DS28E05 Evaluation Kit

Evaluates: DS28E05

General Description

The DS28E05 evaluation system (EV system) consists of a single evaluation kit (EV kit) that includes an evaluation board (EV board) and Maxim 1-Wire adapter module. The preliminary version of this kit has 1-Wire adapter module DS9481R-3C7 and the DS9120P evaluation board. This combined with a DS28E05 in TSOC package will create the hardware necessary to fully evaluate the device. The DS28E05 features 112 bytes of user memory organized as seven pages of 16 bytes. Each page can be write protected or set into EPROM emulation mode. The evaluation software runs under Windows 7, XP, or Vista, providing a handy user interface to exercise the features of the DS28E05.

See Figure 1 below for a picture of the stand-alone EV board and Figure 2a below for a picture of the EV board connected to a PC.

Software and Support Resources

1. DS28E05, 1-Wire® EEPROM with 112 bytes user memory:
   www.maximintegrated.com/ds28e05
2. The D28E05 EV kit software download link: (by request at)
   support.maximintegrated.com/1-Wire

Features

- **Fully Compliant with USB Specification v2.0**
- **Driver support for Windows 7, Vista and XP**
- **USB to 1-Wire Adapter utilizes both the Prolific PL-2303HXD and the Maxim DS2480B emulator to create a virtual COM to 1-Wire port on any PC**
- **Accommodates TSOC package**

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
(Not yet available)	0 to +70 C	KIT

Component List

DESIGNATION	QTY	DESCRIPTION
H1	1	DS9481R-37C 1-Wire USB adapter and USB cable
H2	1	DS9120P and RJ-11 cable
H3	1	DS28E05 in TSOC package

Rev 9/25/12

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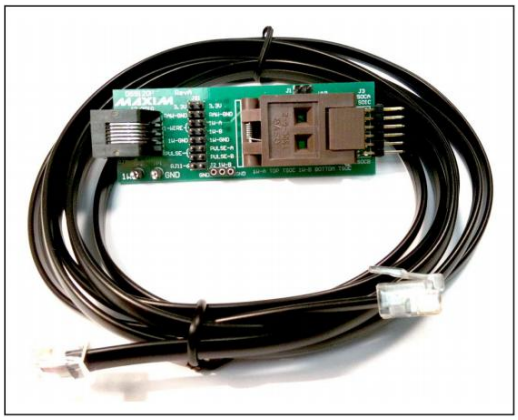

Figure 1. DS9120P EV Board

Figure 2a. DS9481R-3C7 Maxim 1-Wire adapter

Quick Start

1) Before beginning, make sure the following equipment is available:
   - DS9481R-3C7 and USB cable
   - DS9120P board and RJ-11 cable
   - DS28E05 in TSOC package
   - Windows 7, XP or Vista computer with a spare USB port
2) Do the following before connecting to the PC:
   - Insert the DS28E05 in the TSOC socket on the DS9120P EV board
   - Connect the EV board to the DS9481R-3C7 1-Wire adapter with the RJ-11 cable.
   - Wait to insert the DS9481R-3C6 into the PC until prompted by the software installation.
3) Do the following to install PL-2303 Prolific Driver:
   - Download the driver file called:

     PL2303_Prolific_DriverInstaller_v110.zip or newer from:

     http://www.prolific.com.tw/eng/downloads.asp?ID=31
   - **Open** and **Run** the file with the name or newer version:

     PL2303_Prolific_DriverInstaller_v110.exe
   - Follow the directions of the Install Wizard until **Finish** is reached of the PL-2303 USB-to-serial driver install. Close by clicking the **Finish** button.
4) Do the following to install the 1-Wire Drivers:
   - **Download** the 1-Wire Driver from here:

     http://www.maxim-ic.com/1-wiredrivers
   - When prompted the question “Do you want to run or save this file?” select **run**.
   - When you get a security warning that says “Do you want to run the software?” select **run**.
   - Read and check the box if you accept the license agreement and click **install**.
   - Click the **finish** button to exit the Setup Wizard.

5) The Microsoft .NET framework Version 2.0 is required for the program to run. To see if it is installed, look in **Control Panel** under **Add/Remove Software** for a listing. If no listing is found, If it is not installed, please see the following website for download and installation instructions:

   http://msdn.microsoft.com/en-us/netframework/aa569264.aspx

6) Now insert the DS9481R-3C7 into a spare USB port on the computer. Determine the COM port by looking in **Control Panel**->**System**->**Hardware** Tab->**Device Manager**- and expand **Ports (COM & LPT)**. The port is COM2 in the example shown in Figure 2b.

Figure 2b DS9480R-307 COM Port

1. Start the EV Kit software by double-clicking the file, *DS28E05 _Evaluation_Program.exe*, in the file folder containing the unzipped eval software files.

2. Software Quick Start:

   - In the **1-Wire Adapter** panel on the **Setup** tab, the **Adapter Port Type** is fixed at USB(C0M) with **Adapter Part #** DS9481R-3C7**.** The **Adapter Port** is a COM port mapped by the prolific device. Click on **Open Adapter/Port** or use the **Auto-Search button**. If successful then the status field next to the Open Adapter/Port button will report "Success".

   - The device selection options are displayed in the **Device Selection Method** panel in the **Setup** tab.

   - The default settings for the EV kit software is **Match-ROM** in the **ROM Selection Method** drop down. Also the **Use Search-ROM to find first available EVKit device** is checked by default. Leave these default selections for quick setup.

   - Once the adapter/port has successfully been opened then the **Device Selection** drop down will automatically be populated with the unique registration number of the available DS28E05's. If no device is found on the 1-Wire then the selection is blank. In that case insert the device and then click the **Refresh Selection** button. A device must be present to go to the **Memory** tab to exercise the device.

   - Once the device has been selected then click on the **Memory** tab. Select the memory range in the **Memory Resource Selection** drop down menu. If the secret of the device is not known, then first select the **Secret** memory range to load in a secret.

   - Once a memory range has been selected the available commands appear in the **Commands** panel right below the **Memory Range Selection**. The commands appear as buttons.

   - Select a command by clicking on one of the command buttons. The button changes to a yellow highlight to indicate which command is selected.

   - Once a command is selected, the **Options** panel below the command buttons is filled in with the required options for the command. Select the options and then click the **Execute Command** button to execute the selected command with the options provided.

   - The output of the selected command is displayed in the **Log** panel in a scrollable field. The **Key** describing the output in the log is provided at the bottom of the **Log** panel. The window can be resized or maximized to enlarge the **Log** panel.

   - The log can be copied to the clipboard through the **File/Copy Log to Clipboard** menu. The log can be cleared through the **File/Clear Log** menu.

   - The program can be ended through the **File/Exit** menu.

DS28E05 Evaluation Kit

Detailed Description of Software

See the software program's main window in Figure 3a. The window contains three tabs: **Setup**, **Memory**, and **Raw 1-Wire**. The starting tab is **Setup** and selects the 1-Wire Adapter/Port and device selection options. The **Memory** tab as seen in Figure 3b contains the main demo with four areas from top to bottom: **Memory Resource Selection**, **Commands**, **Options**, and **Log**. The **Raw 1-Wire** tab (Figure 11) contains buttons and fields to send and receive raw 1-Wire communication.

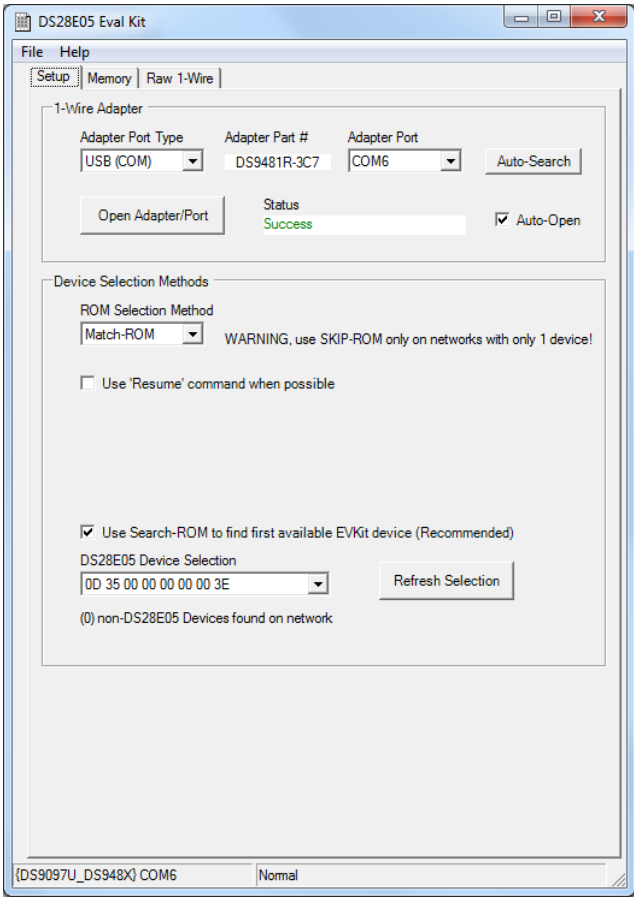

Figure 3a. Evaluation Software: Main Window Setup Tab

The software window contains a menu at the top. The log can be copied to the clipboard through the **File/Copy Log to Clipboard** menu. The log can be cleared through the **File/Clear Log** menu. The **Help** menu will display the version of the software. The **File/Exit** menu will exit the evaluation software.

The **Setup** tab contains two sections: **1-Wire Adapter** and **Device Selection Methods**.

1-Wire Adapter

The **1-Wire Adapter** panel has the adapter type and port selection. This setup is required before any device operations. Only the **Adapter Port Type** of **USB (COM)** is supported along with **Adapter Part #** of **DS9481R-3C7**. Once the **Adapter Port** is selected, click on the **Open Adapter/Port** button. If the adapter is detected *Success* is printed in the status field to the right of the button. If the adapter is not detected then an error message is displayed. If this happens, fix the problem and click the button again. Optionally the **Auto-Search** button can be used to search through all available COM ports to find the DS9481R-3C7.

The **Auto-Open** check box instructs the program to automatically open the selected adapter and port when the program starts. This should be used if the adapter port combination does not change. The **Open Adapter/Port** button does not need to be clicked if the **Auto-Open** was checked when the application started and *Success* is in the status field.

Device Selection Methods

The **Device Selection Methods** section of the **Setup** tab instructs the **Memory** tab operations on how to select the device using the ROM level 1-Wire commands. The 1-Wire protocol uses the unique 64-bit registration number as the network address of the device. The registration number is referred to as the ROM number in the datasheets because it resides in Read-Only-Memory.

The **ROM Selection Method** drop down menu has two options: **Match-ROM** and **Skip-ROM**. **Match-ROM** uses the registration number to select the device with the Match-ROM command. Since this operation uses the registration number then it needs to know this number ahead of time. Consequently when selecting **Match-ROM** the **Use Search-ROM to find first available EVKit device** will automatically be checked. This operation finds the available DS28E05 on the network and populates the drop down menu. The first device found is by default selected. If the contents of the 1-Wire network are changed then the **Refresh Selection** button can be clicked to refresh the list. Note that the message below the device list indicates if there are other non-DS28E05 devices present on the network found during the search. The Skip-ROM option calls on the Skip-ROM command to select any device present. This option should only be used if there is only one device present on the 1-Wire. If multiple devices are present then they are all selected at once potentially

causing collisions. A warning message to that effect will be displayed when changing to the **Memory** tab if potential conflicts are detected.

The **Use 'Resume' command when possible** instructs the **Memory** tab operations to use the Resume command. The Resume command is a short cut command to select the same device that was previously selected with the ROM level command.

Overdrive speed will be used at all times since the DS28E05 are overdrive only devices.

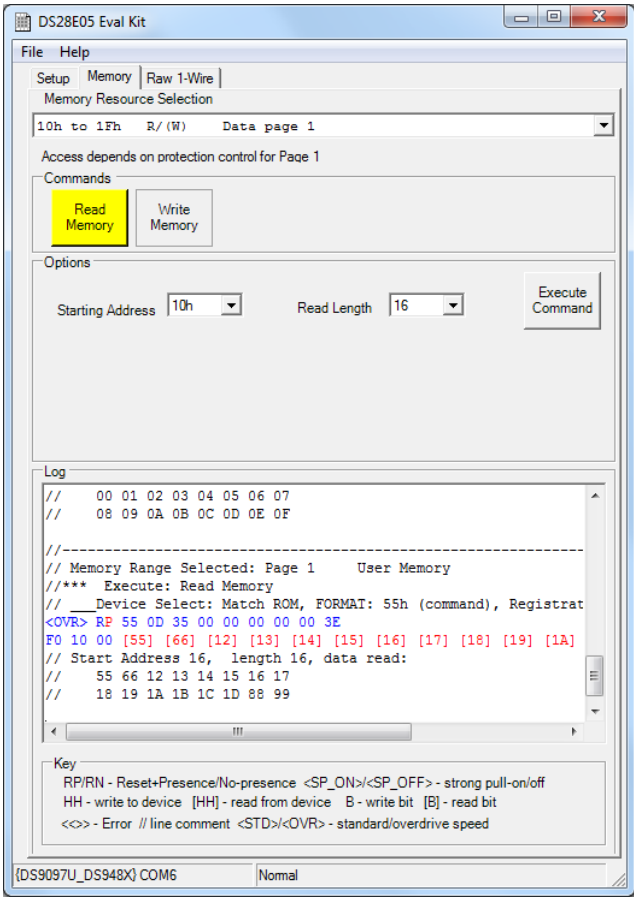

Figure 3b. Evaluation Software: Main Window Memory Tab

Memory Range Selection

The contents of this drop down menu mirror the memory resources described in the device datasheet. Selecting a memory resource automatically displays the commands available to operate on this memory in the **Commands** panel. Most ranges at a minimum provide the **Read** command.

Commands / Options

Once a memory range has been selected, one or more command buttons appear in the **Commands** panel depending on the properties of the memory range. Clicking on one of the command buttons will highlight it in yellow. Clicking on the command button also populates the fields in the **Options** panel. The **Options** change depending on the command selected. Once the options have been set the command can be performed by clicking on the **Execute Command** button in the **Options** panel.

The following sections list all possible commands and the corresponding options.

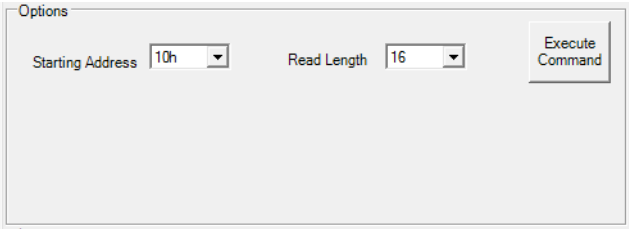

Figure 4. Read Command

Read

The **Read** command (Figure 4) is applicable to all memory ranges. The options to select are the starting address and read length, both in drop down menus. The starting address menu is populated with all possible address in the selected memory range. The read length is populated from one to the maximum size of the memory range.

Figure 5. Write Command

The **Write Memory** command writes a two-byte segment on a data page. The page to write must not be have **Write Protection** enabled. If it is enabled then the write will fail. The segment to write is selected in a drop down. The **New Data** to write must be two bytes of hex digits.

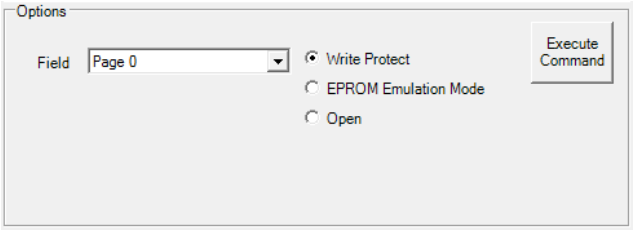

Figure 6. Write Protection

Write Block Protection

The **Write Protection** field uses the standard **Write Memory** command but formats that data to set the desired protection. The following options are provided in radio buttons: **Write Protect**, **EPROM Emulation Mode**, and **Open**. Open selects no protection and is the default state. Once protection has been set on a page it cannot be changed.

Log

The **Log** panel consists of a scrollable output field and a **Key** to explain the output. The output field displays all communication with the DS28E05 along with comments to describe the operations. The log contents can be copied to the system clipboard for pasting into a document or email message through the **File/Copy Log to Clipboard** menu. The log can also be cleared with the **File/Clear Log** menu. The program window can be resized to expand the log panel for easier viewing. The text in the Log panel is also color-coded. This color-coding is preserved when copying to another program. See Table 2 for a detailed explanation of the **Key** to the log contents.

Table 2. Log Key

KEY	DESCRIPTION
RP	1-Wire Reset and Presence pulse response. Color-coded blue for the reset pulse and red for the response.
RN	1-Wire Reset and NO Presence pulse response. Color-coded blue for the reset pulse and red for the response.
<SP_ON>/<SP_OFF>	1-Wire Strong-Pullup ON / 1-Wire Strong Pull-up OFF. Strong pull-up is used to provide additional current to the device during operations such as EEPROM write
HH – write to device	1-Wire write from master to device represented by a pair of hex digits showing the byte that was transmitted. Valid for a line that does not begin with a comment symbol "//". Color-coded blue.
[HH] – read to device	1-Wire read from device represented by a pair of hex digits bounded by brackets "[]" showing the byte that was received. Valid for a line that does not begin with a comment symbol "//". Color-coded red.
B	1-Wire write bit from master to device represented by a single binary digit (1/0). Valid for a line that does not begin with a comment symbol "//". Color-coded blue.
[B]	1-Wire read bit from master to device represented by a single binary digit (1/0) bounded by brackets "[]" showing the bit that was received. Valid for a line that does not begin with a comment symbol "//". Color-coded blue.
<<>>	Indicates an error with the error message between the "<<>>". Color-coded purple.
<STD>/<OVR>	Indicates 1-Wire line speed: <STD> for standard and <OVR> for overdrive. This symbol is logged before every 1-Wire reset pulse and when the speed changes as in a Overdrive-Match command. Color-coded blue.
// line comment	Indicates a line that is not 1-Wire communication but is instead commentary on the operation performed. Color-coded black.

RAW 1-Wire

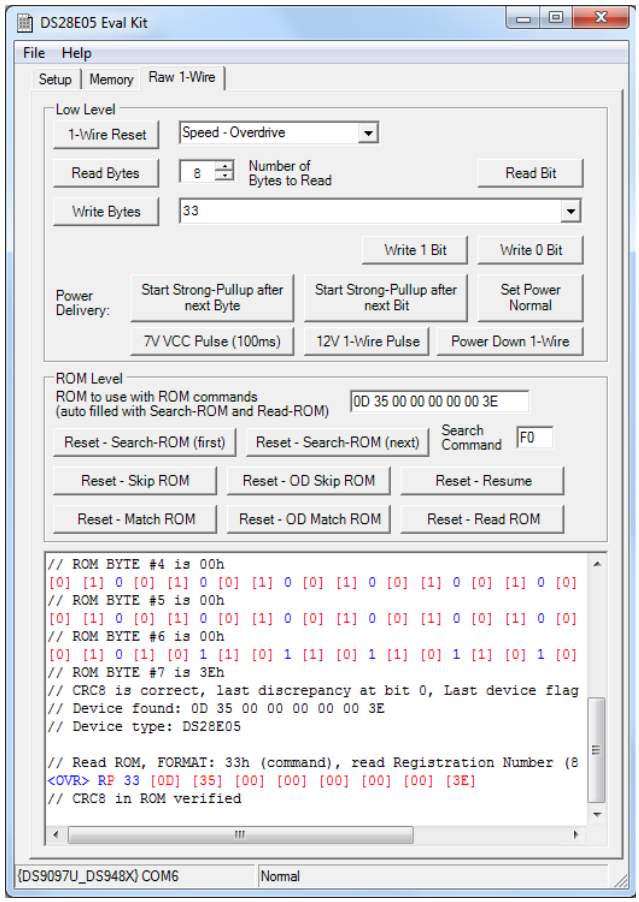

Figure 12. Eval Software: Main Window Raw 1-Wire Tab

The **Raw 1-Wire** tab (Figure 11) provides the facilities to send and receive any raw 1-Wire communication. This can be used to recreate some of the operations seen on the **Memory** tab or to experiment with other operations. It can also be used on 1-Wire devices other than the DS28E05 since it provides direct access to the 1-Wire network. All of the operations are recorded in the **Log** panel on the **Memory** tab as well as on the bottom of **Raw 1-Wire** tab for later examination and copying. The operations available are divided into two panels: **Low Level** and **ROM Level**.

Low Level

The Low Level panel provides the low-level 1-Wire primitives that can be used to construct any 1-Wire communication sequence. The **1-Wire Reset** button issues a reset low presence at the speed specified in the drop down speed menu to the right of the **1-Wire Reset** button.

The **Read Bytes** button will read the number of bytes specified in the input field to the right of the button.

The **Write Bytes** button will write the bytes displayed in the input field to the right of the button. The **Write Bytes** input field is also a drop-down menu that remembers all previous write byte sequences.

The **Write 1 Bit** and **Write 0 Bit** buttons write the indicated bit to the 1-Wire network.

The button **Start Strong-Pullup after next Byte** starts the 1-Wire strong pull-up power delivery after the next communication byte (either read or write).

The button **Start Strong-Pullup after next Bit** starts the 1-Wire strong pull-up power delivery after the next communication bit (either read or write).

The **Set Power Normal** disables the 1-Wire strong pull-up power delivery.

The **7V VCC Pulse (100ms)** enables a 7V pulse on the Pulse pin of the DS9481R-3C7.

The **12V 1-Wire Pulse** enables a 512us pulse on the 1-Wire to support EPROM programming. A warning message will be displayed before the operation completes.

The **Power Down 1-Wire** button powers down the 1-Wire. Any 1-Wire operation will return the 1-Wire to a normal state.

ROM Level

The ROM Level panel has 1-Wire macros that implement the 1-Wire ROM (Read-Only-Memory) commands that utilize the 64-bit unique registration number that each 1-Wire device has for device discovery and selection. The **ROM to use with ROM commands** input field is used with the ROM macros to select a device. This field can be manually edited to input the registration number of the device to select or the field will be auto-filled by the following buttons: **Reset - Search-ROM (first)**, **Reset – Search-ROM** (next), and **Reset – Read ROM**.

The **Reset – Search-ROM (first)** button performs the Search ROM sequence to discover the 'first' device on the network. The registration number and the binary search sequence, not physical location, determine the order of the devices discovered. See Application Note 187: 1-Wire Search Algorithm for details.

The **Reset – Search-ROM (next)** button continues where the last binary search left off and finds the next device. Both of these search buttons use the command supplied in the **Search Command** input field. The default command is F0 (hex) Search-ROM. Alternately

this can be filled in with the Conditional Search-ROM command EC (hex) however this command is not valid for the DS28E05.

The **Reset – Skip ROM** button sends a 1-Wire reset followed by the CC (hex) Skip ROM command. This will select all devices on the 1-Wire. It should only be used if there is one device on the network.

The **Reset – OD Skip ROM** button sends a 1-Wire reset followed by the Overdrive Skip-ROM command 3C (hex) and changes the 1-Wire speed to Overdrive.

The **Reset – Resume** button sends a 1-Wire reset followed by the Resume command A5 (hex).

The **Reset – Match ROM** button sends the 1-Wire reset followed by the Match ROM command 55 (hex) followed by the eight bytes of the registration number in the ROM input field at the top of the **ROM Level** panel. If there is no registration number in the input field a warning will be displayed.

The **Reset – OD Match ROM** button sends the 1-Wire reset followed by Overdrive Match command 69 (hex), change the 1-Wire speed to Overdrive, and then sends the eight bytes of the registration number in the ROM input field at the top of the **ROM Level** panel.

The **Reset – Read ROM** button sends the 1-Wire reset followed by the Read ROM command 33 (hex) and then reads the 64-bit registration (ROM) number of the device. The CRC8 within the number is checked to verify a valid registration number. A warning is logged if the CRC8 is not valid. The registration number is also loaded into the ROM input field to be used by the other ROM macro buttons.

Detailed Description of Hardware

See the DS9481R-3C7 and DS9120P datasheets.