Evaluates: MAX22514

MAX22514 Evaluation Kit

General Description

The MAX22514 evaluation kit (EV kit) consists of the evaluation board and software. The EV kit is a fully assembled and tested circuit board that evaluates the MAX22514 IO-Link® device transceiver with integrated DC-DC buck regulator. The EV kit includes Windows®-compatible software that provides a graphical user interface (GUI) for exercising the features of the MAX22514. The EV kit is connected to a PC through a USB-A-to-micro-B cable.

Windows-based GUI software is available for use with the EV kit and can be downloaded from Maxim's website at ***www.maximintegrated.com/products/MAX22514*** (under the *Design & Development* tab). Windows® 7 or newer Windows operating system is required to use the EV kit software.

Features

- IO-Link-Compliant Device Transceiver
- I/O and SPI Interface Terminals
- Arduino® Uno Compatible Connector
- Windows® 10-Compatible Software
- USB-PC Connection
- Proven PCB Layout
- Fully Assembled and Tested

MAX22514 EV Kit Files

FILE	DESCRIPTION
MAX22513_5EVKIT SetupVx.xx.exe	Installs EV kit files onto the computer

Ordering Information *appears at end of data sheet.*

Quick Start

Required Equipment

- MAX22514 EV kit (USB-A-to-micro-B cable included)
- User-supplied Windows 10 PC with a spare USB port
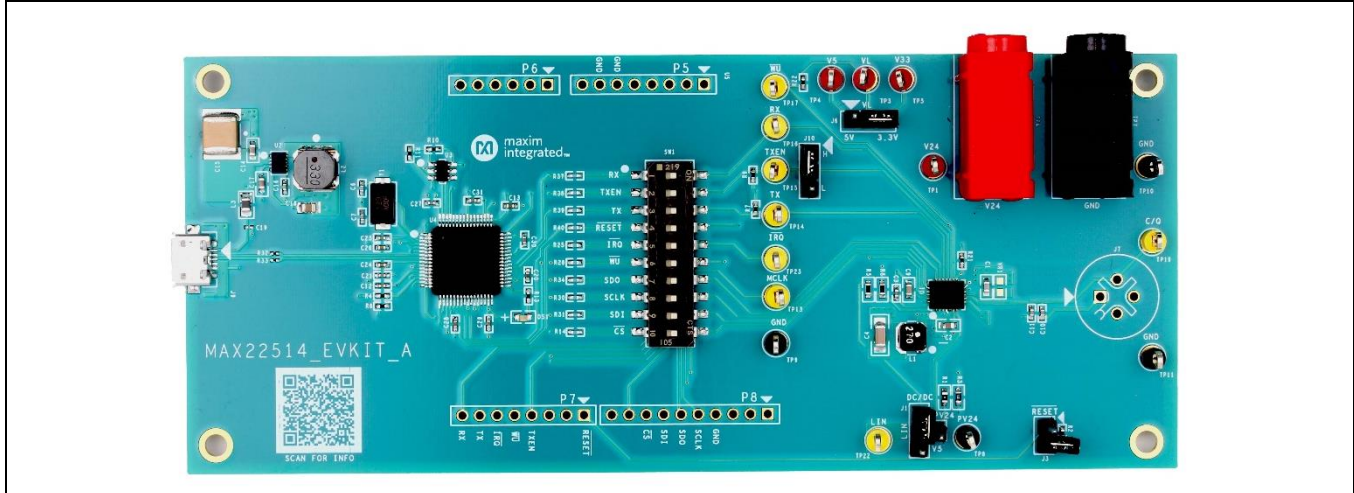- 24V, 1A DC power supply
- Multimeter/voltmeter

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.
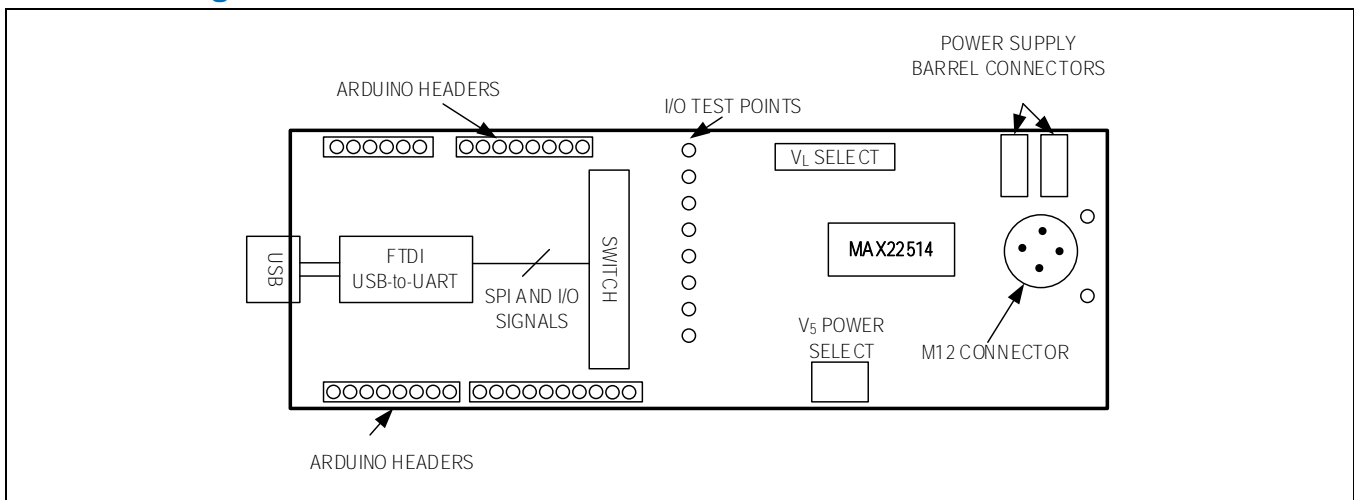
Procedure

The EV kit is fully assembled and tested. Follow the steps to install the EV kit software, make required hardware connections, and start operation of the kit. Note that after communication is established, the IC must still be configured correctly for desired operation mode. Make sure the PC is connected to the Internet throughout the process so that the USB driver can be automatically installed.

1. Visit ***www.maximintegrated.com/products/MAX22514*** (under the *Design & Development* tab) to download the latest version of the MAX22514 EV kit software. Save the software to a temporary folder and unpack the zip file.

2. Install the EV kit software on the computer by running the **MAX22513_5EVKITSetupVx.xx.exe** program inside the temporary folder. This copies the program files and creates an icon in the Windows **Start** menu. The software requires the .NET Framework 4.5 or later. If connected to the Internet, Windows automatically updates the .NET Framework as needed.

ANALOG DEVICES

EV Kit Photo

EV Block Diagram

ARDUINO HEADERS

I/O TEST POINTS

POWER SUPPLY
BARREL CONNECTORS

V_L SELECT

USB

FTDI
USB-to-UART

SPI AND I/O
SIGNALS

SWITCH

MAX22514

M12 CONNECTOR

V_5 POWER
SELECT

ARDUINO HEADERS

3. The EV kit software launches automatically after install, and it can be launched by clicking on its icon in the Windows **Start** menu.
4. Verify that all the jumpers are in their default positions, as shown in *Table 1*.
5. Connect the 24V DC power supply to the V_{24} (TP6) and GND (TP7) barrel connectors or to the V_{24} (TP1) and GND (TP10) test points on the EV kit board.
6. Connect the multimeter to the V_5 test point (TP4).
7. Turn on the V_{24} power supply. Ensure that the voltage on V_5 (TP22) is 5V.
8. Connect the USB cable from the PC to the EV kit board. A Windows message appears when connecting the EV kit.
9. Start the EV kit software by opening its icon in the **Windows Start | Programs | Maxim Integrated** menu. The EV kit software main window appears, as shown in *Figure 1.*
10. Verify that Status: MAX22514 Connected is displayed on the status bar at the bottom left of the main window (*Figure 1*).
11. Click on the **Include Interrupt Register** box to include the INTERRUPT register in serial interface reads. Click the **Read All** button to read all of the registers in the device.
12. Select a register in the top register table to access the bits in that register.
13. Set the individual bits for that register by selecting available settings from the drop-down menu for each bit in the lower register table.

14. Press the **Write Modified** button on the GUI to write the registers that have been changed to the MAX22514.
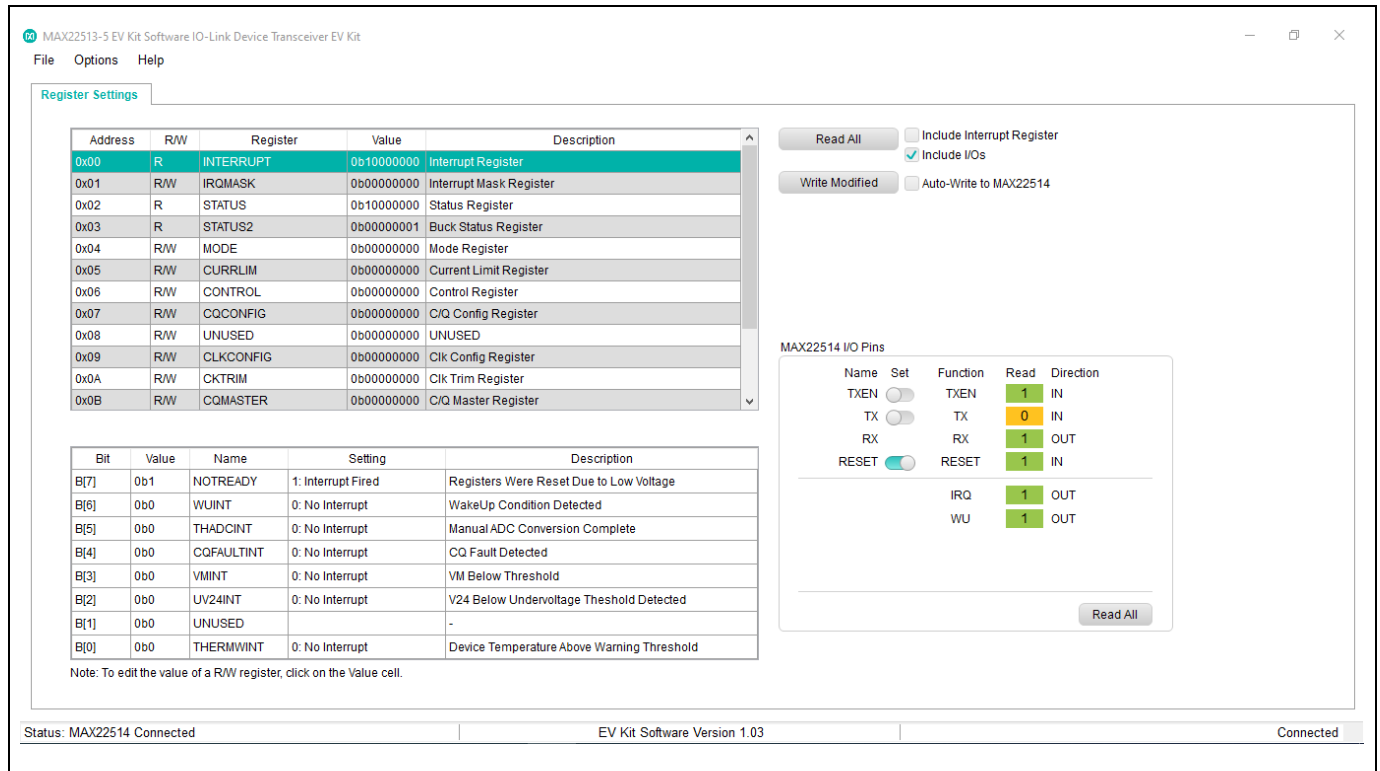

Figure 1. MAX22514 EV Kit Software, EV Kit is Connected

Table 1.   Jumper Connection Guide

JUMPER	CONNECTION	FEATURE
J1	**1-2***	LIN is connected to the 6V DC-DC output.
	1-3	LIN is connected to PV24.
	1-4	LIN is connected to V_5, disabling the internal 5V regulator. Connect an external supply to V_5 for normal operation.
J3	**OPEN***	$\overline{RESET}$ is high (pulled up to V_L through a 10kΩ resistor).
	CLOSED	$\overline{RESET}$ is low.
J6	1-2	V_L is connected to V_5 (5V) linear regulator output.
	2-3*	V_L is connected to V_{33} (3.3V) linear regulator output.
J10	**1-2***	TXEN is high (connected to V_L).
	2-3	TXEN is low.

* *Default options are* **bold**

Detailed Description of Hardware

The MAX22514 EV kit includes the MAX22514 IO-Link transceiver and the external components for evaluating the device. The EV kit is configured for SPI operation and all logic-level input/output (I/Os) and IO-Link-capable I/Os are available on yellow test points.

Logic-Level Power Supply

The MAX22514 features an internal 3.3V linear regulator which can drive loads up to 50mA. Connect V_L to the on-board 3.3V (V_{33}) or 5V (V_5) linear regulator by setting the J6 jumper to set the logic level supply or the I/O pins. To use a different logic-level voltage supply, open the J6 jumper and apply the external supply to the V_L test point (TP3).

Using Serial Interface with an External Master Controller

The MAX22514 EV kit includes a USB-to-serial interface circuit for communication with the PC/GUI and is configured to operate with the SPI when using the on-board FTDI converter. Arduino headers are available to use the board with an external controller. To use an external SPI controller with the MAX22514, open all the switches on SW1 (set all switches to the left) and connect the external controller to the P5, P6, P7, and P8 headers, as labeled.

DC-DC Regulator

The MAX22514 features an integrated high-efficiency synchronous DC-DC buck regulator with active diode reverse protection, current overload protection, soft start, spread spectrum operation, and an adjustable output voltage. The DC-DC regulator operates with a fixed 1.229MHz (typ) frequency during normal operation. The MAX22514 EV kit includes components for a DC-DC output voltage of 6V. Connect the V_5 regulator input, LIN, to the output of the DC-DC by setting the J1 jumper to (1-2), labeled "DC-DC."

Detailed Description of Software

Configuring the Registers

Click on a register name in the top register table to access the individual bits in that register. When the register name is selected in the register table, the lower register table shows the individual bits for that register. Click on the dropdown menu next to each bit in the lower table to select the bit setting. When all of the bits are set as desired, click the **Write Modified** button to write the changed bit settings to the MAX22514 over the SPI. Note that the full IO-Link communication is not available using the EV kit GUI.

I/O Pin Control

The IO-Link universal asynchronous receiver-transmitter (UART) I/Os (TXEN, TX, RX), $\overline{RESET}$, and notification interrupt ($\overline{IRQ}$ and $\overline{WU}$) pins can be controlled and read on the MAX22514 EV kit GUI. Click the toggle buttons next to TXEN, TX, and $\overline{RESET}$ to set these pins on the EV kit board to high (V_L) or low (GND).

When an interrupt is triggered, a bit in the INTERRUPT register is set and $\overline{IRQ}$ asserts low. A yellow tag appears in the I/O Pins box stating "Interrupt Received" (*Figure 2*). Read the INTERRUPT register to clear the interrupt and deassert $\overline{IRQ}$. When a wake-up event is detected, and the WUINT is not masked in the INTERRUPT register (WUM = 0), the wake-up interrupt bit is set in the INTERRUPT register and a yellow tag appears in the I/O Pins box stating "Wake-Up Received." $\overline{IRQ}$ also asserts. Read the INTERRUPT register to clear the interrupt and deassert $\overline{IRQ}$. The green box next to $\overline{WU}$ flashes orange briefly and then turns green again.

Figure 2. MAX22514 EV Kit Software, I/O Pin Status

Ordering Information

PART	TYPE
MAX22514EVKIT#	EV Kit

#Denotes RoHS compliance.

MAX22514 EV Kit Bill of Materials

| REF_DES	DNI/DNP	QTY	VALUE	DESCRIPTION
C1	-	1	0.01UF	CAP; SMT (0603); 0.01UF; 5%; 100V; C0G; CERAMIC
C2	-	1	1UF	CAP; SMT (0603); 1UF; 10%; 50V; X7R; CERAMIC
C3, C5, C8	-	3	1UF	CAP; SMT (0402); 1UF; 10%; 6.3V; X7R; CERAMIC
C4	-	1	6.8UF	CAP; SMT (1206); 6.8UF; 10%; 50V; X5R; CERAMIC
C6, C7	-	2	18PF	CAP; SMT (0402); 18PF; 5%; 50V; C0G; CERAMIC
C9	-	1	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 50V; X7R; CERAMIC
C10, C11	-	2	330PF	CAP; SMT (0402); 330PF; 10%; 50V; X7R; CERAMIC
C12, C20, C21, C25, C27-C31	-	9	0.1UF	CAP; SMT (0402); 0.1UF; 5%; 10V; X7R; CERAMIC
C13, C24, C26	-	3	4.7UF	CAP; SMT (0402); 4.7UF; 20%; 10V; X5R; CERAMIC
C14	-	1	1UF	CAP; SMT (0603); 1UF; 10%; 16V; X7R; CERAMIC
C15	-	1	33UF	CAP; SMT (2220); 33UF; 20%; 25V; X7R; CERAMIC
C16	-	1	3300PF	CAP; SMT (0402); 3300PF; 10%; 50V; X7R; CERAMIC
C17	-	1	1UF	CAP; SMT (0603); 1UF; 20%; 16V; X7R; CERAMIC
C18	-	1	10UF	CAP; SMT (0805); 10UF; 10%; 10V; X5R; CERAMIC
C19	-	1	0.01UF	CAP; SMT (0201); 0.01UF; 10%; 10V; X7R; CERAMIC
DS1	-	1	LGL29K-G2J1-24-Z	DIODE; LED; SMARTLED; GREEN; SMT; PIV=1.7V; IF=0.02A
J1	-	1	TSW-104-07-L-S	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS
J3	-	1	TSW-102-07-T-S	CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 2PINS; -55 DEGC TO +105 DEGC
J6, J10	-	2	TSW-103-07-T-S	CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 3PINS
J9	-	1	ZX62D-AB-5P8(30)	CONNECTOR; FEMALE; SMT; USB MICRO CONNECTOR; RIGHT ANGLE; 5PINS
L1	-	1	27UH	INDUCTOR; SMT; SHIELDED; 27UH; 20%; 0.8A
L2	-	1	33UH	INDUCTOR; SMT; MAGNETICALLY SHIELDED; 33UH; TOL=+/-20%; 1.3A
L3	-	1	600	INDUCTOR; SMT (0805); FERRITE-BEAD; 600; TOL=+/-25%; 0.2A
MISC1	-	1	68784-0001	CONNECTOR; MALE; USB; USB A PLUG TO MICRO B PLUG CABLE ASSY; STRAIGHT; 4PINS-5PINS
R1	-	1	10K	RES; SMT (0603); 10K; 1%; +/-100PPM/DEGC; 0.1000W
R2, R4, R7, R9, R10, R21, R22	-	7	10K	RES; SMT (0402); 10K; 1%; +/-100PPM/DEGC; 0.0630W
R3	-	1	1K	RES; SMT (0603); 1K; 1%; +/-100PPM/DEGC; 0.1000W
R5	-	1	412K	RES; SMT (0603); 412K; 1%; +/-100PPM/DEGC; 0.1000W
R6	-	1	73.2K	RES; SMT (0603); 73.2K; 1%; +/-100PPM/DEGC; 0.1000W
R8	-	1	15K	RES; SMT (0402); 15K; 1%; +/-100PPM/DEGC; 0.1000W

| R11	-	1	2.2K	RES; SMT (0402); 2.2K; 1%; +/-100PPM/DEGC; 0.0630W
R12	-	1	12K	RES; SMT (0402); 12K; 0.10%; +/-25PPM/DEGC; 0.0630W
R13	-	1	806	RES; SMT (0402); 806; 1%; +/-100PPM/DEGC; 0.0630W
R14, R25, R28, R30, R31, R34, R37-R40	-	10	220	RES; SMT (0402); 220; 1%; +/-100PPM/DEGC; 0.1000W
R32, R33	-	2	27	RES; SMT (0201); 27; 1%; +/-200PPM/DEGC; 0.0500W
SU1-SU8	-	8	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; INSULATION=PBT;PHOSPHOR BRONZE CONTACT=GOLD PLATED
SW1	-	1	219-10MST	SWITCH; SPST; SMT; STRAIGHT; 20V; 0.1A; SURFACE MOUNT DIP SWITCH-AUTO PLACEABLE; RINSULATION=1000M OHM
TP1, TP3-TP5, TP8	-	5	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
TP6	-	1	571-0500	CONNECTOR; FEMALE; THROUGH HOLE; BANANA 4MM RED SOCKET; RIGHT ANGLE; 2PINS
TP7	-	1	571-0100	CONNECTOR; FEMALE; THROUGH HOLE; BANANA 4MM BLACK SOCKET; RIGHT ANGLE; 2PINS
TP9-TP11	-	3	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
TP13-TP17, TP19, TP22, TP23	-	8	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
U1	-	1	MAX22514ATG+	EVKIT PART - IC; MAX22514ATG+; PACKAGE OUTLINE DRAWING: 21-0201; LAND PATTERN: 90-0083; PACKAGE CODE: T2445+2C; TQFN24-EP
U2	-	1	MAX17501EATB+	IC; CONV; ULTRA-SMALL; HIGH-EFFICIENCY; SYNCHRONOUS STEP-DOWN DC-DC CONVERTER; TDFN10-EP
U3	-	1	93LC66BT-I/OT	IC; EPROM; 4K MICROWIRE SERIAL EEPROM; SOT23-6
U4	-	1	FT2232HL	IC; MMRY; DUAL HIGH SPEED USB TO MULTIPURPOSE UART/FIFO; LQFP64
Y1	-	1	12MHZ	CRYSTAL; SMT; 12MHZ; 18PF; TOL = +/-20PPM; STABILITY = +/-30PPM
PCB	-	1	PCB	PCB:MAX22514
D1-D3	DNP	0	33V	DIODE; TVS; SMT (DO-216AA); VRM=33V; IPP=7A
J7	DNP	0	09 0431 212 04	CONNECTOR; MALE; TH; MALE RECEPTACLE; THREADED; PCB SOLDER; STRAIGHT; 4PINS;
U5	DNP	0	ARDUINO_UNO_R3	MODULE; ARDUINO_UNO_R3
VR1	DNP	0	VC060326A580DP	VARISTOR; TVS; SMT (0603); VB=34.5V; IP=30A

MAX22514 EV Kit Schematic
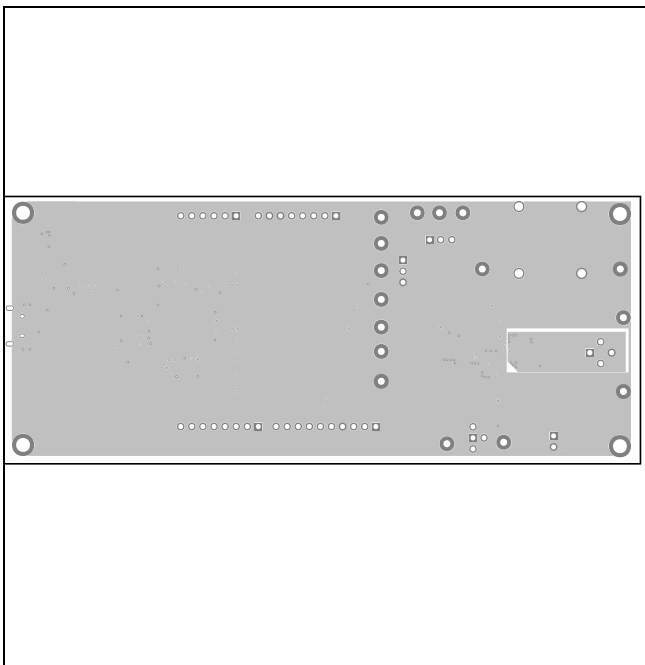
MAX22514 EV Kit Schematic (continued)
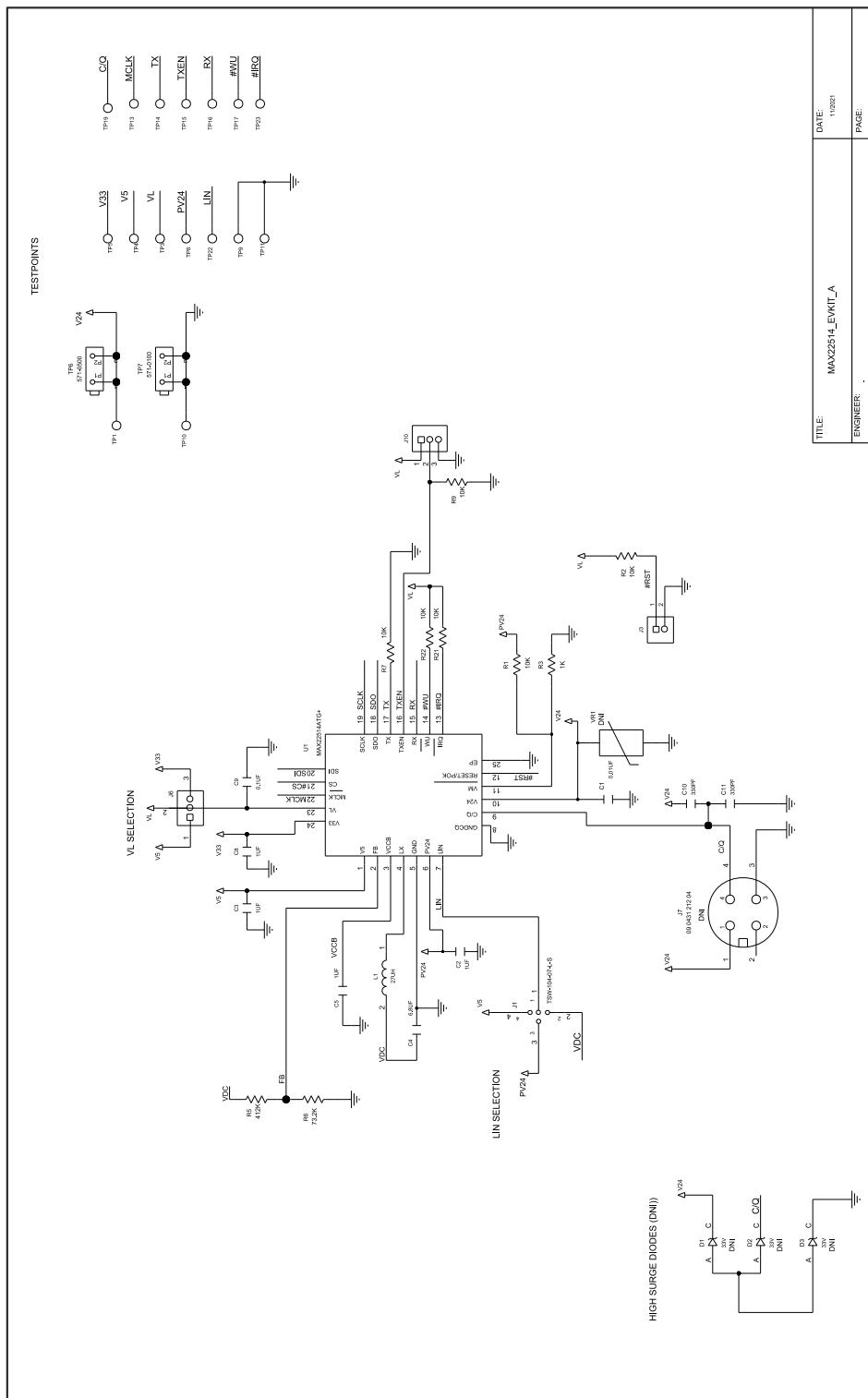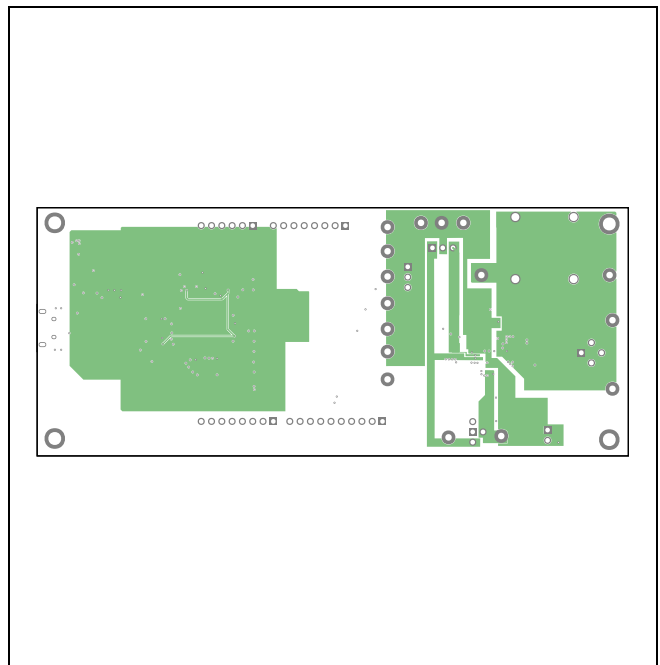
MAX22514 EV Kit PCB Layout
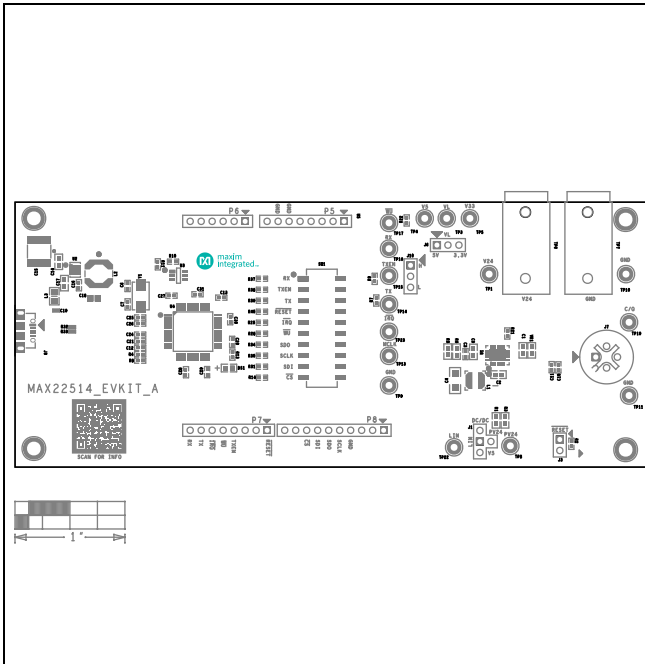
MAX22514 EV Kit Component Placement Guide—Top Silkscreen
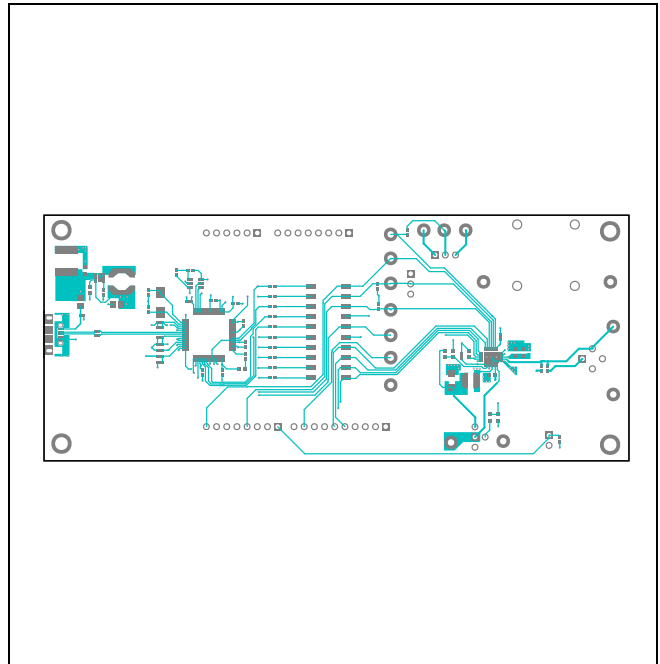
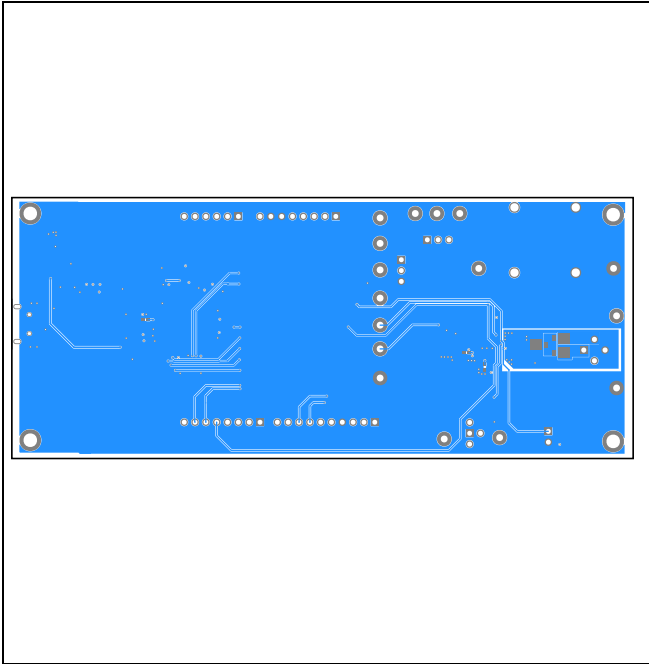*MAX22514 EV Kit PCB Layout—Top*

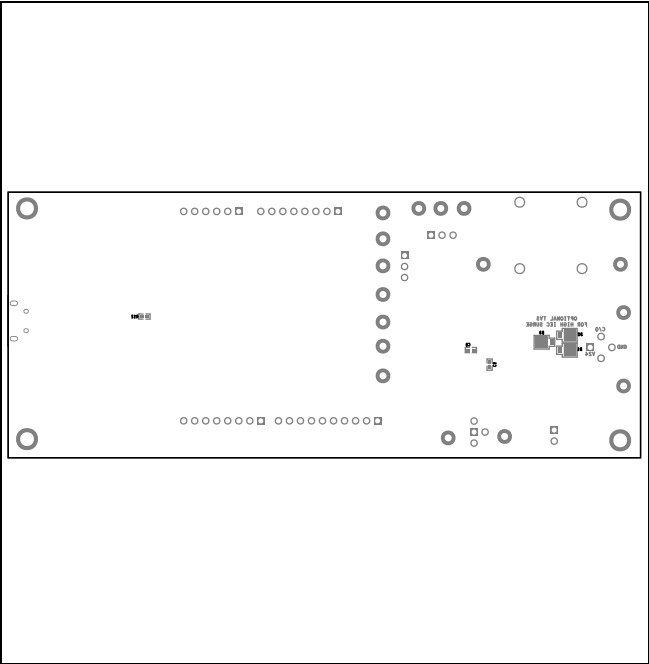

MAX22514 EV Kit PCB Layout—Layer 2 (GND)

MAX22514 EV Kit PCB Layout—Layer 3

MAX22514 EV Kit PCB Layout (continued)

MAX22514 EV Kit PCB Layout—Bottom

MAX22514 EV Kit Component Placement Guide—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/22	Initial release	—

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