

## DS3900P2

## USB HID Communications Module for I2C Programming

### General Description

The DS3900P2 programmer provides bidirectional communication with I2C-compatible devices using a PC's USB port. The DS3900P2 is a small form-factor module that requires appropriate headers to pass communication signals to the device under test. The DS3900P2 is intended to interface with approved Human Interface Device (HID)-compliant PC software designed by Maxim Integrated. It is intended for evaluation purposes only.

### EV Kit Contents

- Assembled DS3900P2 Circuit Board
- Micro-USB Cable
- Ribbon Cable

Ordering Information appears at end of data sheet.

### Features

- Communicates from PCs to ICs and Select Maxim Integrated EV Kits Through a USB Port Using the HID Class
- Fast Communication to I2C-Compatible Devices
- Built-In Pullup Resistors for SDA and SCL Minimize Required External Hardware
- Connection to Standard Prototyping Boards and EV Kits Possible Using Header Connectors
- Fully USB Powered
- Can Provide a 3.3V, 250mA Power Rail
- Fully Assembled and Tested Proven PCB Layout
- USB HID Interface for Windows XP®, Windows Vista®, and Windows® 7-Compatible Software
- RoHS Compliant

### DS3900P2 USB I2C Programmer



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## Quick Start

### Required Equipment

- DS3900P2 EV kit hardware (included)
- Micro-USB cable (included)
- User-supplied PC with Windows XP, Windows Vista, or Windows 7 OS with USB Port
- Approved previously designed HID-compliant GUI designed by Maxim Integrated
- Customer PCB with I<sup>2</sup>C connection or a previously purchased compatible Maxim Integrated EV kit

### Setup Procedure

The DS3900P2 communicates with ICs using a PC's USB port. The microprocessor on the DS3900P2 communicates to the PC using its full-speed compatible USB serial interface engine. The USB interface of the DS3900P2 hardware is configured as an HID device and, therefore, does not require a unique/custom device driver. Once properly connected to a PC through a USB cable, Windows should automatically begin installing the necessary device driver. Once the driver installation is complete, a Windows message appears near the **System Icon** menu indicating that the hardware is ready to use. After the hardware is ready to use, open an approved HID-compliant GUI designed by Maxim Integrated. The GUI then sends commands of various lengths over the USB connection. This provides instruction and data for the DS3900P2 to communicate with the I<sup>2</sup>C-compatible devices. The DS3900P2 has a 3.3V LDO that supplies power to the microcontroller and optionally to a connected EV kit or PCB. The 3.3V rail supplies up to 250mA.

## Detailed Description of Hardware

### Designing Hardware to Use the Built-In Support for I<sup>2</sup>C Devices

The DS3900P2 has custom firmware that uses either the master synchronous serial port (MSSP) of the microcontroller configured in I<sup>2</sup>C mode or several bit-banging routines with support for clock stretching. These two modes of operation are configured through the evaluation software. The DS3900P2 has built-in pullup resistors (R11, R12) that connect 10k $\Omega$  resistors to both I<sup>2</sup>C signals.

Upon initial power-up, the DS3900P2 configures itself in I<sup>2</sup>C mode using the MSSP block of the microcontroller with a SCL clock speed of 400kHz. Note that most evaluation software configures the DS3900P2 to the desired communication protocol upon initial software execution and during all USB reconnects of the DS3900P2.

For designs that use the DS3900P2 to communicate to I<sup>2</sup>C devices, the following items must be accounted for in the hardware design:

- Place an appropriate connection on the circuit board.
- Connect GND, SCL, and SDA. 3.3V can also be connected if the DS3900P2 is providing power to the circuit board.
- Drive the DS3900P2 with evaluation software provided by Maxim Integrated.

**Note:** The DS3900P2 ribbon cable mates with standard 2.54mm (0.100in) 2 x 4 male header connectors. Some Maxim Integrated EV kits provide a 1 x 4 male header for this connection.

## Table 1. Recommended Operating Conditions

(Typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = +25°C, unless otherwise noted.) (Notes 1, 2)

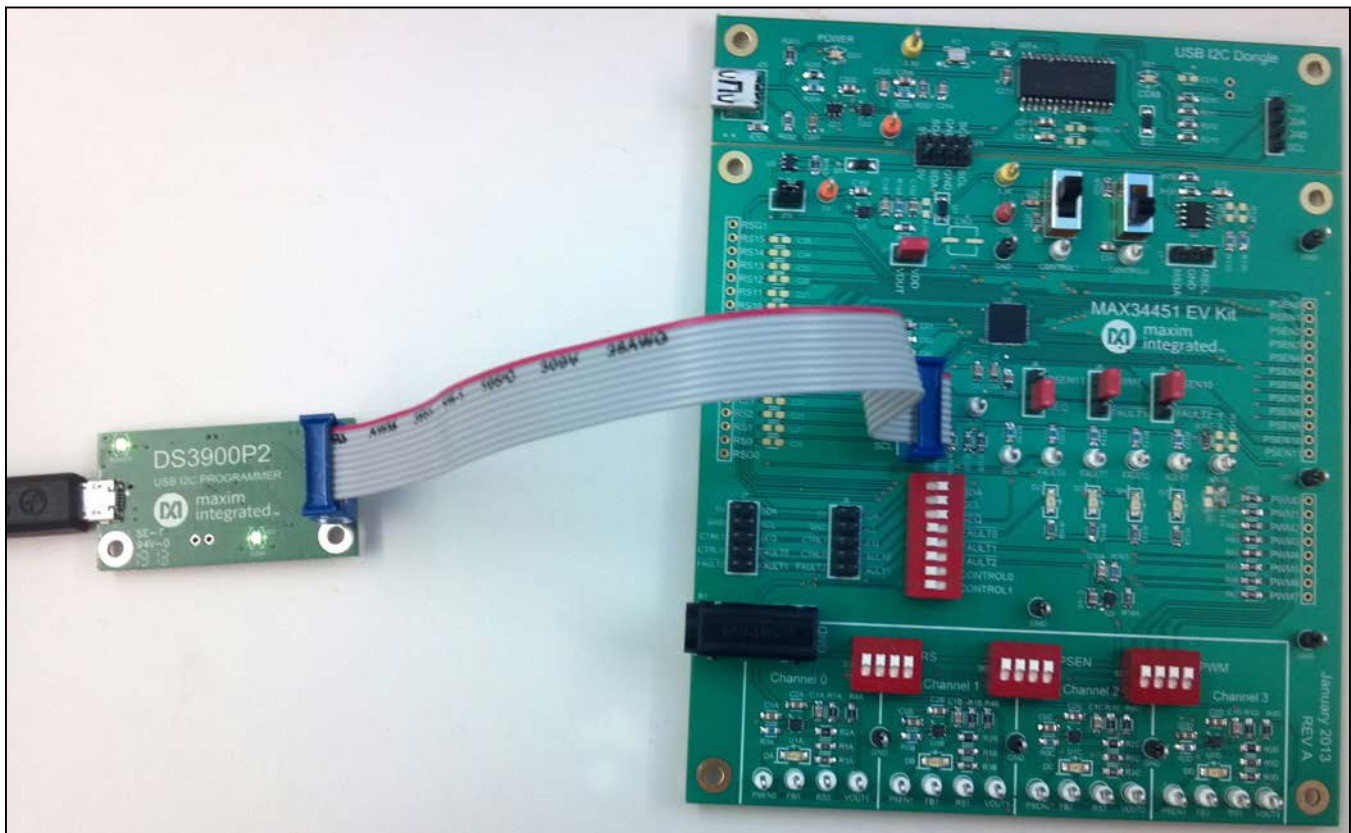
| PARAMETER                        | SYMBOL          | CONDITIONS               | MIN                        | TYP | MAX                 | UNITS |
|----------------------------------|-----------------|--------------------------|----------------------------|-----|---------------------|-------|
| Operating Voltage                | V <sub>CC</sub> |                          |                            | 3.3 |                     | V     |
| Supply Current                   | I <sub>CC</sub> | Current provided by 3.3V |                            |     | 250                 | mA    |
| Input Low Voltage                | V <sub>IL</sub> |                          |                            |     | 0.15V <sub>CC</sub> | V     |
| Input High Voltage               | V <sub>IH</sub> |                          | 0.25V <sub>CC</sub> + 0.8V |     |                     | V     |
| Output Low Voltage               | V <sub>OL</sub> | I <sub>OL</sub> = 8.5mA  |                            |     | +0.6                | V     |
| Ambient Temperature              | T <sub>A</sub>  |                          | -40                        |     | +85                 | °C    |
| I <sup>2</sup> C Clock Frequency |                 |                          | 100                        |     | 400                 | kHz   |

**Note 1:** All voltages listed are with respect to ground.

**Note 2:** Devices are only functionally tested; parameters listed are not guaranteed.

**Table 2. Pin Description**

| PIN  | FUNCTION                                                             |
|------|----------------------------------------------------------------------|
| 3.3V | Power supply that can be used to power EV kit or customer PCB.       |
| SDA  | Data Input/Output for I2C-compatible communication.                  |
| GND  | Ground Connection. This must be connected to EV kit or customer PCB. |
| SCL  | Clock Output for I2C-compatible communication.                       |

*Figure 1. Recommended PCB Connection for DS3900P2*

**Table 3. Description of LEDs**

| LED        | COLOR                   | DESCRIPTION                                                                                                                 |
|------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| D1 (POWER) | Green                   | USB Power Fault. The USB power is connected.                                                                                |
|            | Red                     | USB Power Fault. A fault occurred due to overvoltage limit, current limit, or thermal limit.                                |
| D2 (COM)   | Green                   | Waiting. Software has initialized the hardware. Waiting for user data to be sent from the GUI.                              |
|            | Red                     | Communication. After the software has initialized the hardware, the LED flashes red when a command from the PC is received. |
|            | Flashing Red and Orange | Waiting. Hardware is powered on and waiting for the software to be opened                                                   |

**Table 4. Troubleshooting the DS3900P2**

| SYMPTOM                           | CHECK                                      | SOLUTION                                                                                                                                                                                                                                      |
|-----------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows does not detect hardware. | Is the LED labeled D1 on the DS3900P2 red? | If yes, then the electronic fuse is in a fault state. Inspect for electrical shorts on the PCB and ensure that the PCB is not sitting on a conductive surface.                                                                                |
|                                   | USB cable and port?                        | Try connecting the USB cable to a different USB port on the PC and wait for a Windows message that indicates that the hardware is ready to use. If the device is not detected, unplug the USB cable and reboot the PC. Connect the USB cable. |
|                                   | Are any of the LEDs illuminated?           | If not, then the PCB may not be getting power. Ensure bias is applied to VCC and all three GND terminals are connected to system ground. Verify the USB cable is connected to a PC.                                                           |

## Troubleshooting

All efforts were made to ensure that the DS3900P2 works on the first try, right out of the box. In the rare occasion that a problem is suspected, refer to Table 4 to troubleshoot the issue.

## DS3900P2 Revisions

Revisions yielding significant changes and/or improvements are tracked in firmware and are displayed in most evaluation software provided by Maxim Integrated. Revision is broken up into a major and minor revision. For example, if the DS3900P2's revision is 3.2, it returns a major revision of 3, a minor revision of 2. Knowing the revision allows the software to utilize new functions that are not available in previous versions of the DS3900P2's firmware and to avoid using commands that are not present in prior versions. Although there are no plans to change the firmware at this time, Maxim Integrated reserves the right to change the firmware at any time without notice.

## Intended Use

The DS3900P2 module is intended only to be used to evaluate Maxim Integrated circuits. All hardware, firmware, and any relative software is provided "as is", without warranty of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular purpose, and noninfringement. In no event shall Maxim Integrated be liable for any claim, damages or other liability, whether in an action of contract, tort or otherwise, arising from, out of, or in connection with the hardware, firmware, and any relative software or the use or other dealings in the hardware, firmware, and any relative software.

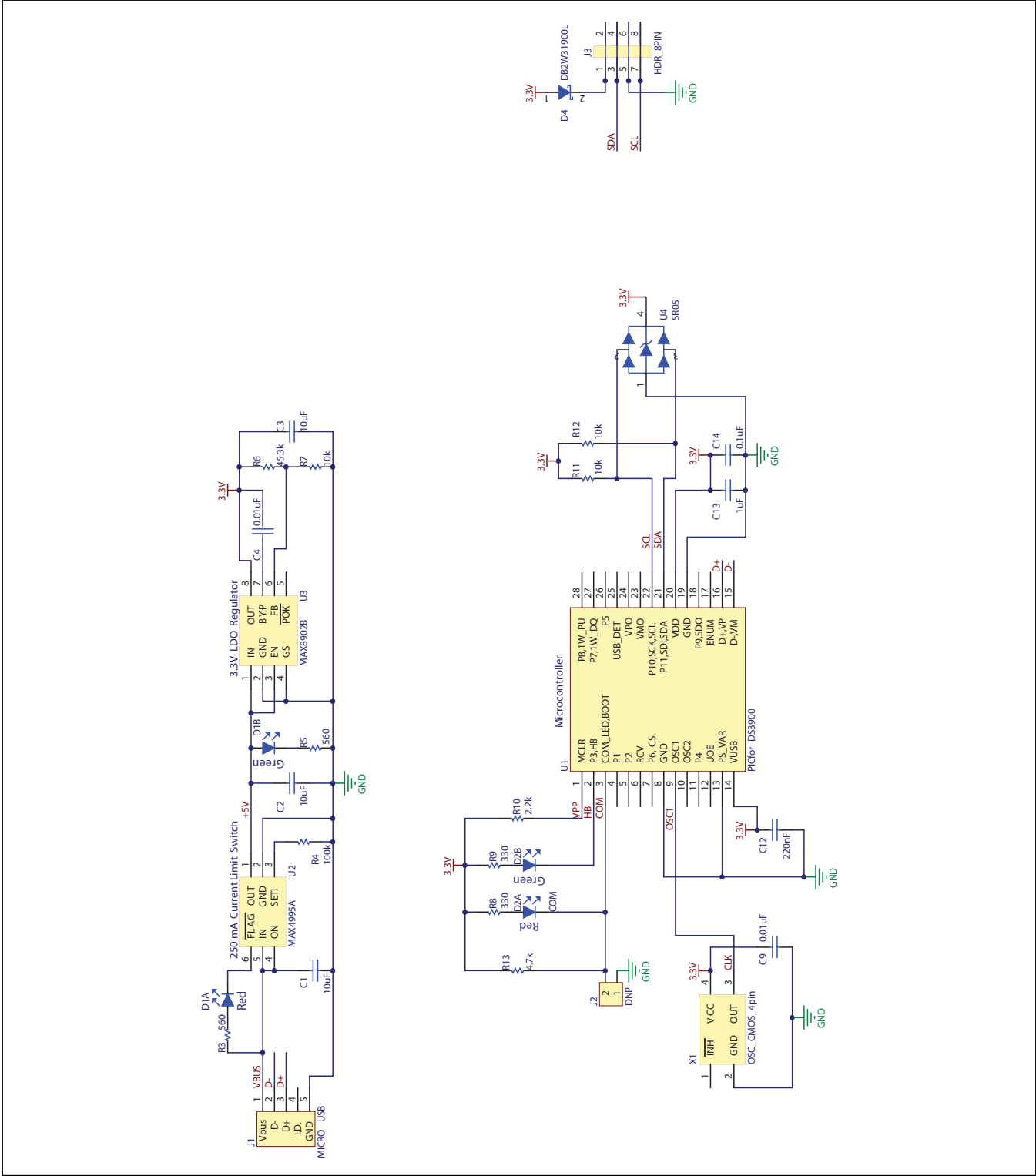


Figure 2. DS3900P2 Schematic

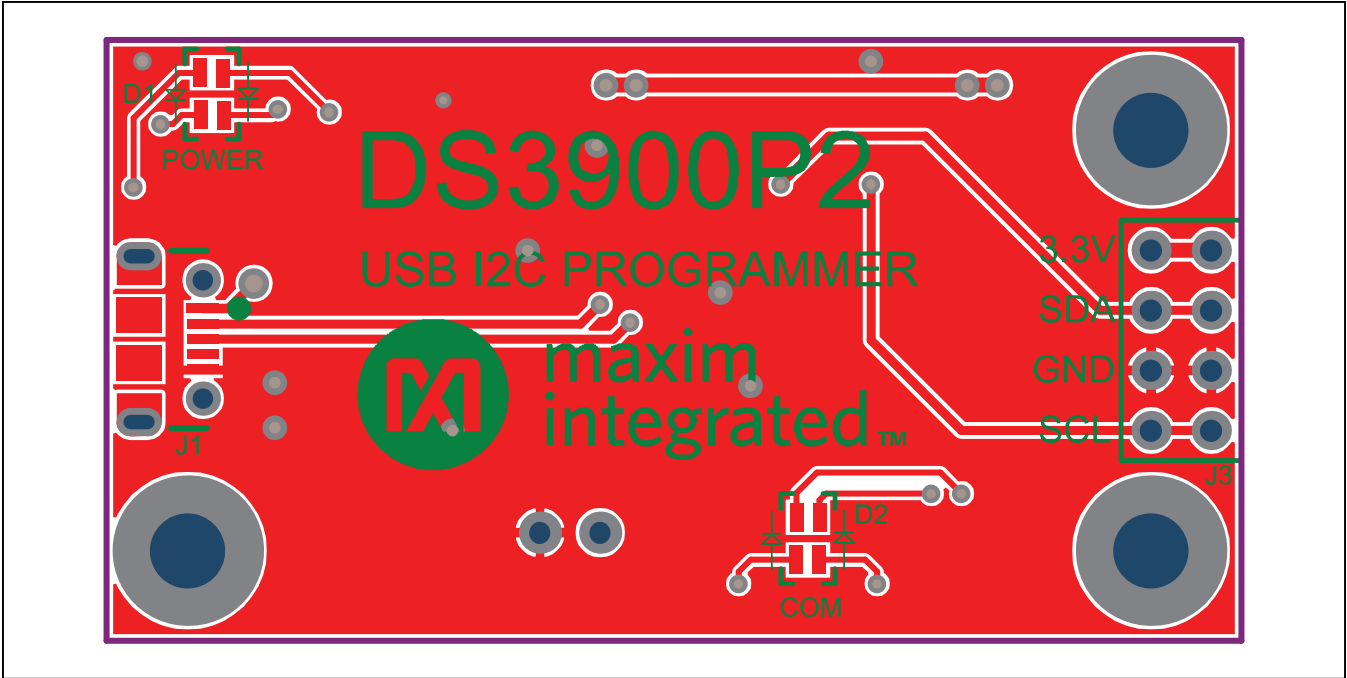


Figure 3. DS3900P2 PCB Layout—Top

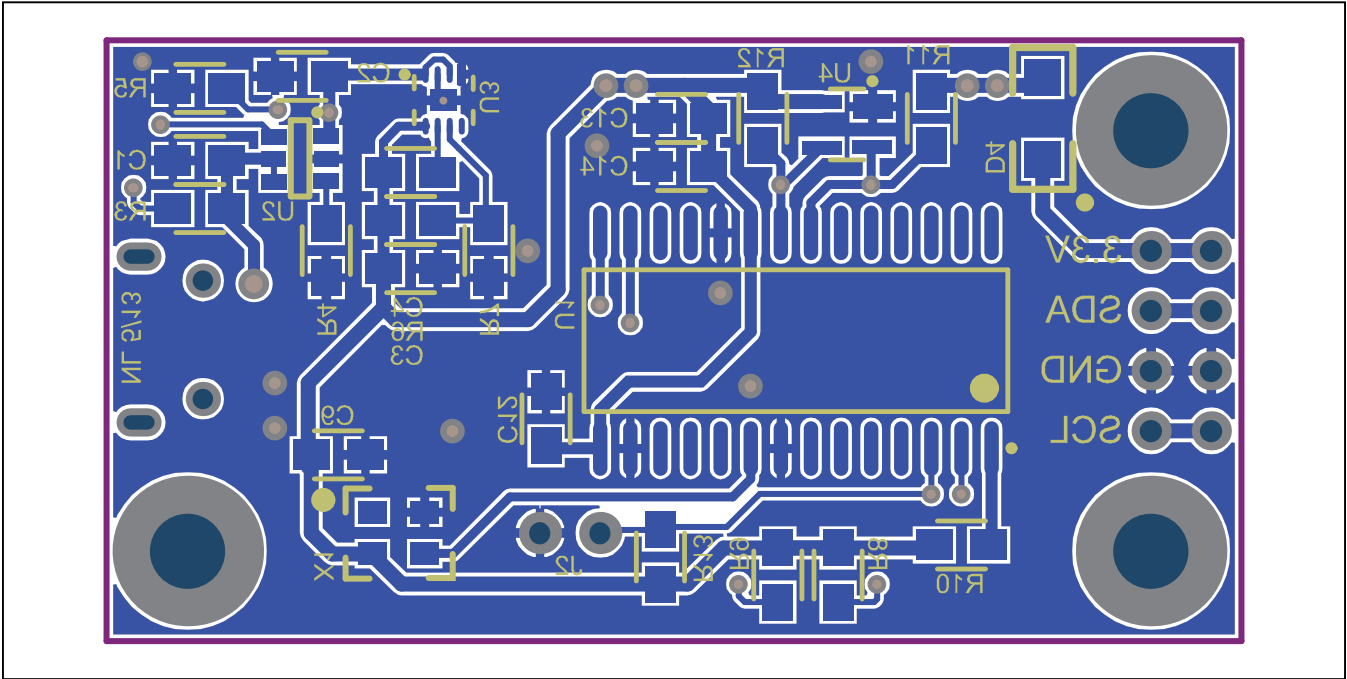


Figure 4. DS3900P2 PCB Layout—Bottom



## Component List

| COMMENT      | DESIGNATOR   | QTY | DESCRIPTION                                                              |
|--------------|--------------|-----|--------------------------------------------------------------------------|
| 10 $\mu$ F   | C1, C2, C3   | 3   | 10 $\mu$ F ceramic capacitors (0805)<br>Taiyo Yuden EMK212ABJ106KD-T     |
| 0.01 $\mu$ F | C4, C9       | 2   | 0.01 $\mu$ F ceramic capacitors (0805)<br>Murata GRM21BR72A103K          |
| 0.22 $\mu$ F | C12          | 1   | 0.22 $\mu$ F ceramic capacitors (0805)<br>TDK Corp. C2012X7R1H224K       |
| 1.0 $\mu$ F  | C13          | 1   | 1.0 $\mu$ F ceramic capacitors (0805)<br>TDK Corp. C2012X7R1H105K/SOFT   |
| 0.1 $\mu$ F  | C14          | 1   | 0.1 $\mu$ F ceramic capacitors (0805)<br>TDK Corp. CGA4J2X7R2A104K       |
| LED_DUAL     | D1, D2       | 2   | Red/green dual LEDs<br>Kingbright APHBM2012SURKCGKC                      |
| SCHOTTKY     | D4           | 1   | Schottky diode<br>Panasonic - SSGDB2W31900L                              |
| MICRO USB    | J1           | 1   | 5-pin Micro-USB<br>Molex 105017-0001                                     |
| HDR_8PIN     | J3           | 1   | 8-pin header<br>3M 961208-6404-AR                                        |
| 560          | R3, R5       | 2   | 560 $\Omega$ $\pm$ 1% resistors (0805)<br>Vishay/Dale CRCW0805560RFKEA   |
| 100k         | R4           | 1   | 100k $\Omega$ $\pm$ 1% resistors (0805)<br>Vishay/Dale CRCW0805100KFKEA  |
| 45.3k        | R6           | 1   | 45.3k $\Omega$ $\pm$ 1% resistors (0805)<br>Vishay/Dale CRCW080545K3FKEA |
| 10k          | R7, R11, R12 | 3   | 10k $\Omega$ $\pm$ 1% resistors (0805)<br>Vishay/Dale CRCW080510K0FKEA   |
| 330          | R8, R9       | 2   | 330 $\Omega$ $\pm$ 1% resistors (0805)<br>Vishay/Dale CRCW0805330RFKEA   |
| 2.2k         | R10          | 1   | 2.2k $\Omega$ $\pm$ 1% resistor (0805)<br>Vishay/Dale CRCW08052K20FKEA   |
| 4.7k         | R13          | 1   | 4.7k $\Omega$ $\pm$ 1% resistor (0805)<br>Vishay/Dale CRCW08054K70FKEA   |
| DS3900_PIC   | U1           | 1   | Microprocessor<br>Microchip PIC18LF2550-I/SO                             |
| MAX4995A     | U2           | 1   | Current-limit switch (6 SOT)<br>Maxim Integrated MAX4995AAUT+            |
| MAX8902B     | U3           | 1   | Low-noise, LDO regulator (8 TDFN-EP)<br>Maxim Integrated MAX8902BATA+    |
| SR05         | U4           | 1   | TVS diode array<br>Littelfuse SR05-02CTG                                 |
| 48MHz        | X1           | 1   | 4-pin CMOS oscillator<br>AVX KC3225A48.0000C30E00                        |
| —            | —            | 1   | PCB: DS3900P2 USB I2C PROGRAMMER                                         |

### Ordering Information

| PART           | TYPE                         |
|----------------|------------------------------|
| DS3900P2EVKIT# | EV Kit Communications Module |

*#Denotes a RoHS-compliant device that may include lead that is exempt under the RoHS requirements.*



## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 8/13             | 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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