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# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### General Description

The MAX14578 evaluation kit (EV kit) provides a proven design to evaluate the MAX14578 USB battery charger detector in a 12-bump wafer-level package (WLP). The IC features charger detection compliant to USB Battery Charging Revision 1.1, dedicated charger detection, Apple charger detection, China YD/T1591-compliant charger detection, and USB pass-through communication. The EV kit has various power options to separate the charging current from the system current. The EV kit is self-powered through USB, but needs external power to demonstrate charging. The EV kit features the MAX8903A 1-cell lithium-ion (Li+) DC-DC USB charger for interfacing with the MAX14578 in an application setting.

The EV kit uses Windows XP®, Windows Vista®, and Windows® 7-compatible software to provide a simple graphical user interface (GUI) to simplify evaluation. The EV kit GUI enables testing of the IC's features. The EV kit PCBs come with a MAX14578EEWC+ installed.

### Features

- ◆ Windows XP-, Windows Vista-, and Windows 7-Compatible Software
- ◆ GUI Simplifies Learning the IC's Operation
- ◆ Includes MAX8903A USB Charger for Application Testing
- ◆ Can be USB Powered or Externally Powered for Greater Charging Current
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

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

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C4, C6, C7, C11, C12, C100, C102-C109	15	0.1µF ±10%, 25V X5R ceramic capacitors (0603) Murata GRM188R61E104K
C2, C5, C10	3	4.7µF ±10%, 25V X5R ceramic capacitors (0805) Murata GRM21BR61E475K
C8, C9	2	10µF ±10%, 10V X7R ceramic capacitors (0805) Murata GRM21BR71A106K
C13	1	2.2µF ±10%, 6.3V X5R ceramic capacitor (0603) Murata GRM185R60J225K
C14, C116	0	Not installed, ceramic capacitors (0603)
C101	1	4.7µF ±10%, 6.3V X5R ceramic capacitor (0603) Murata GRM188R60J475K
C110, C111	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J

DESIGNATION	QTY	DESCRIPTION
C112, C114	2	10µF ±10%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M
C113, C115	2	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K
C117, C118	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
C119	1	3300pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H332K
CE1, CE2, CEN, INT	4	White multipurpose test points
D1-D4	4	Red LEDs (0603) Panasonic LNJ208R8ARA
D100	1	Green LED (0603) Panasonic LNJ314G8TRA
DM, DP	0	Not installed, miniature test points

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# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### Component List (continued)

DESIGNATION	QTY	DESCRIPTION
EXT_VBAT, EXTDC, VB, VBAT, VBATTERY, VBUS, VL, VSYS, +5V	9	Red multipurpose test points
GND	6	Black multipurpose test points
JU1, JU2, JU3, JU5-JU8	7	3-pin headers
JU4, JU9, JU10, JU12	4	2-pin headers
L1	1	1 $\mu$ H, 2.2A inductor TOKO FDSD0415-1R0M
NTC	1	100k $\Omega$ NTC thermistor (0402) Murata NCP15WF104J03RC
P1	1	USB micro-B right-angle PC-mount receptacle
P2, P3	2	USB type-A right-angle receptacles
P100	1	USB type-B right-angle female receptacle
R1, R2, R4, R5, R11, R14, R101, R102	0	Not installed, resistors (0603)
R6, R7, R8, R19, R20, R21	6	2k $\Omega$ $\pm$ 5% resistors (0603)
R9, R22, R23	3	0 $\Omega$ $\pm$ 5% resistors (0603)
R10	1	4.53k $\Omega$ $\pm$ 1% resistor (0603)
R12, R15	0	Not installed, potentiometers
R13	1	1.2k $\Omega$ $\pm$ 1% resistor (0603)
R16, R17	2	10k $\Omega$ $\pm$ 5% resistors (0603)
R18	1	100k $\Omega$ $\pm$ 1% resistor (0603)
R100	1	220 $\Omega$ $\pm$ 5% resistor (0603)
R103	1	1.5k $\Omega$ $\pm$ 5% resistor (0603)

DESIGNATION	QTY	DESCRIPTION
R104, R105	2	27 $\Omega$ $\pm$ 5% resistors (0603)
R106, R107, R108	3	1k $\Omega$ $\pm$ 5% resistors (0603)
U1	1	USB battery charger detector (12 WLP) Maxim MAX14578EEWC+
U2	1	1-cell Li+ charger for USB power (28 TQFN-EP) Maxim MAX8903AETI+
U100	1	UART-to-USB converter (32 TQFP)
U101	1	32-bit microcontroller (68 QFN-EP) Maxim MAXQ2000-RAX+
U102	0	Not installed, 93C46 3-wire EEPROM (8 SO)
U103	1	3.3V regulator (5 SC70) Maxim MAX8511EXK33+
U104	1	2.5V regulator (5 SC70) Maxim MAX8511EXK25+
Y100	1	16MHz crystal (HCM49) Hong Kong X'tals SSM1600000E18FAF
Y101	1	6MHz crystal (HCM49) Hong Kong X'tals SSL600000018FAF
—	1	USB high-speed A-to-B cable, 6ft
—	1	USB high-speed A-to-micro-B cable, 1m
—	11	Shunts
—	1	PCB: MAX14578 EVALUATION KIT

### Component Suppliers

SUPPLIER	PHONE	WEBSITE
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America Inc	770-436-1300	www.murata-northamerica.com
Panasonic Corp.	800-344-2112	www.panasonic.com
TOKO America, Inc.	847-297-0070	www.tokoam.com

**Note:** Indicate that you are using the MAX14578 when contacting these component suppliers.

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### MAX14578 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX14578.EXE	Application program
CDM20600.EXE	Installs the USB device driver
UNINSTALL.EXE	Uninstalls the EV kit software
USB_Driver_Help_200.PDF	USB driver installation help file

### Quick Start

#### Required Equipment

- MAX14578 EV kit (includes USB cable)
- User-supplied Windows XP, Windows Vista, or Windows 7 PC with a spare USB port
- USB flash memory stick

**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) Visit [www.maxim-ic.com/evkitsoftware](http://www.maxim-ic.com/evkitsoftware) to download the latest version of the EV kit software, 14578Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 2) Install the EV kit software and USB driver on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
- 3) Verify that all jumpers are in their default positions, as shown in Table 1.
- 4) Connect the A-to-B USB cable from the PC to the P100 USB connector on the EV kit board. A Windows message appears when connecting the EV kit board to the PC for the first time. Each version of Windows has a slightly different message.

If you see a Windows message stating **ready to use**, then proceed to the next step. Otherwise, open the USB\_Driver\_Help\_200.PDF document in the Windows **Start | Programs** menu to verify that the USB driver was installed successfully.

- 5) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1. The EV kit GUI indicates if the USB hardware is connected in the lower-left status bar and whether the device was detected in the lower-right status bar.
- 6) The interrupt is enabled in the software by default (**INTEN = 1**). The **Charger Type (read only)** drop-down list shows that no charger is connected to the device. Observe that **VBCOMP** reads **0**.
- 7) The first example of charger detection is by connecting a USB cable.
- 8) Connect the USB A-to-micro-B cable from the PC to the P1 connector on the EV kit. The **Charger Type (read only)** drop-down list changes to show that a USB cable is connected and **VBCOMP** now reads **1**. There can be a few seconds of latency for the results to show on the PC.
- 9) Now to perform USB pass-through communication, connect a USB flash memory stick into the P2 connector.
- 10) In the software, press the **USBSWC** button to drive the bit to **1**. This should connect the USB flash memory stick to the PC. Wait a few seconds and verify on your PC that the USB flash memory is visible and the content in the **Removable Disk** can be accessed.
- 11) To safely remove the USB flash memory stick, double-click on the **Safely Remove Hardware** icon on the Windows lower-right status bar. Click on **USB Mass Storage Device** and press **Stop**. An update should indicate that the hardware is safe to be removed. Remove the flash memory stick from the P2 connector. Remove the USB A-to-micro-B cable from the P1 connector.

#### Additional Evaluation

- 12) The EV kit can detect different chargers, but many times the chargers have custom cables and connectors. This section describes how to simulate China YD/T1591-compliant charger detection.
- 13) Switch the jumper on JU1 to the 2-3 position.
- 14) Apply 5V on the EXTDC test point. Alternatively, you can connect the 5V present on board to the EXTDC test point.

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

- 15) Start the EV kit software by opening its icon in the **Start | Programs** menu. Observe that the **Charger Type (read only)** drop-down list shows that a USB cable is connected even though no cable is connected to P1. The device is monitoring the VBUS voltage to determine whether a USB cable is connected.
- 16) The China YD/T1591-compliant charger detects a dedicated charger by seeing whether the D+ line is shorted to the D- line. Locate the CD+ and CD- test points near the P1 connector. Using a wire with clips, short CD+ to CD-. The EV kit software **Charger Type (read only)** drop-down list shows that a **Dedicated Charger** is detected.

**Table 1. Jumper Table (JU1–JU10, JU12)**

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	The VB supply (VBUS detector) is connected to the P1 VBUS line.
	2-3	External VB. Apply an external voltage on the EXTDC test point to power the VB supply.
JU2	1-2*	The VBAT supply is connected to the on-board MAX8903A regulated output supply.
	2-3	External VBAT. Apply an external voltage on the EXT_VBAT test point to power the VBAT supply.
JU3	1-2*	Connects the P2 VBUS to the VB supply.
	2-3	Connects the P2 VBUS to the MAX8903A system output supply.
JU4	Closed*	On-board interrupt. Connects the on-board interrupt input to the MAX14578's $\overline{\text{INT}}$ signal.
	Open	Disconnects the MAX14578's $\overline{\text{INT}}$ signal (useful when evaluating the device).
JU5	1-2*	On-board I <sup>2</sup> C. Connects the on-board SCL signal to the MAX14578.
	2-3	User-supplied I <sup>2</sup> C. Apply the SCL signal to the EXT_SCL PCB pad.
JU6	1-2*	On-board I <sup>2</sup> C. Connects the on-board SDA signal to the MAX14578.
	2-3	User-supplied I <sup>2</sup> C. Apply the SDA signal to the EXT_SDA PCB pad.
JU7	1-2*	Connects the MAX8903A USB input supply to the MAX14578 VB supply.
	2-3	Connects the MAX8903A USB input supply to the EXTDC test point.
JU8	1-2*	Connects the MAX8903A input supply to the internal +5V supply.
	2-3	Connects the MAX8903A input supply to the EXTDC test point.
JU9	Closed*	Connects the MAX8903A DCM input to the CE1 output on the MAX14578.
	Open	MAX8903A DCM input is not connected.
JU10	Closed*	Connects the MAX8903A IUSB input to the CE2 output on the MAX14578.
	Open	MAX8903A IUSB input is not connected.
JU12	Closed	USB shield is grounded by PCB GND.
	Open*	USB shield is not grounded by PCB GND.

\*Default position.

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

**MAX14578 Evaluation Kit**

File Options Help

Main Control Registers Reset Read Registers

**Schematic Diagram:**

- SF\_REG:** SFOutAsrt (1), SFOut\_EH (0)
- LOW POWER:** LOW\_POW (1), SUS\_LO (0)
- PASS-THROUGH:** CP\_EHA (0), USBWC (0)
- LOGIC:** IINTPOL (0), IITEH (1), USBCPL (1)
- CHARGER DETECTION:** DCHK (0), USB\_CHGDET (1), CDP\_DET (0), CHG\_RUN (0)
- Dead Battery Chg:** DBCHG (0), DB\_EXIT (0), DB\_IDLE (0)
- Data Contact Det:** DCD\_T (0), DCD\_EXIT (1), DCD\_EH (1)
- Other:** VBCOMP (0), CE0, CE1, CE2

**Legend:** Text in Blue = Read Only; Text in Red = Read/Write

**I2C Register Access:**

- Register: 0x04
- Command: 0x0B
- Description: Reset
- Charger Type (read only): Nothing attached
- USB Suspend:
- Charger Disable:

Hardware: Connected | MAX14578 Detected

Figure 1. MAX14578 EV Kit Software (Main Control Tab)

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

**MAX14578 Evaluation Kit**

File Options Help

Main Control **Registers** Reset Read Registers

	B7	B6	B5	B4	B3	B2	B1	B0	
<b>Device ID</b> Reg = 0x00	vid3	vid2	<b>vid1</b>	vid0	rev3	rev2	rev1	<b>rev0</b>	0x 21
Read									
<b>Control1</b> Reg = 0x01	intpol	<b>inten</b>	usbswc	cp_ena	<b>low_pow</b>	dchk	chgtypm	<b>usb_chg</b>	0x 49
Read									
<b>Interrupt</b> Reg = 0x02	chgtyp2	chgtyp1	chgtyp0	vbcomp	dbchg	dcd_t	chgrun	rfu	0x 00
Read									
<b>Control2</b> Reg = 0x03	<b>dcd_en</b>	db_exit	db_idle	sus_lo	ce_frc	ce2	ce1	ce0	0x 80
Read									
<b>Control3</b> Reg = 0x04	rfu	rfu	rfu	cdp_det	<b>usb_cpl</b>	sfouten	<b>sfoutasrt</b>	<b>dcd_exit</b>	0x 0B
Read									

**Bold font: bit = 1**

I2C Register: 0x04 Command: 0x0B

**Charger Type** (read only) Nothing attached

**Description:**

USB Suspend  Charger Disable

Hardware: Connected MAX14578 Detected

Figure 2. MAX14578 EV Kit Software (Registers Tab)

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### **Detailed Description of Software**

The main window of the MAX14578 EV kit is shown in Figure 1.

The EV kit uses Windows-compatible software to provide a simple GUI to demonstrate the MAX14578. The lower-left status bar indicates whether the EV kit is detected by the software. The lower-right status bar indicates if the device was detected by reading and verifying the **Device ID** register. The buttons with red text program read/write registers while buttons in blue text are read-only. When a button is pressed to drive a bit high or low, the **I2C** group box on the lower left shows the register address and command byte sent. The register values can be viewed in the **Registers** tab (Figure 2). This allows easy prototyping with the GUI with different configuration settings.

#### **Main Control Tab**

The **Main Control** tab sheet (Figure 1) visually displays different bit settings. The functions are grouped by group boxes. Pressing a button toggles the bit and a short description is displayed in the **Description** edit box. To get the latest register settings, press the **Read Registers** button located in the top-right corner of the GUI. Some actions such as performing charger detection are automated by the device. When **INTEN** is **1**, the GUI automatically detects charger detection based on the interrupt line. The types of chargers the device can detect are located in the **Charger Type (read only)** drop-down list. This drop-down list is for reference as to what is detectable by the device and clicking on a different setting performs a read command and the detected charger is displayed in the drop-down list. When a button is pressed, a read/write action is performed, the **I2C** group box displays the data, and a short description of the action is displayed in the **Description** edit box. The device is always reset at startup to default values. The default values are the same as in the MAX14578/MAX14578A IC data sheet except for **INTEN**, which is set to 1 by the software.

#### **PASS-THROUGH Group Box**

The device has two primary functions: charger detection and pass-through of USB signals. The **PASS-THROUGH** group box controls the pass-through portion. Everything else is for the charger detection. Although the USB switches can be controlled by the GUI to be opened or closed, some charger detection schemes open the switches.

The **USBSWC** button controls the USB switches. The **CP\_ENA** button controls the internal charge pump to

generate a negative rail for the D+/D- lines. Only when the switches are open and **CP\_ENA** is set to **1**, the D+/D- lines can tolerate a negative voltage such as those from DirectDrive® audio amplifiers. If **CP\_ENA** is **0**, then the charge pump is disabled and a negative voltage cannot be placed on the D+/D- lines.

#### **LOGIC Group Box**

The **LOGIC** group box controls automatic detection of the charger types. When **INTEN** is **1**, the device generates an interrupt for changes in **VBCOMP**. The interrupt polarity is controlled by the **INTPOL** bit. When an interrupt occurs, the EV kit software reads the interrupt register (0x02) to clear the interrupt. The charger type is located in that register and is updated in the **Charger Type (read only)** drop-down list.

#### **Interface to the MAX8903A**

The EV kit comes with the 2A Li+ MAX8903A charger installed. CE1 and CE2 are outputs of the MAX14578 that interface to the MAX8903A to select the current limit. The CE1 and CE2 outputs are both either high or low depending on the state of the **SUS\_LO** bit in the off state. The **CE\_FRC** bit can bypass the automatic detection settings and force CE1 and CE2 to output high or low depending on the **CE1** or **CE2** checkboxes.

The MAX8903A has two more inputs that are controlled by the GUI. The **USB Suspend** and **Charger Disable** checkboxes control the logic levels of those two inputs.

#### **Registers Tab**

The **Registers** tab sheet (Figure 2) displays each register's individual bit logic-level status. A data bit in bold indicates a logic-high, while a data bit not bolded indicates a logic-low. Clicking on the individual data bit toggles the bit and performs a write/read command. The new value is shown in the edit boxes at the far right. Full register values can be written to the registers alternatively by typing a hex value in the edit box and pressing the Enter key on the keyboard.

#### **Advanced User Interface**

There are two methods for communicating with the device. The first is through the windows shown in Figures 1 and 2. The second is through the **Advanced User Interface** window shown in Figure 3. The **Advanced User Interface** window becomes available when selecting the **Options | Interface (Advanced User)** menu item and allows execution of serial commands manually.

The **Advanced User Interface** window can also be used as a debug tool because it is capable of manually reading and writing to every register of the device.

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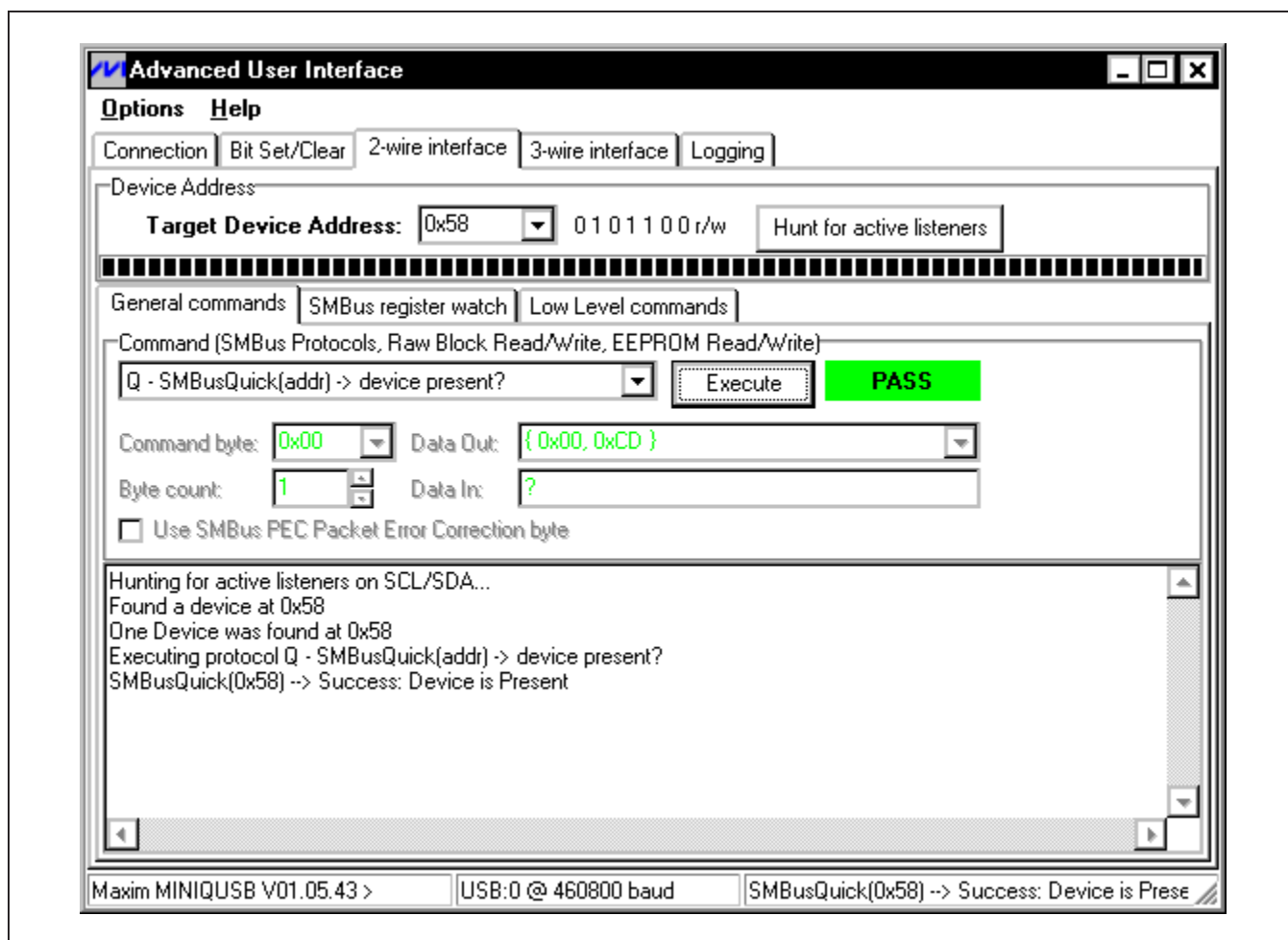


Figure 3. Advanced User Interface Window (2-Wire Interface Tab)

### Detailed Description of Hardware

The MAX14578 EV kit evaluates the MAX14578 USB charger detector, which communicates over I<sup>2</sup>C. The EV kit demonstrates USB signal pass-through, charger detection, and on-board charging using the MAX8903A. The EV kit has various on-board test points to monitor various signals.

The EV kit uses the MAX14578EEWC+ in a 12-bump WLP (2mm x 2mm) on a proven four-layer PCB design. The EV kit operates off the USB supply. To test charging applications, power the EV kit with a separate supply.

#### Pass-Through Communication

The EV kit USB signal traces are designed with 90Ω differential impedances. The controlled impedances allow the EV kit to pass USB-compliance testing using eye diagrams.

### Charger Detection

The EV kit detects the charger plugged into the P1 connector. Charger detection can occur without any interface to the MAX8903A charger. Test points are located on the D+/D- lines (DP/DM) that connect to P1 to simulate different types of chargers. One common charger detection method is the China YD/T1591-compliant charger, which looks for a short between D+ and D-. If that charger is not available, shorting the DP and DM test points with a wire and reading the **Charger Type (read only)** on the EV kit software shows a **Dedicated Charger**. Another common charger is the Apple charger. The detection involves looking for a specific voltage on the D+ and D- lines, with 5V on VBUS. The 1A Apple charger has approx 2V on D+ and 2.68V on D-. Placing the following voltages on the DP and DM test points and reading the **Charger Type (read only)** on the EV kit software shows an **Apple Charger**.

# MAX14578 Evaluation Kit

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### On-Board Charging

The MAX8903A charger circuitry has a dedicated USB type-A receptacle to charge an external Li+ battery. The maximum input voltage to the MAX8903A is 16V. The EXTDC test point can power both the MAX14578 and the MAX8903A. The MAX14578's maximum input voltage is 28V, but due to the MAX8903A, do not exceed 16V on the EXTDC test point.

The MAX8903A is set for a maximum 1.5A charging current. The current limit is set by the MAX14578 depending on the state of the **SUS\_LO** bit, but that setting can be bypassed with the **CE\_FRC** bit. The EV kit has a fixed current limit of 1.5A, but the EV kit layout is designed to install Vishay TSM4-series potentiometers on R12 and R15, for custom current limits.

### Power Supply

The EV kit has various power options and jumpers to separate the supply current from the charging current. The EV kit is USB powered by default. The 5V comes from the P100 VBUS line and powers the input to the MAX8903A. The MAX8903A has a regulator output (VL test point) that powers the MAX14578. The total USB current is approximately 500mA; therefore, to test more than 500mA charging current, use an external supply.

The MAX14578 has two supply inputs that it can be powered from. In the EV kit default state, VBAT is powered

by the MAX8903A VL output. When a charger is plugged into the P1 connector, or a voltage is placed on the EXTDC test point (change the appropriate jumpers, JU1 for the MAX14578 and JU8 for the MAX8903A), the EV kit power is supplied externally and the charging current can be as high as 1.5A (2A if modifications are made to the EV kit). Change R10 and R13 for different charger current limits.

### Interfacing with a Rechargeable Battery

The EV kit does not include an on-board battery, and therefore the VBAT supply is connected to the internal VL supply by default. In the typical application setting, as shown in the MAX14578/MAX14578A IC data sheet, the VBAT connection should connect to a 1-cell rechargeable Li+ battery. To test with a battery, change the jumper on JU2 to the 2-3 position. Then connect the battery to the EXT\_VBAT and nearest GND test points. The device is then powered by the battery. To test the charger, connect the VBATTERY test point to the EXT\_VBAT test point with a wire or clip. This connects the output of the battery charger to the battery.

Additionally, if the battery is on an external board that is accessible through the USB, then you can use P3 to connect the charger to the battery.

**Table 2. Power Test Points**

TEST POINTS	RANGE (V)	DESCRIPTION
EXT_VBAT	3 to 5.5	Externally applied when jumpers are selected for external power. Powers the MAX14578 VBAT supply. Connect the power supply to the EXT_VBAT test point.
EXTDC	3 to 16	Externally applied when jumpers are selected for external power. Powers the MAX14578 and MAX8903A. Connect the power supply to the EXTDC test point near the MAX8903A.
VB	3 to 16	VB supply input to the MAX14578. VB can be externally supplied through EXTDC or internally supplied by VBUS5 on the P1 VBUS line. Do not connect a supply to this test point.
VBAT	3 to 5.5	BAT supply input to the MAX14578. VBAT can be externally supplied through EXT_VBAT or internally supplied by VL. Do not connect a supply to this test point.
VBATTERY	4 to 4.2	Internally generated by the MAX8903A BATT output. This is the charger output and also connects to the P3 connector for charging applications. Do not connect a supply to this test point.
VBUS	4 to 16	VBUS is connected to VSYS or VB depending on the jumper settings. The VBUS test point connects to the VBUS voltage line for the P2 connector. Do not connect a supply to this test point.
VL	5	Internally generated by the MAX8903A VL regulator. This can be lower if the EXTDC is below 5V. Do not connect a supply to this test point.
VSYS	3 to 4.5	Internally generated by the MAX8903A SYS output. Do not connect a supply to this test point.
+5V	5	Internally generated when the USB cable is plugged into the P100 connector. Powers the MAX8903A by default. Do not connect a supply to this test point.

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### Stand-Alone User-Supplied I<sup>2</sup>C Communication

The EV kit can be used in stand-alone operation to interface with a user's I<sup>2</sup>C system without using a PC. The I<sup>2</sup>C slave address is 0x58 for writes and 0x59 for reads. Jumpers JU4, JU5, and JU6 are for the I<sup>2</sup>C and  $\overline{\text{INT}}$  signals. The  $\overline{\text{INT}}$  signal is an output from the device that asserts for changes in **VBCOMP** when the interrupt is enabled. The EV kit can be powered by the USB while an external system communicates over the I<sup>2</sup>C lines. To use the EV kit with a user-supplied I<sup>2</sup>C interface, perform the following steps:

- 1) Change the shunt to the 2-3 position for jumpers JU5 and JU6.
- 2) The user-supplied I<sup>2</sup>C interface is expected to have its own pullup resistors.
- 3) The  $\overline{\text{INT}}$  line can be used with JU4 installed, but make sure the software is not on because it will service the interrupt by default.
- 4) Connect the user-supplied I<sup>2</sup>C interface signals and signal ground return to the EV kit PCB pads, as shown in Table 3.

Table 3. User-Supplied I<sup>2</sup>C Interface

USER-SUPPLIED SIGNAL	SIGNAL
EXT_SCL	I <sup>2</sup> C clock
EXT_SDA	I <sup>2</sup> C data
GND	Signal ground return, GND nearest the EXT_SCL PCB pad
INT	MAX14578 $\overline{\text{INT}}$

### Interfacing to the MAX14578A (Advanced Users)

The EV kit comes with the MAX14578 installed, but the MAX14578A can also work with this EV kit. There are three pins that are different between the MAX14578 and MAX14578A. The three pins are:  $\overline{\text{INT}}$ , SCL, and SDA. The  $\overline{\text{INT}}$  pin becomes LOUT. Remove the shunt from JU4 and install a 0.1 $\mu$ F ceramic capacitor on C14. The SCL pin becomes  $\overline{\text{EN}}$ . Place the shunt on JU5 in the 2-3 position and apply the  $\overline{\text{EN}}$  signal to the EXT\_SCL PCB pad. The SDA pin becomes CE0. CE0 is an output that connects to the USB suspend (USUS) input on the MAX8903A. Remove resistor R23 to disconnect the MAXQ2000. CE0 must be pulled up to VL, so install a 1k $\Omega$  resistor on R5. Connect the EXT\_SDA PCB pad to the MAX8903A by installing a 0 $\Omega$  resistor on R2.

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

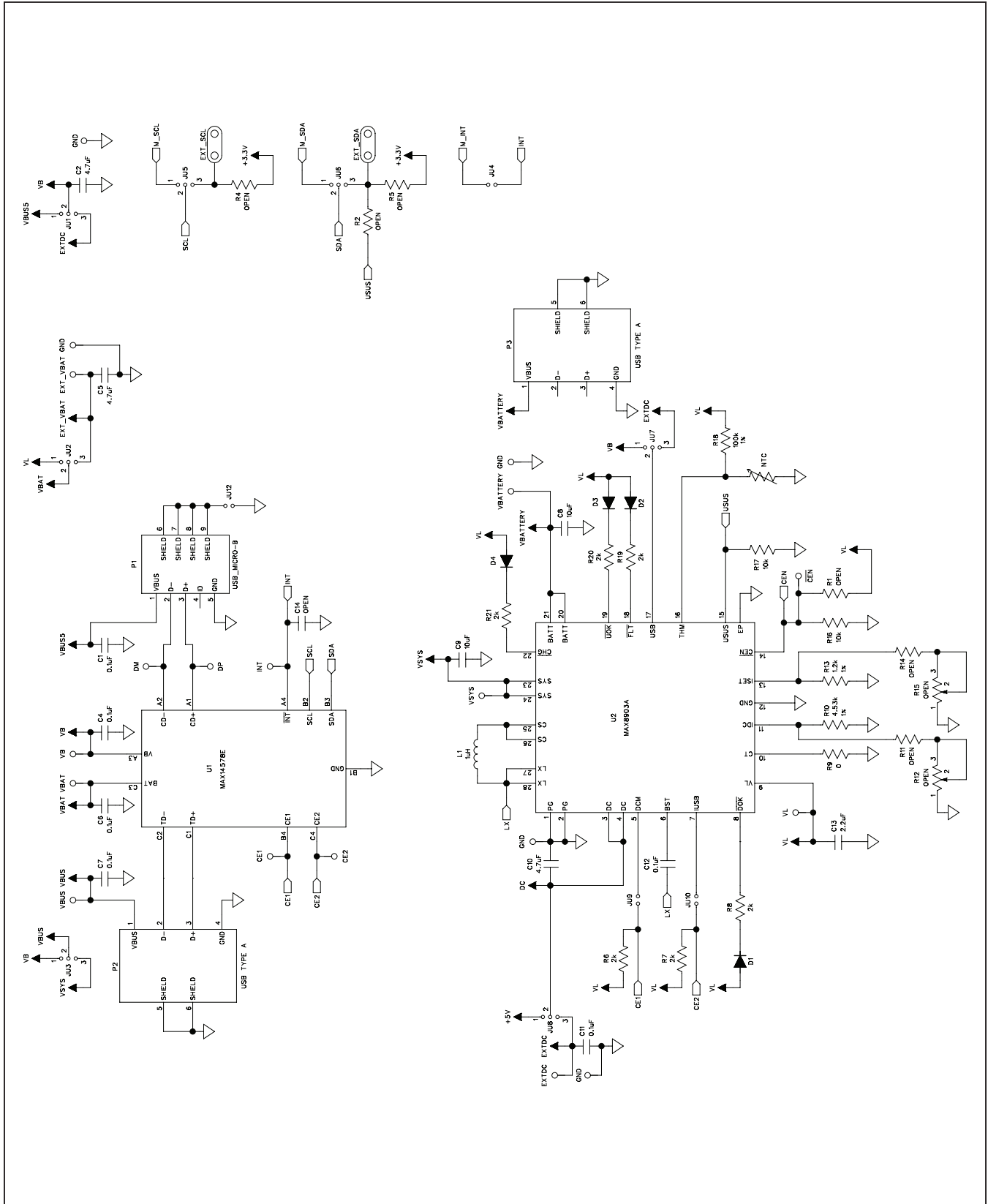


Figure 4a. MAX14578 EV Kit Schematic (Sheet 1 of 2)

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

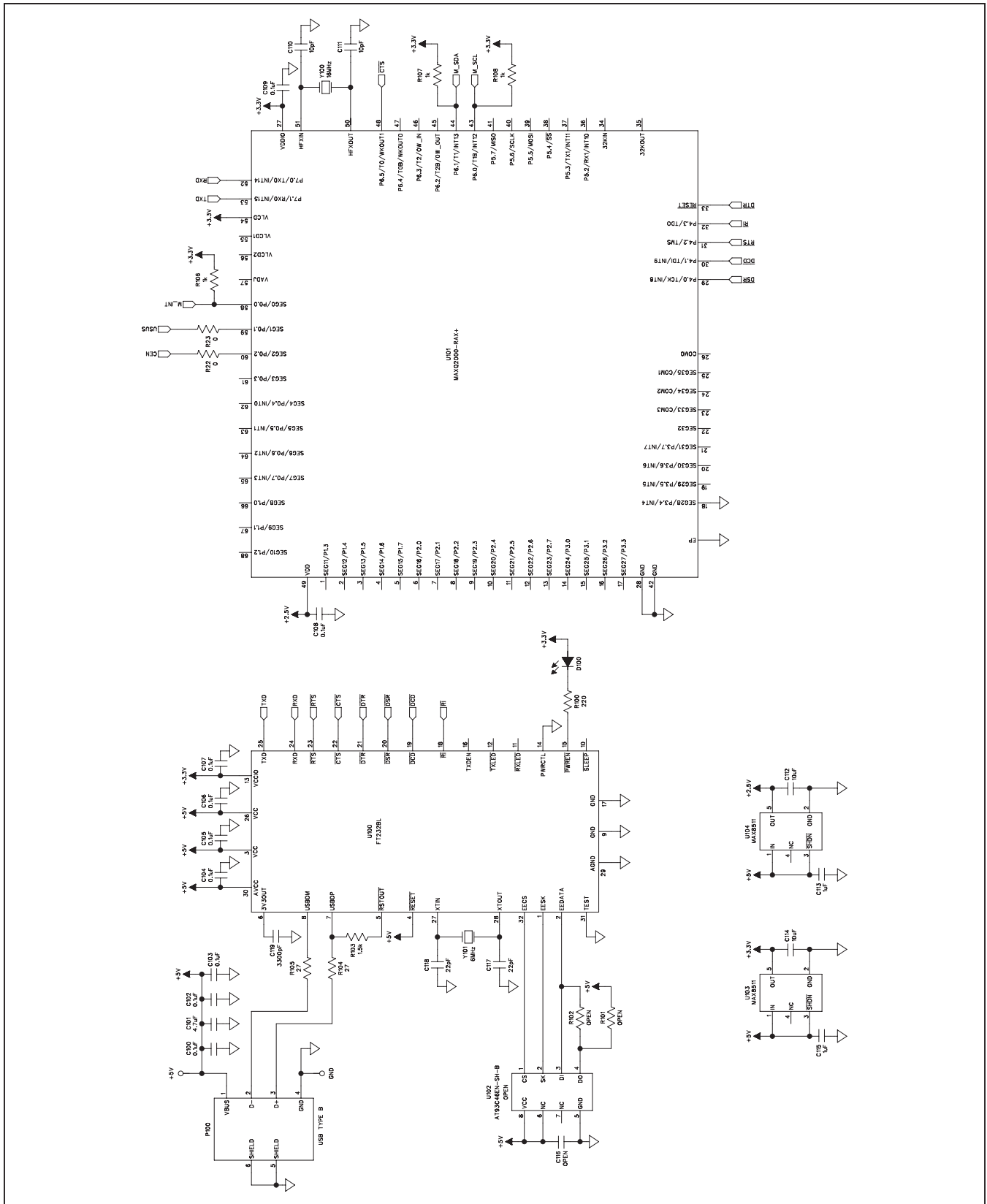


Figure 4b. MAX14578 EV Kit Schematic (Sheet 2 of 2)

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

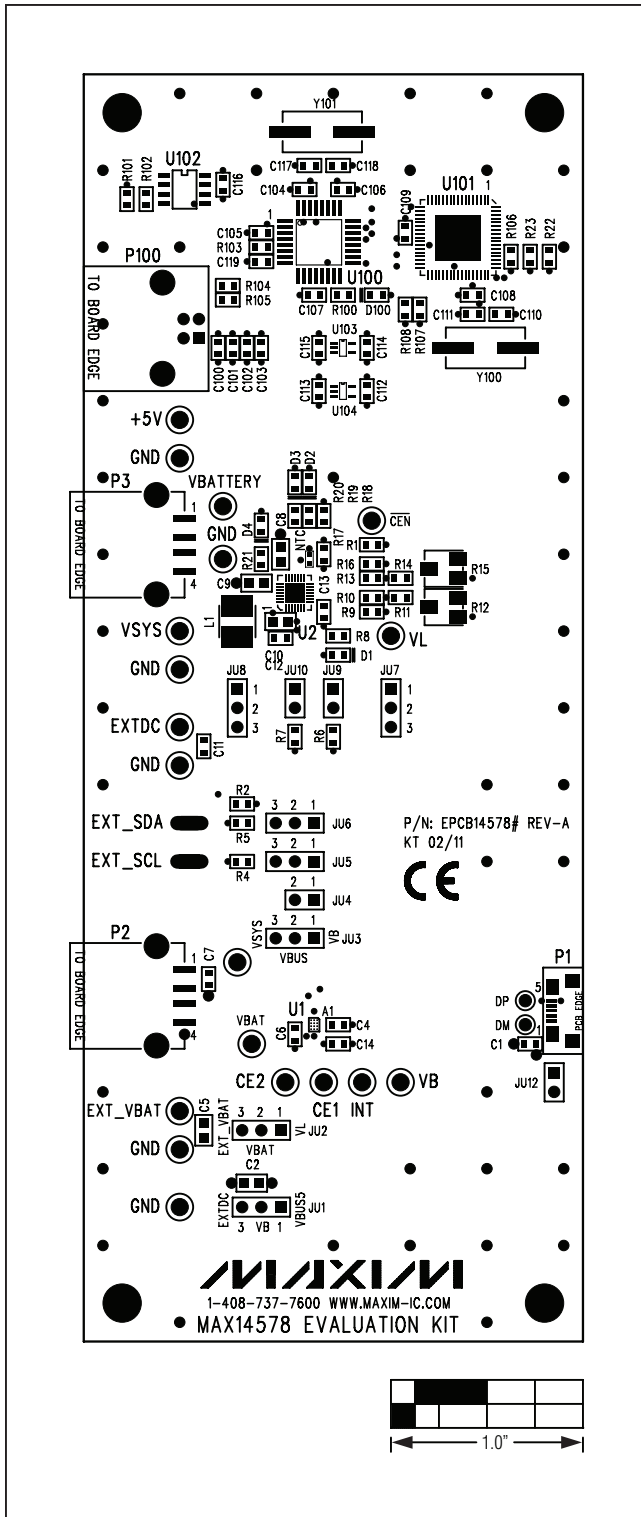


Figure 5. MAX14578 EV Kit Component Placement Guide—Component Side

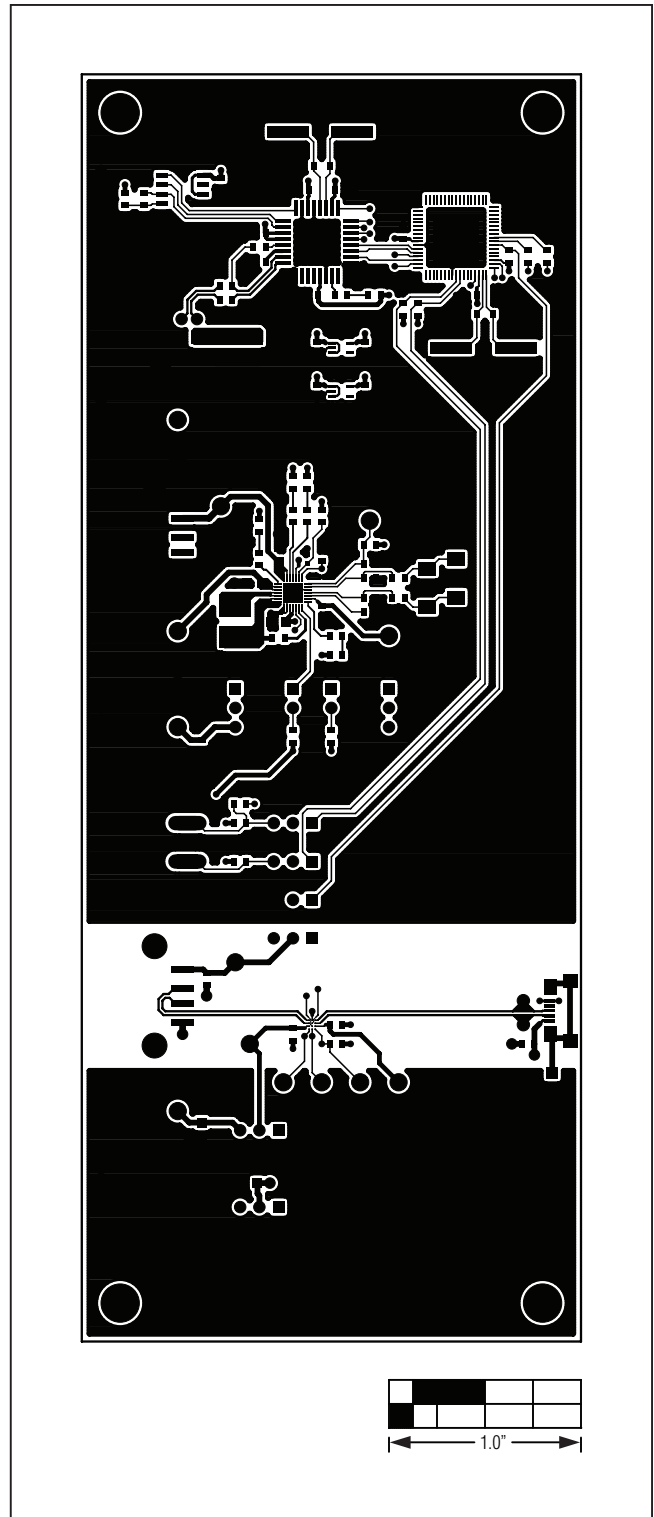


Figure 6. MAX14578 EV Kit PCB Layout—Component Side

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

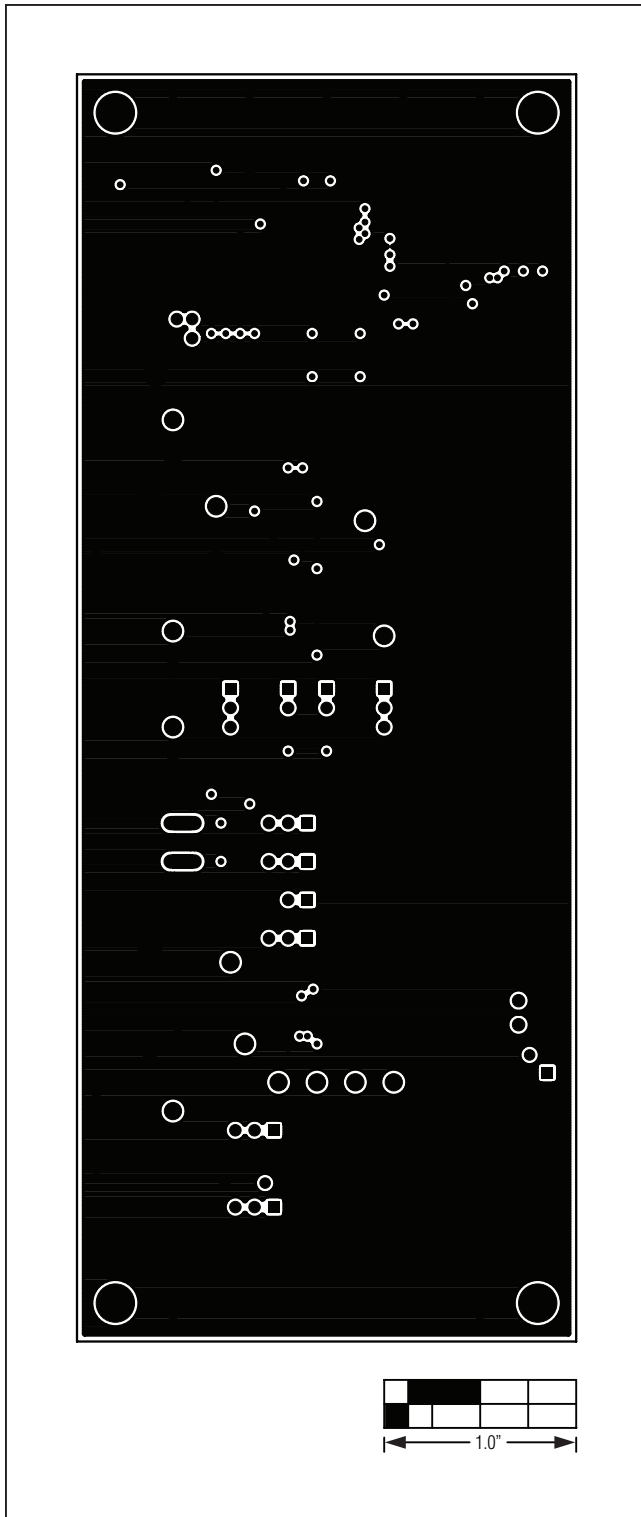


Figure 7. MAX14578 EV Kit PCB Layout—Layer 2

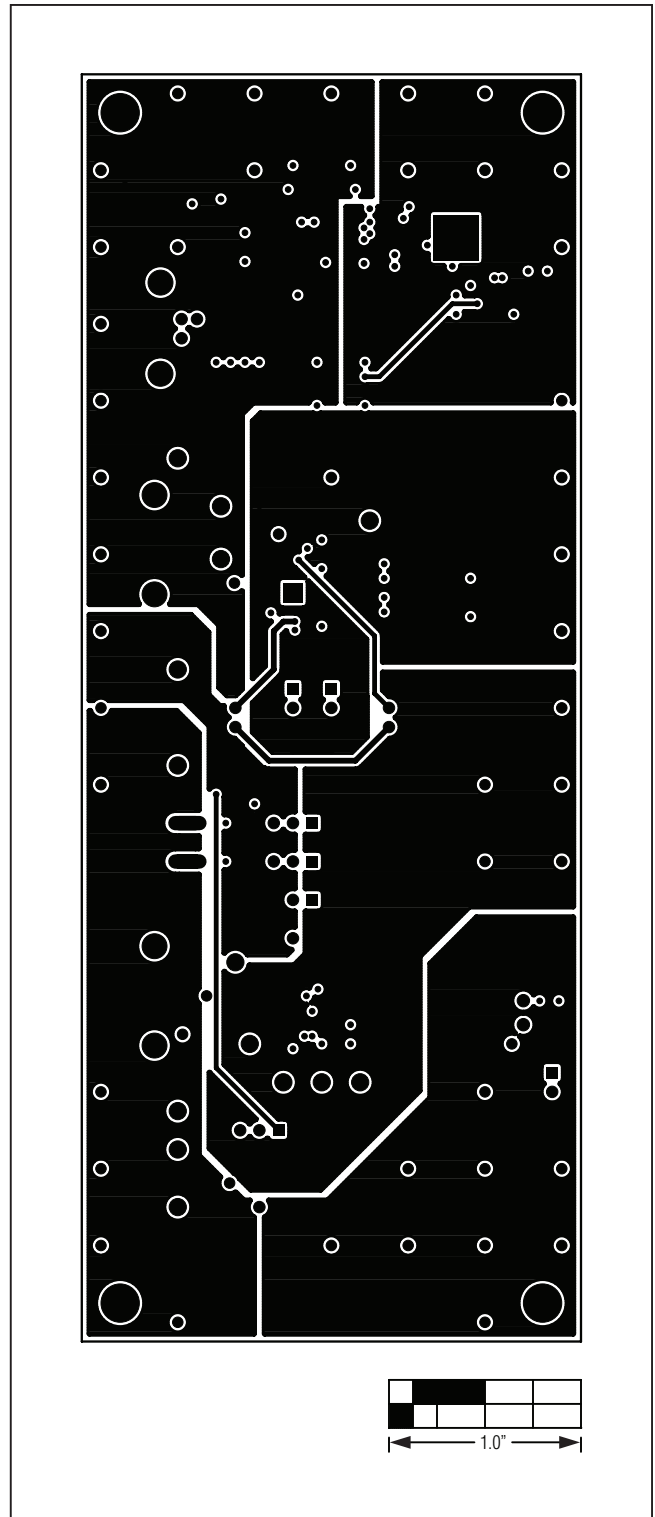


Figure 8. MAX14578 EV Kit PCB Layout—Layer 3

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

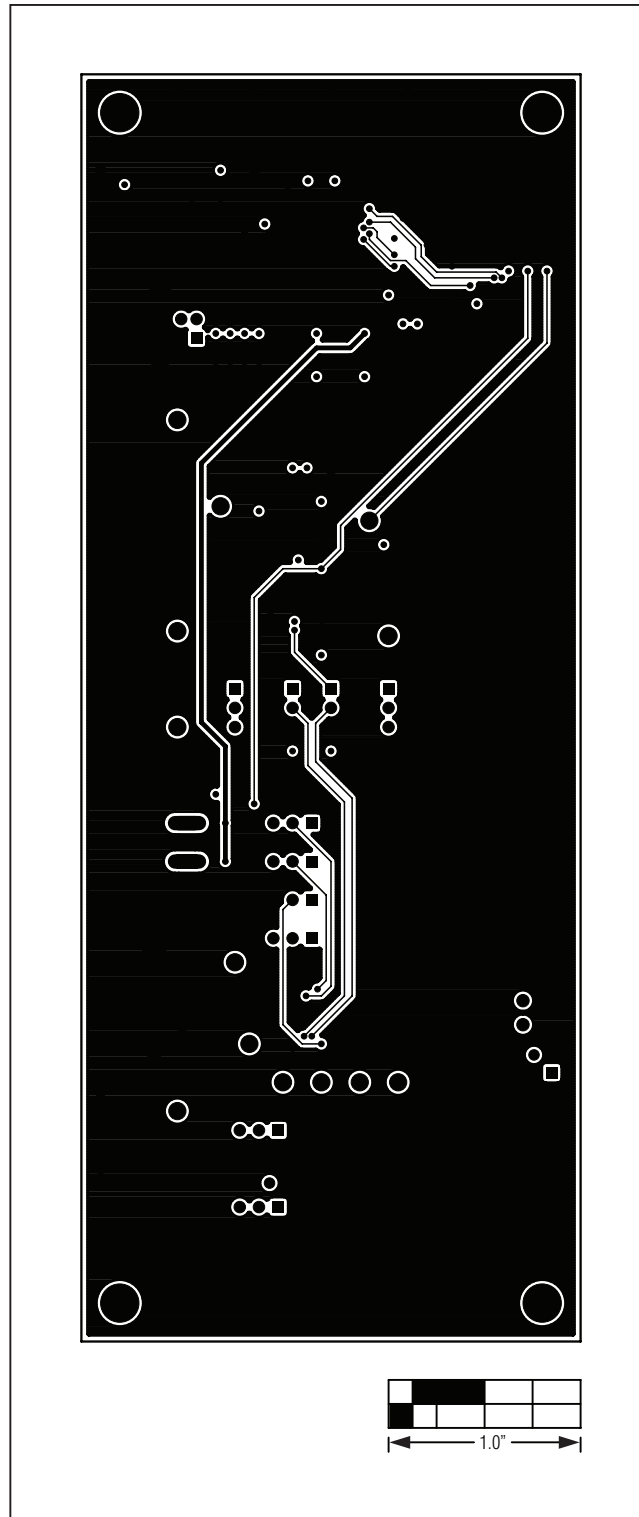


Figure 9. MAX14578 EV Kit PCB Layout—Solder Side



# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### **Ordering Information**

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<b>PART</b>	<b>TYPE</b>
MAX14578EVKIT#	EV Kit

#Denotes RoHS compliant.

# MAX14578 Evaluation Kit

## Evaluates: MAX14578

### *Revision History*

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/11	Initial release	—

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