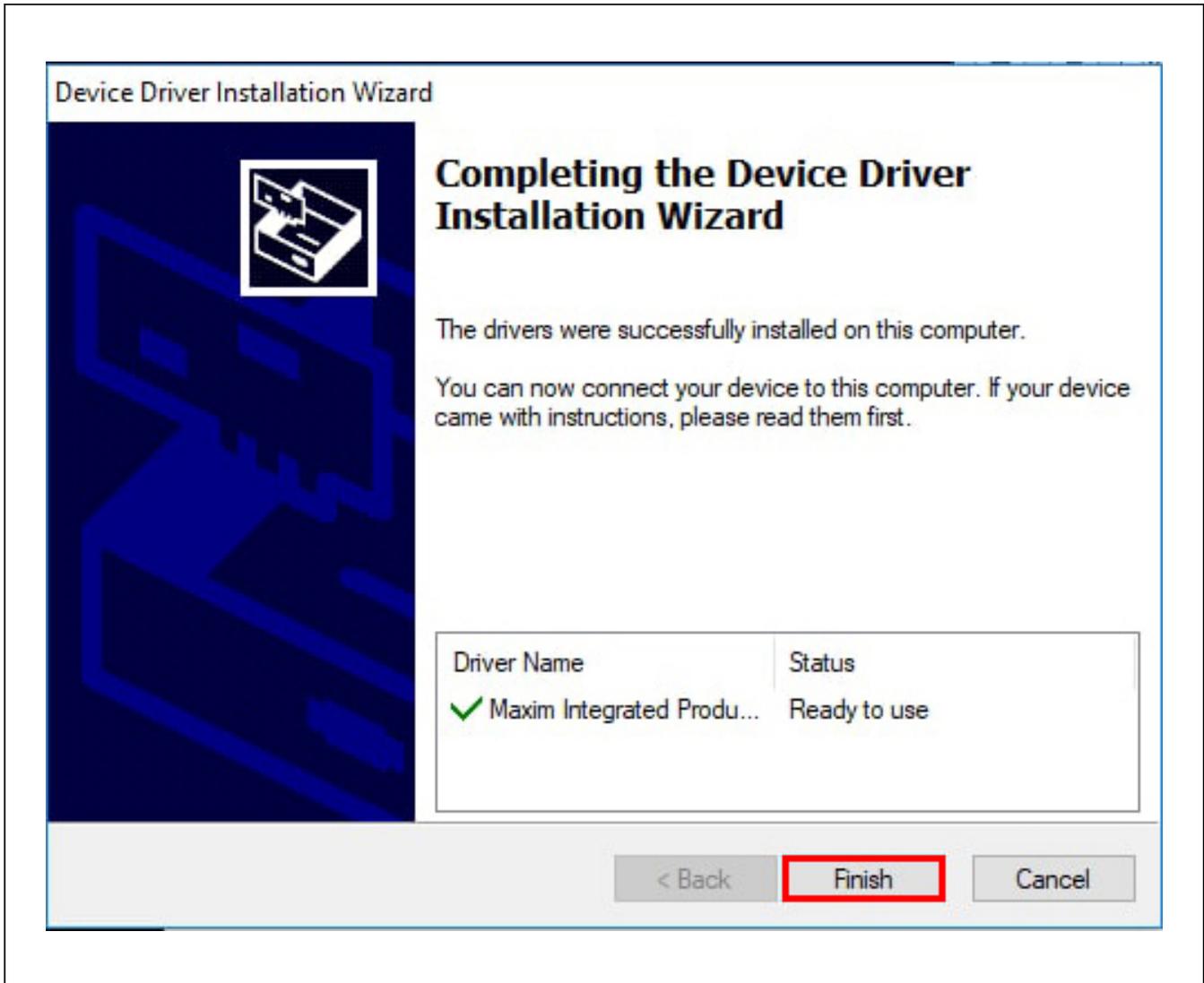


Figure 4. DS9481 Device Driver Installation Finished

- 5) Go back to the **DS28E50EVkit Lite** folder and open the **DS28E50\_EVkitLite\_Installer** folder and run **DS2477DS28E50GUILiteSetupV02.exe** (Figure 5).
- 6) The software license agreement will open. Read through the terms and select **I accept the agreement** and click **OK** to install the software (Figure 6).

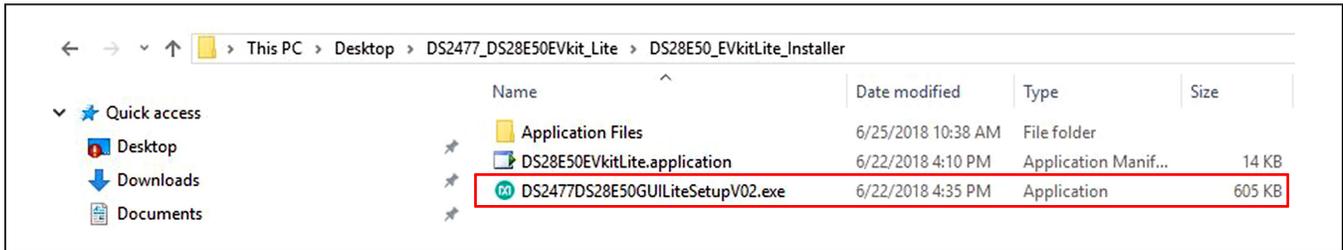


Figure 5. DS28E50/DS2477 EV Kit Installer File

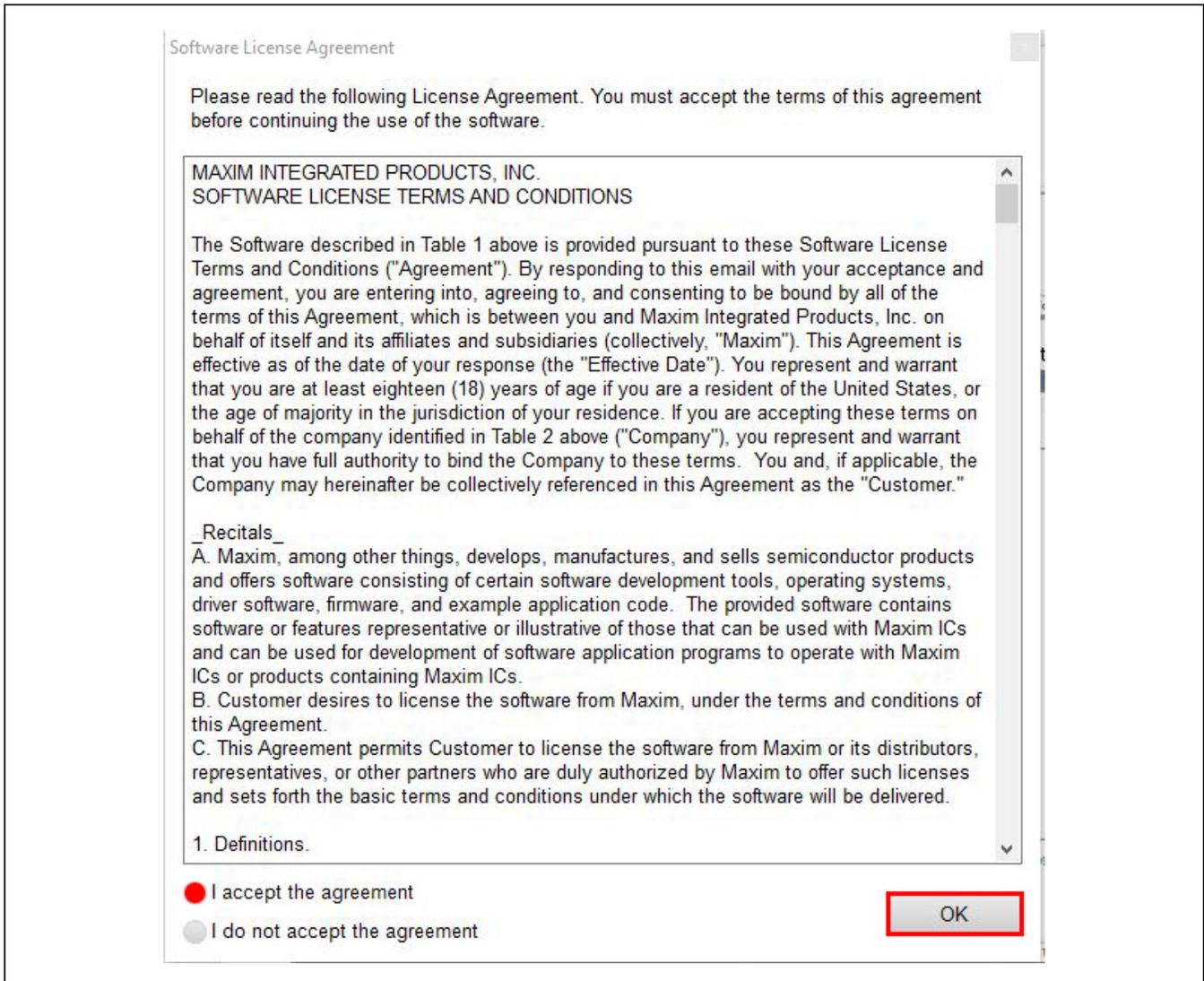


Figure 6. DS28E50 EV Kit Software License Agreement

- 7) Go to the **Windows Start** menu and click on **DS28E50EVkitLite** under the **Maxim Integrated Products** folder to launch the DS28E50 EV Kit program ([Figure 7](#)).

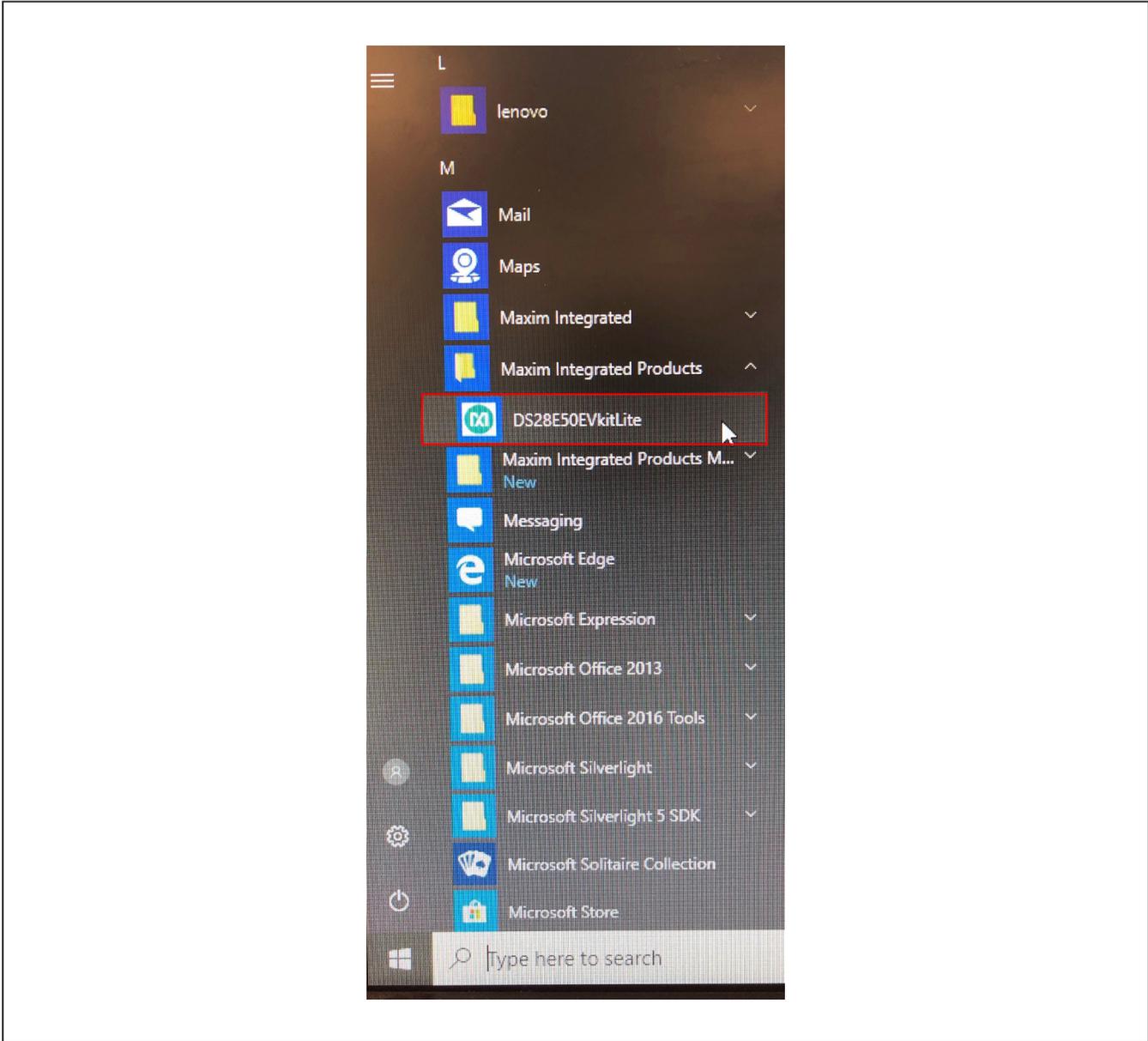


Figure 7. DS28E50 EV Kit Lite Software Program File in Windows Start in the Maxim Integrated Products Folder.

- 8) Plug the DS9481P-300# into the PC with one or both DS9121BQ+ socket boards by doing the following:
  - a) (Optional—Perform only if using the coprocessor): Open the 1st socket and insert a DS2477 into one of the cavities, as shown in [Figure 8](#). **Note:** The plus (+) must be oriented in the bottom left corner of the socket.
  - b) Open the 2nd socket and insert a DS28E50 into the cavity, per the same orientation shown in [Figure 8](#), with the plus (+) oriented in the bottom left corner of the socket.
  - c) Close both burn-in sockets.

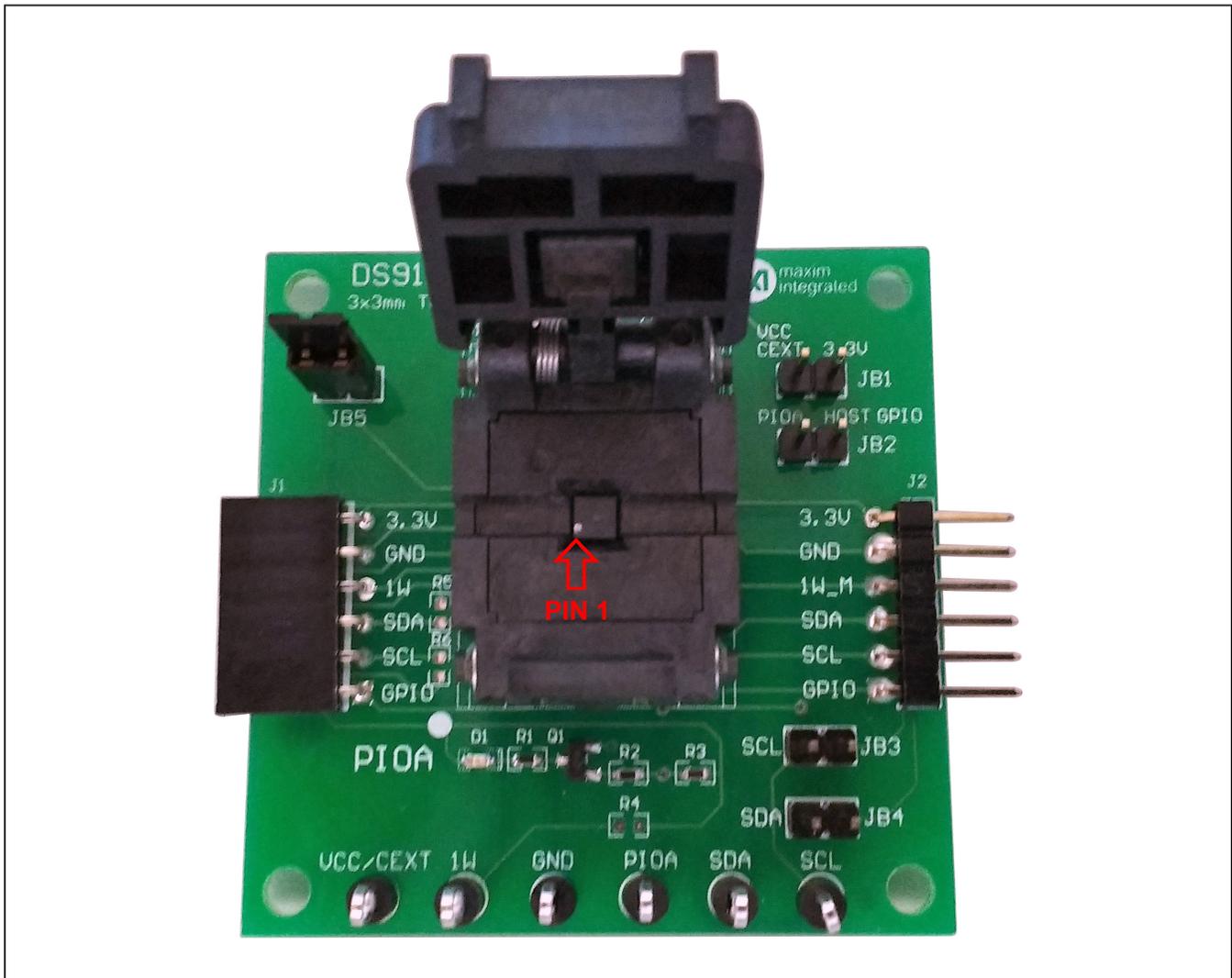


Figure 8. DS28E50 and DS2477 Orientation in Burn-In Socket

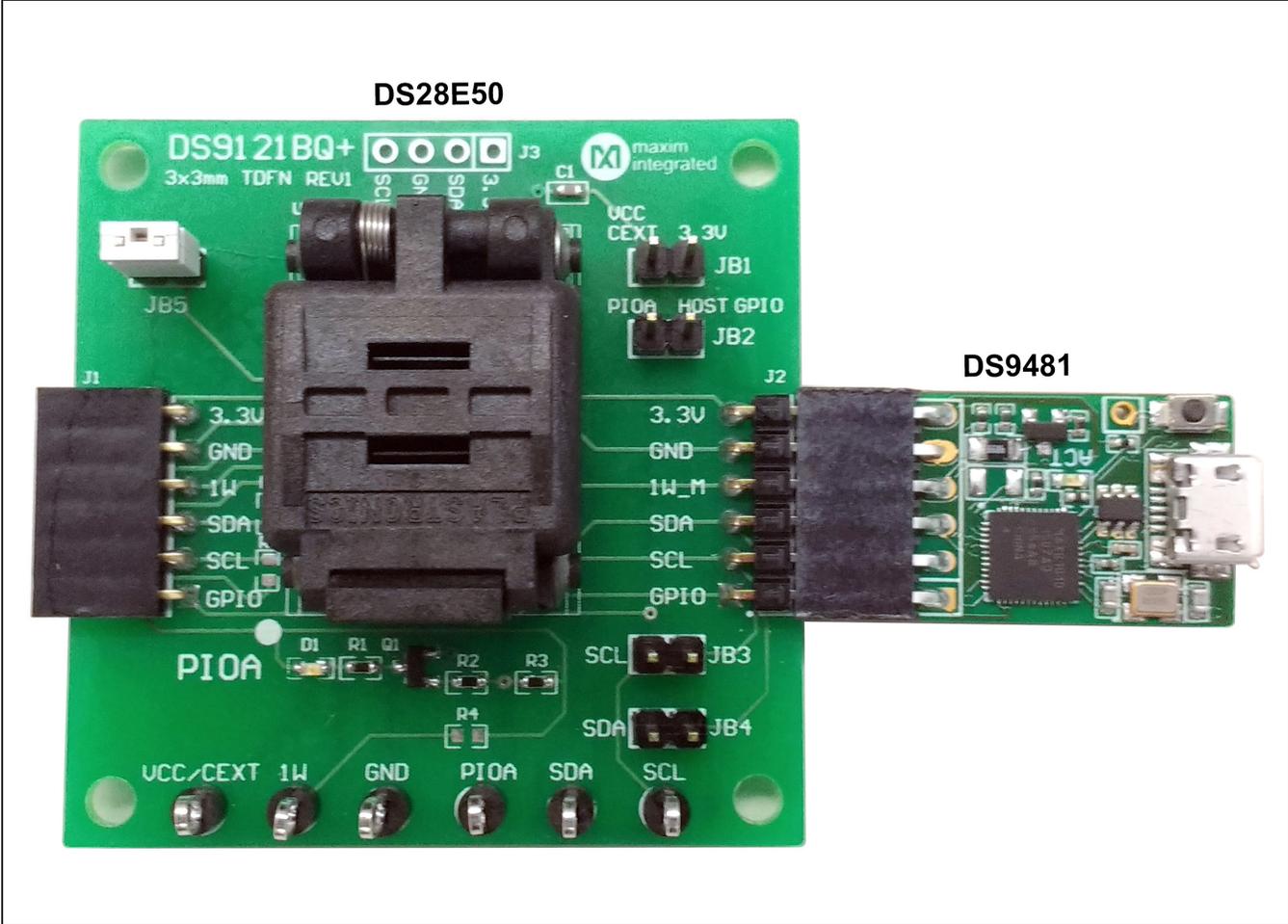


Figure 9. DS9481 Connected to DS28E50

## DS28E50 Evaluation Kit

## Evaluates: DS28E50 and DS2477

- d) Connect the 1st DS9121BQ J2, 6-pin male plug, into the DS9481P-300#, 6-pin female socket per [Figure 10](#).
- e) Connect the 2nd DS9121BQ J2, 6-pin male plug, into the 1st DS9121BQ J1, 6-pin female socket per [Figure 10](#).
- f) For the 1st DS9121BQ+ socket boards that contains the DS2477, configure jumpers JB3 to use SCL, JB4 to use SDA and JB1 to use 3.3V per [Figure 10](#).
- g) For the 2nd DS9121BQ+ socket board that contains the DS28E50, configure jumpers JB5 to use 1W per [Figure 10](#).
- h) Plug the DS28E50 EV kit, using a USB Type-A to Micro-USB Type-B cable, into the PC.

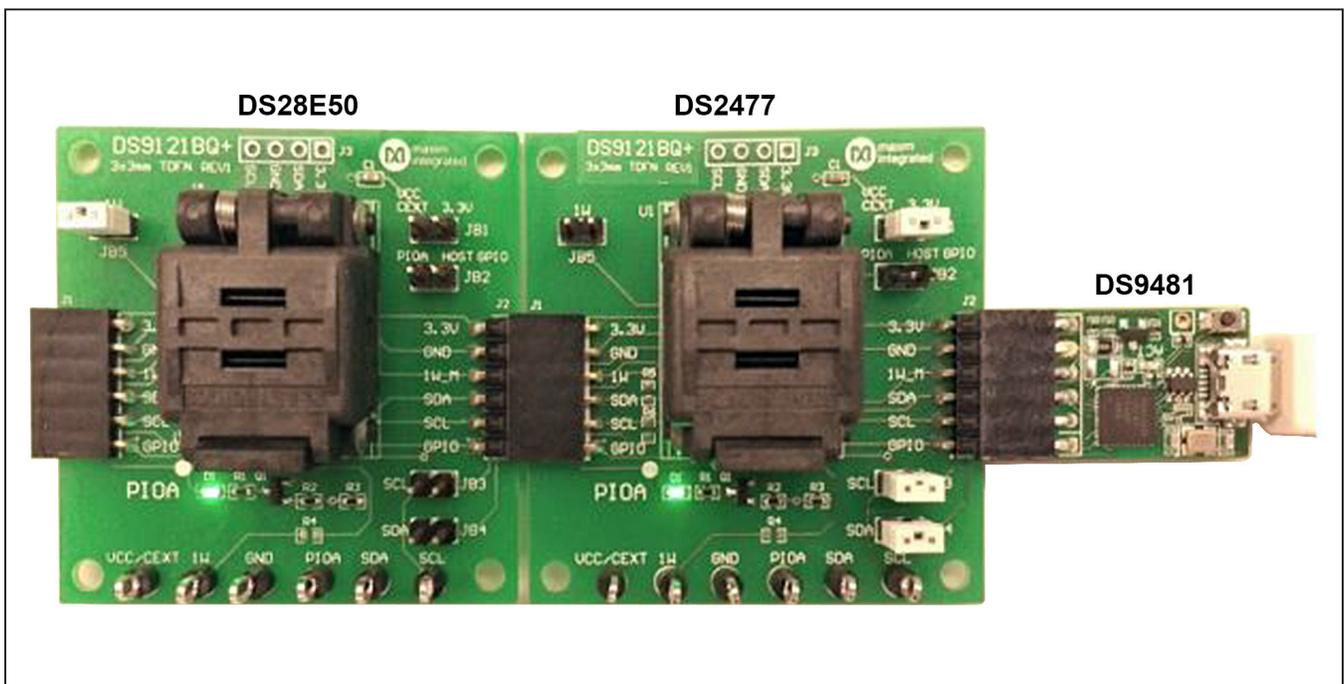


Figure 10. DS9481 Connected to DS2477 and DS28E50

- 9) Choose the DS28E50 or DS2477 under the **Device** tab, shown in [Figure 11](#) and click **Run** to complete the detection process.

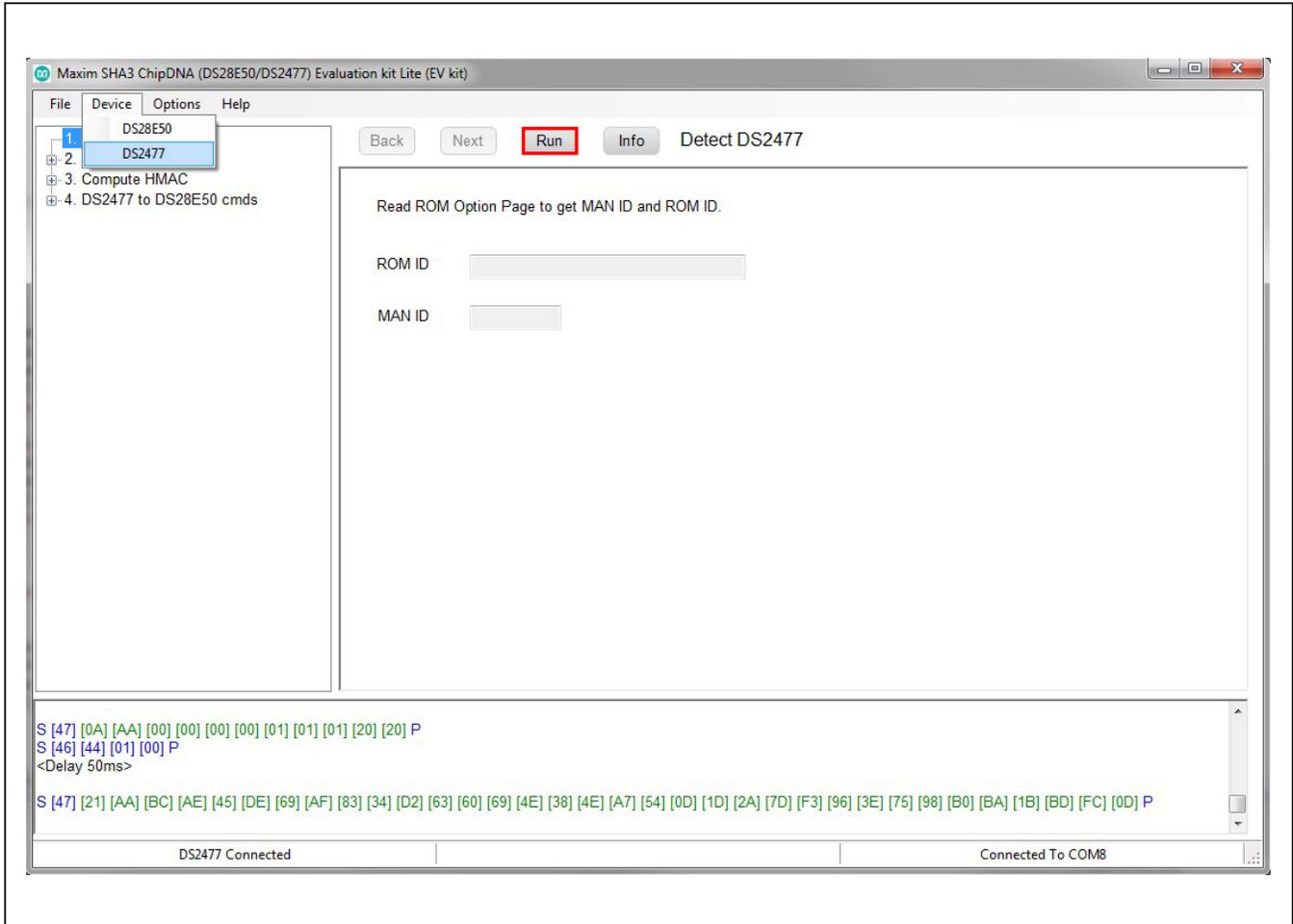


Figure 11. DS28E50 EV Kit Main Program Screen. Choose a Device from the Device Pulldown Menu.

10) Wait for the green **Device Detected** message to appear and the ROMID and MANID fields to populate as shown in [Figure 12](#). If this message does not appear, check your hardware connections.

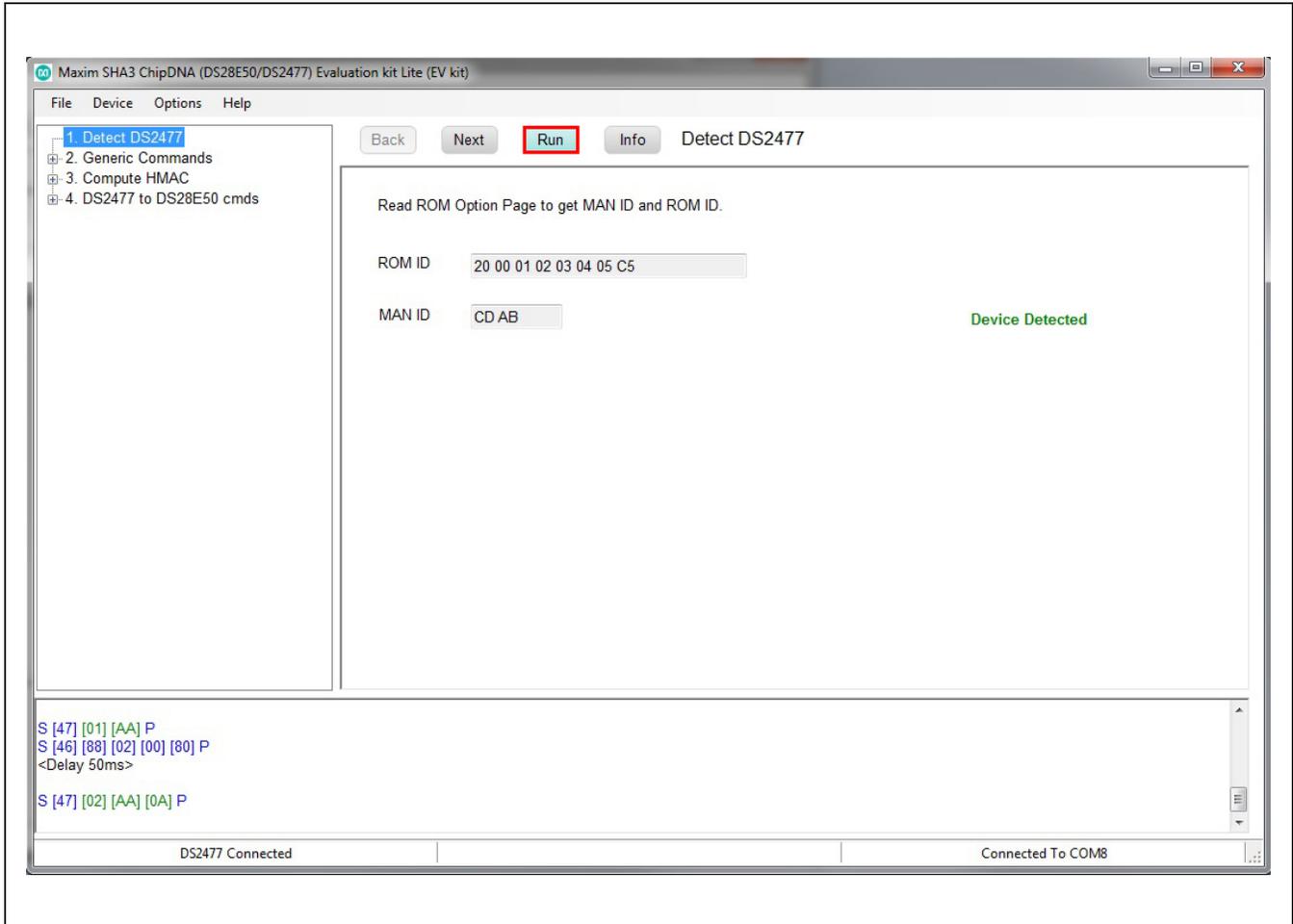


Figure 12. DS2477 Successfully Detected by the EV Kit Software

### EV Kit Supported Functions

The DS28E50 EV kit program is designed as a usage example.

The software can be used to evaluate the DS28E50 independently or in conjunction with the DS2477.

To evaluate the DS28E50 by itself, use the hardware configuration shown in [Figure 9](#). In this case, select **DS28E50** from the **Device** drop-down menu. If **DS2477** is selected from the device menu, the coprocessor (DS2477) is

used to communicate with the DS28E50. The hardware configuration in [Figure 10](#) is used for evaluation of the DS28E50 combination.

The GUI displays all the I<sup>2</sup>C and 1-Wire sequences for each step performed to assist the firmware engineer. See [Table 1](#) and [Table 2](#) for descriptions of the limited functions provided in the lite version of the EV kit GUI for both the DS28E50 and DS2477, respectively. To request the full developer version of the program, click the link at the top of page 1.

**Table 1. GUI Setup and Usage Flows Supported in DS28E50**

FLOW*	DESCRIPTION
Detect Device	Reads page 7 to get ROMID and MANID.
Compute and Read Page Authentication	Creates authentication response based on given challenge. Results in a SHA-3 signature. CRPA sequence can be done on pages 0-5. Use in field to do an authentication with HMAC for a read page(s) of memory.
Authenticated SHA3 Write Memory	Use at factory to do an authenticated write to a page of memory.
Read Status	Read page protections set on each page.
Read Memory	Read any page of memory without RP or EPH protection set.
Write Memory	Write data to any page (0-8) without WP, APH, or EPH protection set.
1-Wire Read ROM	Read device ROMID.

\*Software supports all DS28E50 flows in Table 1.

**Table 2. GUI Setup and Usage Flows Supported in DS2477**

FLOW*	DESCRIPTION
Detect DS2477	Reads page 7 to get ROMID and MANID.
Compute HMAC	Write the Master Secret, Bind Data, and Partial Secret and issue the Compute and Lock Secret Command to generate an HMAC.
Read Status	Read page protections set on each page.
Read Memory	Read any page of memory without RP or EPH protection set.
Write Memory	Write data to any page (0-8) without WP, APH, or EPH protection set.
1-Wire Search ROM	Search for the slave ROMID values on the 1-Wire line.
DS2477 to DS28E50 Commands	Send the following commands to the DS28E50: Read Status, Read Memory and Write Memory

\*Software supports all DS2477 flows in Table 2.

### Ordering Information

PART	TYPE
DS28E50EVKIT#	EV Kit

#Denotes RoHS compliant.

**DS9121 BQ EV Kit Bill of Materials**

DESIGNATOR	QTY	DESCRIPTION	MANUFACTURER	PART NO.
J1	1	CONN FEMALE 6POS .100" R/A GOLD	Sullins Connector Solutions	PPPC061LGBN-RC
J2	1	CONN HEADER 6 POS RA 2.54	Würth Electronics Inc.	61300611021
TP1-TP6	6	TEST POINT PC MULTI PURPOSE BLK	Keystone Electronics	5011
U1	1	SOCKET+, IC TDFN, 3MM, 3x2, CLAMSHELL	PLASTRONICS	06QN10T23030
C1	1	CAP CER 0.47UF 16V X7R 0603	KEMET	C0603C474K4RACTU
D1	1	LED GREEN CLEAR 0603 SMD	Dialight	5988081107F
JB1-JB5	5	CONN HEADER 2 POS 2.54	Würth Electronics Inc.	61300211121
Q1	1	MOSFET N-CH 50V 200MA SOT-23	ON Semiconductor	BSS138LT1G
R1, R3	2	RES SMD 10K OHM 0.1% 1/10W 0603	Bourns Inc.	CRT0603-BY-10R0ELF
R2	1	RES SMD, 3.3K OHM, 1%, 0603	Yageo	RC0402JR-071K5L



## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/18	Initial release	—
1	10/18	Added DS2477	1–15
2	2/19	Updated <i>General Description</i> , <i>Quick Start</i> , <i>Hardware Setup and Driver Installation Quick Start</i> , Figure 6 caption, Figure 7 caption, Figure 11 caption, <i>EV Kit Supported Functions</i> section, <i>Ordering Information</i> , and replaced schematic	1, 5, 6, 9, 10, 12, 14

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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