

## General Description

The DS28E17 evaluation system (EV system) provides the special hardware and software system to exercise the features of the DS28E17 1-Wire<sup>®</sup>-to-I<sup>2</sup>C master bridge IC. The EV system consists of a DS28E17 EV kit board and a DS9481P-300# USB-to-1-Wire adapter for PC connectivity. The EV kit is compatible with Windows<sup>®</sup> operating systems.

## EV System Contents

- DS28E17 EV Kit Board ([Figure 1](#))
- DS9481P-300# USB-to-1-Wire Adapter ([Figure 2](#))

## Benefits and Features

- Driver Support for Windows 8 and Windows 7
- Fully Compliant with USB Specification v2.0
- USB Powered with No External Power Supply Required
- On-Board DS7505 Digital Thermometer I<sup>2</sup>C Slave Peripheral
- Extended I<sup>2</sup>C Peripheral Module Connector for Rapid Prototyping of I<sup>2</sup>C Slaves
- Proven PCB Layout

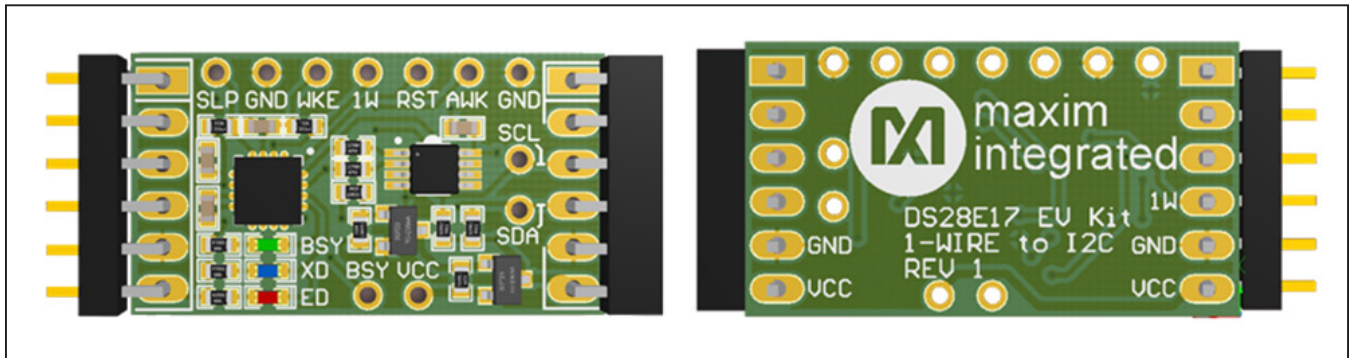


Figure 1. DS28E17 EV Kit Board

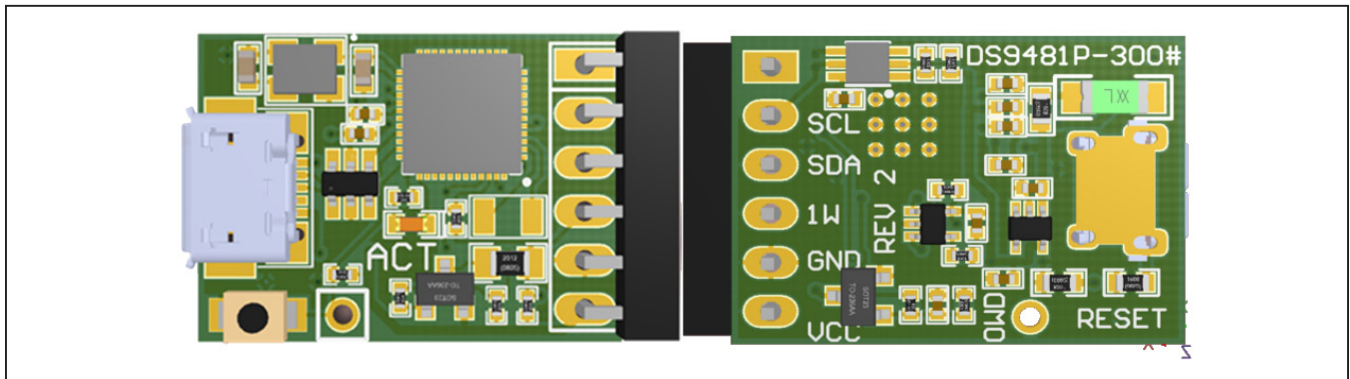


Figure 2. DS9481P-300# USB-to-1-Wire Adapter

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

[Ordering Information](#) appears at end of data sheet.

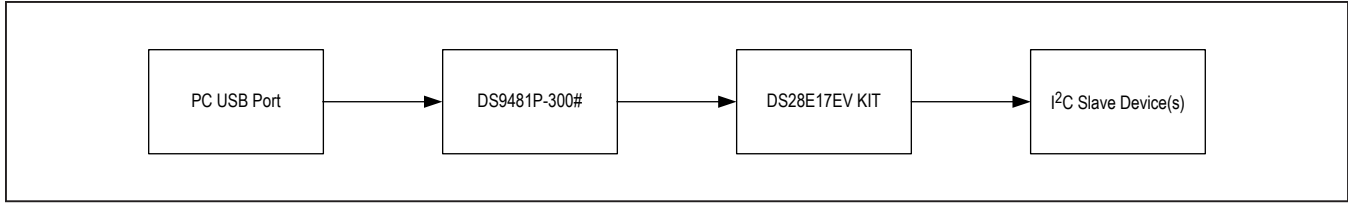


Figure 3. Typical Setup

### DS28E17EVKIT Files

FILE	DESCRIPTION
DS28E17 EV Kit	EV Kit Software

### Quick Start

#### Required Equipment

- DS28E17 EV kit (included)
- DS9481P-300# USB-to-1-Wire adapter (included)
- PC with a Windows 8 or Windows 7 (32-bit or 64-bit) operating system and a spare USB 2.0 or higher port
- 1-Wire drivers
- DS28E17 evaluation 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.

#### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Install the 1-Wire drivers (see the *Installing DS9481P-300# and 1-Wire Drivers* section for instructions).
- 2) Attach the DS9481P-300# adapter to the DS28E17 EV kit (Figure 4).
- 3) Visit <http://content.maximintegrated.com/en/design/tools/applications/evkit-software/> to download the latest version of the DS28E17 EV kit software.
- 4) Unzip and save the EV kit software to a known location.
- 5) Open the **DeviceDriver** folder.
- 6) Right-click on **install.bat** and then choose **Run as administrator** (Figure 5).
- 7) A command window opens with a prompt asking to install the device driver (Figure 6). Click **Install**.
- 8) Open the folder where the DS28E17 EV kit software was extracted and double-click the **Setup.exe** file.
- 9) Plug the USB cable to the DS9481P-300# adapter.
- 10) Insert the DS9481P-300# into a spare USB port on the PC.
- 11) The device will automatically search and install the driver (Figure 7).
- 12) Click on the **Install** button to start installation (Figure 9).
- 13) To start the evaluation software, ensure that the DS9481P-300# has been properly installed and the DS28E17 board and DS9481P-300# adapter are connected.
  - a. Run the DS28E17 EV kit software: **Start** → **Programs** → **Maxim Integrated** → **DS28E17EV Kit**
- 14) If the DS9481P-300# is not detected or connected to the USB port, the software displays an error message (Figure 10). Close the program window, reconnect the DS9481P-300# adapter and restart the program again.
- 15) Once properly installed, the initial screen graphical user interface (GUI) should appear (Figure 11).

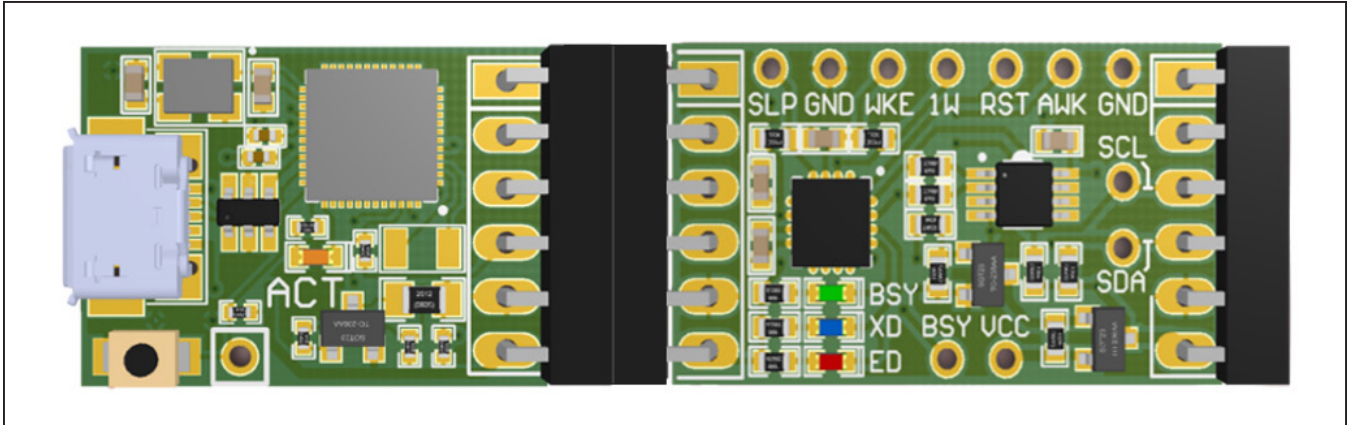


Figure 4. DS9481P-300 Attached with DS28E17 EV Kit

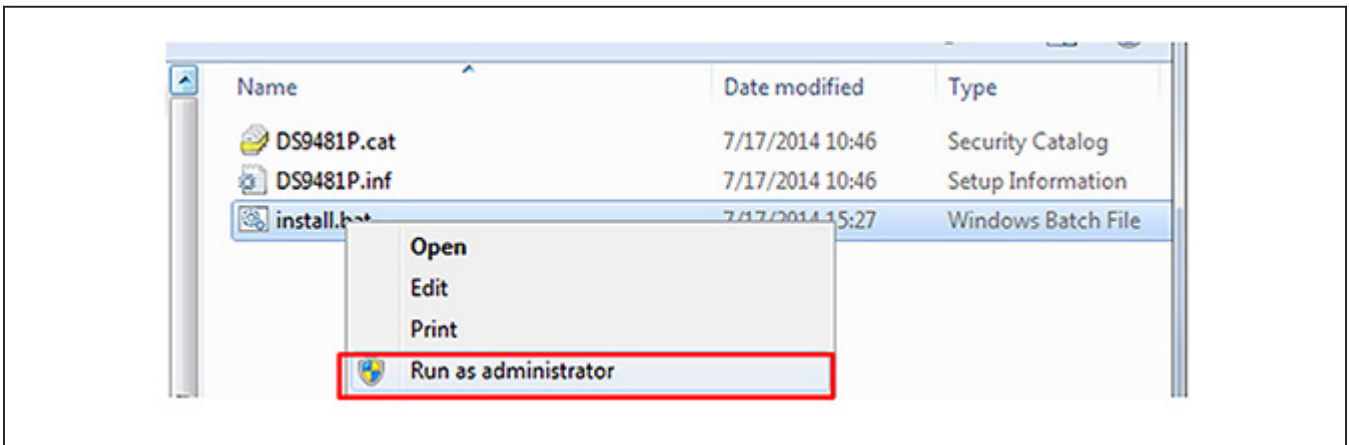


Figure 5. Device Driver Installation

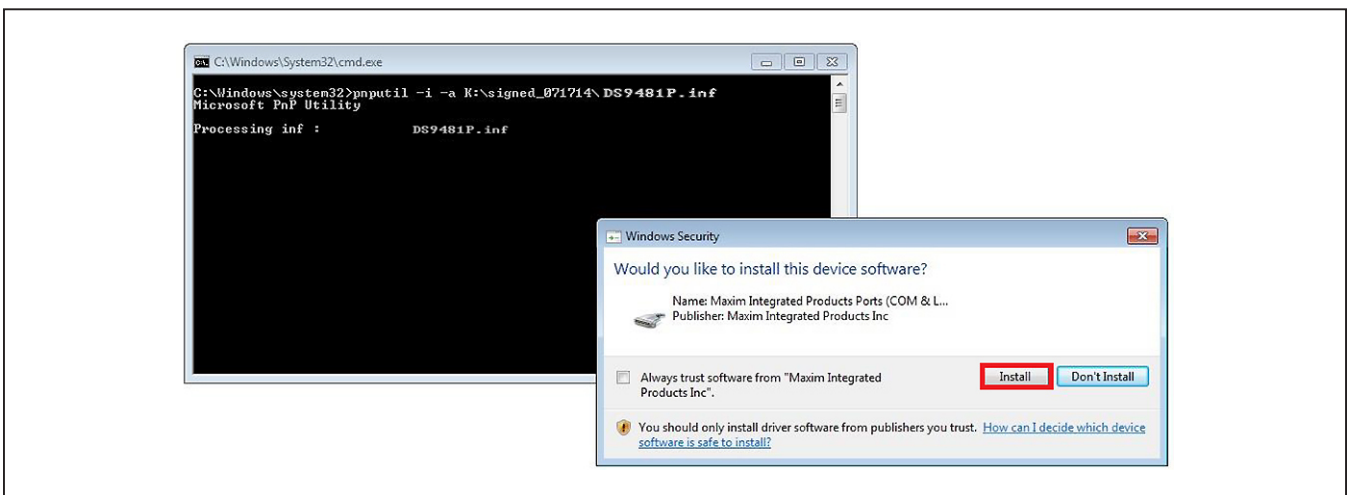


Figure 6. Device Driver (Install Device Software)

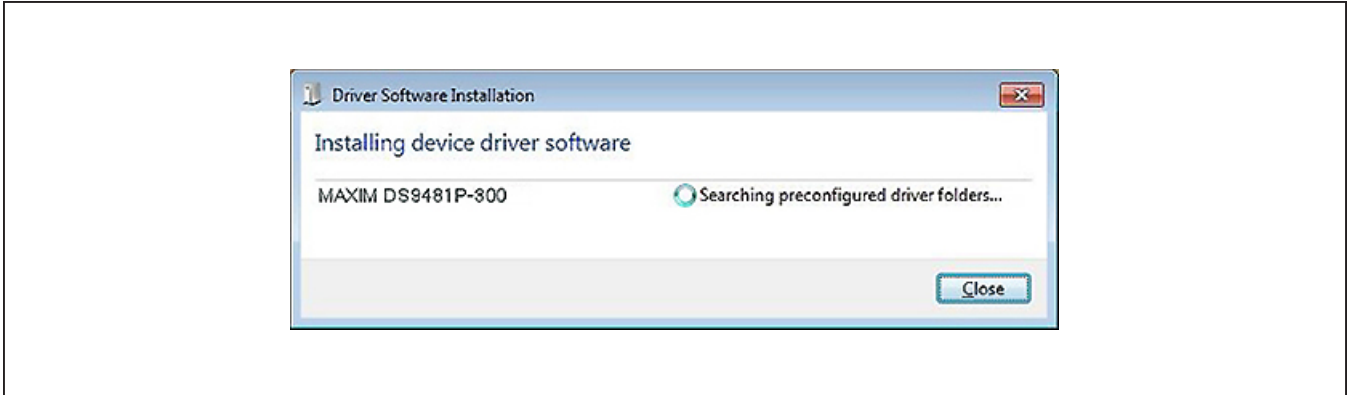


Figure 7. Device Driver Successfully Installed

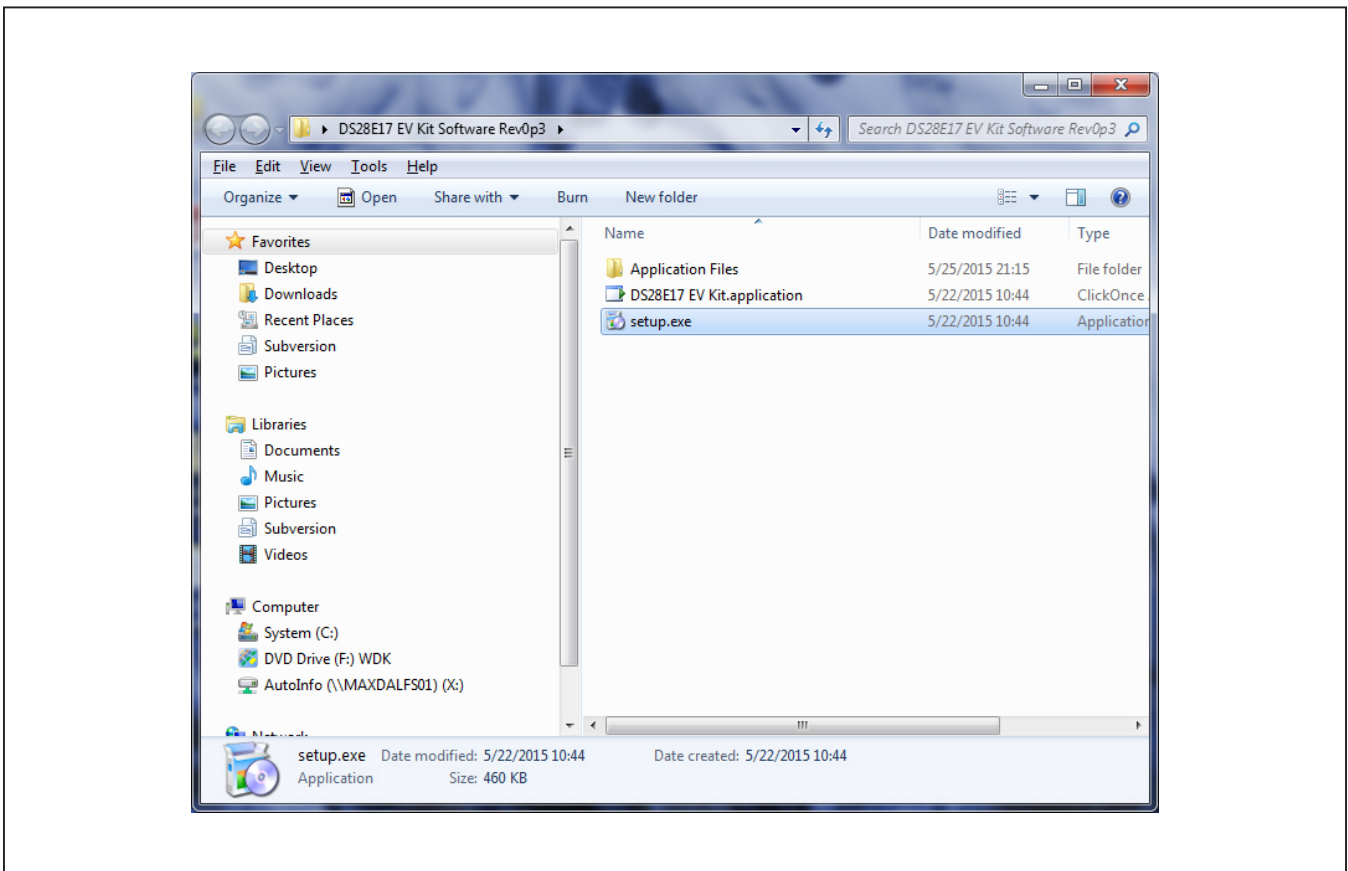


Figure 8. Opening the DS28E17 Evaluation Program Setup

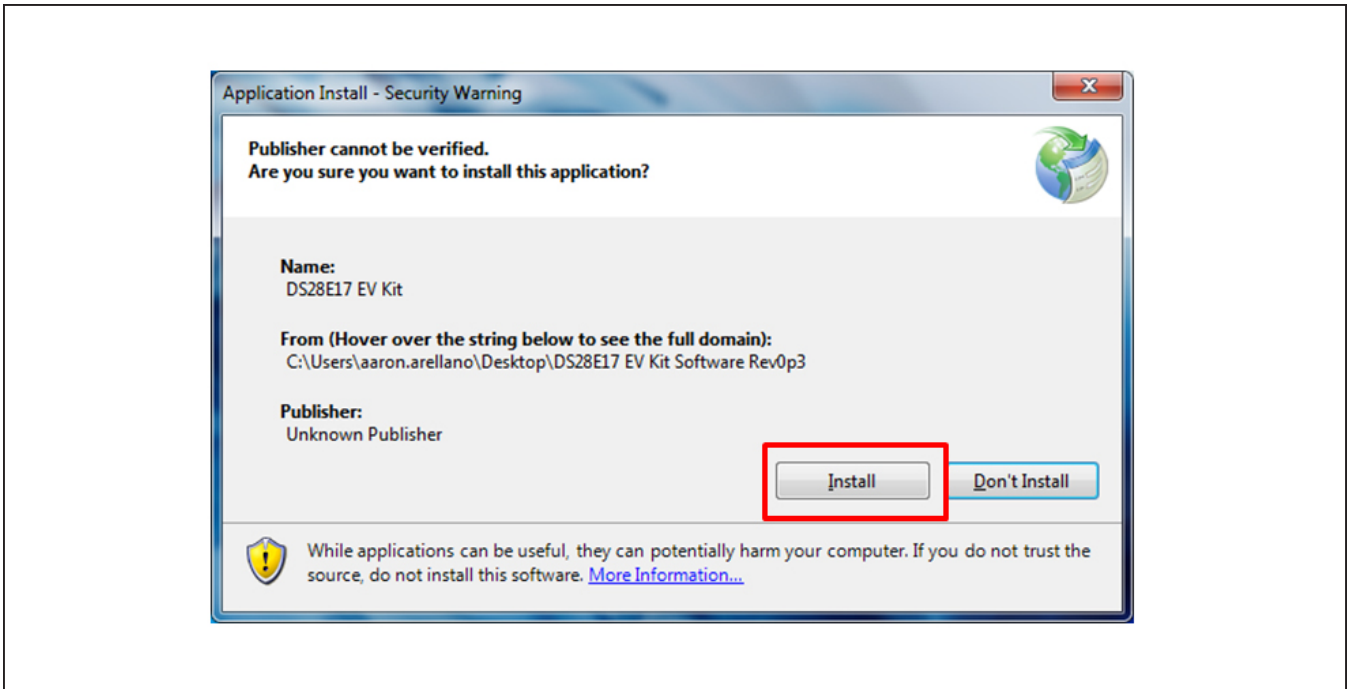


Figure 9. DS28E17 EV Kit Application Install

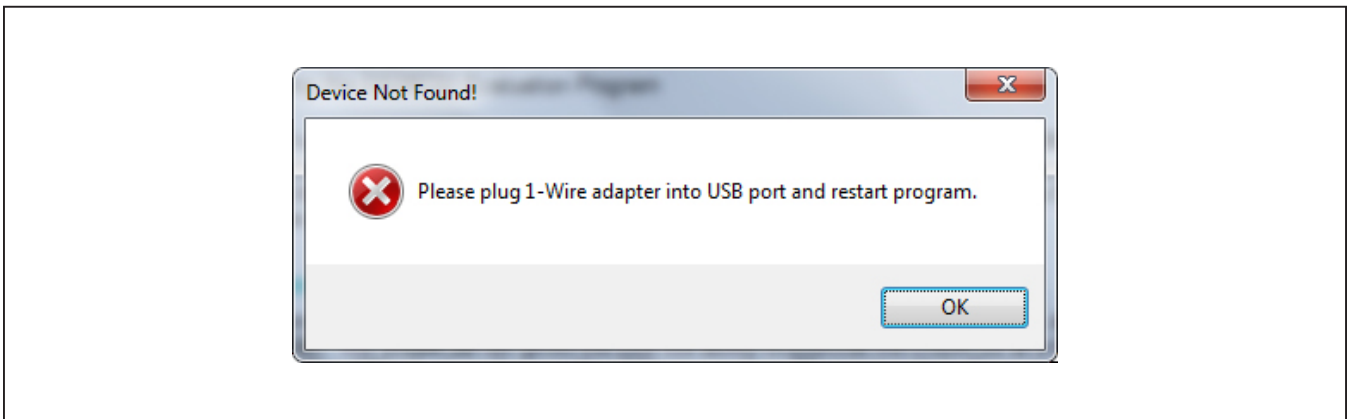


Figure 10. DS9481P-300# (Device Not Found!)

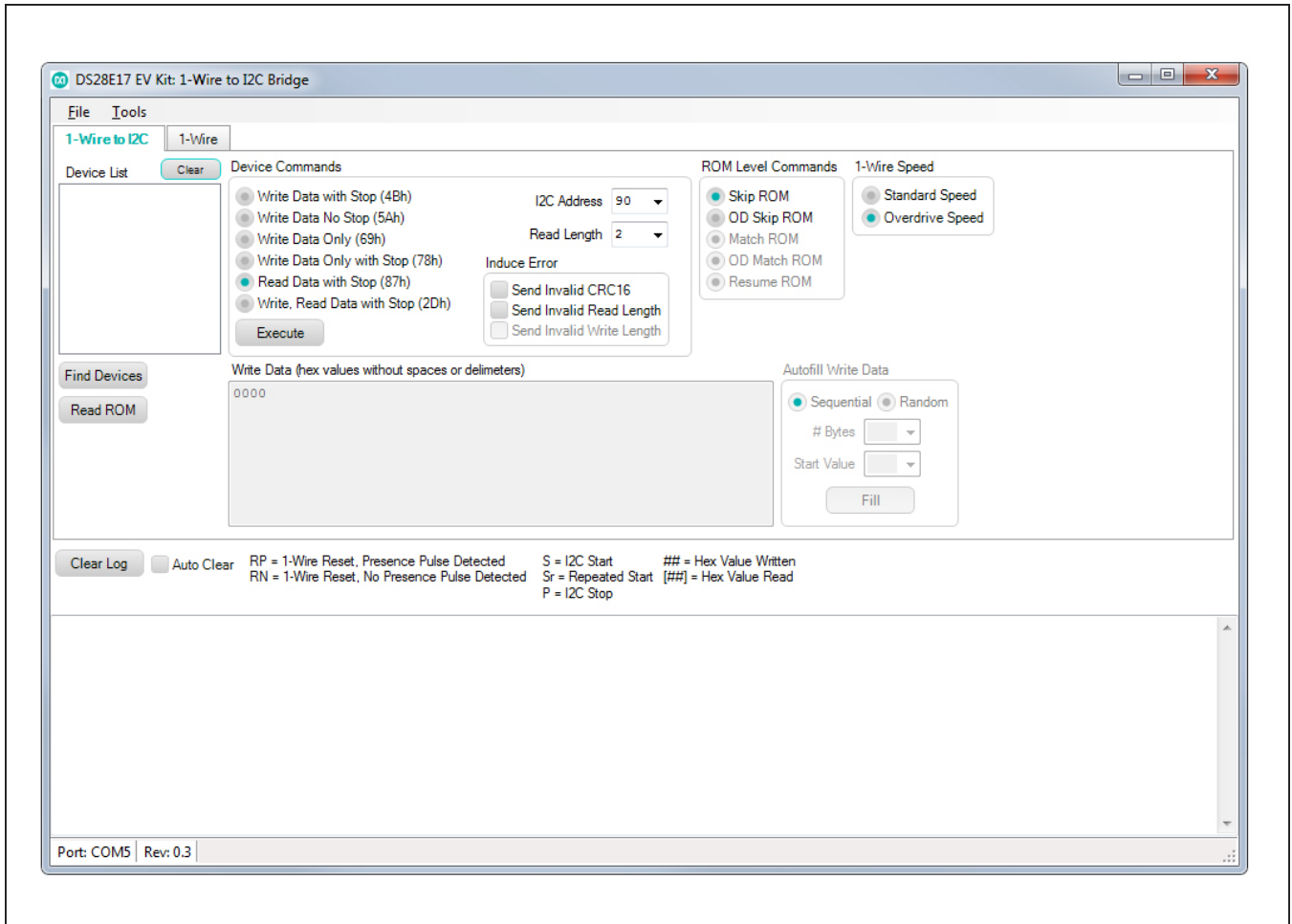


Figure 11. DS28E17 EV Kit Software Initial Screen GUI

### Detailed Description of Software

The DS28E17 evaluation program user interface (Figure 12) has two tabs: **1-Wire to I2C** and **1-Wire**. The **1-Wire to I2C** tab (Figure 15) is the main tool to evaluate specific functions of the DS28E17. The **1-Wire** tab (Figure 16) provides 1-Wire communication functions down to the bit level. These functions allow manual creation of communication sequences beyond those found on the **1-Wire to I2C** tab.

#### File Menu Section

**Exit** closes the 1-Wire connection and exits the applications.

#### Tools Menu Section

The **Tools** menu provides all the connection information and settings required for 1-Wire transactions (Figure 13).

- **Read Device Revision** returns the DS28E17 revision.
- The **Set I2C Speed** selection sets the device’s I2C communication speed. The DS28E17 supports three different I2C speeds: 100kHz, 400kHz, and 900kHz
- **Read I2C Speed** reads the current I2C communication speed set on the device registry.
- **Sleep:** This selection makes the device go into sleep mode. After selecting this option, the device no longer responds to any command until a high-level signal is detected on the WAKEUP pin. See Figure 14 for example log returns after **Sleep** condition.

The WAKEUP pin (shown as WKE) is located at the top of the EV kit board (Figure 1).

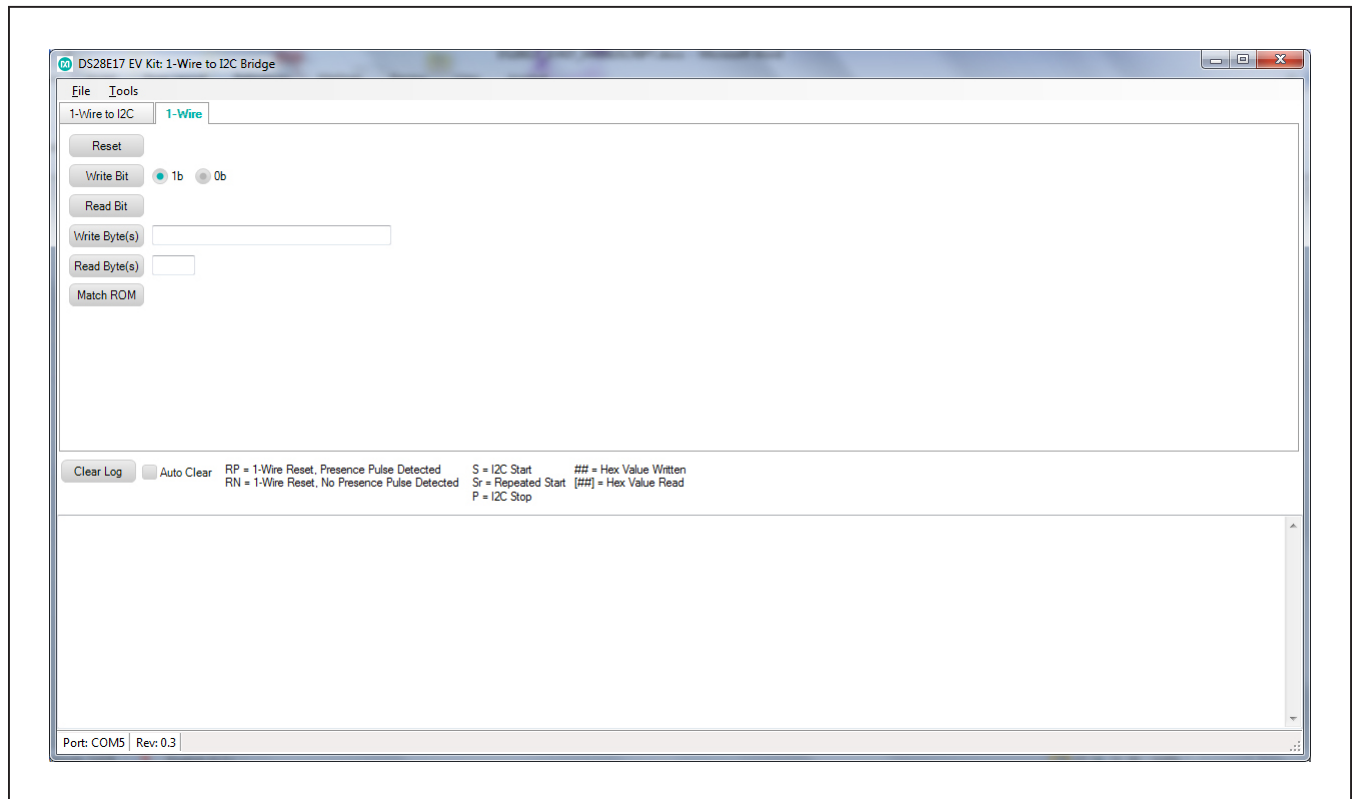


Figure 12. DS28E17 EV Kit Software, Main GUI Interface

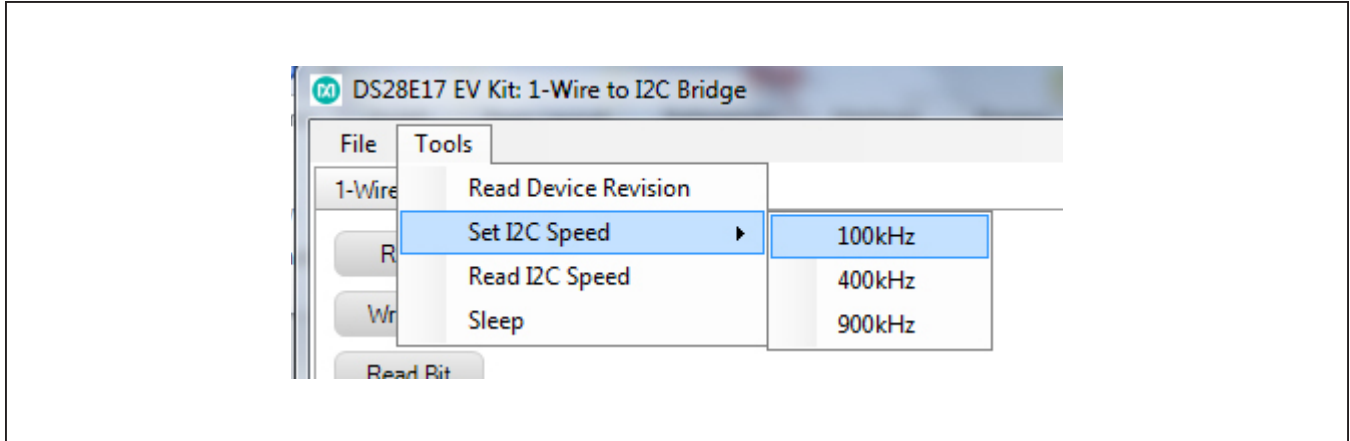


Figure 13. DS28E17 EV Kit Software GUI, Tools Menu

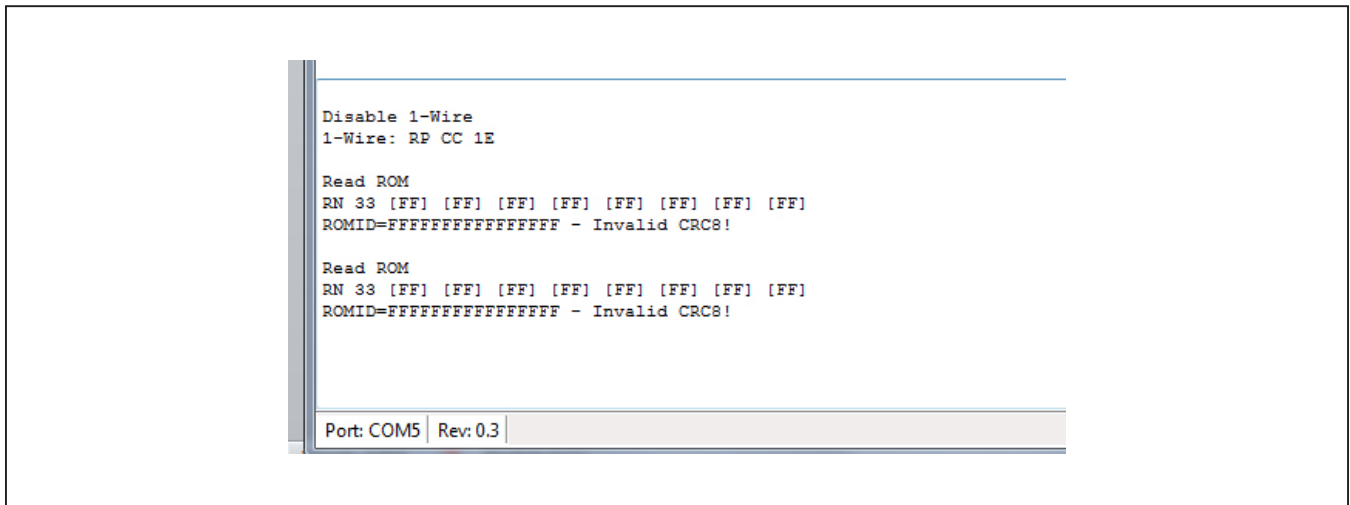


Figure 14. DS28E17 EV Kit Software GUI, Tools Menu (Sleep Condition Log Results)

### 1-Wire to I2C Tab

The **1-Wire to I2C** tab (Figure 15) provides the following elements: **Device List** text box, **Device Commands** group box, **ROM Level Commands** group box, **1-Wire Speed** group box, **Find Devices** and **Read ROM** buttons,

**Write Data** edit box, **Autofill Write Data** group box, and **Log** section. Details for each element are explained next. The **Log** section displays the 1-Wire and 1-Wire-to-I2C communication commands. See Table 1 and Table 2.



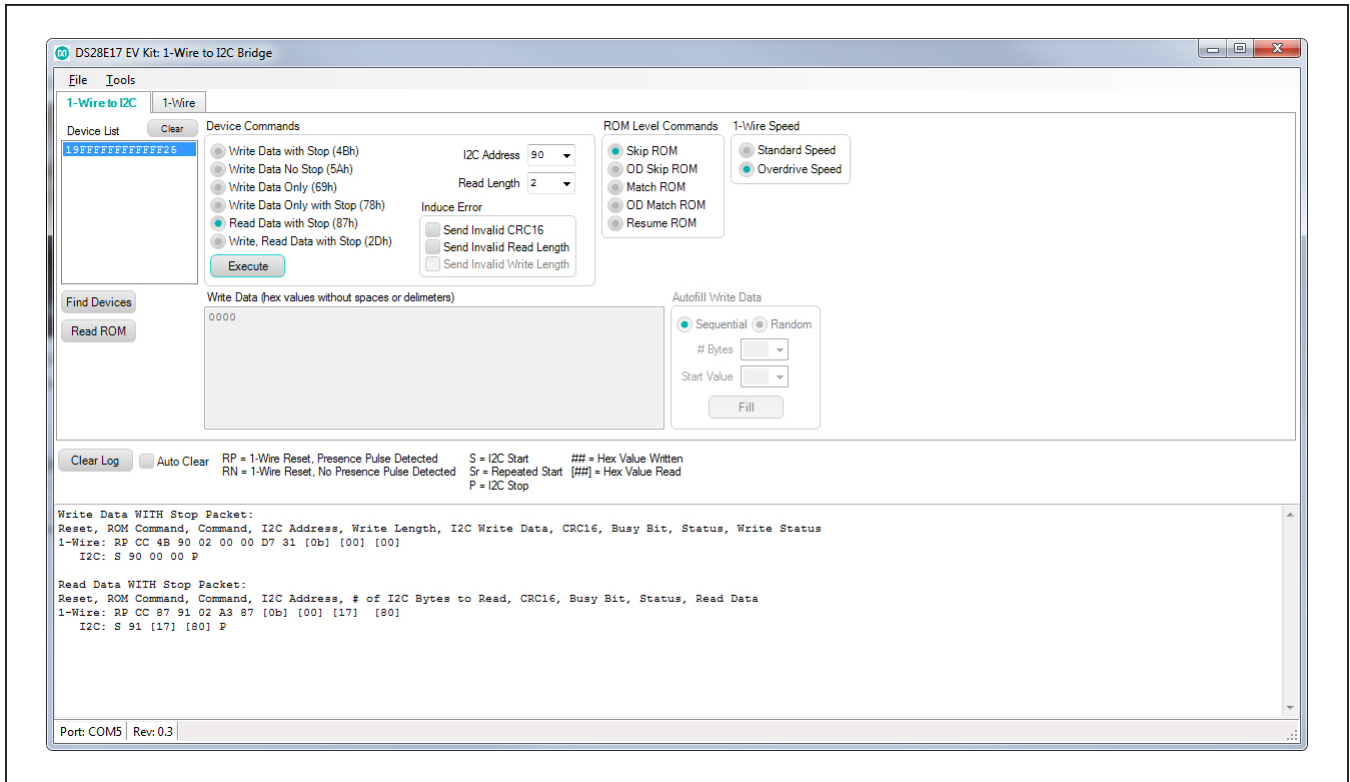


Figure 15. DS28E17 EV Kit Software GUI (1-Wire to I2C Tab)

Table 1. 1-Wire to I2C Options

ELEMENT NAME (TYPE)	PURPOSE	USAGE/SETTINGS
<b>Device List</b> (Text Box)	Display 1-Wire devices found	Displays the ROM ID for the attached devices on the 1-Wire bus. Used for <b>Match ROM</b> commands. <b>Match ROM</b> commands use the selected device under the <b>Device List</b> text box. The data in this field is used with the ROM function action buttons to select a particular 1-Wire slave device. It is automatically filled when using the <b>Find Devices</b> button.
<b>Find Devices</b> (Action button)	Search for available devices attached to the 1-Wire line	Triggers the search command and adds discovered devices to the <b>Device List</b> text box.
<b>Clear Log</b> (Action button)	Clears the Log box	Clears all contents under the <b>Log</b> section.
<b>Read ROM</b> (Action button)	1-Wire command	Sends the 1-Wire reset followed by the <b>Read ROM</b> command (33h) and then reads the 64-bit ROM ID of the 1-Wire slave device. The CRC8 within the number is checked to validate the ROM IDs. A warning is logged if the CRC8 is not valid. The ROM ID is also loaded into the <b>Device List</b> text box to use with ROM commands.
<b>Auto Clear</b> (Checkbox)	Select if Log should be cleared each time a command is executed	This keeps a clean log, with only the last command executed displayed under the <b>Log</b> section.
<b>Execute</b> (button)	Executes the selected command	Issues the selected command to the DS28E17.

**Table 2. Device Commands**

ELEMENT NAME (TYPE)	PURPOSE	USAGE,SETTINGS
<b>Write Data With Stop (4Bh)</b> (Radio button)	I <sup>2</sup> C Write command	Sends an I <sup>2</sup> C packet command containing data and the stop command at the end of the data.
<b>Write Data No Stop (5Ah)</b> (Radio button)	I <sup>2</sup> C Write command	Addresses and writes 1 to 255 bytes to an I <sup>2</sup> C slave without completing the transaction with a stop. This command allows writing large amounts of data at one time when used in conjunction with the <b>Write Data Only</b> or <b>Write Data Only with Stop</b> device commands.
<b>Write Data Only (69h)</b> (Radio button)	I <sup>2</sup> C Write command	Used when a start and I <sup>2</sup> C address has previously been issued with a <b>Write Data No Stop</b> device command. This command writes 1 to 255 bytes to an I <sup>2</sup> C slave without completing the transaction with a stop and enables writing large amounts of data at one time when used with the <b>Write Data Only</b> or a last <b>Write Data Only with Stop</b> device commands.
<b>Write Data Only with Stop (78h)</b> (Radio button)	I <sup>2</sup> C Write command	Used when a start and I <sup>2</sup> C address has previously been issued with a <b>Write Data No Stop</b> device command. This command writes 1 to 255 bytes to an I <sup>2</sup> C slave, completing the transaction with a stop.
<b>Read Data with Stop (87h)</b> (Radio button)	I <sup>2</sup> C Write command	This is used to address and read 1 to 255 bytes from an I <sup>2</sup> C slave in one transaction.
<b>Write, Read Data with Stop (2Dh)</b> (Radio button)	I <sup>2</sup> C Write command	This is used to first address and write 1 to 255 bytes to an I <sup>2</sup> C slave. Secondly, it addresses and reads 1 to 255 bytes from an I <sup>2</sup> C slave and issues a stop.
<b>I<sup>2</sup>C Address</b> (Combo box)	I <sup>2</sup> C Slave address selection	To select the address of the I <sup>2</sup> C slave device for each transaction.
<b>Read Length</b> (Combo box)	Selection of bytes to read	Provides the total number of bytes desired to read. Option is disabled until a <b>Read Data</b> option is selected.
<b>Induce Error</b>	To test DS28E17 I/O states	This option includes three different error states to help monitor the device I/O pin states for each error ( <b>Invalid CRC16</b> , <b>Invalid byte length</b> , and <b>Invalid Write length</b> ). This selection helps the user understand the DS28E17 behavior after each error. For I/O states for each error, refer to the DS28E17 IC data sheet.

**Table 3. 1-Wire Speed**

ELEMENT NAME (TYPE)	PURPOSE	USAGE/SETTINGS
<b>Standard Speed</b> (Radio button)	1-Wire Speed	Indicates 1-Wire communication speed. The selected speed is also applicable when user selects the <b>1-Wire</b> tab.
<b>Overdrive Speed</b> (Radio button)	1-Wire Speed	Indicates 1-Wire communication speed. The selected speed is also applicable when user selects the <b>1-Wire</b> tab.

**Table 4. Autofill Write Data**

ELEMENT NAME (TYPE)	PURPOSE	USAGE/SETTINGS
<b>Sequential</b> (Radio button)	Write Data fill selection	Fills the <b>Write Data</b> edit box with bytes in a sequential order. Requires user to select the <b># Bytes</b> to be written and the <b>Start Value</b> .
<b>Random</b> (Radio button)	Write Data fill selection	Fills the <b>Write Data</b> edit box with bytes in a random order. Requires user to select the <b># Bytes</b> to be written and the <b>Start Value</b> .

**Table 5. ROM Level Commands**

ELEMENT NAME (TYPE)	USAGE/SETTINGS
<b>Skip ROM</b> (Radio button)	Sends a 1-Wire reset followed by the CCh Skip ROM command. This selects all devices on the 1-Wire bus.
<b>OD Skip ROM</b> (Radio button)	Sends a 1-Wire reset followed by the 3Ch Overdrive Skip ROM command. This sets all devices on the 1-Wire bus to Overdrive speed. The <b>1-Wire Speed</b> section will display the current device's speed. The <b>ROM Level commands</b> will display the next available command. To bring back device to standard speed under the <b>1-Wire Speed</b> , select <b>Standard Speed</b> .
<b>Match ROM</b> (Radio button)	Sends the 1-Wire reset followed by the Match ROM command 55h followed by the 8 bytes of the ROM ID in the ROM to use with ROM commands. Requires to previously use the <b>Find Devices</b> button to read device ROM ID and use the selected ROM ID for the match rom sequence.
<b>OD Match ROM</b> (Radio button)	Sends the 1-Wire reset followed by the Overdrive Match ROM command (69h), followed by the 8 bytes of the ROM ID in the ROM to use with ROM commands. Requires to previously use the <b>Find Devices</b> button to read device ROM ID and use the selected ROM ID for the match ROM sequence. The initial selection will set the device in overdrive speed. The <b>1-Wire Speed</b> section displays the current device's speed. The <b>ROM Level Commands</b> displays the next available command. To bring back device to standard speed under the <b>1-Wire Speed</b> , select <b>Standard Speed</b> .
<b>Resume ROM</b> (Radio button)	Sends a 1-Wire reset followed by the Resume command A5 (hex).

**1-Wire Tab**

The **1-Wire** tab (Figure 16) provides the low-level 1-Wire primitives that can be used to construct any 1-Wire communication sequence. Choices made in the **1-Wire Speed** group box under the **1-Wire to I2C** tab (**Standard**

**Speed** and **Overdrive Speed** only) also apply to ROM-level functions. The **ROM Level** section has functions that implement the 1-Wire ROM function commands, which use the 64-bit ROM ID selected under the **Device List** in the **1-Wire to I2C** tab.

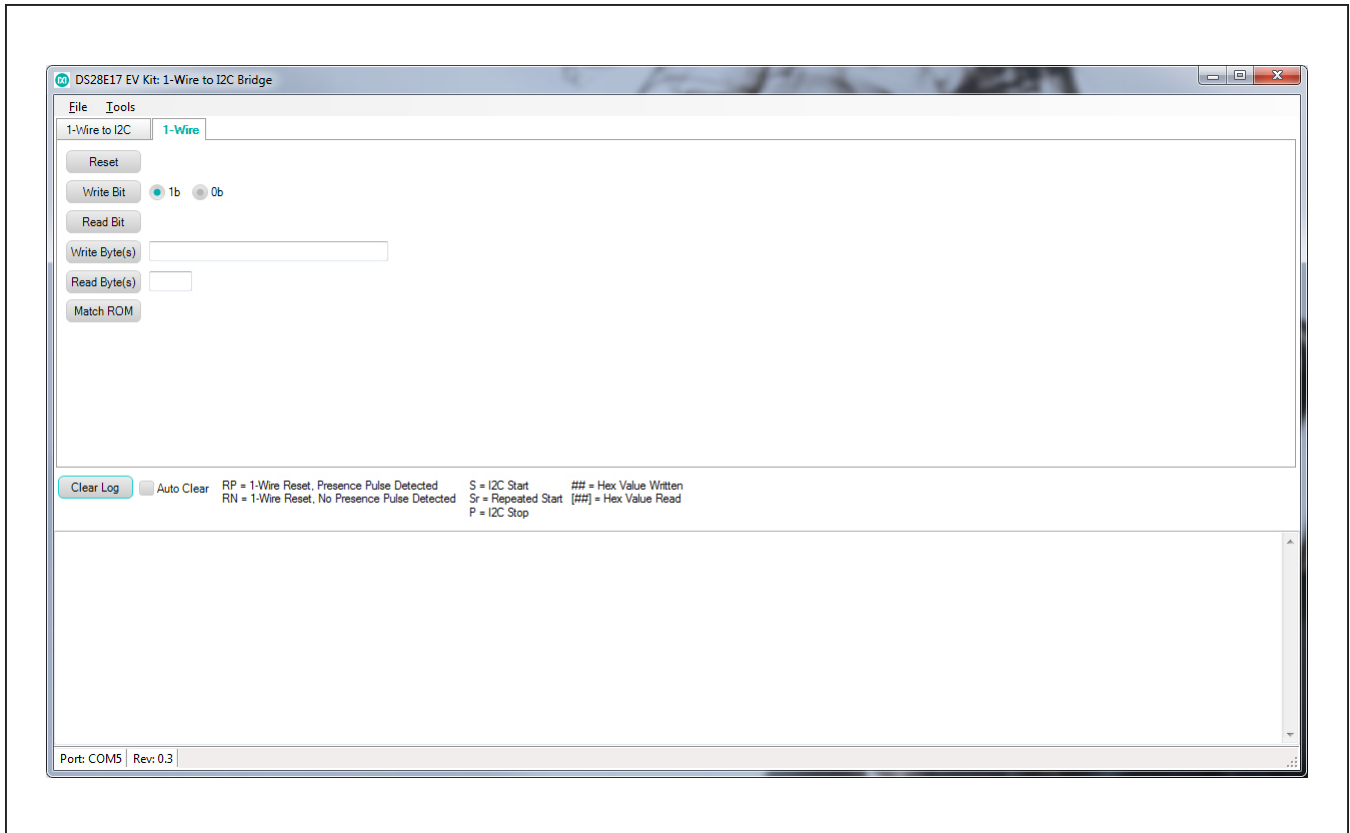


Figure 16. DS28E17 EV Kit Software GUI (1-Wire Tab Functions)

Table 6. 1-Wire Tab

ELEMENT NAME (TYPE)	DESCRIPTION
<b>Reset</b> (Action button)	Generates a 1-Wire reset at the speed specified in the toggle button.
<b>Write Bit</b> (Action button)	Generates a write time slot on the 1-Wire bus. Bit sent is specified in the logic 1 ( <b>1b</b> ) or logic 0 ( <b>0b</b> ) toggle button.
<b>Read Bit</b> (Action button)	Generates a read-data time slot on the 1-Wire bus.
<b>Write Byte(s)</b> (Action button)	Transmits the bytes displayed in the Write Bytes data input box on the 1-Wire bus.
<b>Read Byte(s)</b> (Action button)	Reads as many bytes from the 1-Wire bus as specified by the Number of Bytes to Read counter.
<b>Standard Speed/ Overdrive Speed</b> (Toggle button)	Defines the speed to be used for 1-Wire communication.

**Table 7. Communication Log Decoder**

CODE	1-WIRE ACTIVITY	DESCRIPTION
RP	Presence Pulse Detected	The 1-Wire master generates a Reset pulse and receives a Presence pulse.
RN	No Presence Pulse Detected	The 1-Wire master generates a Reset pulse and does not receive a Presence pulse.
S	None	I <sup>2</sup> C Start
Sr	None	Repeated Start
P	None	I <sup>2</sup> C Stop
##	None	Hex value written
[##]	None	Hex value read

**DS7505 I<sup>2</sup>C Temperature Sensor Example**

The EV kit board includes a DS7505 I<sup>2</sup>C sensor for demo purposes. Additional I<sup>2</sup>C devices can also be attached to the end of the DS28E17 board.

The DS7505 IC data sheet is available for download at [www.maximintegrated.com](http://www.maximintegrated.com).

**Reading Temperature from DS505**

Follow the steps below to read temperature from the DS505:

- 1) Click the **Find Devices** button.
- 2) In the **Device Commands** group box, click the **Write Data with Stop (4Bh)** radio button.
- 3) In the **I<sup>2</sup>C Address** combo box, type or select **90** to set the I<sup>2</sup>C slave address to 90h.
- 4) Inside the **Write Data** edit box, type **0000**.
- 5) Click the **Execute** button.
- 6) The **Log** section will display the 1-Wire and I<sup>2</sup>C transaction.
- 7) In the **Device Commands** group box, click the **Read Data with Stop (87h)** radio button.

- 8) The **Read Length** combo box is enabled.
- 9) Type or select **2** to set the read length to 2 bytes.
- 10) For more information regarding temperature readings, refer to the *Operation—Measuring Temperature* section in the DS2705 IC data sheet.

**Temperature Readings Results**

- Four bytes are returned on the 1-Wire line. These bytes represent the Status byte, Write Status, and two I<sup>2</sup>C bytes from the device. Refer to the DS28E17 IC data sheet for more details.
- The two I<sup>2</sup>C bytes received ([17] [80]) denote the device temperature, 23.5°C (see [Figure 15](#)).
- The DS7505 power-up default is configured for 9-bit resolution.
- 1780h in binary represents 0001 0111 1000 0000. Following [Figure 17](#), the temperature can be calculated.

The DS7505 IC data sheet provides exact temperature calculation procedures and device-specific operation.

Other I<sup>2</sup>C devices can be read using the extension port on the DS28E17 EV kit boards. See [Figure 1](#) for pin selection.

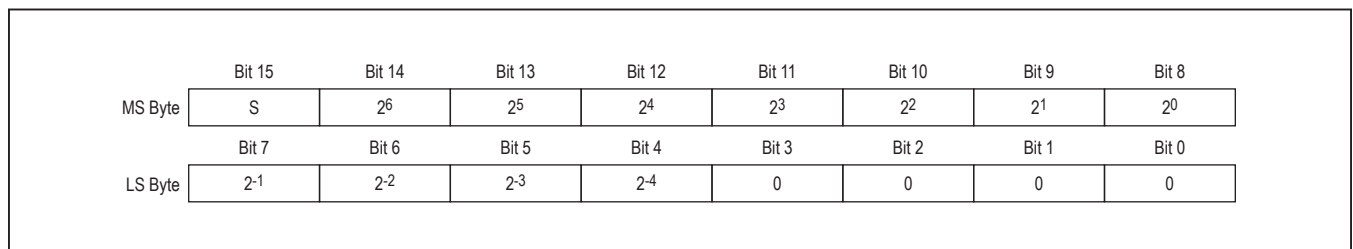


Figure 17. Temperature Reading Registry

### Detailed Description of Hardware

#### DS28E17 EV Kit Component List, PCB Layout, and Schematic

See the following links for component information, schematic diagrams, and PCB layouts:

- [DS28E17 EV kit BOM](#)
- [DS28E17 schematic](#)
- [DS28E17 PCB](#)
- [DS9481P-300 BOM](#)
- [DS9481P-300 schematic](#)
- [DS9481P-300 PCB](#)

### Ordering Information

PART	TYPE
DS28E17K#	EV System

#Denotes RoHS compliant.

**Table 8. DS28E17 EV Kit Pinout**

SIGNAL NAME	DESCRIPTION
SLP	Input pin to place the device into sleep mode
GND	Ground
WKE	Input pin to wake the device after the sleep command
1W	1-Wire I/O pin
RST	Input reset device
AWK	Output pin to enable the external I <sup>2</sup> C device
BSY	I <sup>2</sup> C busy pin
SDA	I <sup>2</sup> C data output pin
SCL	I <sup>2</sup> C clock output pin
VCC	I <sup>2</sup> C V <sub>CC</sub> Output

**Table 9. PCB Layout Diagrams (Color Legend)**

COLOR	DESCRIPTION
Red	Top metal layer
Green	Top silkscreen
Brown	Bottom silkscreen
Blue	Bottom metal layer
Grey	All metal layers
Purple	Board outline

### Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Cannot communicate through the 1-Wire adapter	PC port hardware is not functioning properly.	Does the port work with other applications, such as a keyboard or mouse? If not, contact the motherboard vendor for BIOS updates or new drivers.
	1-Wire adapter is not functioning.	Try the 1-Wire adapter on another PC. If the problem persists, use a different 1-Wire adapter or order a new adapter of this type.
	Adapter type selected is not what is connected.	Run the Default 1-Wire Net application and select the correct adapter type and/or port number.

### Appendix A: Extended Setup Guide

#### Installing the DS9481P-300# and 1-Wire Drivers

The DS9481P-300# adapter also requires 1-Wire drivers to operate the 1-Wire port. Unless you have been using 1-Wire devices before (e.g., with a different adapter), the drivers need to be installed before this EV kit can function. Follow the steps below to install the 1-Wire Drivers software package. For installation details, refer to Tutorial 4373: *OneWireViewer and iButton Quick Start Guide*, available at [www.maximintegrated.com/en/app-notes/index.mvp/id/4373](http://www.maximintegrated.com/en/app-notes/index.mvp/id/4373).

- 1) To download the 1-Wire Drivers software package, visit [www.maximintegrated.com/en/products/comms/one-wire/software-tools/drivers.html](http://www.maximintegrated.com/en/products/comms/one-wire/software-tools/drivers.html). Click the button that takes you to the **Download Page**. Select the applicable version of the Windows operating system and select the file that corresponds to your PC's configuration (e.g., 32-Bit 1-Wire Drivers or 64-Bit 1-Wire Drivers) and then click the **Download** button. The web page provides assistance on how to detect whether your PC runs a 32-bit or 64-bit operating system.
- 2) Select **Run** when prompted with the question **Do you want to run or save this file?**
- 3) Select **Run** when you get a security warning that reads **Do you want to run the software?**
- 4) Read and check the box if you accept the license agreement. Click **Install**.
- 5) Click the **Finish** button to exit the **Setup Wizard**.
- 6) Now return to the Procedure section and execute Step 2.

## Revision History

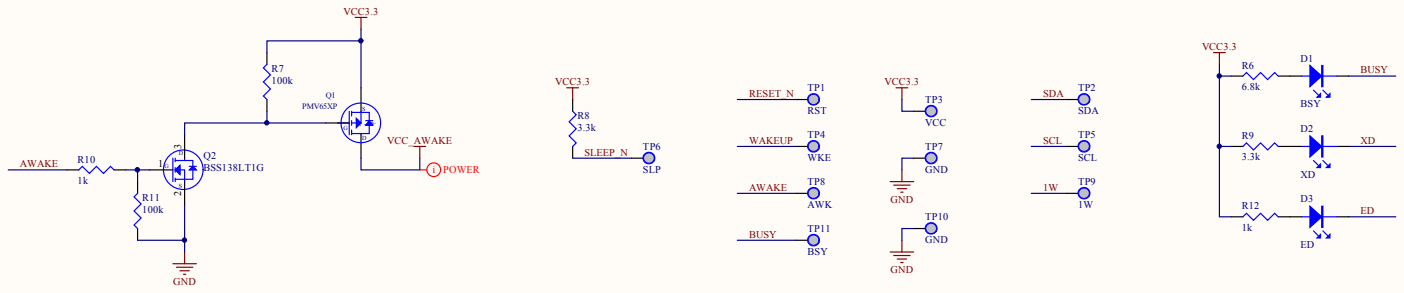
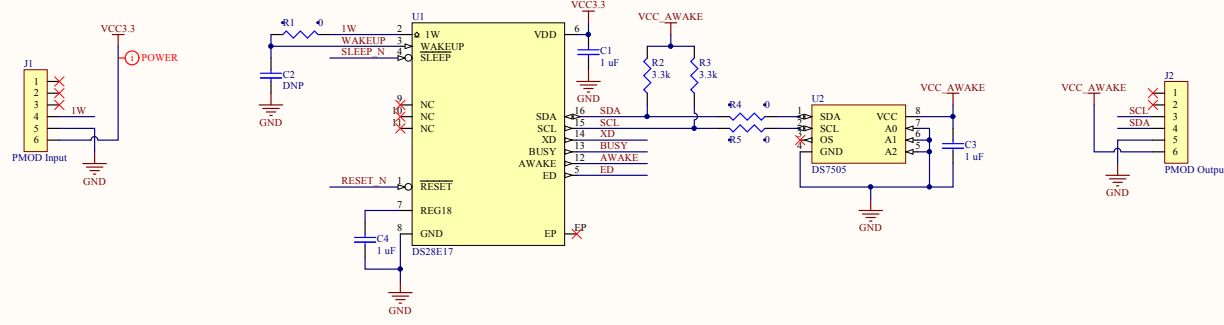
REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/15	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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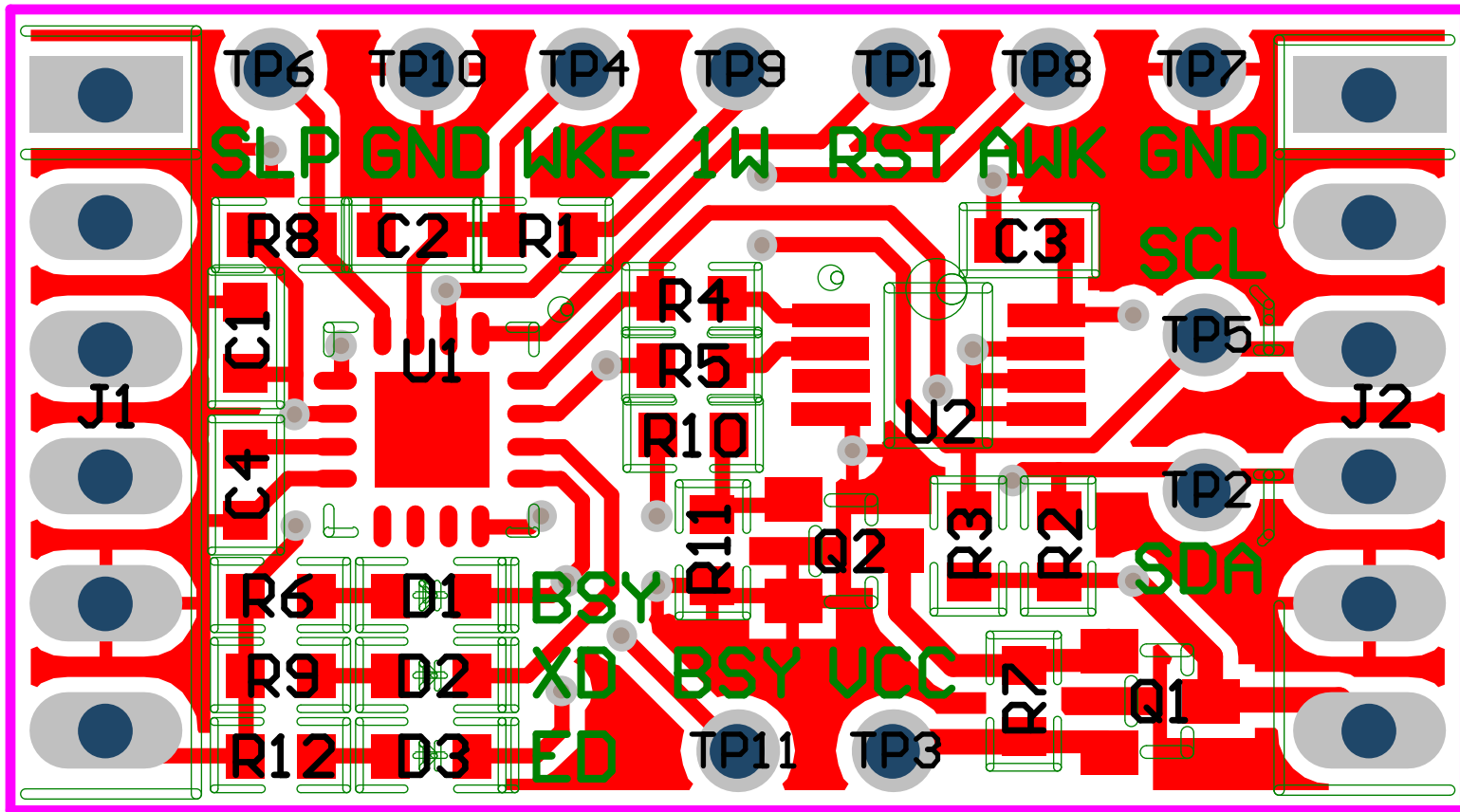






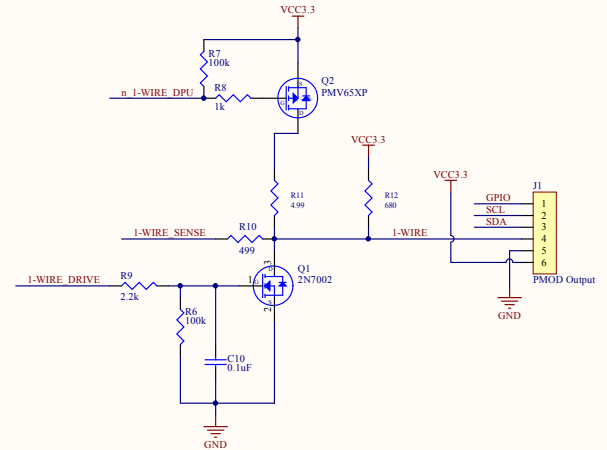
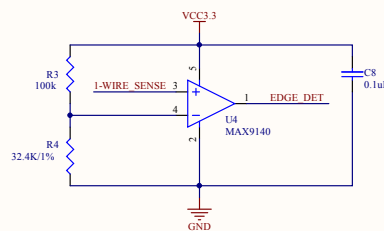
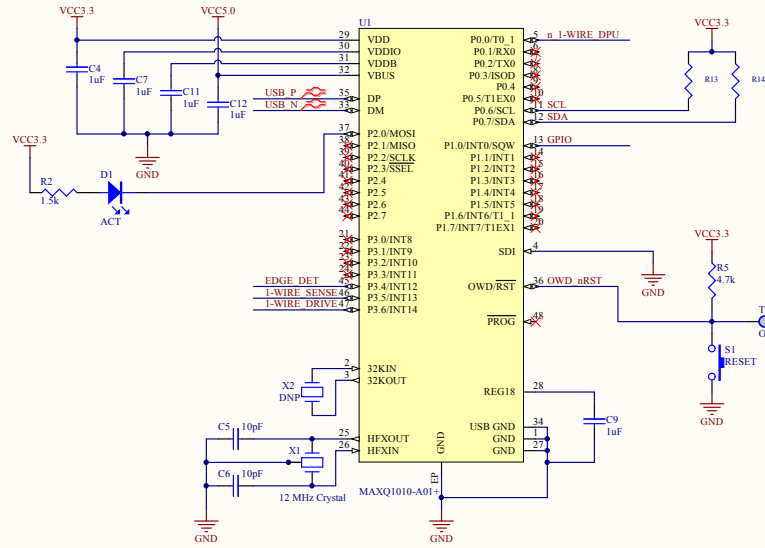
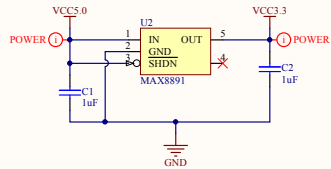
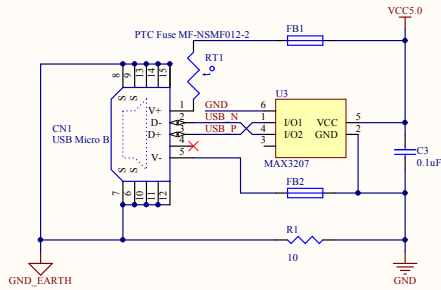
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File:	C:\Users\..._DS28E17-EVK.it_SchDoc	Drawn By:

← 29 mm →



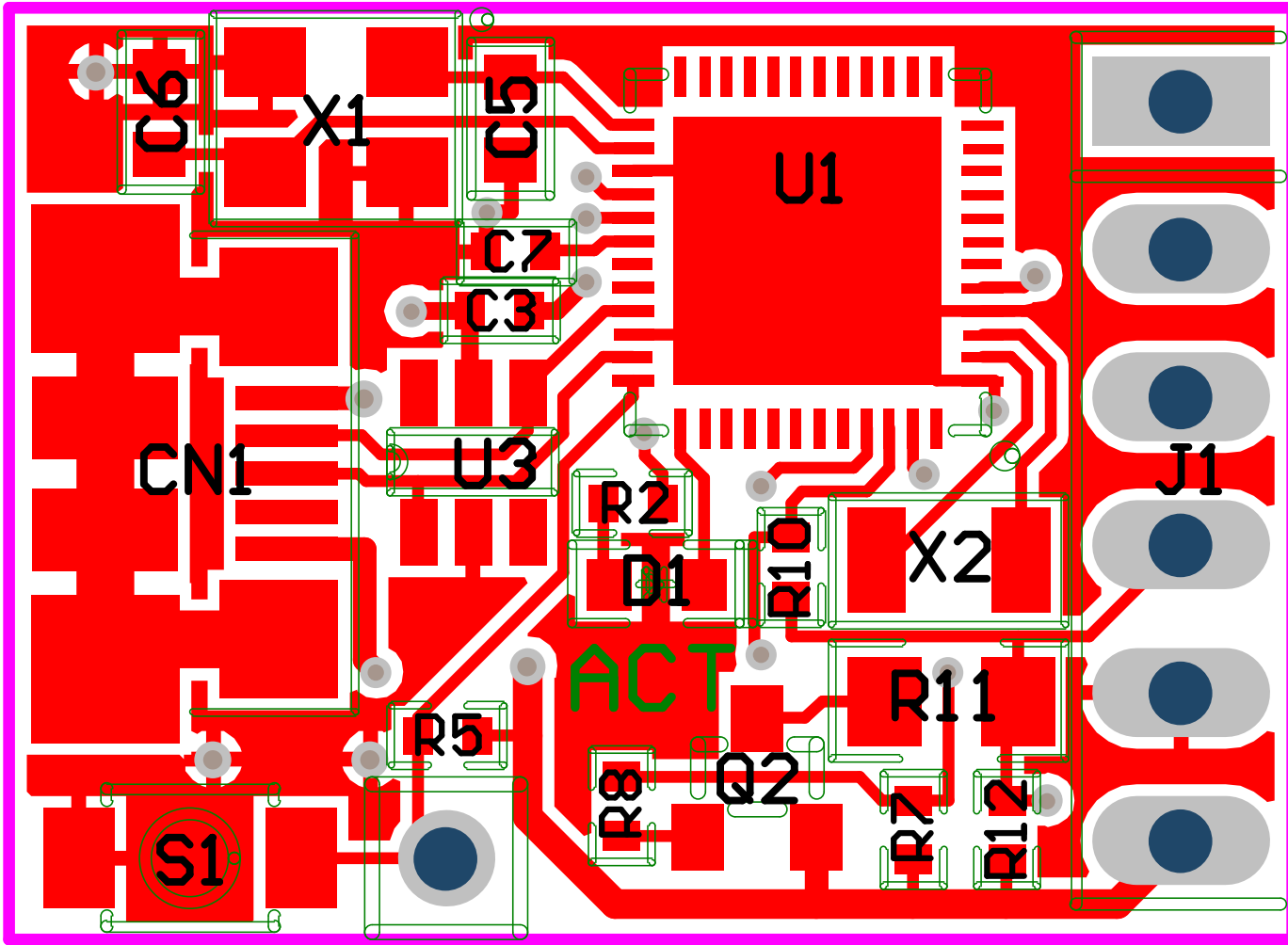
↑ 16mm ↓





Title			
<b>USB to 1-Wire Adapter</b>			
Size	Number	Revision	
Tabloid	<b>DS9481P-300#</b>	<b>1</b>	
Date:	6/19/2015	Sheet	1 of 1
File:	C:\Users\... \DS9481P-300_SchDoc	Drawn By:	<b>Ian Benz</b>

← 22 mm →



↑ 16mm ↓