#### 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-I<sup>2</sup>C/1-Wire<sup>®</sup> adapter. The evaluation software runs under Windows<sup>®</sup> 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/I <sup>2</sup> C Adapter
1	USB Type-A to Micro-USB Type-B Cable

#### **Features**

- Demonstrates the Features of the DS28E83 DeepCover<sup>®</sup> Radiation Resistant 1-Wire Authenticator
- Demonstrates the Features of the DS2476 DeepCover Secure Coprocessor
- 1-Wire/I<sup>2</sup>C Communication Is Logged to Aid Firmware Designers Understanding of DS28E83 and DS2476
- 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, 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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#### 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/I<sup>2</sup>C 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 <u>DS28E83 EV kit software (light version)</u> 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.

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# 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.

- In a file viewer (Figure 1), double click on <u>DS28E83</u> <u>EV\_Kit\_Software\_Setup\_V1.0.0.exe</u> to begin the installation.
- The setup wizard opens; click on <u>Next</u>, as shown in <u>Figure 2</u>.

→ → DS28E83_EV_Kit_Software_Setup_V1.0.0	)	• 4 <sub>7</sub>	Search DS28E83_EV_K	(it_Software )
ile <u>E</u> dit <u>V</u> iew <u>T</u> ools <u>H</u> elp				
Organize	New folder		:==	- 🔟 🔞
☆ Favorites	Name	Date modified	Туре	Size
📙 Downloads	DS28E83_EV_Kit_Software_Setup_V1.0.0.exe	7/11/2017 4:41 PM	Application	27,639 K
🕮 Recent Places				
🧮 Desktop				
ConeDrive - maximintegrated.onmicrosoft.com				

Figure 1. File Viewer



Figure 2. DS28E83 Setup Wizard

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

Select Destination Loc	ation			
Where should DS28E83 installed?	DeepCover Secure Aut	henticator Evaluation Ki	t be	
Setup will inst the following f	all DS28E83 DeepCover older.	Secure Authenticator Ev	valuation Kit into	
To continue, click Next.	If you would like to sele	ect a different folder, <mark>c</mark> li	ck Browse.	
ntegrated\DS28E83 D	eepCover Secure Auther	nticator Evaluation Kit	Browse	
At least 31.7 MB of free	e disk space is required.			

Figure 3. Install Folder Location

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5) Click <u>Next</u> to install shortcuts to the default folder (Figure 4).

Figure 4. Program Shortcuts Location

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6) Unplug any Maxim adapter and click on <u>Next</u>, 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).

Select Additional Tasks	ha antonnado	
which additional tasks should	be performed?	
Select the additional tasks you DeepCover Secure Authentica	u would like Setup to perform while installing ator Evaluation Kit, then click Next.	g DS28E83
Install DS9481P-300 drive	er	
Additional icons:		
Create desktop icon		
Start menu icons:		
Create uninstall icon		
	< Back Next >	Cancel

Figure 5.Select to Install the Driver

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

Ready to Install Setup is now ready to begin insta Evaluation Kit on your computer.	lling DS28E83 DeepCover Secure Authentica	itor
Click Install to continue with the ir change any settings.	nstallation, or click Back if you want to review	vor
Destination location: C:\Program Files (x86)\Maxim Start Menu folder: Maxim Integrated\DS28E83 Additional tasks: Install DS9481P-300 driver Start menu icons: Create uninstall icon	m Integrated\DS28E83 DeepCover Secure A DeepCover Secure Authenticator Evaluation	uthei 🗖
٠ [	11	
	< Back Install	Cancel

Figure 6. Ready to Install

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8) Click on <u>Next</u> when the Device Driver Installation Wizard appears (Figure 7).



Figure 7. Device Driver

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



Figure 8. Device Driver Installation Finished

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- 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 <u>Figure 9</u>.
  - 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 1<sup>st</sup> DS9121AQ J1, 6-pin male plug per <u>Figure 10</u>.
- 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

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



Figure 11. Software Installation Finished

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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.

<u>Elle Edit Settings H</u> eip					
Auth w/ECDSA; Setup	Back Nex	t Info Run	Auth w/ECDSA; Setu	qu	
Auth w/ECDSA; Write Auth KP  Auth w/ECDSA; Write App KP  Auth w/HMAC SHA-256; Setup  Auth w/HMAC SHA-256; Nrite  ECDSA Encrypted; Setup  ECDSA Encrypted; Setup  ECDSA Encrypted; Read  Secure Boot w/ECDSA; Setup  Secure Boot w/ECDSA; Usage  Miscellaneous	This is the selec	t flow to be used at	the factory to setup for autho	entication with ECDSA.	
1-Wire I2C					

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

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#### **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 I<sup>2</sup>C and 1-Wire sequences for each step performed to assist the firmware engineer. See <u>Table 1</u> 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 I<sup>2</sup>C 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.

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

#### Table 1. GUI Setup and Usage Flows Supported

\*Software supports all flows in Table 1.

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## **Ordering Information**

PART	ТҮРЕ
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

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#### **DS28E83 EV Kit Schematic**

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#### **Revision History**

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

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