DS28CZ04 Evaluation System

Evaluates: DS28CZ04

General Description

The DS28CZ04 evaluation system (EV system) consists of a DS28CZ04 evaluation board (EV board) and a Maxim CMAXQUSB command module. The DS28CZ04 is a 4Kb EEPROM with four nonvolatile programmable I/O pins (PIO) using the industry-standard I2C and SMBus™ interface. The memory is organized as two segments of 256 bytes. Individual PIO lines can be configured as inputs or outputs. The power-on state of PIO programmed as outputs is stored in nonvolatile memory. The evaluation software runs under the Windows XP® or Windows 2000 operating system (OS), providing a handy user interface to exercise the features of the DS28CZ04.

Order the DS28CZ04EVKIT for the complete EV system to evaluate the DS28CZ04 using a PC.

Features

♦ **Proven PCB Layout**
♦ **Complete Evaluation System**
♦ **Convenient On-Board Test Points**
♦ **Fully Assembled**
♦ **Downloadable Evaluation Software**

Ordering Information

PART	TYPE
DS28CZ04EVKIT	EV Kit

EV Kit Contents

QTY	DESCRIPTION
1	DS28CZ04EVBD: DS28CZ04 evaluation board.
1	CMAXQUSB: Command module and cable.

Component List

DESIGNATION	QTY	DESCRIPTON
D1	1	Green LED (T1-3/4)
D2	1	Yellow LED (T1-3/4)
D3	1	Amber LED (T1-3/4)
D4	1	Red LED (T1-3/4)
J1	1	2-pin jumper post
J2	1	2x10 right-angle receptacle
J3, J4, J5	3	2-pin jumper posts
Q1–Q4	4	SOT23 n-channel FET transistors
R1–R10	10	SMT resistors (1206)
S1, S2, S3, S5–S8	7	3-pin jumper posts
S4	1	2-pin jumper post
U1	1	4Kb I2C/SMBus EEPROM with nonvolatile PIO (12 TQFN-EP*) Maxim DS28CZ04G-4+
—	1	PCB: DS28CZ04 EVAL BOARD

+Denotes a lead(Pb)-free/RoHS-compliant package.
*EP = Exposed pad.

SMBus is a trademark of Intel Corp.

Windows XP is a registered trademark of Microsoft Corp.

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at www.maximintegrated.com.

Rev 2; 10/09

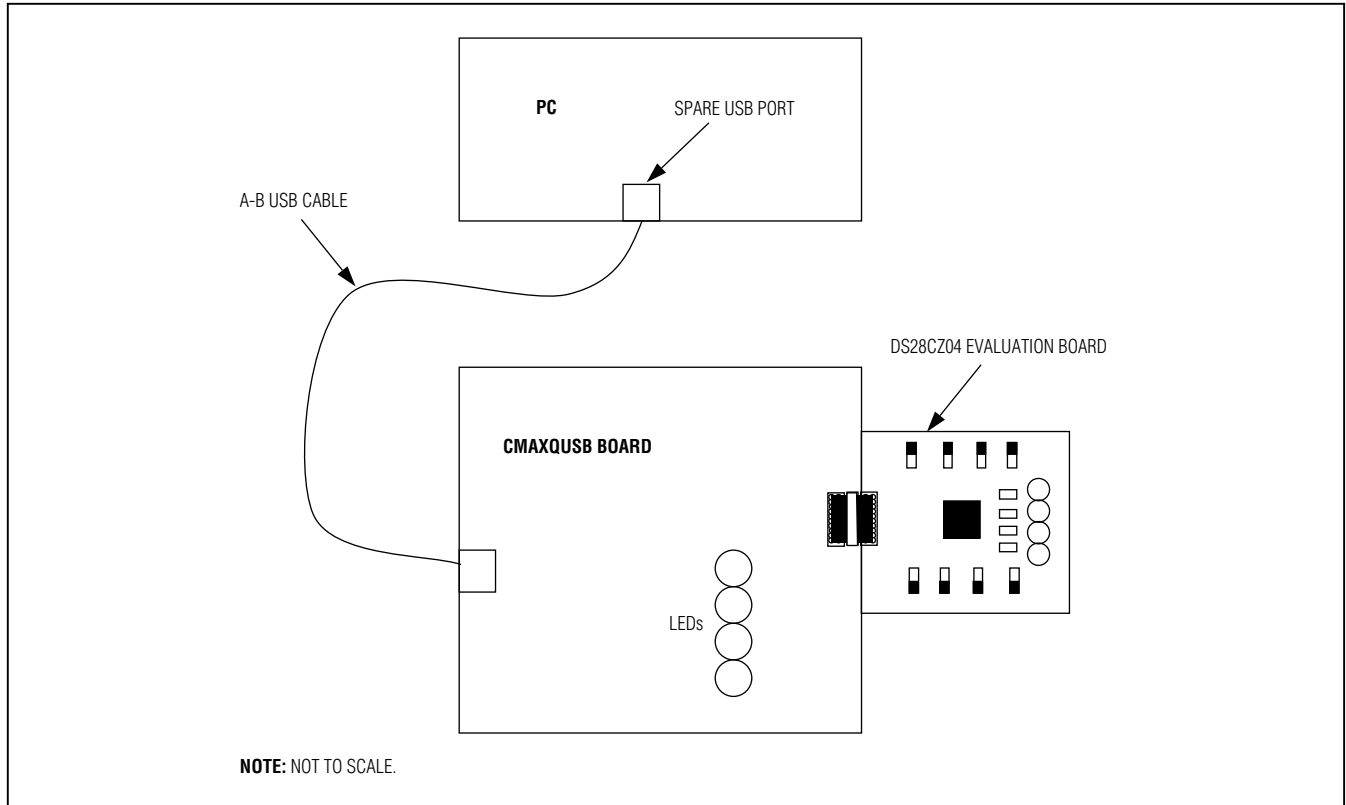# DS28CZ04 Evaluation System

Evaluates: DS28CZ04

Figure 1. Typical Setup

Quick Start

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.

Required Equipment

- PC running Windows XP or 2000 OS
- Spare USB port on the PC

Evaluation Board

The DS28CZ04 EV board provides a proven PCB layout to facilitate evaluation of the DS28CZ04. It must be interfaced to appropriate timing signals for proper operation. The DS28CZ04 EV board is a simple circuit with the DS28CZ04 located on top of the board and a right-angle, 20-pin, female connector located on the leftmost side of the board. This female 20-pin connector plugs into the CMAXQUSB command module and connects the power (VCC), ground return (GND), data (SDA), and clock (SCL) pins of the DS28CZ04. See the *DS28CZ04 Evaluation Board Schematic*.

Evaluation System

The DS28CZ04 EV system is defined to be the DS28CZ04 EV board coupled with the CMAXQUSB command module and the evaluation software. The DS28CZ04 EV board connects to the appropriately labeled pins on the CMAXQUSB command module. See location P3 labeled "MAX SMBus COMPATIBLE INTERFACE" in Figure 2. The evaluation software runs under the Windows XP/2000
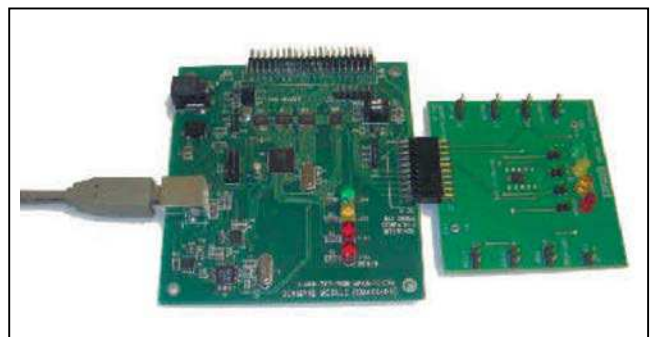

Figure 2. CMAXQUSB with DS28CZ04 EV Board

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OS, interfacing to the EV board through the computer's USB port. See the *Quick-Start Sequence* section for setup and operating instructions.

Quick-Start Sequence

1) Before beginning, make sure the following equipment is available:
   - DS28CZ04 EV system (contains DS28CZ04 EV board and CMAXQUSB module)
   - PC running Windows XP/2000 OS with a spare USB port

2) Do the following before connecting to the PC:
   a. Select +5V logic by setting the CMAXQUSB VDD SELECT jumper.
   b. Install the master reset jumper S5 (text label MRZ) to VCC (jumper center pin to pin on left) and the address jumpers S1 (text label A1) and S2 (text label A2) on the DS28CZ04 EV board (see Figure 2).
   c. Install the write-protect S4 (text label WP) jumper to allow writing to the device.
   d. Connect the EV board to the CMAXQUSB board with the 20-pin connector at location P3 (the I^2C/SMBus pins).

3) Download the evaluation software from Maxim's EV kit software page or from the EV kit's QuickView: **www.maximintegrated.com/DS28CZ04EVKIT**. The evaluation software is provided as a .zip archive file. Unzip the archive's contents into an empty or newly created directory.

4) Connect the USB cable between the CMAXQUSB and the computer. When you plug in the CMAXQUSB board for the first time, the **Windows Plug-and-Play** system detects the new hardware and automatically runs the **Add New Hardware Wizard**. Be sure to specify the search location for the device driver, which is the directory where the evaluation software files were unzipped.

5) During device driver installation, Windows displays a warning message indicating that the device driver Maxim uses does not contain a digital signature. This is not an error condition. It is safe to proceed with the installation.

6) The **Microsoft .NET framework Version 1.1** is required for the program to run. If it is not installed, refer to the following website for download and installation instructions: http://msdn.microsoft.com/netframework/downloads/framework1_1/.

7) Start the EV kit software by double-clicking the file **DS28CZ04_Evaluation_Program.exe** in the file folder containing the unzipped evaluation software files.

8) If any problems occur during device driver installation, refer to Application Note 3601: *Troubleshooting Windows Plug-and-Play and USB for Maxim Evaluation Kits* for more details.

EV Kit Usage

The following EV kit usage examples demonstrate what steps to take to utilize the different features of the DS28CZ04.

Setup

1) Install the files as described in the *Quick-Start Sequence* section.

2) Install the master reset jumper S5 (text label MRZ) to VCC (jumper center pin to pin on left).

3) Set the desired physical slave address by changing the S1 (text label A1) and S2 (text label A2) switches for address lines A1 and A2. Note that the A1 or A2 pin can be shorted to ground (jump center pin to pin on left) or VCC (jump center pin to pin on right) (see Figure 2).

4) Install the write-protect S4 (text label WP) jumper to allow writing to the device.

5) Plug in the DS28CZ04 EV board to the CMAXQUSB SMBus interface connector.

6) Plug in the CMAXQUSB board using the provided USB cable.

PIO Output

1) Complete setup.

2) Select the **Lower Memory Segment** in the **I2C Slave Address** panel.

3) Remove jumper from the corresponding input GPIO switch control to allow output control. For example, to set up PIO3 as an output, remove jumper on S3 (text label GPIO3) (see Figure 2).

4) Add jumper to output LED control. For example, to set up PIO3 as an LED control, add jumper J1 (text label GPIO3).

5) Select the **PIO** tab for a high-level view of the PIO features. Alternately select the **Status** tab to select bit-level PIO features.

PIO Input

1) Complete setup.

2) Select the **Lower Memory Segment** in the **I2C Slave Address** panel.

3) Remove jumper to output LED control. For example, to disable PIO1 as an LED control, remove jumper J3 (text label GPIO1) (see Figure 2).

4) Add jumper to short PIO to either ground or VCC by using a switch. For example, to set the input value for PIO1, move the jumper on switch S7 to either short the center pin to ground (on right) or VCC (on left).

5) Select the **PIO** tab for a high-level view of the PIO features. Alternately, select the **Status** tab to select bit-level PIO features.

Memory

1) Complete setup.

2) Select the **Lower Memory Segment** or **Upper Memory Segment** in the **I2C Slave Address** panel.

3) Select the **Read / Write** tab.

4) Verify the write-protect S4 (text label WP) jumper is installed to allow writing to the device.

5) Set the start address in hex (see reference of addresses at the bottom of the tab).

6) Set the number of bytes to transfer with the **Read Op** or **Write Op** radio button.

7) Click the **Execute Memory Op** to perform the function.

__Detailed Description of Software

The software is a single screen with multiple tabs that divide the features into logical divisions. The topmost panel allows for the configuration of the device's I2C slave address. If the address is unknown, clicking the **Find Slave Address** button finds and reports the first address on the bus that responds. This is the **Lower Memory Segment** address referred to in the IC data sheet as Device Address = A0. The label to the right of the **Set Slave Address** button indicates whether the upper or lower memory segment is selected. To select the upper memory segment then manually change the hex slave address to set bit 1, click **Set Slave Address**. For example, with the default address, set it to A2. See Table 1 to select the upper memory segment. The address panel is visible while viewing any of the feature-specific tabs.

Table 1. Lower/Upper Memory Segment Address

LOWER MEMORY SEGMENT	UPPER MEMORY SEGMENT
A0	A2
A4	A6
A8	AA
AC	AE

Figure 4 shows the first tab with the **PIO** selection. It provides feature settings for each of the four PIO channels. The PIO direction can be selected (**Input**, **Output**). If the PIO is set to **Output**, the output type can be selected (**Push/Pull**, **Open Drain**) along with the value. For a PIO set to input, the read value is displayed in the **Value** field with an optional **Read Inverted** mode. The button **Set As Power-on Default** makes the settings the power-on default. The **Refresh Display from Power-on Defaults** sets the display options to match the device's power-on defaults. The **PIO** tab requires that the **Lower Memory Segment** is selected by the slave address.

The **Status** tab (Figure 5) allows the bit-level features of the mode, direction, input/output flags to be set. It displays the raw control and the status registers for the GPIO functionality. The status tab requires that the **Lower Memory Segment** is selected by the slave address. The groups of information found on this tab represent the control/status registers of the DS28CZ04. Each register is laid out such that the value can be set directly or individual bits can be toggled using the appropriate checkbox (in all cases, a "checked" checkbox results in a "1" value for that bit).

The first group of bits represents the control register located at memory address 0x07A. The ADMD (Address Mode), CM (Communication Mode), and SFF (SFF-8472 Mode) bits can all be toggled in this group. The ADMD mode bit determines whether or not the GPIO input status and output control information is stored in one memory byte (ADMD = 1) or across four memory bytes (ADMD = 0). The CM bit determines whether the device uses SMBus timeouts (CM = 1) or no timeouts (CM = 0). The SFF bit selects whether the general-purpose memory address 0x16E contains user data (SFF = 0) or the status of TXF and LOS (SFF = 1). The BUSY bit is a status bit that is only checked if the DS28CZ04 is in the middle of a EEPROM write cycle. Finally, the DIR_ checkbox for the appropriate GPIO pin can be used to set that pin as an input (DIR_ = 1) or an output (DIR_ = 0).
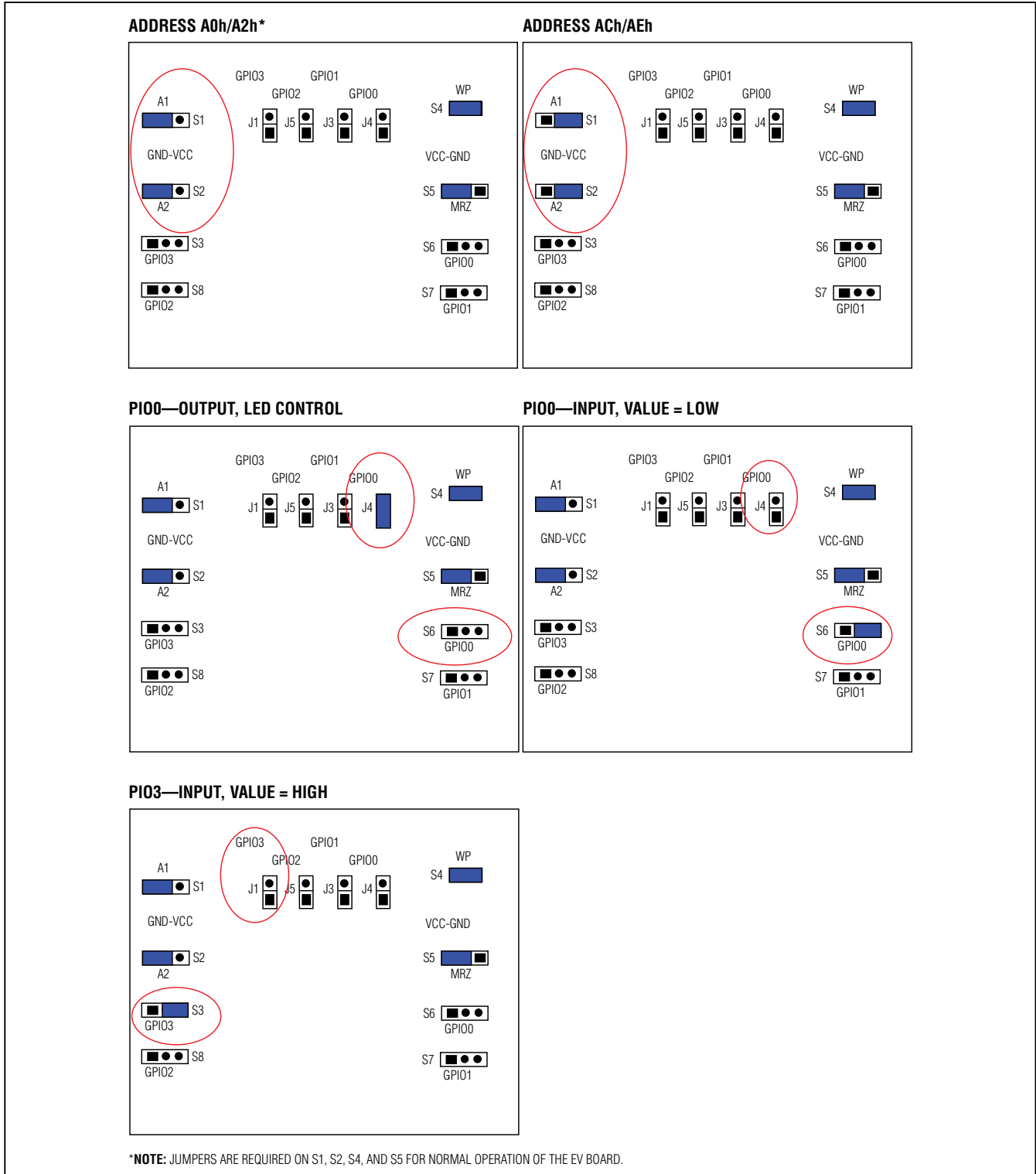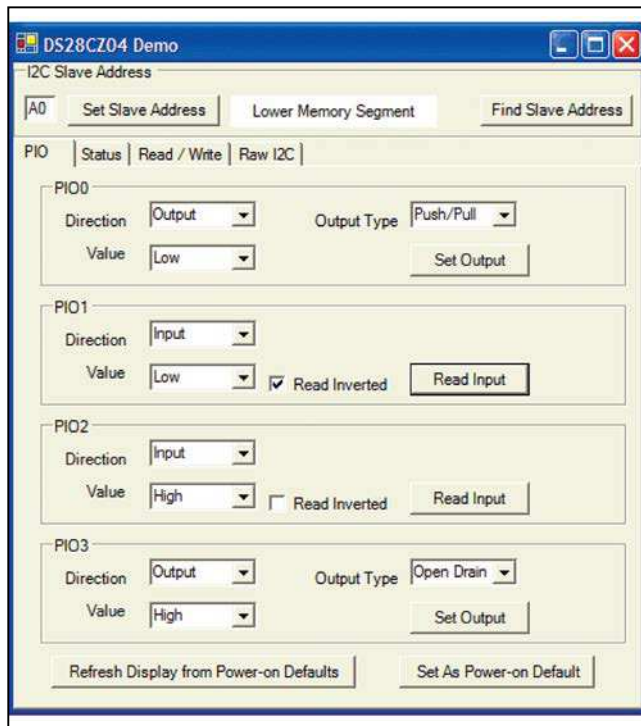
Figure 3. Jumper Examples

Figure 4. PIO Tab

Figure 5. Status Tab

The second group of bits represents the control register located at memory address 0x07B. The OT_ bits control the output type of each GPIO, where each GPIO can be configured as either an open-drain (OT_ = 1) or push-pull (OT_ = 0) output. The IMSK_ bits control the input inversion mask for each GPIO, where each input can be optionally inverted (IMSK_ = 1) or left alone to show the actual line status (IMSK_ = 0).

The last group of bits represents the GPIO output value control and input value status register(s). If ADMD is set, these values are stored in one memory byte at 0x07C, otherwise they are spread across four memory bytes from 0x07C to 0x07F. The GIV_ bits reflect the current input level on the line whether high (GIV_ = 1) or low (GIV_ = 0). The GOV_ represents the output level on the line whether it is being driven high (GOV_ = 1) or driven low (GOV_ = 0). Note that if the output is configured as an open-drain output, driving the output value high will
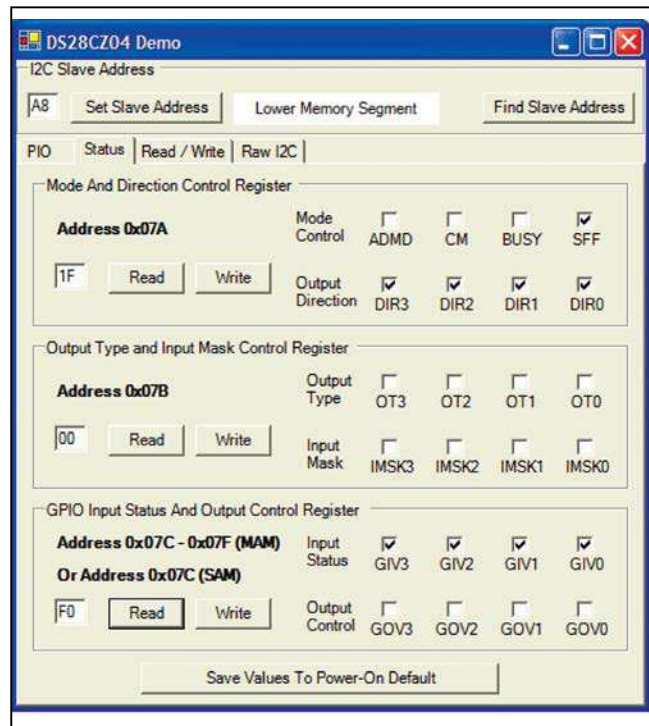
only result in floating the gate, and the input level (if unconnected to another driving device or a pullup) will be unpredictable.

The **Save Values To Power-On Default** button at the bottom saves the value of SFF, DIR_, GOV_, OT_, and IMSK_ to a EEPROM register that is read on power-up to restore the state of these bits.

The **Read / Write** tab (Figure 6) allows easy read or write access to the general-purpose memory areas, as well as the control registers. Simply specify the start address to begin reading from, specify the number of bytes to read, and select **Read Op**. Then, click the **Execute Memory Op** button and a hexadecimal representation of the memory contents is displayed in the large text area. The values can be edited by replacing them with the new memory contents, selecting **Write Op**, and clicking the **Execute Memory Op** button.
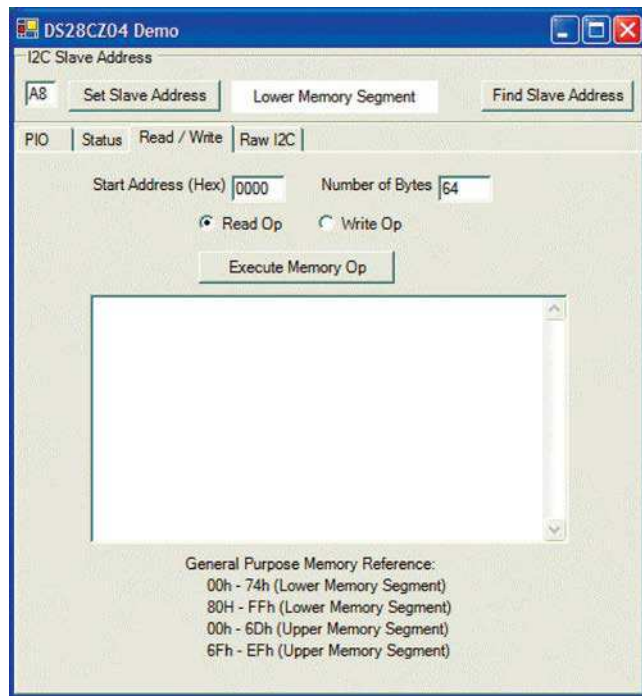
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Figure 6. Raw Memory Read/Write Tab

Figure 7. Raw I2C Tab

The **Raw I2C** tab (Figure 7) provides low-level communication tools for the device. It allows for raw I2C commands, including start, stop, write, and read (last byte is always "not acknowledged"). This tab is useful for testing custom I2C communication sequence.
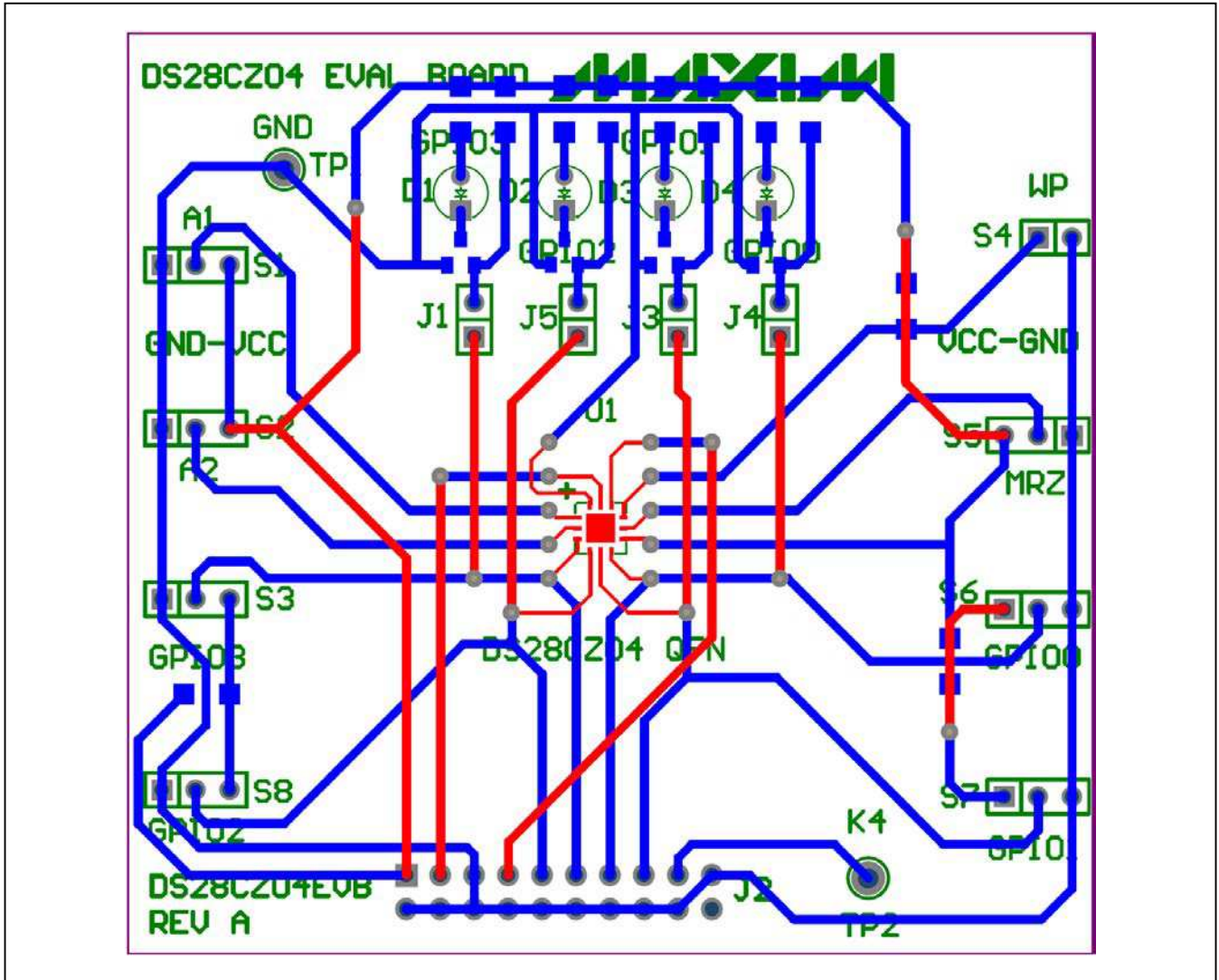
Online Resources

DS28CZ04 IC Data Sheet: **www.maximintegrated.com/DS28CZ04**

CMAXQUSB User's Guide: **www.maximintegrated.com/CMAXQUSB**

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DS28CZ04 Evaluation Board Schematic

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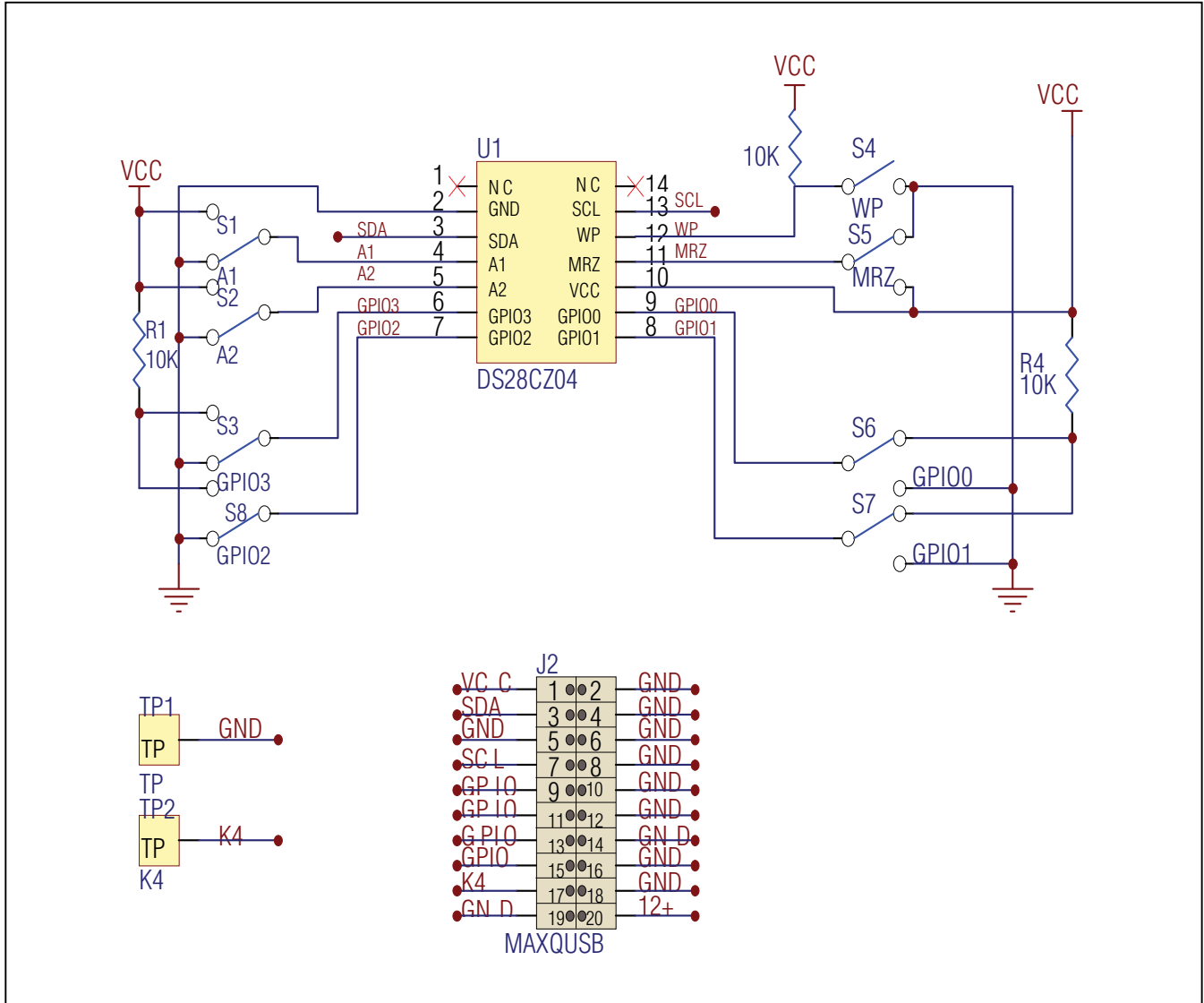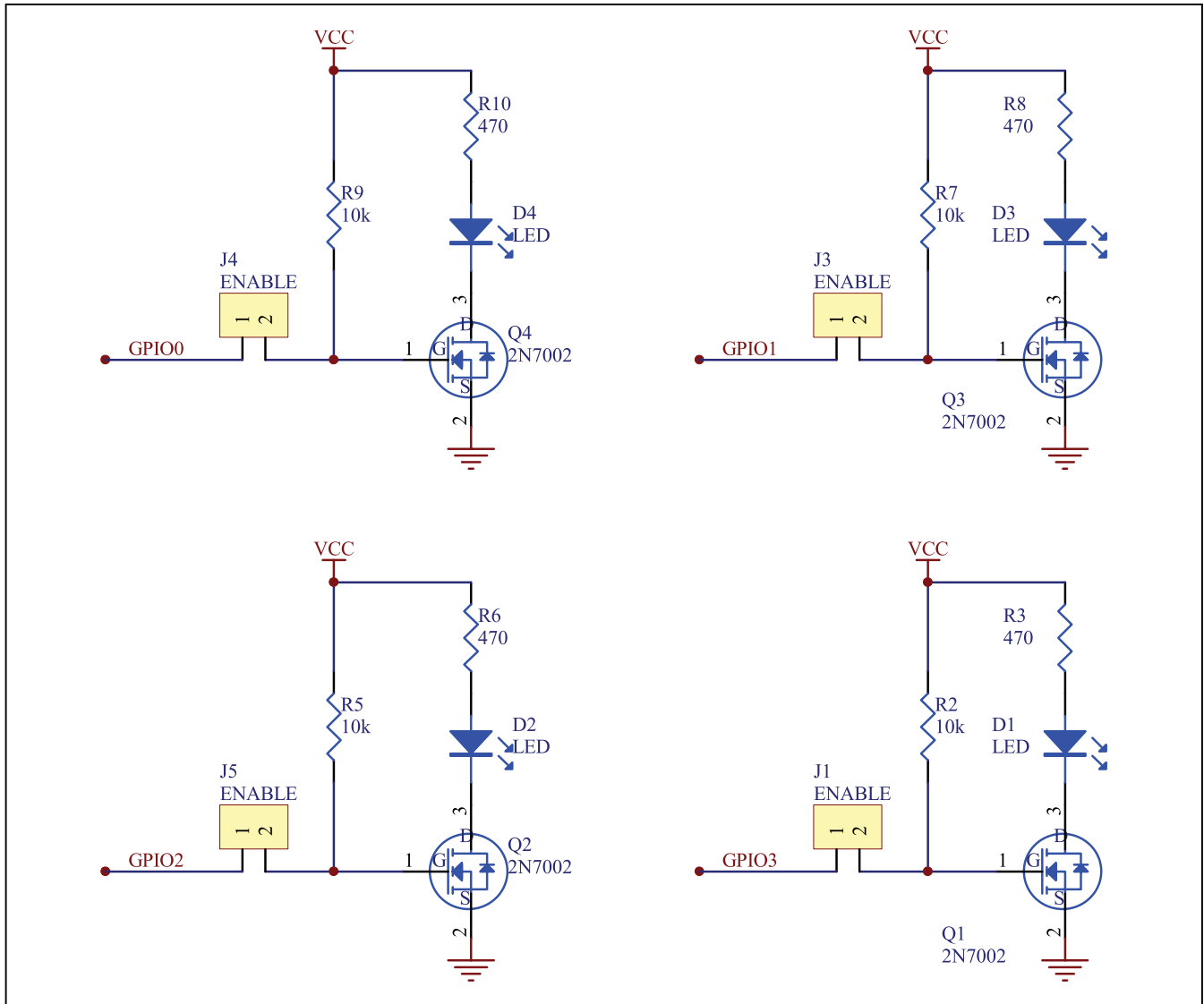
REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/06	Initial release.	—
1	8/06	Corrected schematic and composite view to include pullup on WP. Added text to install WP jumper during setup.	9, 10, 11
2	10/09	Created newer, template-style data sheet.	All

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