

## MAX22192 Evaluation System

Evaluates: MAX22192

### General Description

The MAX22192 Evaluation System (EV system) provides the hardware and software necessary to evaluate the MAX22192 octal industrial digital input device with diagnostic features and digital isolation. The MAX22192 Evaluation Kit (EV kit) has Pmod™ compatible connector for SPI communication. The EV system includes the USB2PMB2# adapter board that receives commands from a PC through the USB port to create an SPI interface for communication between the software and the MAX22192 on the EV kit.

The EV system includes a graphical user interface (GUI) that provides communication between the target device and the PC. The MAX22192 EV kit has a MAX22192 device (U1) and a MAX22190 device (U2), which is an octal industrial digital input device without digital isolation. The EV kit can be configured to operate in multiple modes, as shown in [Figure 1](#):

- 1) **Single-Channel Mode:** The USB2PMB2# adapter communicates with either U1 or U2 on the EV kit, depending on which channel is preferred and selected using the on-board jumpers.
- 2) **Independent Slave Mode:** The USB2PMB2# adapter uses two chip-select signals ( $\overline{CS1}$  and  $\overline{CS2}$ ) to control each chip through a single connector/GUI interface.
- 3) **Daisy-Chain Mode:** The USB2PMB2# adapter communicates with both U1 and U2 in SPI daisy-chain mode. The OSDI from U1 connects to SDI of U2, and the SDO of U2 connects to FSDI of U1. Both U1 and U2 are controlled from a single SPI interface.

### EV System Contents

- MAX22192EVKIT#, including the MAX22192ARC+
- USB2PMB2# Adapter Board
- Micro-USB Cable

### Features

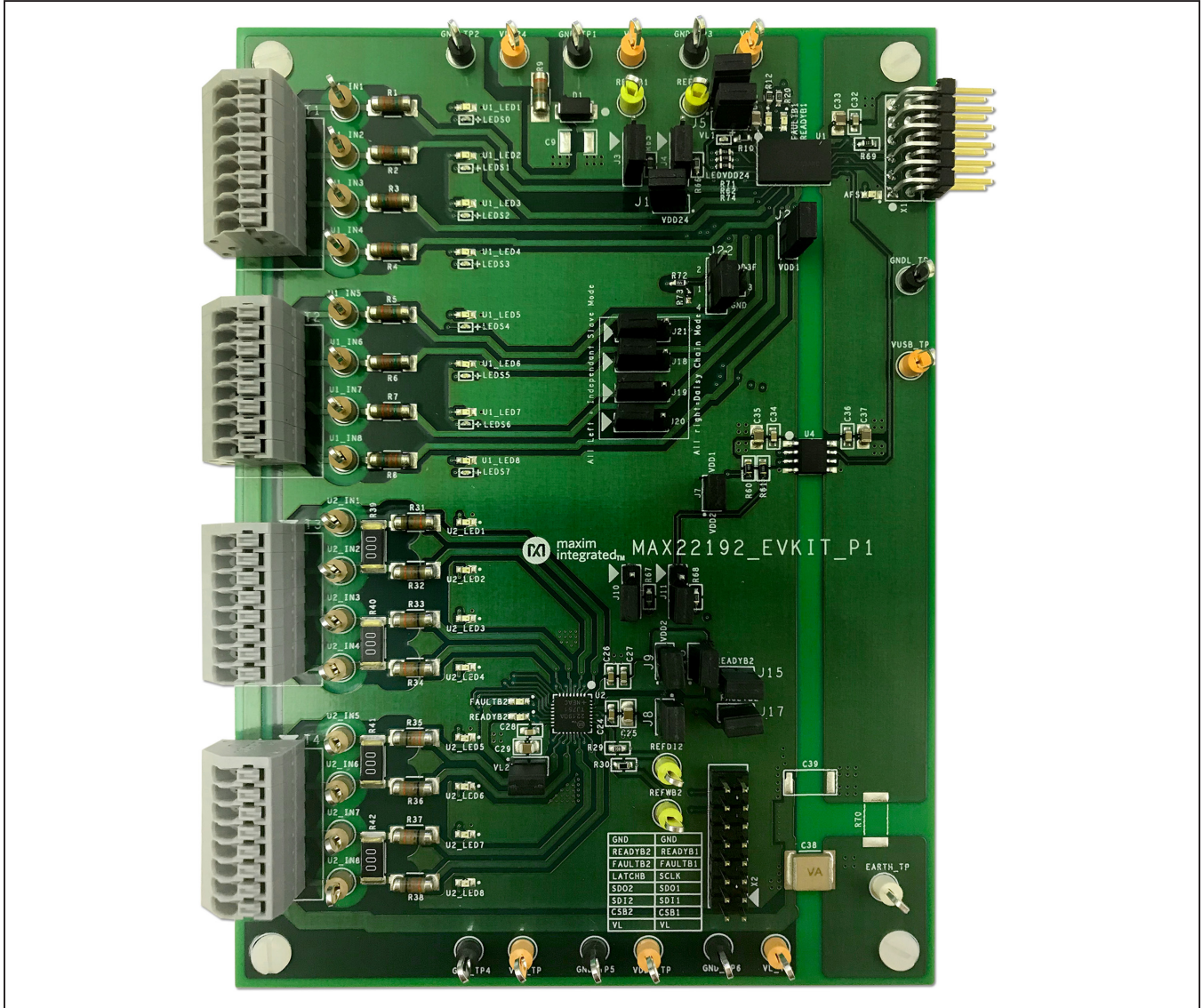
- Easy Evaluation of the MAX22192
- EV Kit Logic-Side is USB-Powered
- Configured for IEC 61131-2 Type 1, 3 and Type 2
- Independent Slave or Daisy-Chain SPI Interface
- Galvanic Isolation using MAX22192 and MAX12931
- Robust Design  $\pm 1$ kV Surge Tolerant Line-to-Ground
- Windows® 10, Windows 8.1, Windows 7, and Windows XP® Compatible Software
- Fully Assembled and Tested
- Proven PCB Layout
- RoHS Compliant

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

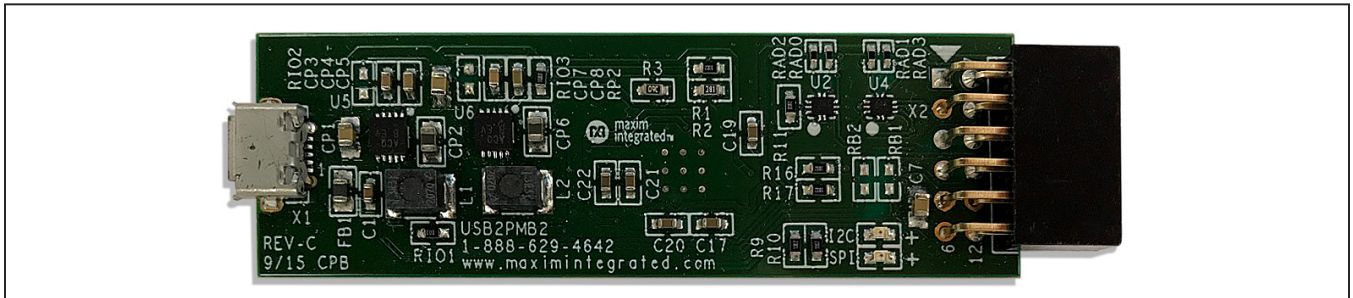
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*Pmod is a trademark of Digilent, Inc*

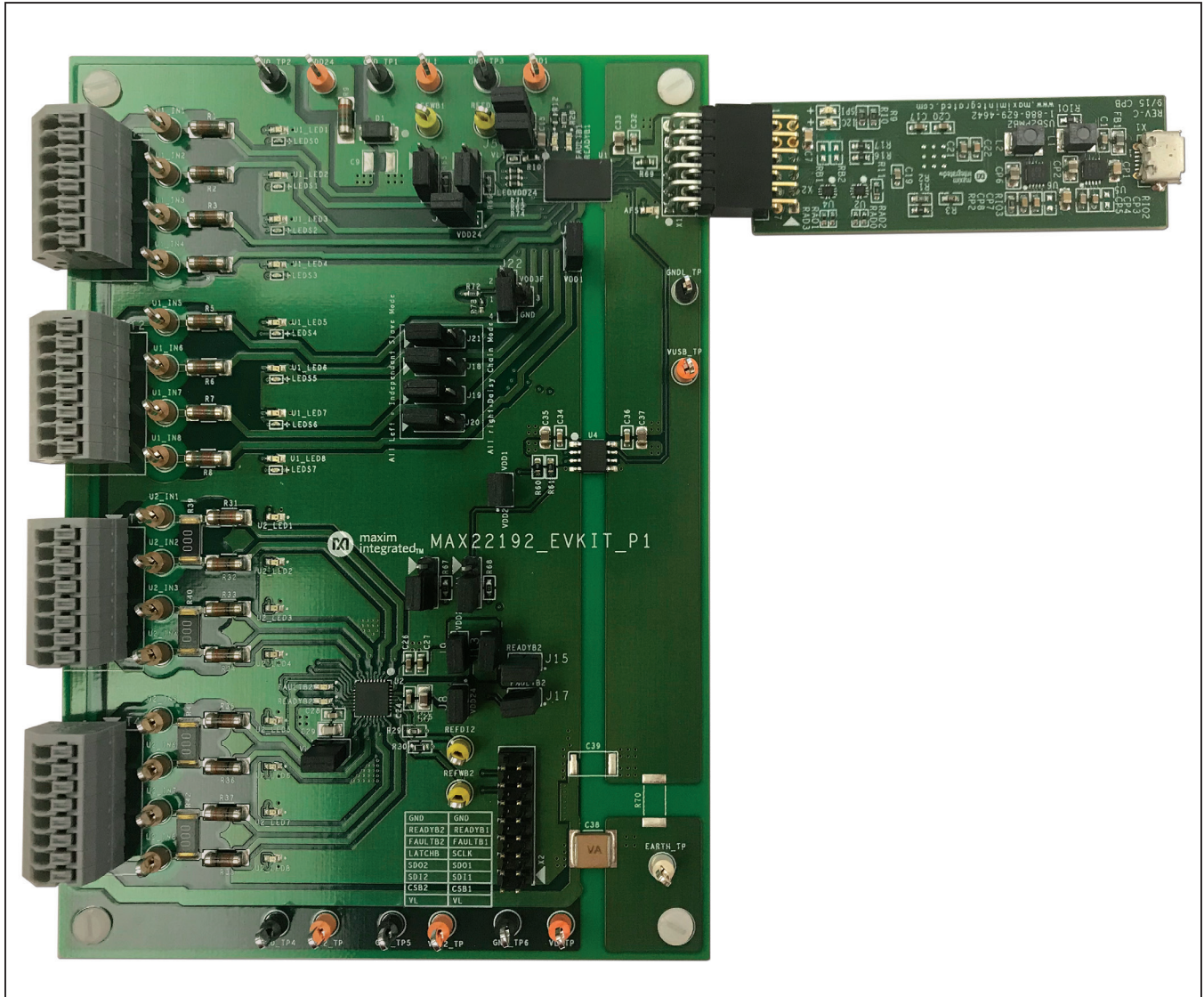
MAX22192 EV Kit



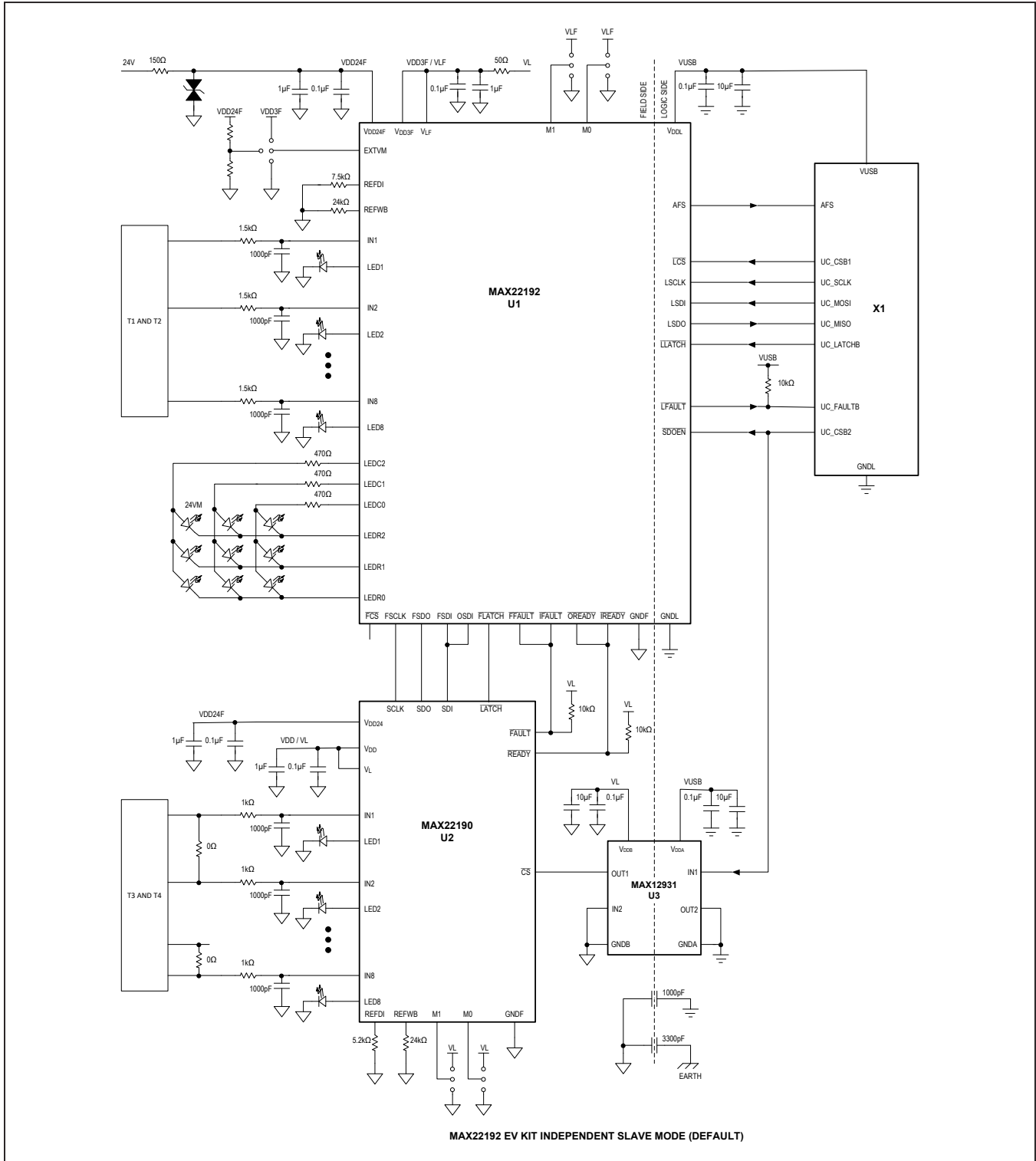
USB2PMB2 Adapter Board



MAX22192 EV System



System Block Diagram



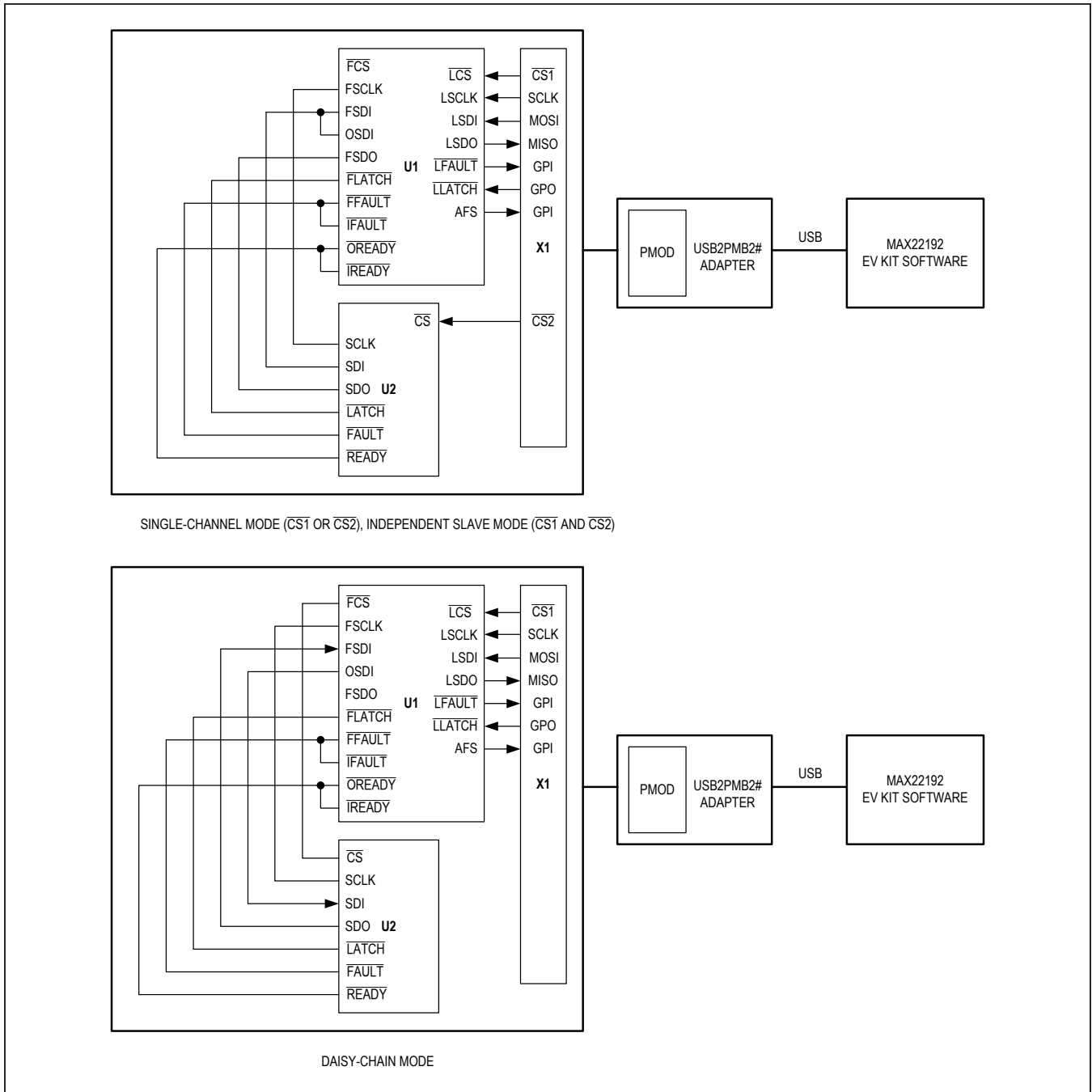


Figure 1: MAX22192 EV Kit Operation Modes

### MAX22192 EV Kit Files

FILE	DESCRIPTION
MAX22192EVKitSetupV1.00.ZIP	Application Program

## Quick Start

### Required Equipment

- MAX22192 EV kit
- USB2PMB2# adapter board
- Micro-USB cable
- 24V DC voltage supply
- Windows 10, Windows 8.1, Windows 7, Window XP PC with a spare USB port

**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 underline** refers to items from the Windows operating system.

### Procedure

The EV kit is fully assembled and tested. The default jumper settings configure the EV kit to operate in the independent slave mode using both U1 and U2. In this configuration, the EV kit “logic side” is powered by +3.3V from the USB2PMB2# adapter connected to the X1 Pmod connector, and the “field side” is powered by the external DC supply connected to VDD24 and GND. U1 is configured for eight Type 1 or Type 3 inputs (terminal blocks T1 and T2) and U2 is configured for four Type 2 inputs (terminal blocks T3 and T4). Follow the steps below to verify the MAX22192 operation:

- 1) Verify all jumper settings are in default position from [Table 1](#).
- 2) For initial testing, MAX22192 EV kit is powered from USB2PMB2# (+3.3V) from the Pmod connector and 24V at VDD24 and GND.
- 3) Visit [www.maximintegrated.com](http://www.maximintegrated.com) to download the latest version of the EV kit software, MAX22192EVKit-SetupV1.00.ZIP.
- 4) Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 5) Install the EV kit software and USB driver on your computer by running the MAX22192EVKitSetupV1.00.exe program inside the temporary folder. A message box asking **Do you want to allow the following program to make changes to this computer?** may appear. If so, click **Yes**.
- 6) The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. At the end of the installation process, the installer launches the installation for the FTDI Chip CDM drivers.
- 7) The installer includes the drivers for the hardware and software. Follow the instructions on the installer and once complete, click **Finish**. The default location of the software is in the program files directory.
- 8) Connect the MAX22192 EV kit Pmod connector X1 to the connector on the USB2PMB2# adapter.
- 9) Connect the USB2PMB2# to the PC with the micro-USB cable. Windows should automatically recognize the device and display a message near the **System Icon** menu indicating that the hardware is ready to use.
- 10) Connect the DC power supply between the EV kit's VDD24\_TP and GND\_TP1 test points. Set the DC power supply output to 24V, and then enable the output. Observe that, on the EV kit, the FAULTB1, READYB1, FAULTB2 and READYB2 LEDs are on, indicating the EV kit is powered up.
- 11) Once the hardware is ready to use, launch the EV kit software by opening its icon in the **Start | Programs** menu. During the EV kit software launch, two message boxes are shown to indicate the default operation mode (independent slave mode), and U1 and U2 SPI Mode (Mode 0). Click **OK** to close the message boxes. The EV kit software appears as shown in [Figure 2](#).
- 12) Verify that the lower-right status bar indicates the EV kit hardware is **Connected**. If the status bar indicates **Disconnected**, from the **Device** menu, click **Connect to Hardware**. Then select a device in the list or use the default device already selected.
- 13) Click **Clear POR** button. Observe that **POR** status lights for U1 and U2 are changed to green, and the **FAULT Signal** status light is also changed to green in the **Configuration** tab as shown in [Figure 3](#).
- 14) Observe that FAULTB1 and FAULTB2 LEDs on the EV kit are turned off.
- 15) Click **Read DI Continuously** button. The EV kit software reads the U1 and U2 DI registers continuously. Connect the 24V DC voltage to one of the input test points, for example, test point U1\_IN3. The corresponding **Digital Inputs** status light **IN3** is changed to green from yellow to indicate U1 channel IN3 is high as shown in [Figure 4](#).

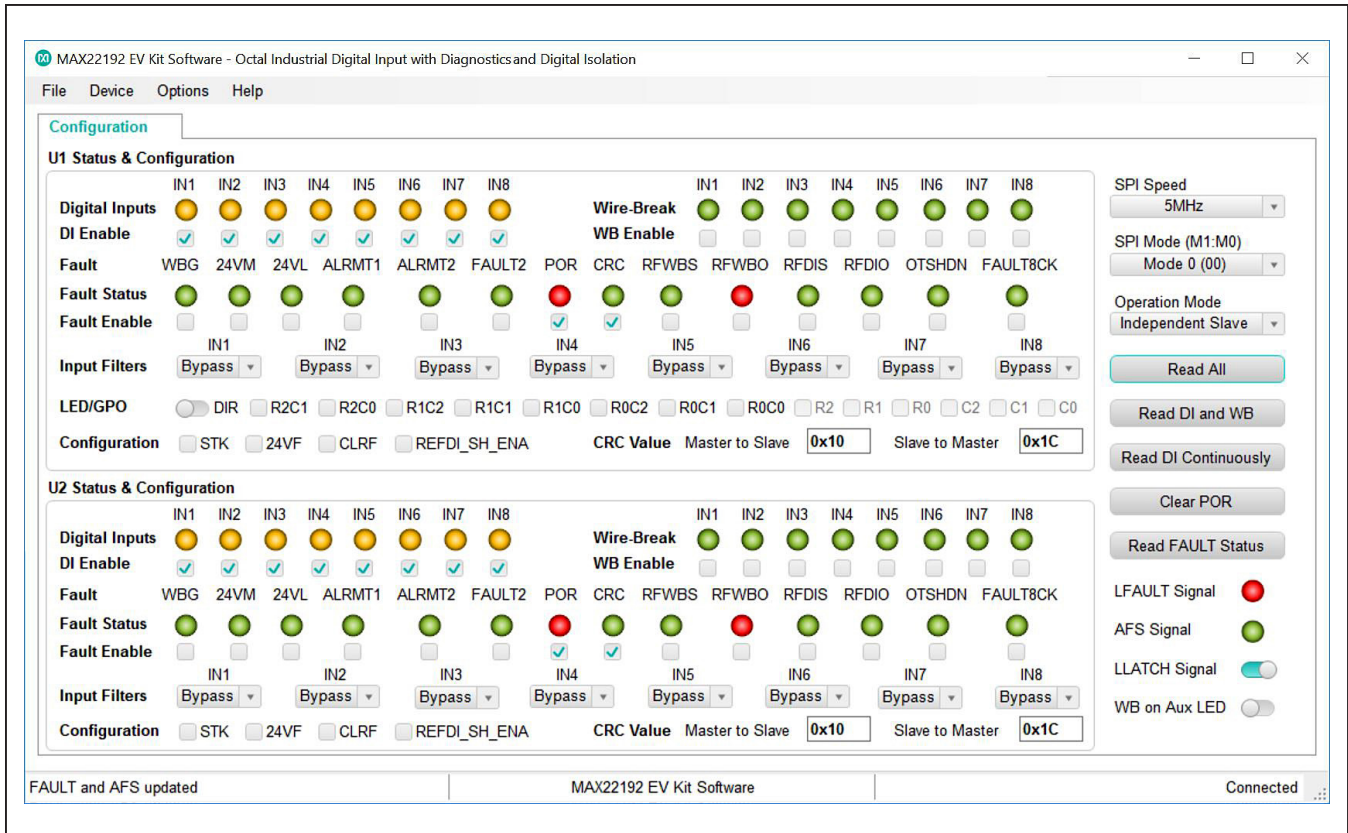


Figure 2. MAX22192 EV Kit Software Startup Window

Table 1. MAX22192 EV Kit Jumper Settings

JUMPER	SHUNT POSITION	DEVICE	DESCRIPTION
<b>POWER</b>			
J1	1 - 2*	U1	Connect external power supply to U1 V <sub>DD24F</sub>
	Open		Use current meter to measure U1 V <sub>DD24F</sub> supply current
J2	1 - 2*	U1	Connect external power supply to U1 V <sub>DD3F</sub> or connect U1 V <sub>DD3F</sub> output to the EV kit
	Open		Use current meter to measure U1 V <sub>DD3F</sub> supply current
J5	1 - 2*	U1	Connect power supply to U1 V <sub>LF</sub>
	Open		Use current meter to measure U1 V <sub>LF</sub> supply current
J6	1 - 2*	U1	Connect U1 V <sub>DD3F</sub> supply to U1 V <sub>LF</sub> supply
	Open		Connect external power supply from VL1 test point to U1 V <sub>LF</sub>
J7	1 - 2	U1 and U2	Power U1 by V <sub>DD3F</sub> and U2 by V <sub>DD</sub> with same external power supply
	Open*		Power U1 by V <sub>DD3F</sub> and U2 by V <sub>DD</sub> separately, or together by V <sub>DD24</sub>
J8	1 - 2*	U2	Connect external power supply to U2 V <sub>DD24</sub>
	Open		Use current meter to measure U2 V <sub>DD24</sub> supply current

Table 1. MAX22192 EV Kit Jumper Settings (continued)

JUMPER	SHUNT POSITION	DEVICE	DESCRIPTION
J9	1 - 2*	U2	Connect external power supply to U2 V <sub>DD</sub> or connect U2 V <sub>DD</sub> output to the EV kit
	Open		Use current meter to measure U2 V <sub>DD</sub> supply current
J12	1 - 2*	U2	Connect power supply to U2 V <sub>L</sub>
	Open		Use current meter to measure U2 V <sub>L</sub> supply current
J13	1 - 2*	U2	Connect U2 V <sub>DD</sub> supply to U2 V <sub>L</sub> supply
	Open		Connect external power supply from VL2_TP test point to U2 V <sub>L</sub>
J22	1 - 2	U1	Connect U1 EXTVM to V <sub>DD3F</sub> to disable V <sub>DD24F</sub> voltage monitoring 24VL and 24VM faults if the device is powered by V <sub>DD3F</sub>
	1 - 3		Connect U1 EXTVM to external resistor divider (R72 and R73) to set external undervoltage thresholds for V <sub>DD24F</sub>
	1 - 4*		Connect U1 EXTVM to GND to use internal undervoltage thresholds for V <sub>DD24F</sub> voltage monitoring
<b>SPI</b>			
J3	1 - 2	U1	U1 SPI Mode M1 = 1
	2 - 3*		U1 SPI Mode M1 = 0
J4	1 - 2	U1	U1 SPI Mode M0 = 1
	2 - 3*		U1 SPI Mode M0 = 0
J10	1 - 2	U2	U2 SPI Mode M1 = 1
	2 - 3*		U2 SPI Mode M1 = 0
J11	1 - 2	U2	U2 SPI Mode M0 = 1
	2 - 3*		U2 SPI Mode M0 = 0
J15	1 - 2*	U2	Connect U2 $\overline{\text{READY}}$ to U1 $\overline{\text{IREADY}}$ isolation channel
	Open		Disconnect U2 $\overline{\text{READY}}$ from U1 $\overline{\text{IREADY}}$ isolation channel
J17	1 - 2*	U2	Connect U2 $\overline{\text{FAULT}}$ to U1 $\overline{\text{IFAULT}}$ isolation channel
	Open		Disconnect U2 $\overline{\text{FAULT}}$ from U1 $\overline{\text{IFAULT}}$ isolation channel
J18	1 - 2*	U1 and U2	Connect U2 SDO to U1 FSDO to share SDO isolation channel in the single-channel or independent slave mode
	2 - 3		Connect U2 SDO to U1 FSDI in the daisy-chain mode
J19	1 - 2*	U1 and U2	Connect U1 OSDI to U1 FSDI in the single-channel or independent slave mode
	2 - 3		Connect U1 OSDI to U2 SDI in the daisy-chain mode
J20	1 - 2	U1 and U2	Connect U1 $\overline{\text{FCS}}$ and U2 $\overline{\text{CS}}$ together to share $\overline{\text{CS}}$ isolation channel in the daisy-chain mode
	2 - 3*		Disconnect U1 $\overline{\text{FCS}}$ from U2 $\overline{\text{CS}}$ in the single-channel mode or independent slave mode
J21	1 - 2*	U1 and U2	Connect U1 FSDI and U2 SDI together in the single-channel or independent slave mode; U1 FSDI is connected to U1 OSDI (J19 in 1–2 position)
	2 - 3		Disconnect U1 FSDI from U2 SDI in the daisy-chain mode



**Table 1. MAX22192 EV Kit Jumper Settings (continued)**

JUMPER	SHUNT POSITION	DEVICE	DESCRIPTION
<b>TEST or PROBE POINTS (NEVER INSTALL JUMPERS)</b>			
X2	1, 2	VL, field-side logic supply	
	3	CSB1, U1 chip-select $\overline{FCS}$	
	4	CSB2, U2 chip-select $\overline{CS}$	
	5	SDI1, U1 FSDI	
	6	SDI2, U2 SDI	
	7	SDO1, U1 FSDO	
	8	SDO2, U2 SDO	
	9	SCLK, U1 and U2 field-side serial clock	
	10	LATCHB, U1 and U2 field-side $\overline{LATCH}$ signal	
	11	FAULTB1, U1 $\overline{FFAULT}$ signal	
	12	FAULTB2, U2 $\overline{FAULT}$ signal	
	13	READYB1, U1 $\overline{OREADY}$ signal	
	14	READYB2, U2 $\overline{READY}$ signal	
	15, 16	GND, field-side ground	

\*Default position

**Table 2. MAX22192 EV Kit Jumper Settings for Different Operation Modes**

JUMPER	SINGLE CHANNEL U1	SINGLE CHANNEL U2	INDEPENDENT SLAVE MODE*	DAISY CHAIN MODE
J3	1 - 2	1 - 2	1 - 2*	2 - 3
J4	Don't Care	Don't Care	Don't Care*	Don't Care
J10	1 - 2	1 - 2	1 - 2*	2 - 3
J11	Don't Care	Don't Care	Don't Care*	Don't Care
J15	Open	1 - 2	1 - 2*	1 - 2
J17	Open	1 - 2	1 - 2*	1 - 2
J18	Open or 1 - 2	1 - 2	1 - 2*	2 - 3
J19	1 - 2	1 - 2	1 - 2*	2 - 3
J20	Open or 2 - 3	2 - 3	2 - 3*	1 - 2
J21	Open or 1 - 2	1 - 2	1 - 2*	2 - 3

\*Default position

### Detailed Description of Software

When the MAX22192 EV kit software starts, it automatically detects if the EV kit is connected to a PC and indicates it in the status bar at the bottom edge of the GUI. If the software does not recognize the USB2PMB2# adapter board, make sure that the software and all drivers are properly installed, check the USB connection, and go to the **Device** menu and select the **Search for Hardware** option. When the EV kit is properly connected, the MAX22192 (U1) and MAX22190 (U2) devices are read and all controls are updated (see [Figure 2](#)).

The main window of the EV kit software contains three groups of controls: **U1 Status & Configuration**, **U2 Status & Configuration**, and general controls for the EV kit. The U1 or U2 Status and Configuration box provides the controls to directly configure MAX22192 and MAX22190 features such as reading digital inputs, wire-break configuration, input filter configuration, fault status reporting, etc. The general controls for the EV kit allow the user to select the SCLK speed, EV kit operation mode, U1 and U2 SPI mode, LLATCH signal level, etc. Next to the **Configuration** tab, the **Register Map** tab lists all registers in the MAX22192 and MAX22190, and provides direct read and write access to all the control bits (not implemented until software rev. 2.0).



Figure 3. MAX22192 EV Kit Software—Clear POR

If the MAX22192EVKIT# hardware is not connected automatically, the **Device** menu provides the functions to connect or disconnect to the hardware by choosing detected USB2PMB2# serial numbers. Under the **Options** menu, a **CRC Calculator** (Figure 6) is provided to calculate the

5-bit CRC code based on the data frame provided by the user. The jumper positions are shown in the **Jumper Setting Diagram** (Figure 7) under the **Options** menu based on selectable operation mode and SPI mode.

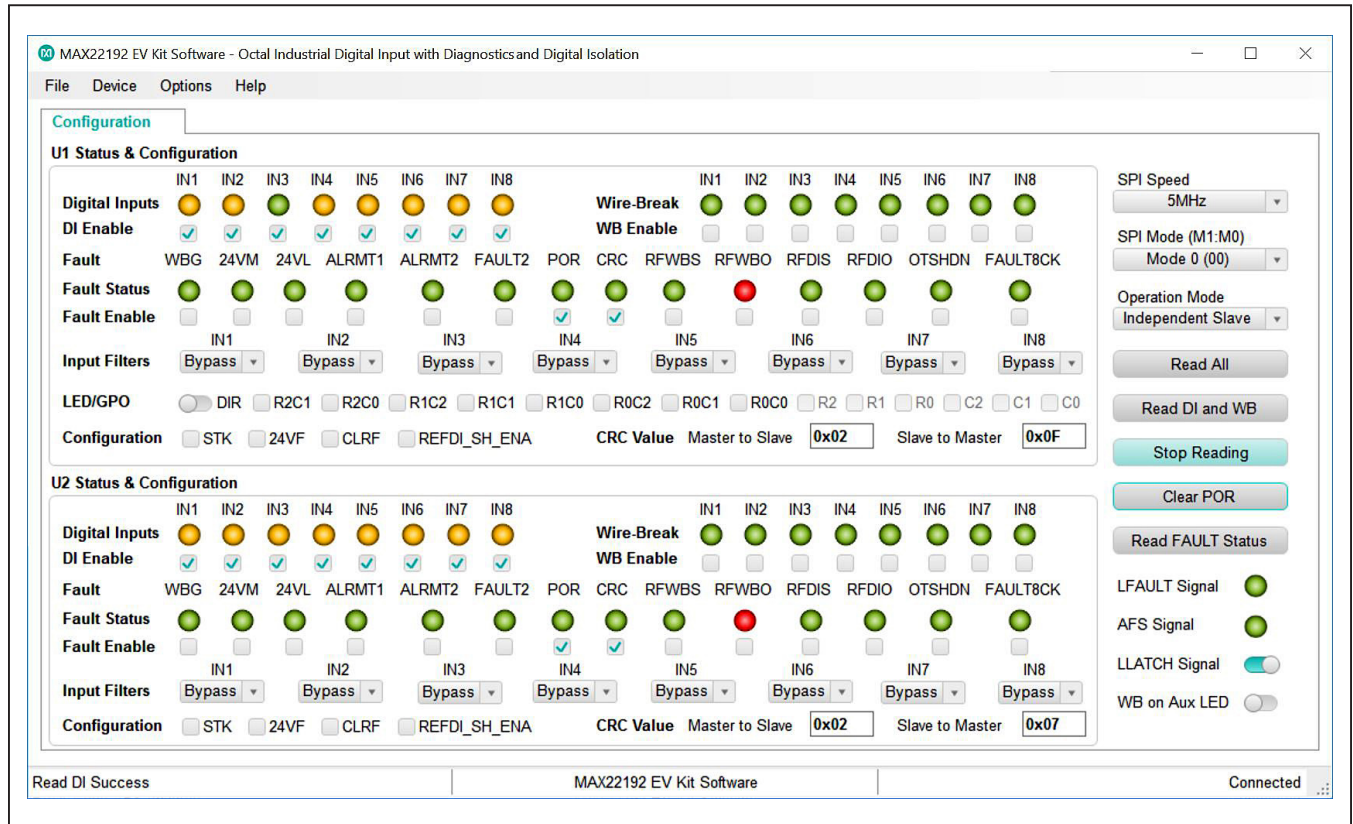


Figure 4. MAX22192 EV Kit Software—Read DI Continuously

### Configuration Tab

The **Configuration** tab provides an interface for configuring the MAX22192 and MAX22190 from a functional perspective. Before sending the commands to the MAX22192 and MAX22190, select desired operation mode and SPI mode, and configure the jumpers according to [Table 1](#).

If single-channel mode U1 is selected, all U2 controls are disabled ([Figure 5](#)), and vice-versa. The status and configuration box provides the controls for digital inputs reading, DI channel enable, wire-break status, wire-break enable, fault status reporting, FFAULT pin configuration, input filter configuration, LED and GPO configuration, and CRC value calculation.

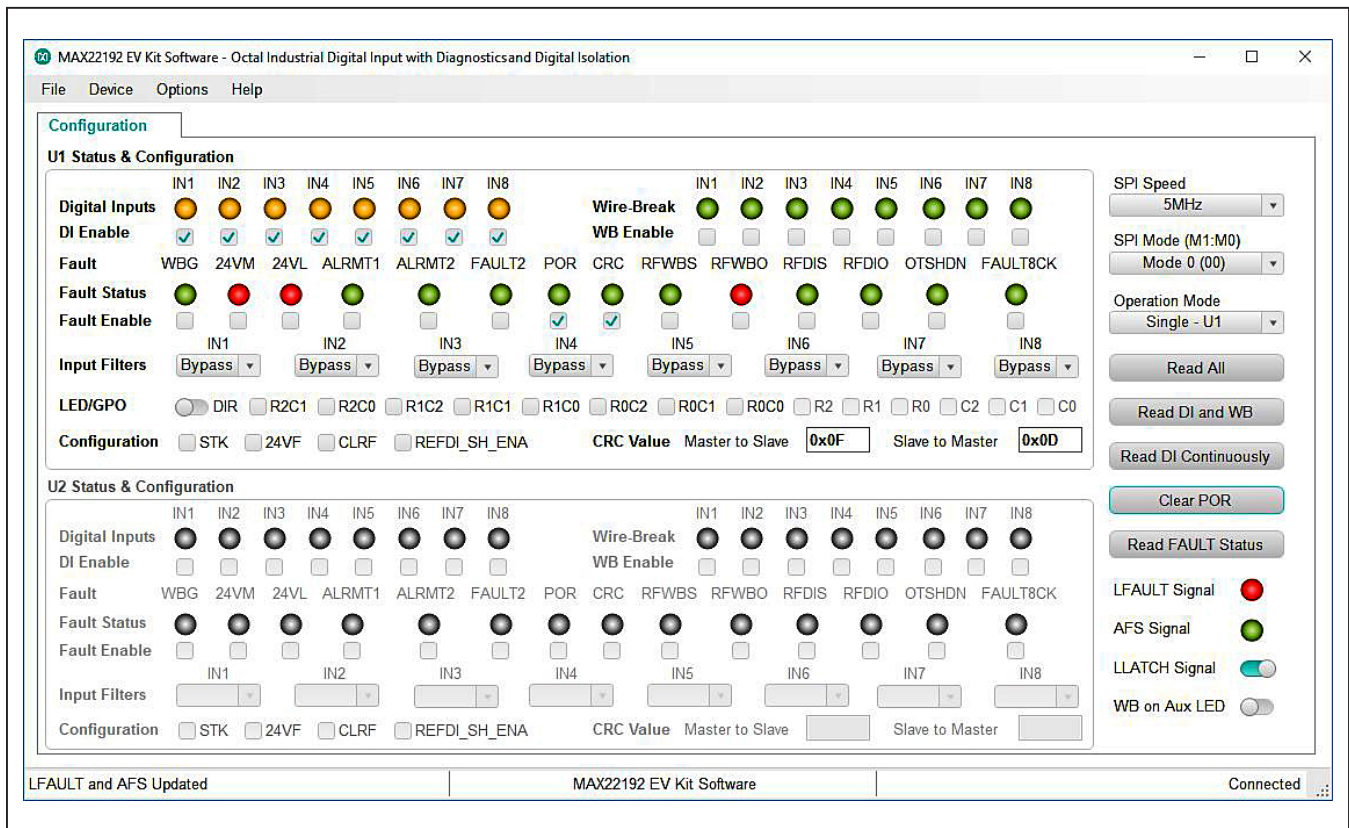


Figure 5. MAX22192 EV Kit Software—Single Channel Mode U1

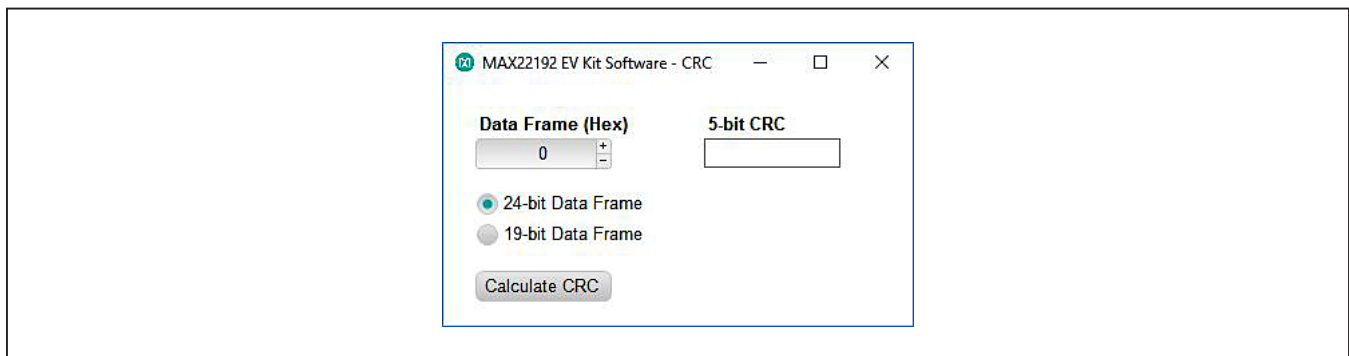


Figure 6. MAX22192 EV Kit Software—CRC Calculator

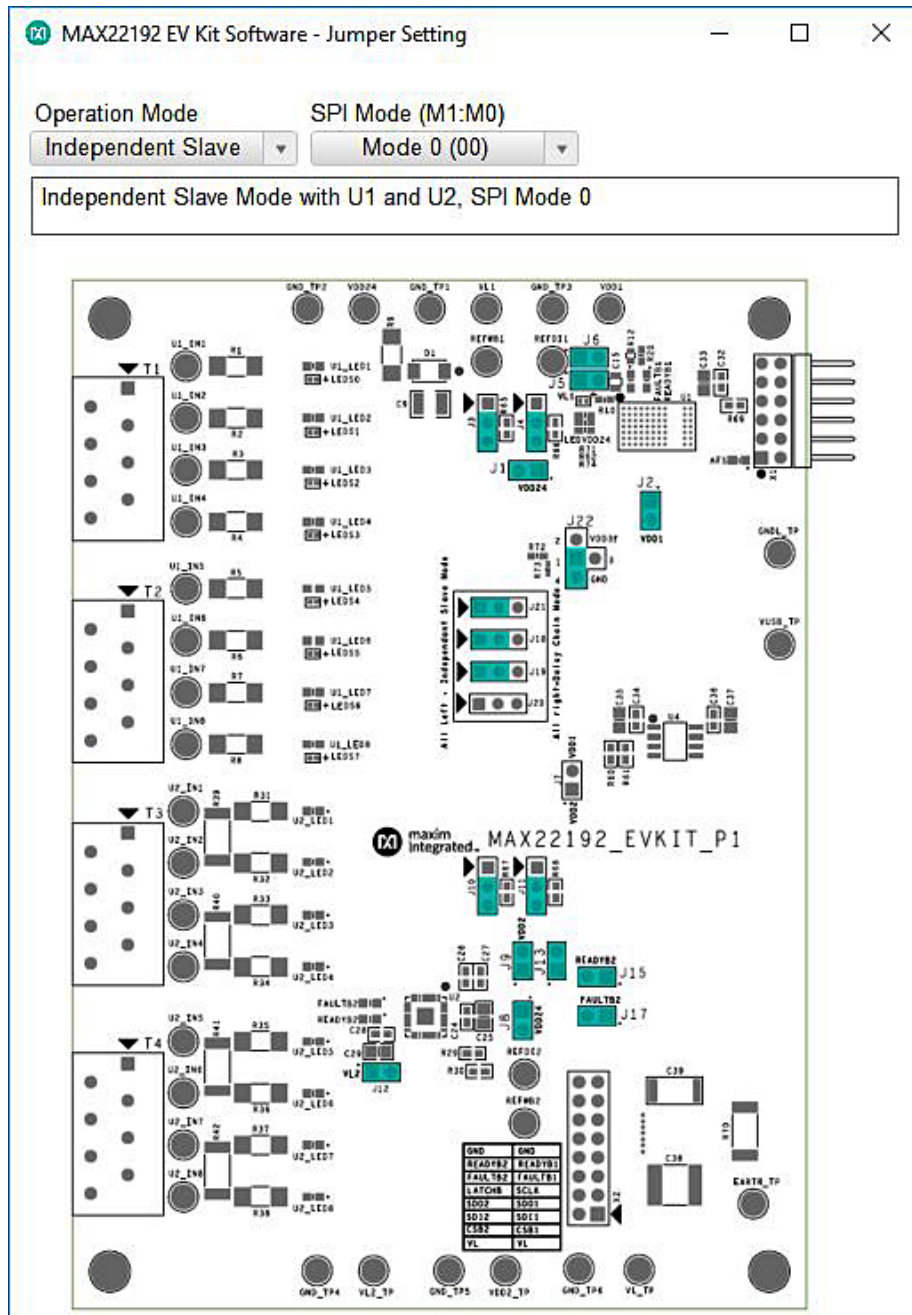


Figure 7. MAX22192 EV Kit Software—Jumper Setting Diagram

After power up, the MAX22192  $\overline{\text{LFAULT}}$  pin is low and the POR bit in the FAULT1 register is set, indicating that a power-on-reset has happened and all registers are set to default (Figure 2). After clicking the **Clear POR** button, the GUI clears the POR bit in the FAULT1 register. The  $\overline{\text{LFAULT}}$  pin is pulled high and FAULTB1 and FAULTB2 LEDs are turned off after clearing the POR (Figure 3).

The **Read All** button reads the MAX22192 and MAX22190 registers and refreshes all the controls with current setting. The **Read DI and WB** and **Read DI Continuously** buttons read digital input (DI) and wire-break (WB) registers value and update the corresponding controls. The **Read FAULT Status** button reads the FAULT1 and FAULT2 registers, polls  $\overline{\text{LFAULT}}$  and AFS status, and update the corresponding controls.

### CRC Calculator

Clicking **CRC Calculator** under the **Options** menu opens the CRC calculation window (Figure 6). The software calculates the 5-bit CRC code based on the 19-bit data or 24-bit data (5 LSB bits are ignored) and display the result.

### Jumper Setting Diagram

Clicking the **Jumper Setting Diagram** under the **Options** menu opens the jumper setting window (Figure 7). The software displays the jumper position based on the current operation mode and SPI mode in the top silkscreen diagram. Changing the operation mode and SPI mode updates the shunt positions in the diagram. Note that SPI mode should be set to Mode 0 or Mode 1 in single-channel mode or independent slave mode, and set to Mode 2 or Mode 3 in daisy-chain mode. Daisy-chain mode is not implemented until software version 2.0.

### Auxiliary LED Matrix

The MAX22192 features an auxiliary LED matrix that can be configured to indicate the input channel wire-break status. After enabling the **WB on Aux LED** feature, every time the software reads the wire-break status, it writes the WB register value to the LED register to show the wire-break status on the LED matrix on the EV kit hardware. See Figure 8 for an example where IN3 is connected to the field input and all other channels are unconnected.

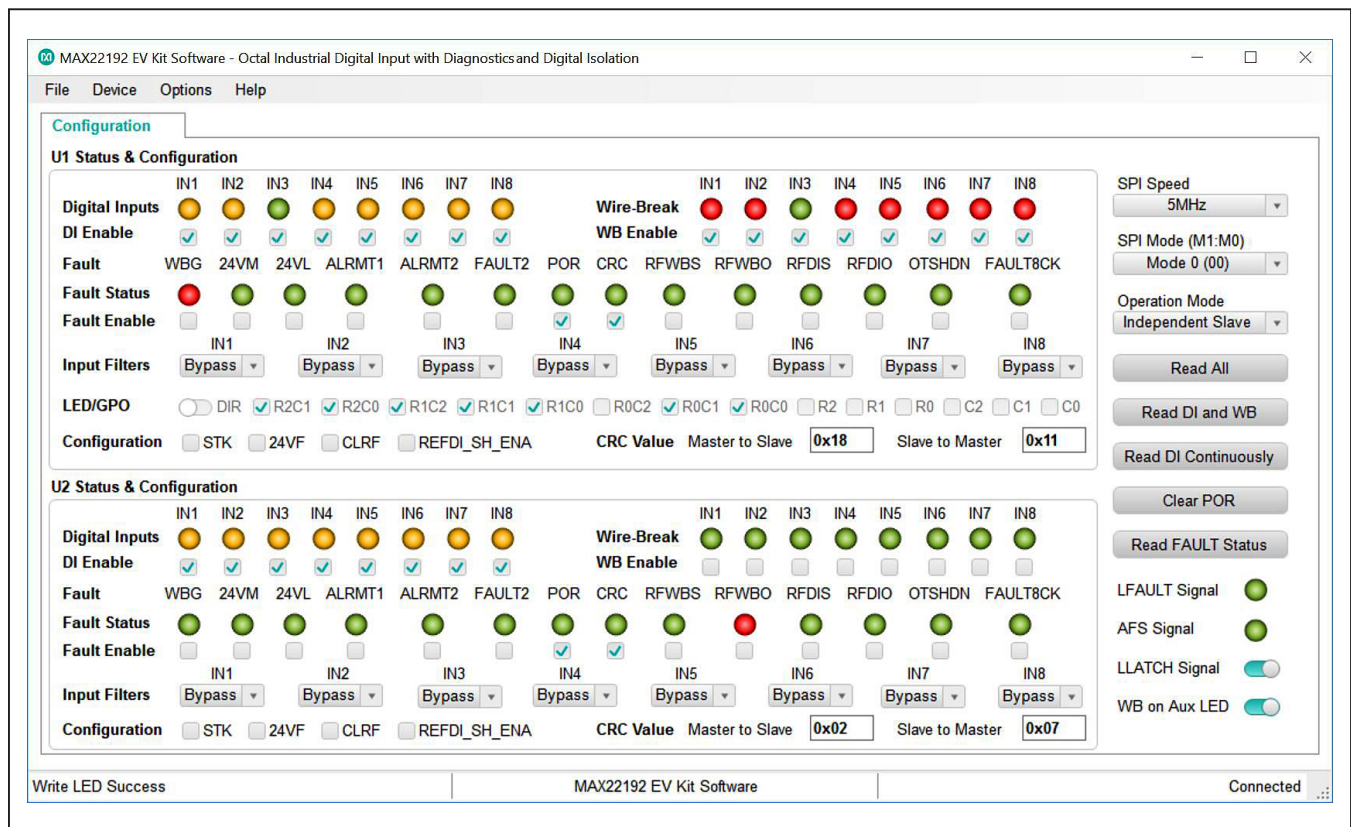


Figure 8. MAX22192 EV Kit Software—WB on Aux LED feature

## Register Map

The **Register Map** tab shows all MAX22192 and MAX22190 register information including the register name, address, value, read or write accessibility, and the register description. The **Value** cell can be changed by the user if the register is writable. Pressing the **Enter** key after changing the **Value** writes to the register. When a certain register is highlighted in the register list, the bits' information in this register are displayed in the **Bits Description** table. The bit **Setting** is configurable if the bit is writable, which triggers a write operation to its register.

Clicking the **Read All** button reads all registers and refreshes the window with register settings. Clicking the **Write All** button writes the current settings to all registers.

The Register Map tab is not implemented until software version 2.0.

## Detailed Description of Hardware

The MAX22192 EV kit provides a proven layout for a 16-input galvanically isolated digital input solution using MAX22192 and MAX22190. Both MAX22192 and MAX22190 are included with flexibility for operation modes making it easier to evaluate system performance of the MAX22192. This includes different SPI interface modes as well as support for all three types of IEC 61131-2 sensor inputs.

### SPI Interface

The EV kit software communicates over USB to the SPI interface and supports full 5MHz clock rate for the MAX22192. The SPI interface can communicate to a single device, or both devices can be daisy-chained. Three SPI operation modes are supported by the EV kit: single-channel mode, independent slave mode, and daisy-chain mode. [Table 2](#) describes how to configure the EV kit jumpers to operate in different operation modes. The EV kit uses a standard Pmod-compatible 12-pin header to connect to an external adapter board (USB2PMB2#), which provides an interface to a PC with an USB port. If the users wish to interface to their own Microcontroller or FPGA, simply hardwire the SPI signals to the Pmod connector X1.

## Power Supplies

The EV kit has two power domains, the “logic side,” which is powered from the USB-supplied power (VUSB and GNDL), and the “field side,” which is typically powered from an external 24V DC supply connected to VDD24 and GND. MAX22192 has an integrated regulator to provide low voltage output to VDD3F (3.3V, nominal) to power other field-side devices such as MAX22190 or a digital isolator such as MAX12931. Alternatively, if an external 24V supply is not available, the field side can be powered using an external 3.0V–5.5V supply through the VDD3F pin of the MAX22192 and leaving VDD24F pin unconnected (refer to [Table 1](#) for jumper settings). The USB2PMB2# adapter board converts the USB 5V supply to a regulated +3.3V supply, which powers the EV kit logic side. Alternatively, if an external microcontroller is used, connect 3.0V–5.5V external supply to test points VUSB\_TP and GNDL\_TP. The EV kit should be powered from two independent isolated power supplies to evaluate the galvanic isolation. For evaluating the electrical parameters of the device without any isolation between the two sides, a single dual-output power supply can also be used.

### Type 1, 3 Inputs (U1)

The MAX22192 senses the state (high or low) of eight digital inputs. U1 is designed to support the trip points (voltage and current) to satisfy the requirements of IEC 61131-2 Type 1 and Type 3 inputs. Resistor R10 sets the current limit value at 2.35mA and input resistors R1–R8 set the voltage threshold to ensure compliance. The input resistors R1–R8 are 1.5k $\Omega$ , 1W MELF resistors to support IEC 61000-4-5 surge tolerance at  $\pm 1$ kV line-to-ground. A separate LED for each input port indicates the status of each input.

### Type 2 Inputs (U2)

Type 2 inputs require higher current limits (6mA minimum) and U2 is configured to support four Type 2 inputs by using two MAX22190 inputs in parallel. The current limit for each channel is set to a nominal 3.39mA through resistor R29. To set the correct voltage threshold, R31–R38 are 1k $\Omega$ , 1W MELF resistors. Resistors R39–R42 are 0 $\Omega$  resistors to create a pair of inputs. By changing the value of the resistor R29, the current threshold can be set to a different value as desired. A separate LED for each input port indicates the status of the inputs.

**Galvanic Isolation**

The MAX22192 features a 600V<sub>RMS</sub> galvanic isolation. The 4-wire SPI,  $\overline{\text{LATCH}}$ ,  $\overline{\text{FAULT}}$  and  $\overline{\text{READY}}$  signals of both MAX22192 (U1) and MAX22190 (U2) are isolated using the integrated isolation channels in the MAX22192. When the MAX22192 and the MAX22190 are configured in the SPI independent slave mode, a 2-channel MAX12931 is required to isolate a second chip select ( $\overline{\text{CS}}$ ) signal of the MAX22190. When configured in daisy-chain mode, no extra isolation channels are needed. The field-side logic supply  $V_{LF}$  can operate between 3.0V–5.5V and logic-side supply  $V_{DDL}$  can operate between 1.71V–5.5V. The  $V_{LF}$  and  $V_{DDL}$  can be set to different logic levels and provide voltage translation as well as galvanic isolation. The logic-side supply  $V_{DDL}$  is powered from  $V_{USB}$  and  $\text{GNDL}$  while the field-side  $V_{LF}$  is powered from the MAX22192 internal LDO output ( $V_{DD3F}$ ). The PCB layout ensures correct creepage and clearance rules are followed. Connector X2 is provided to allow easy probing of digital signals on the field-side of the isolation barrier. When testing isolation performance, care should be taken not to have a multichannel oscilloscope ground connection to both  $\text{GND}$  and  $\text{GNDL}$ .

**Ordering Information**

PART	TYPE
MAX22192EVKIT#	EV Kit
MAX22192EVSYS#	EV System

#Denotes RoHS compliant.

The MAX22192EVSYS# includes the MAX22192EVKIT# and USB2PMB2#.

Protective Earth is provided on the lower-right corner of the EV kit with safety rated Y capacitors between field ground ( $\text{GND}$ ) and Earth (C38), and between field ground ( $\text{GND}$ ) and logic ground ( $\text{GNDL}$ ) (C39) to improve the high-voltage, fast transient performance.

**IEC 61000-4 Immunity Compliance**

The typical application for the MAX22192 requires it to pass basic transient immunity standards as defined by IEC 61000-4-x, covering -2 for electrostatic discharge (ESD), -4 for electrical fast transient/burst (EFT), and -5 for surge immunity. The MAX22192 EV kit includes circuitry to support testing to these standards including  $\pm 1\text{kV}$  line-to-GND surge,  $\pm 8\text{kV}$  contact ESD, and  $\pm 15\text{kV}$  air-gap ESD. MELF resistor R9 and TVS D1 provide protection from surge and ESD voltage applied through  $V_{DD24}$ . C38 is a 3300pF safety rated Y capacitor placed between protective earth (PE) and field ground ( $\text{GND}$ ) to improve transient immunity (EFT). C39 is a 1000pF safety rated Y capacitor connected across the isolation barrier between field ground and logic ground ( $\text{GNDL}$ ). For systems where PE and  $\text{GNDL}$  are bonded together, the user can install the resistor R70. Both C39 and R70 are provided with the EV kit.

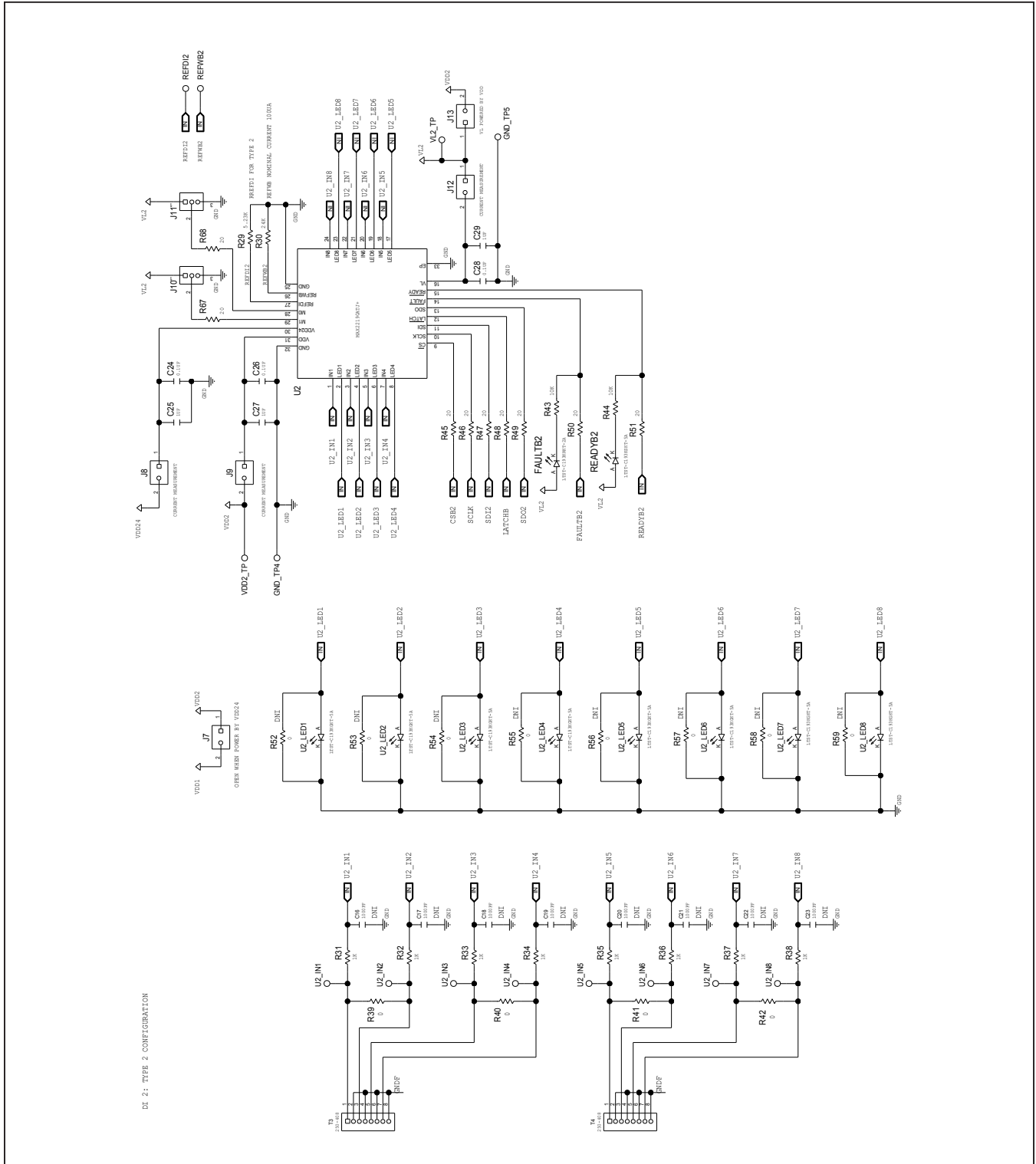


MAX22192 EV Kit Bill of Materials

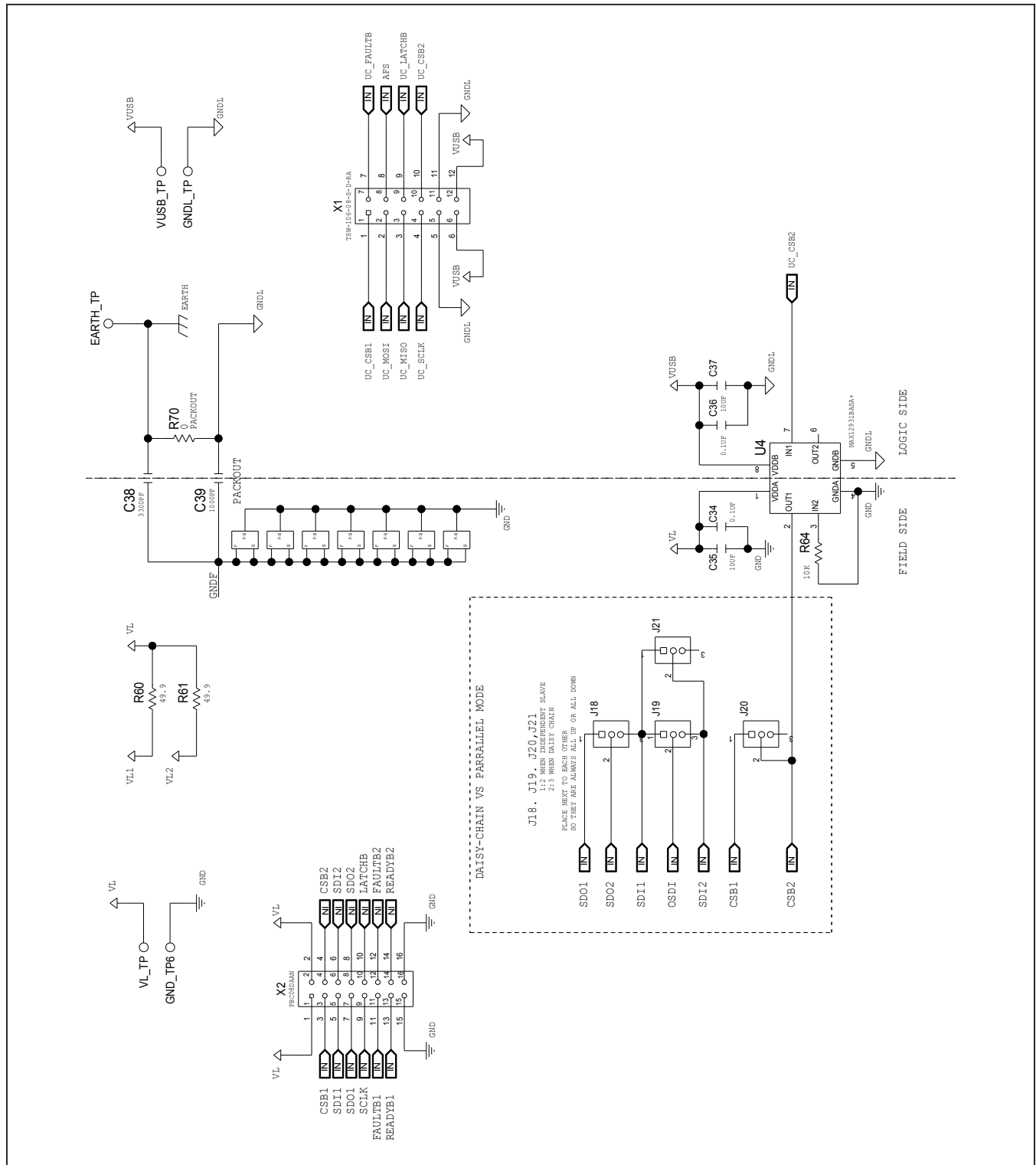
ITEM	REF DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	AFS, READYB1, READYB2	-	3	LTST-C193KSKT-5A	LITE-ON ELECTRONICS INC.	LTST-C193KSKT-5A	DIODE; LED; YELLOW; SMT (0603); VF=2V; IF=0.005A
2	C10, C12, C14, C24, C26, C28, C32, C34, C36	-	9	CC0603KRX7R0BB104;GRM188R72A104KA35;GCJ188R72A104KA01	YAGEO;MURATA;MURATA	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
3	C11, C15, C25, C29	-	4	C2012X7S2A105K125;GRJ21BC72A105KE11;CGA4J3X7S2A105K125AB;GRM21BC72A105KE01	TDK;MURATA;TDK;MURATA	1UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
4	C13, C27	-	2	UMK107AB7105KA	TAYO YUDEN	1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
5	C33, C35, C37	-	3	GRM21BZ71E106KE15	MURATA	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
6	C38	-	1	VJ2220Y332KXUSTX1	VISHAY VITRAMON	3300PF	CAP; SMT (2220); 3300PF; 10%; 250V; X7R; CERAMIC CHIP
7	D1	-	1	SMAJ33CA	VISHAY GENERAL SEMICONDUCTOR	33V	DIODE; TVS; SMA (DO-214AC); VRM=33V; IPP=7.5A
8	EARTH_TP	-	1		5012 KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
9	FAULTB1, FAULTB2	-	2	LTST-C193KRKT-2A	LITE-ON ELECTRONICS INC.	LTST-C193KRKT-2A	DIODE; LED; EXTRA THIN; EXTRA BRIGHT; RED; SMT (0603); VF=2.2V; IF=0.002A
10	GNDL_TP, GND_TP1-GND_TP6	-	7		5011 KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
11	J1, J2, J5-J9, J12, J13, J15, J17	-	11	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
12	J3, J4, J10, J11, J18-J21	-	8	PEC03SAAN	SULLINS ELECTRONICS CORP.	PEC03SAAN	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC;
13	J22	-	1	PEC04SAAN	SULLINS ELECTRONICS CORP.	PEC04SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS
14	LEDS0-LEDS7, LEDVDD24	-	9	SML-P12PT	ROHM	SML-P12PT	DIODE; LED; SML-P1 SERIES; ULTRA COMPACT HIGH BRIGHTNESS LED; GREEN; SMT (0402); VF=2.2V; IF=0.02A
15	R1-R8	-	8	CMB02070X1501G	VISHAY BEYSCHLAG	1.5K	RESISTOR; SMT; 1.5K OHM; 2%; 1W; CARBON FILM
16	R9	-	1	CMB02070X1500G	VISHAY BEYSCHLAG	150	RES; SMT; 150.2%; 1W
17	R10	-	1	ERJ-3EKF7501V	PANASONIC	7.5K	RESISTOR; 0603; 7.5K OHM; 1%; 100PPM; 0.10W; THICK FILM
18	R11, R30	-	2	ERJ-3EKF2402V	PANASONIC	24K	RESISTOR; 0603; 24K OHM; 1%; 100PPM; 0.10W; THICK FILM
19	R12, R13, R43, R44, R63, R64, R69	-	7	CRG0603F10K	TE CONNECTIVITY	10K	RESISTOR; 0603; 10K OHM; 1%; 100PPM; 0.1W; THICK FILM
20	R14-R20, R45-R51, R65-R68	-	18	CRCW060320R0FK; ERJ-3EKF20R0V	VISHAY DALE; PANASONIC	20	RESISTOR; 0603; 20 OHM; 1%; 100PPM; 0.10W; THICK FILM
21	R29	-	1	CRCW06035K23FK	VISHAY DALE	5.23K	RESISTOR; 0603; 5.23K OHM; 1%; 100PPM; 0.10W; THICK FILM
22	R31-R38	-	8	CMB02070X1001G	VISHAY BEYSCHLAG	1K	RESISTOR; SMT; 1K OHM; 2%; 250PPM; 1.0W; CARBON FILM
23	R39-R42	-	4	CRCW25120000Z0EGHP	VISHAY DRALORIC	0	RES; SMT (2512); 0; JUMPER; 1.5W
24	R60, R61	-	2	CRCW060349R9FK	VISHAY DALE	49.9	RESISTOR; 0603; 49.9 OHM; 1%; 100PPM; 0.10W; THICK FILM
25	R62, R71, R74	-	3	CRCW0603470RFK; ERJ-3EKF4700	VISHAY DALE; PANASONIC	470	RESISTOR; 0603; 470 OHM; 1%; 100PPM; 0.10W; THICK FILM
26	R72	-	1	ERA-3AEB164	PANASONIC	160K	RESISTOR; 0603; 160K OHM; 0.1%; 25PPM; 0.1W; THIN FILM
27	R73	-	1	CRCW040210K0FK; RC0402FR-0710K	VISHAY DALE; YAGEO PHICOMP	10K	RESISTOR; 0402; 10K; 1%; 100PPM; 0.0625W; THICK FILM
28	REFD1, REFID2, REFWB1, REFWB2	-	4		5014 KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
29	SU1-SU13, SU15-SU21	-	20	STC02SYAN	SULLINS ELECTRONICS CORP.	STC02SYAN	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.256IN; BLACK; INSULATION=PBT CONTACT=PHOSPHOR BRONZE; COPPER PLATED TIN OVERALL
30	T1-T4	-	4	250-408	WAGO	250-408	CONNECTOR; FEMALE; THROUGH HOLE; COMPACT TERMINAL STRIP WITH PUSH BUTTON; STRAIGHT; 8PINS
31	U1	-	1	MAX22192ARC+	MAXIM	MAX22192ARC+	EVKIT PART -IC; MAX22192ARC+; GQFN70; PACKAGE OUTLINE: 21-100252; PACKAGE CODE: R70610M+1
32	U1_IN1-U1_IN8, U2_IN1-U2_IN8	-	16		5125 KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BROWN; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
33	U1_LED1-U1_LED8, U2_LED1-U2_LED8	-	16	LTST-C193KGKT-5A	LITE-ON ELECTRONICS INC.	LTST-C193KGKT-5A	DIODE; LED; STANDARD; YELLOW-GREEN; SMT (0603); PIV=1.9V; IF=0.005A; -55 DEGC TO +85 DEGC
34	U2	-	1	MAX22190ATJ+	MAXIM INTEGRATED	MAX22190ATJ+	EVKIT PART-IC; OCTAL INDUSTRIAL DIGITAL INPUT WITH DIAGNOSTICS; PACKAGE OUTLINE: 21-0140; PACKAGE CODE: T3255+6; LAND PATTERN NO.: 90-0603; TQFN32-EP
35	U4	-	1	MAX12931BASA+	MAXIM	MAX12931BASA+	EVKIT PART -IC; DISO; 1/1 CHANNEL; 25MBPS; DEFAULT HIGH; 3.75KV RMS DIGITAL ISOLATOR; NSOIC8
36	VDD1, VDD2_TP, VDD24, VL1, VL2_TP, VL_TP, VUSB_TP	-	7		5013 KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
37	X1	-	1	TSW-106-08-S-D-RA	SAMTEC	TSW-106-08-S-D-RA	CONNECTOR; THROUGH HOLE; DOUBLE ROW; RIGHT ANGLE; 12PINS;
38	X2	-	1	PBC08DAAN	SULLINS ELECTRONICS CORP.	PBC08DAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 16PINS; -65 DEGC TO +125 DEGC
39	PCB	-	1	MAX22192	MAXIM	PCB	PCB; MAX22192
40	MTH1-MTH4	DNI	4	1902B	GENERIC PART	N/A	STANDOFF; FEMALE-THREADED; HEX; 4-40IN; 3/8IN; NYLON
41	MTH1-MTH4	DNI	4	P440.375	GENERIC PART	N/A	MACHINE SCREW; SLOTTED; PAN; 4-40IN; 3/8IN; NYLON
42	C1-C8, C16-C23	DNI	16	GRM155R72A102KA01	MURATA	1000PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
43	C9	DNI	1	GRM32EC72A106KE05	MURATA	10UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 10UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S
44	C39	DNI	1	GA352QR7GF102KW01	MURATA	1000PF	CAP; SMT (2211); 1000PF; 10%; 250V; X7R; CERAMIC CHIP
45	R70	DNI	1	CRCW25120000Z0EGHP	VISHAY DRALORIC	0	RES; SMT (2512); 0; JUMPER; 1.5W
46	R21-R28, R52-R59	DNP	0	CRCW06030000Z0	VISHAY DALE	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM
TOTAL			219				



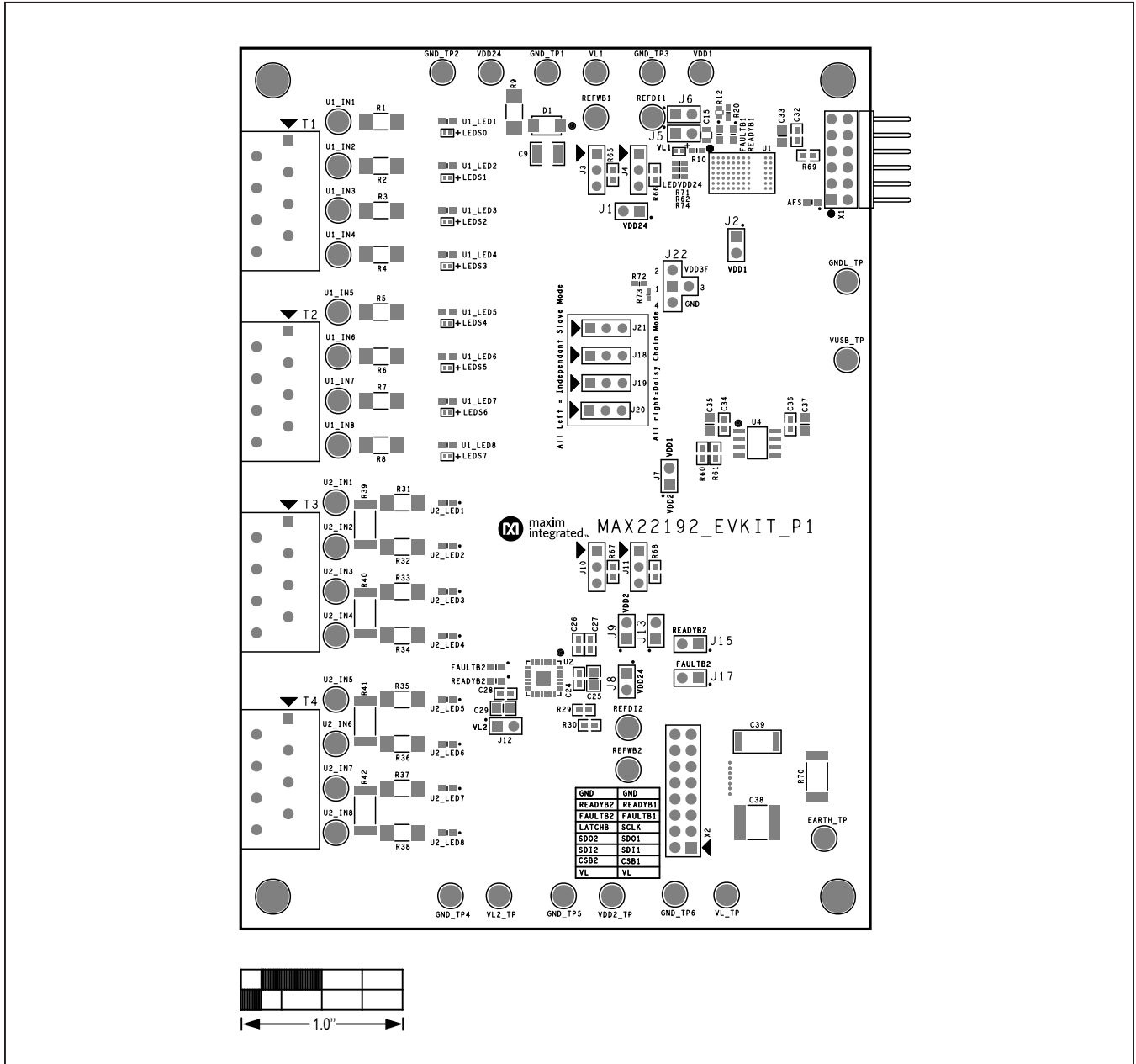
MAX22192 EV Kit Schematics (continued)



MAX22192 EV Kit Schematics (continued)

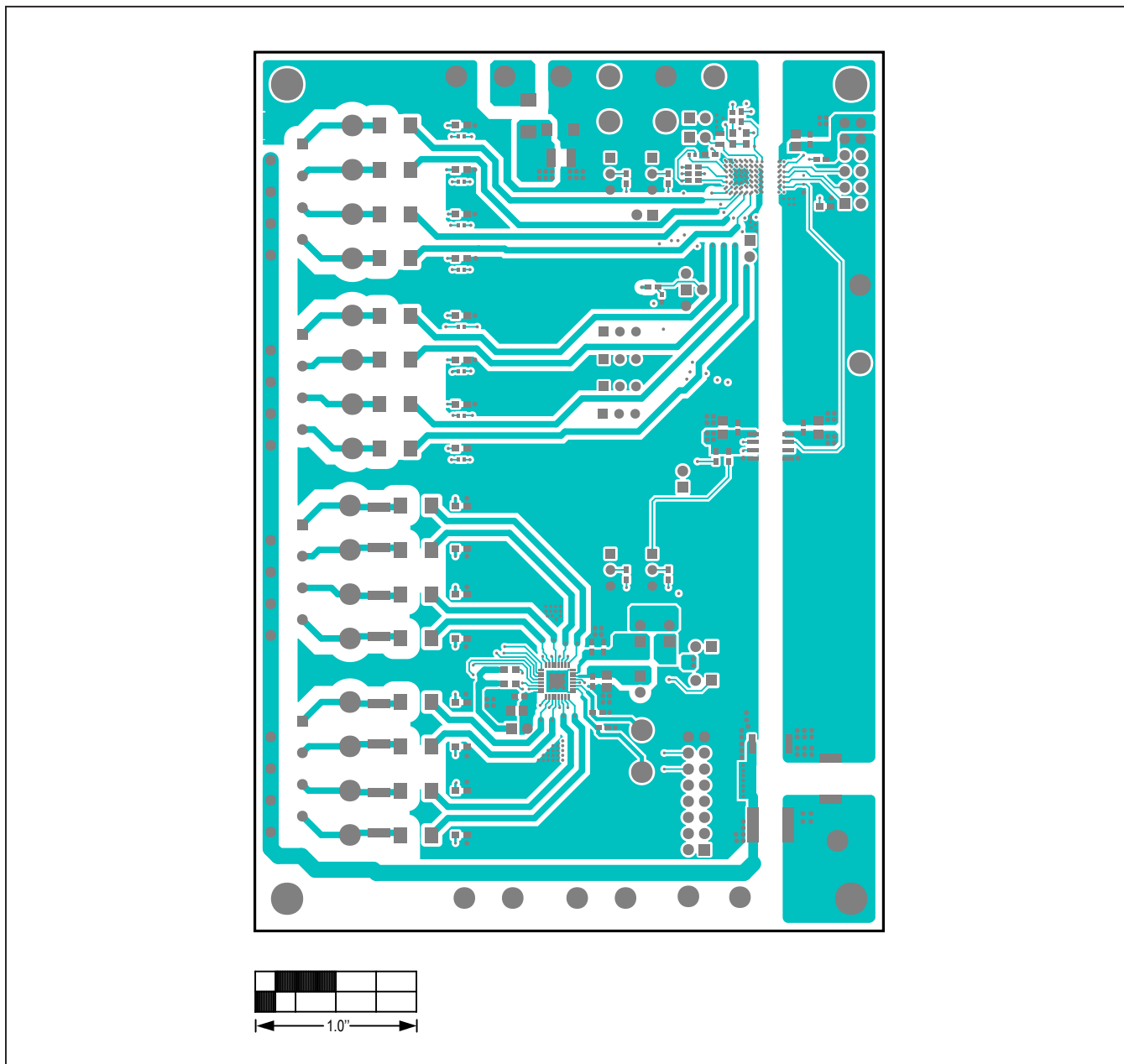


MAX22192 EV Kit PCB Layout



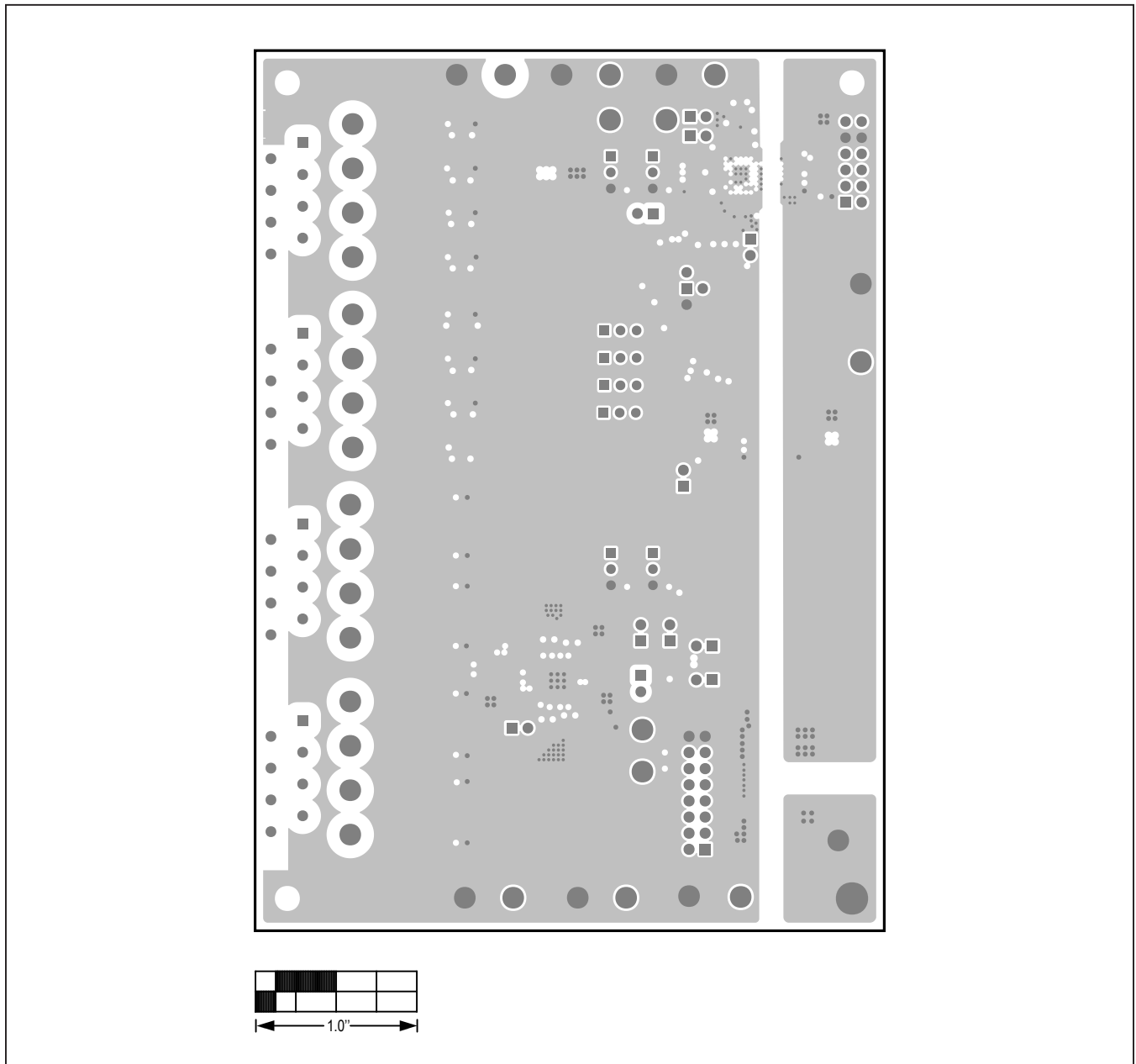
MAX22192 EV Kit—Top Silkscreen

MAX22192 EV Kit PCB Layout (continued)



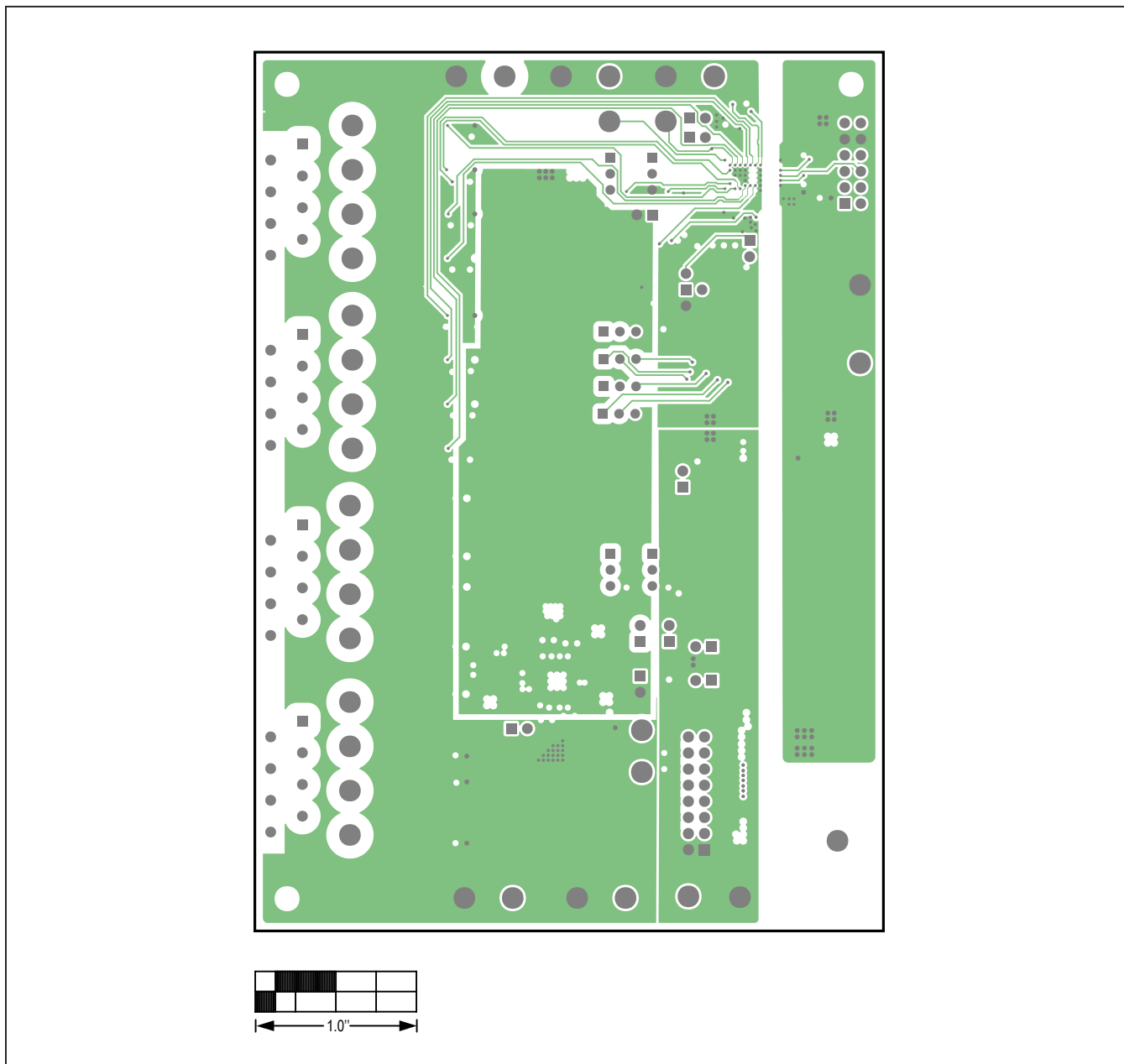
MAX22192 EV Kit—Top

MAX22192 EV Kit PCB Layout (continued)



MAX22192 EV Kit—Internal 2

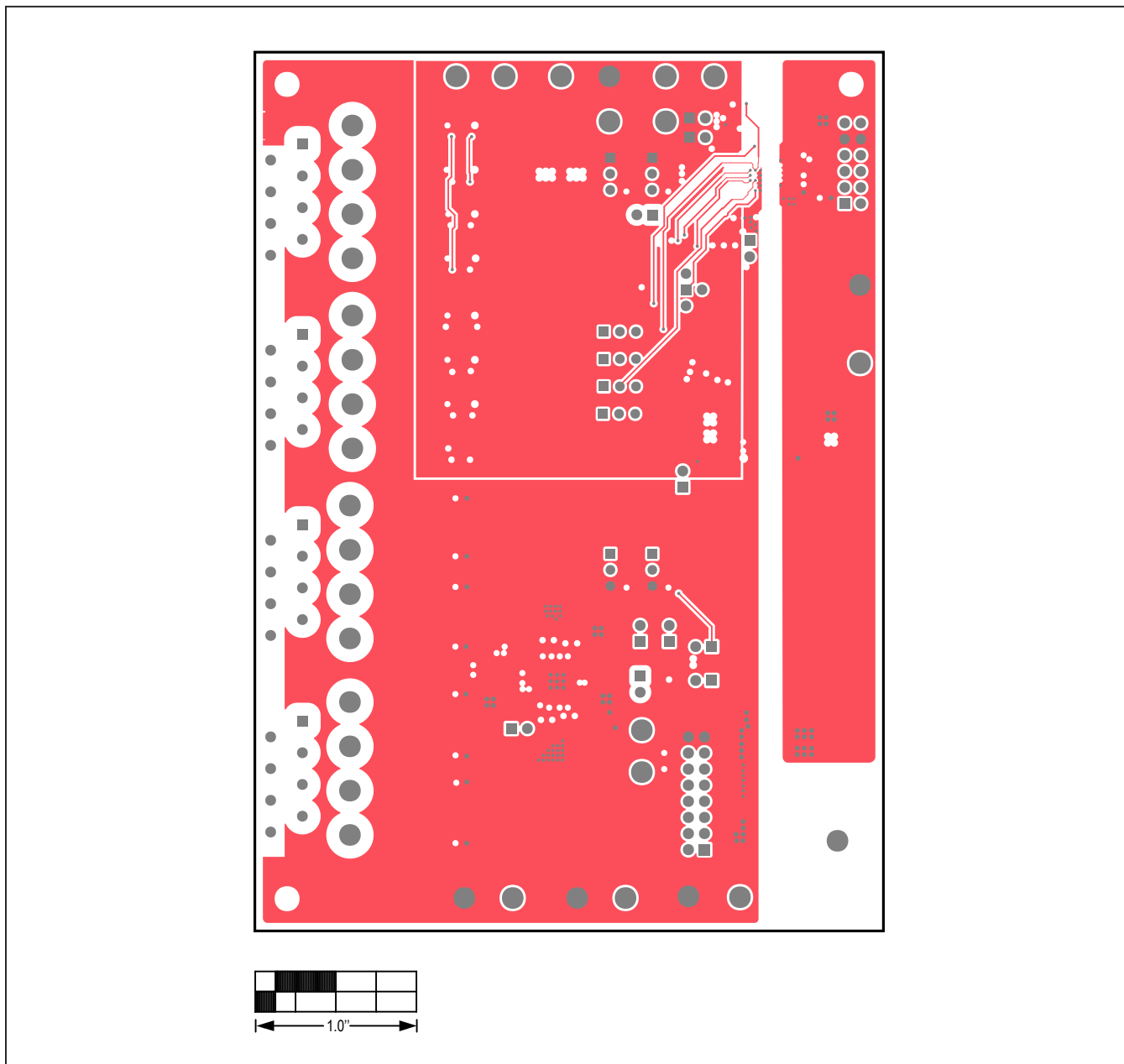
MAX22192 EV Kit PCB Layout (continued)



MAX22192 EV Kit—Internal 3

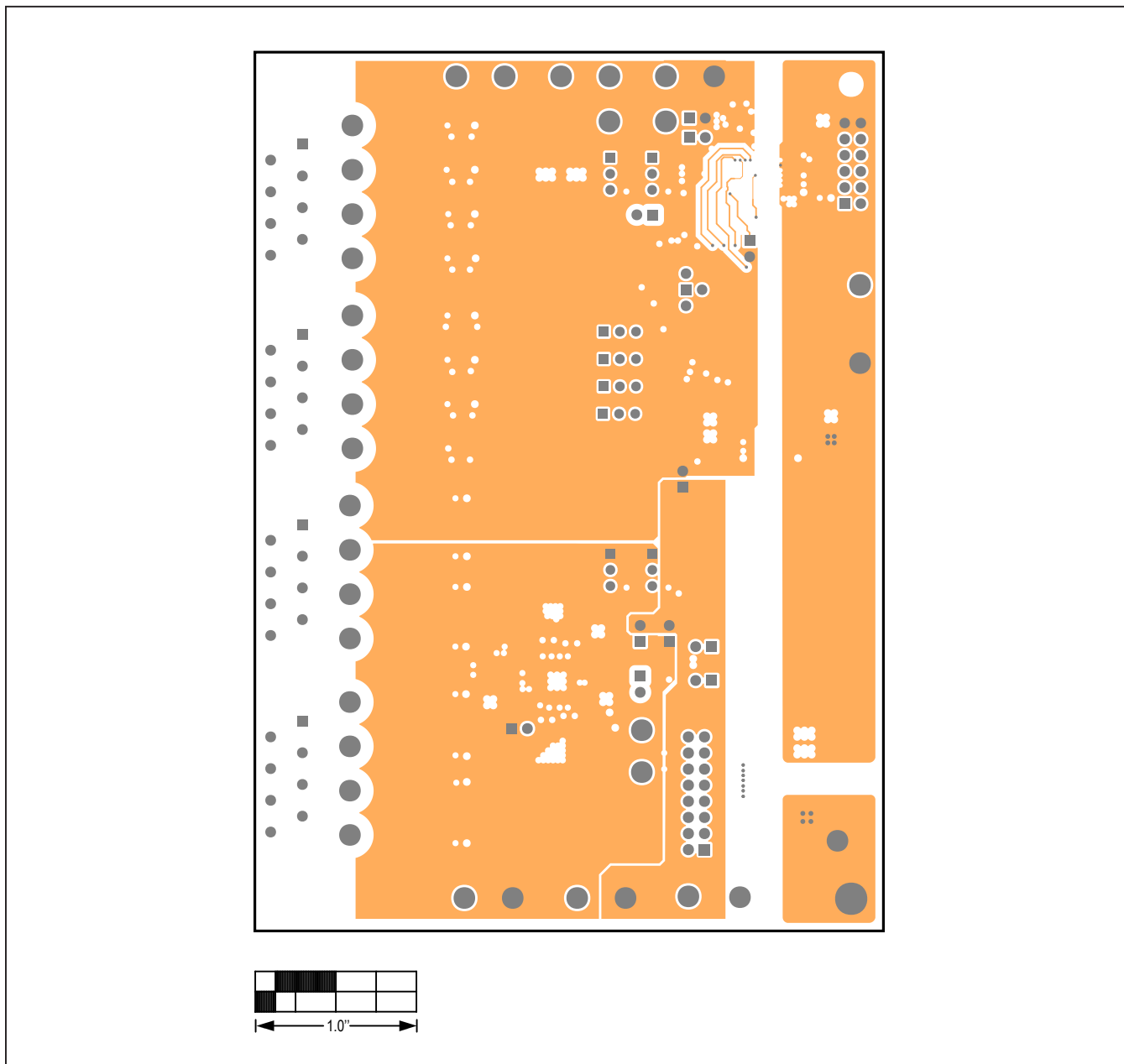


MAX22192 EV Kit PCB Layout (continued)



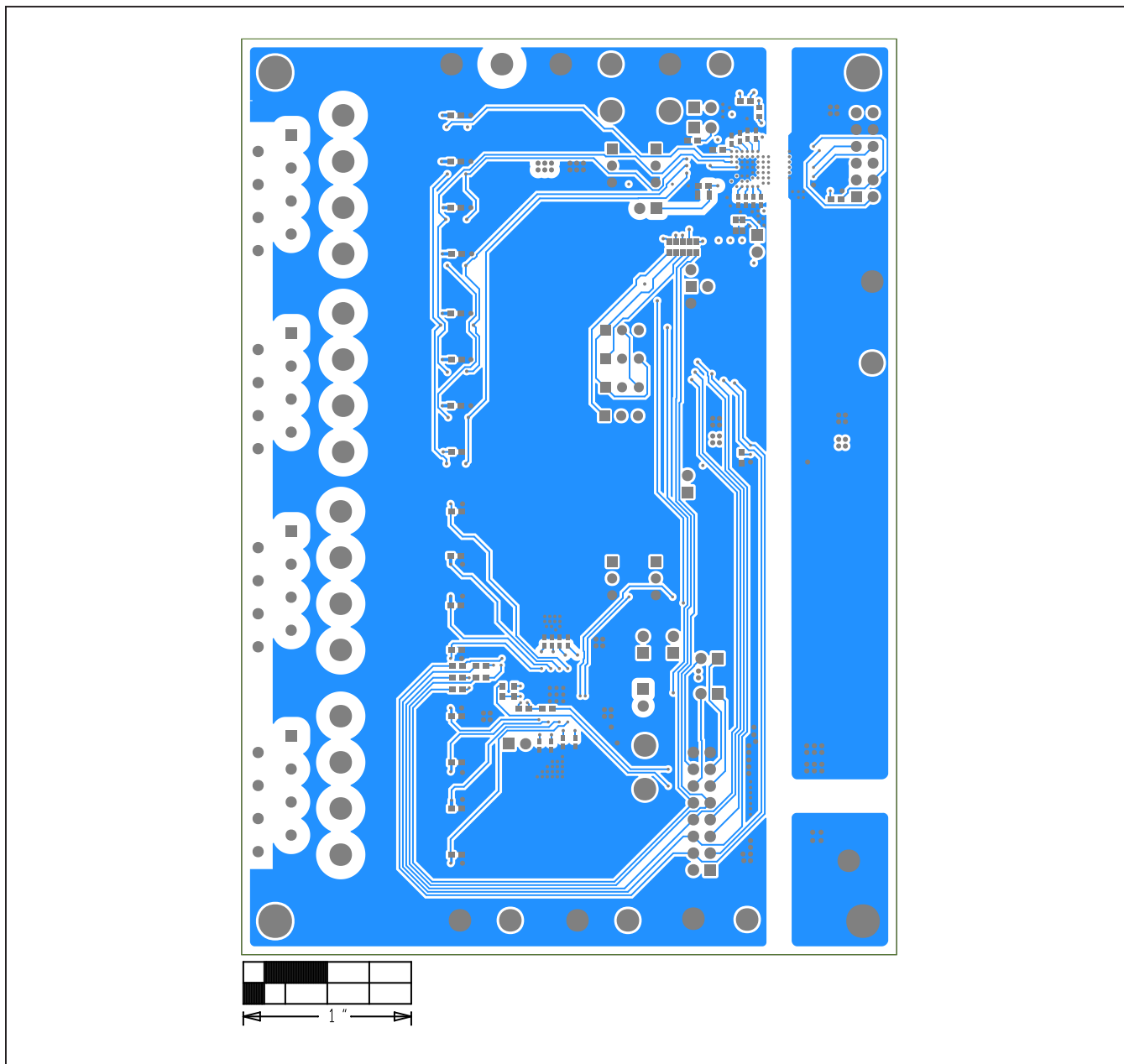
MAX22192 EV Kit—Internal 4

MAX22192 EV Kit PCB Layout (continued)



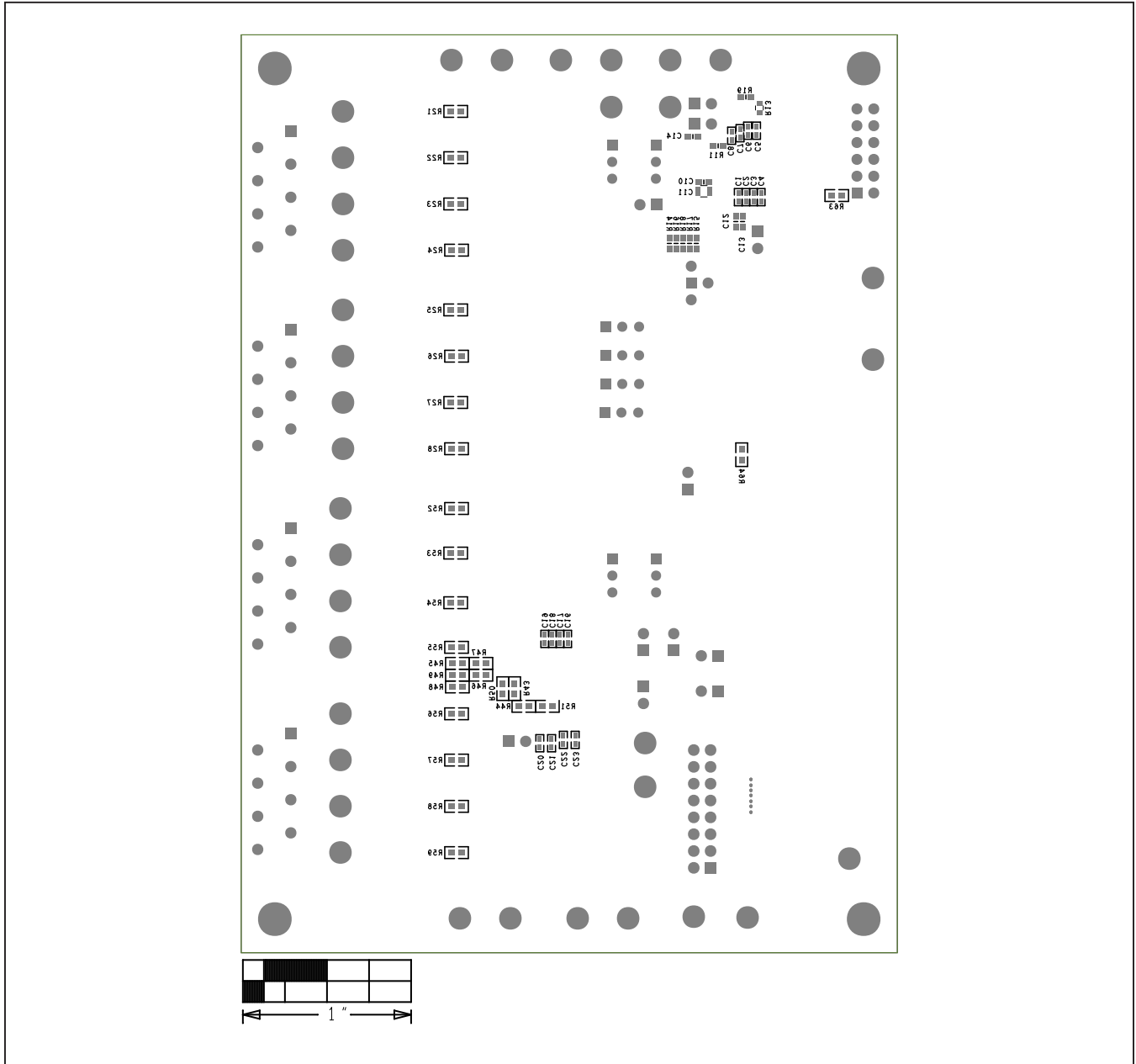
MAX22192 EV Kit—Internal 5

MAX22192 EV Kit PCB Layout (continued)



MAX22192 EV Kit—Bottom

MAX22192 EV Kit PCB Layout (continued)



MAX22192 EV Kit—Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/18	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at <https://www.maximintegrated.com/en/storefront/storefront.html>.

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