MAX22191PMB

Evaluates: MAX22191

General Description

The MAX22191PMB# peripheral module provides the hardware to evaluate the MAX22191 parasitically powered digital input. Refer to the MAX22191 IC data sheet for detailed information regarding operation of the IC. The PMB features two circuits: one for isolated parasitically powered circuit (using an optoisolator) and one for a 24V input signal with the circuit powered from a low-voltage logic supply.

The module can be used in various ways. Maxim sells low-cost USB2PMB1#, USB2PMB2#, and USB2GPIO# adapter boards that use the Munich GUI software for communication through a USB cable. This is not included with this board. Alternatively, any microcontroller or FPGA with a 12-pin Pmod™-compatible connector can be used. Another option for the user is to wire-wrap a temporary connection from their system to the pins on connector X1. For these later two options the user needs to write their own control software.

The Pmod PCB dimension is just 42mm long x 20mm wide, with the width determined by the size of the X1 connector.

Features

- Easy Evaluation of the MAX22191
- Isolated, Paristically Powered and Logic-Powered Circuits for Easy Evaluation
- Proven PCB Layout
- Works with USB2PMB2# or USB2GPIO# Adapter and Munich GUI Software

MAX22191PMB EV Kit Files

FILE	DECRIPTION
Munich_GUISetupV2.21.ZIP	Munich GUI Software for use with the USB2PMB adapter

***Ordering Information* appears at end of data sheet.**

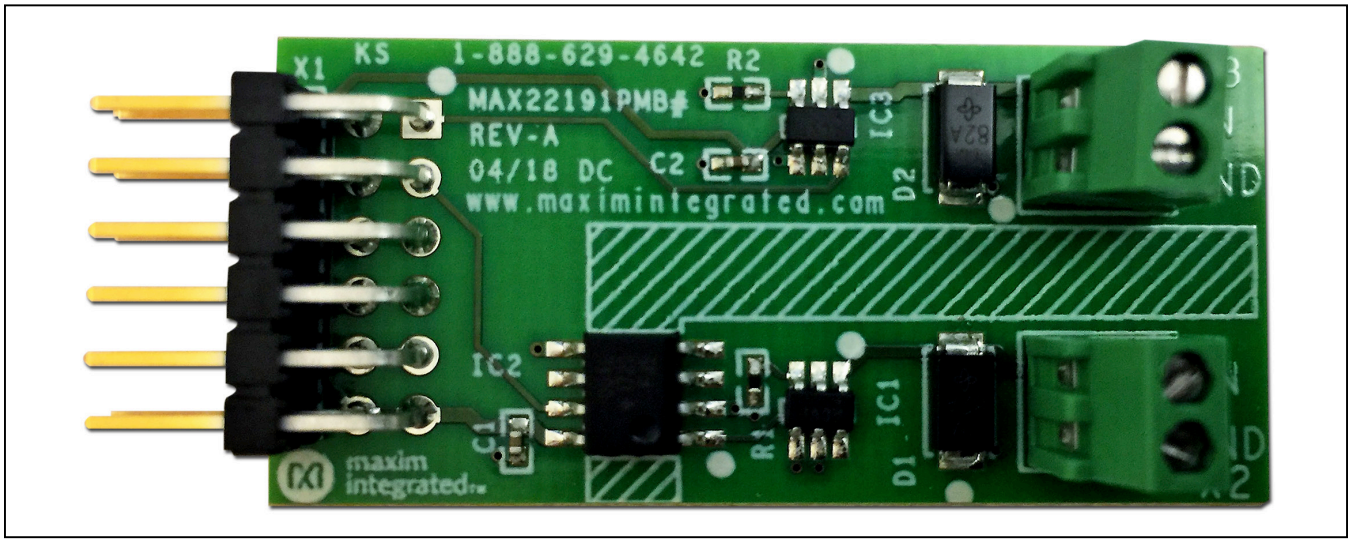


Figure 1. MAX22191PMB# Board Photo

Pmod is a trademark of Digilent Inc.

maxim integrated™

Quick Start

Required Equipment

- MAX22191PMB#
- USB2PMB2# or USB2GPIO#
- 24V DC power supply or 24V digital signal generator
- Oscilloscope
- PC with Windows® XP, Windows 7, Windows 8.1, Windows 10 and a spare USB port
- Micro-USB cable
- Munich GUI

Note: *In the following sections, software-related items are identified by bolding. Text in* **bold** *refers to items directly from the EV system software. Text in* **bold and underline** *refers to items from the Windows operating system.*

Procedure

The Pmod board is fully assembled and tested. Follow the steps below to verify board operation: If the USB2PMB1#, USB2PMB2#, or USB2GPIO# adapter is used, the user can download software by following the steps below to get started. In this description the USB2PMB2# adapter is used:

1) Visit www.maximintegrated.com/ to download the latest version of the Munich_GUI software, version 2.21 or later, Munich_GUISetupV2.21.ZIP.
2) Save the software to a temporary folder. Unzip the zip file and double-click the executable (EXE) file to run the installer. A message box asking **Do you want to allow the following program to make changes to this computer?** might appear. If so, click **Yes**.
3) 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.
4) Connect the MAX22191PMB# Pmod connector X1 to the connector on USB2PMB2#.
5) Connect the USB2PMB2# to the PC with the micro-USB cable.
6) Once the hardware is ready to use, launch the Munich software. The status bar in the GUI should display **Disconnected** in the bottom right-hand corner. Go to the **Device** tab to select the **MAX22191PMB**. Click the button **Connect** and then in the **Sample** box select **Read Continuously**.
7) If nothing is connected to Input 1 (X2) and Input 2 (X3), then both levels should be **LOW**/0V.
8) Connect the 24V DC supply to MAX22191PMB# on connector X2, this is Input 1 on the Isolated Parasitic Channel. Output 1 signal should flip and the Munich GUI should say **HIGH** for Input 1.
9) Connect the 24V DC supply to MAX22191PMB# on connector X2, this is Input 2 on the logic voltage powered channel. Now the Output 2 signal should flip and the Munich GUI should say **HIGH** for Input 2.
10) If Munich GUI is not available, you can also measure the logic voltage on connector X1, but USB2PMB2# and the USB-Cable are still needed to provide VL.
11) Also note that if you're manually measuring with a Voltmeter, Optocoupler IC2 inverts the input signal, so Input 1 is inverted vs the 24V side, while Input 2 is not inverted. Munich GUI shows the level as provided on the 24V side.

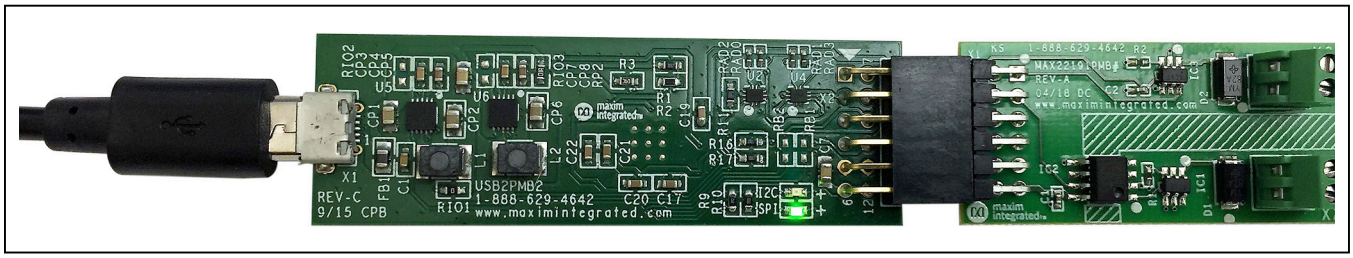


Figure 2. MAX22191PMB# with USB2PMB2# Adapter

Windows is a registered trademark and registered service mark of Microsoft Corporation.

Detailed Description of Hardware

The MAX22191 can be powered parasitically from the 24V digital input signal. The MAX22191PMB# has two circuits to demonstrate the two most common ways to use this device: one for isolated parasitically powered circuit (using an opto-isolator) and one for a 24V input signal with the circuit powered from a low-voltage logic supply. The MAX22191PMB# hardware provides everything needed to evaluate the MAX22191 using the Pmod interface with a USB adapter for easy control with a Windows based GUI. An optional USB2PMB2# module can be used with the Munich GUI to provide the USB-to-MAX22191 interface to read the MAX22191 in either circuit. The USB2PMB2# adapter provides a 3.3V input from the USB interface providing VL to MAX22191.

The MAX22191 is an IEC 61131-2 compliant, industrial digital input (DI) device that translates a 24V digital industrial input to a 2.4mA (typ) current for driving optical isolators. Depending upon how the sensor is connected, each input can sink or source current—refer to MAX22191 datasheet for examples showing this.

Isolated Parasitic Channel

To power the device (IC1) parasitically, the VCC pin is connected to GND and power is derived from the signal on the IN pin of connector X2. By deriving operating power from the input signal, it eliminates the need for an external field-side power supply. The output from IC1 drives the anode of the diode in the opto-isolator (IC2) and the output of the opto connects to pin 3 (signal L_DI1) of connector X1 allowing the sensor input state to be read using software. Note that in this circuit the opto-isolator inverts the input signal, but the Munich GUI reports the true sensor level. The 'logic-side' of the opto is powered from VL on connector X1, which is derived from the USB power supply.

Low-Voltage Logic Supply Channel

To power the device (IC3) from a local or 'logic' power supply, VCC is connected to VL on connector X1 which is derived from the USB power supply. When VCC is powered, the output (OUT) changes from a current source to a CMOS output and the propagation delay from IN to OUT is reduced. The output of IC3 connects to pin 1 (signal L_DI2) of connector X1 allowing the sensor input state to be read using software. Note that this channel has no galvanic isolation. If isolation is required for an end application an external digital isolator such MAX12930 could be used.

Pmod Style Connector

The MAX22191PMB# can plug directly into a Pmod-compatible port through X1. Note the pin definitions are determined by the USB2PMB2# adapter, and if the user wishes to use this board with their own host they must configure the microcontroller or FPGA to match MAX22191PMB# signals. For more information on the interface and control, refer to the MAX22191 IC data sheet. See Figure 5 for the X1 pinout.

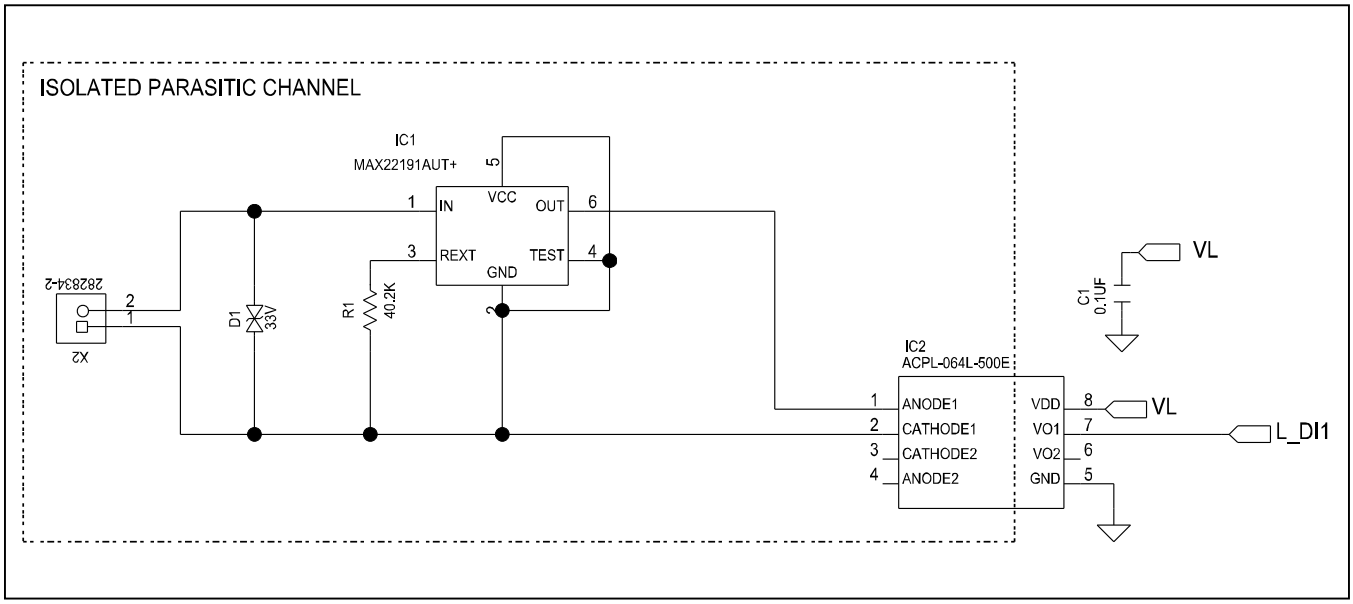


Figure 3. Input 1–Isolated Parasitic Channel

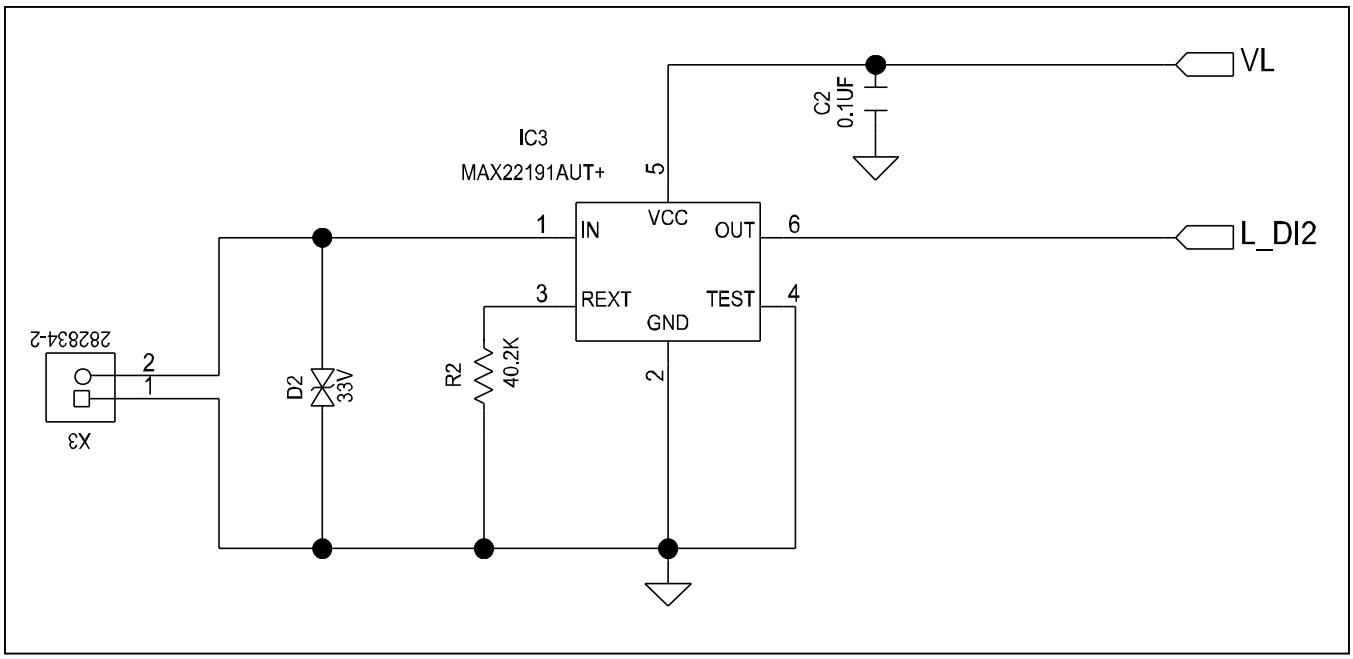


Figure 4. Input 2–VL Powered Channel

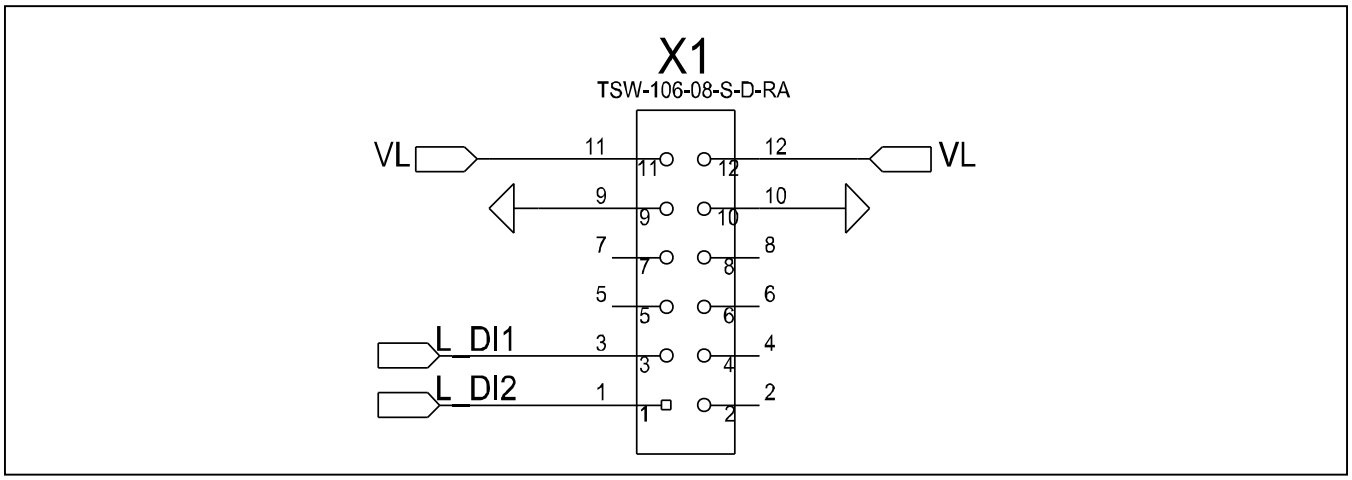


Figure 5. X1 Connector Pin Out

Detailed Description of Software

For easy development and testing, Maxim provides our Munich GUI that supports a number of different Pmod boards using low-cost USB adapters also available from Maxim. For MAX22191PMB#, use Munich GUI version 2.21 or later.

Connect to Hardware

The **Device** menu has options to search and connect to the hardware (see Figure 6). Select **MAX22191PMB**. Use the **Scan Adapters** option to search for the USB2PMB2 modules connected to the PC. If modules are found, the serial numbers of the modules are listed in the **USB2PMB2s** menu item. Select the serial number in the USB2PMB2s list to connect the software to communicate with that module. The software can only communicate to one module at a time. Select **Connect** and notice how status changes from Disconnected to Connected in the lower-right corner of the GUI.

Reading Input Channels

Select **Read Continuously** to make the GUI continuously poll the two input channels. When an input channel goes high the GUI show this change of state.

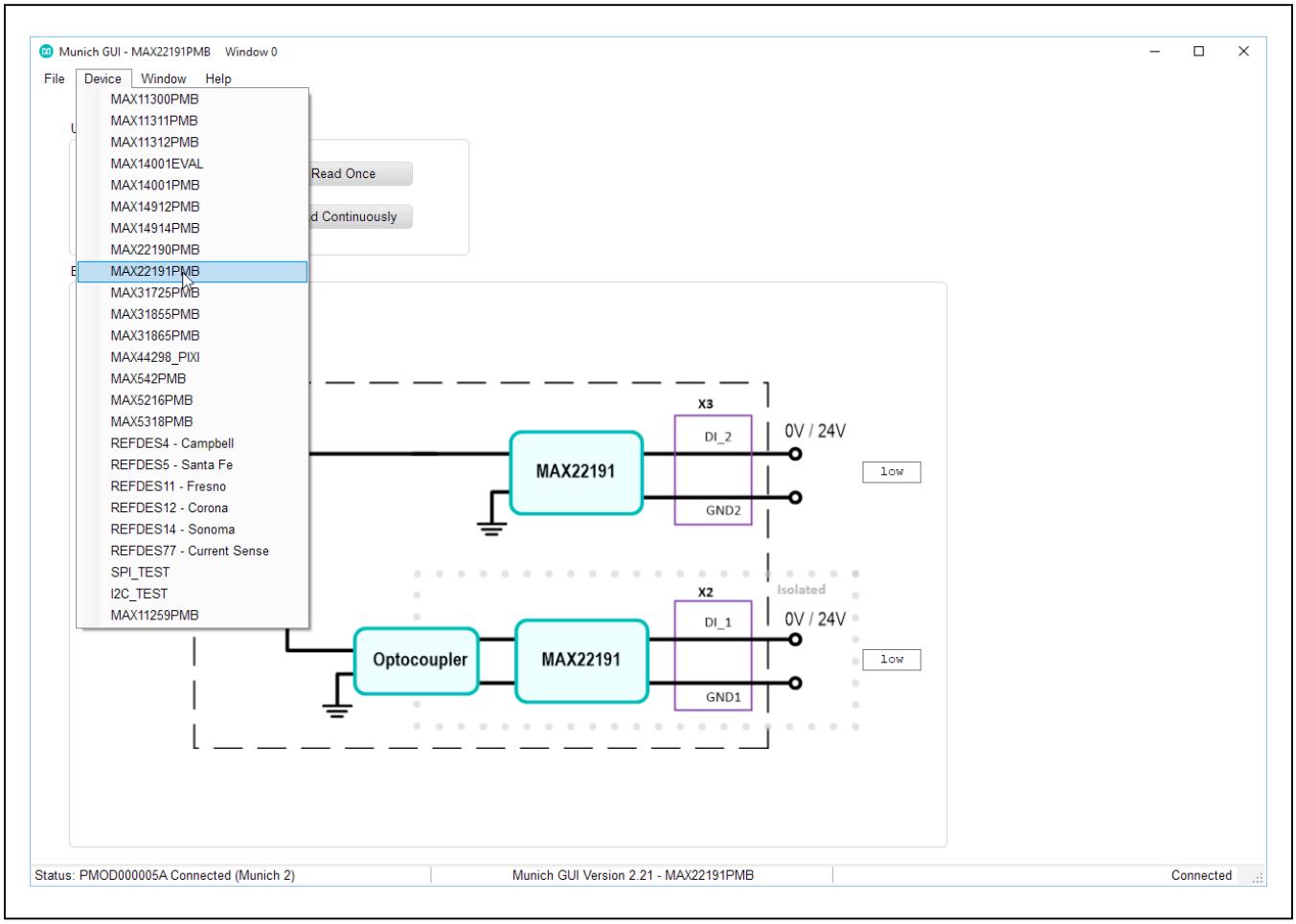


Figure 6. MAX22191PMB# Software (Munich GUI Device Menu)

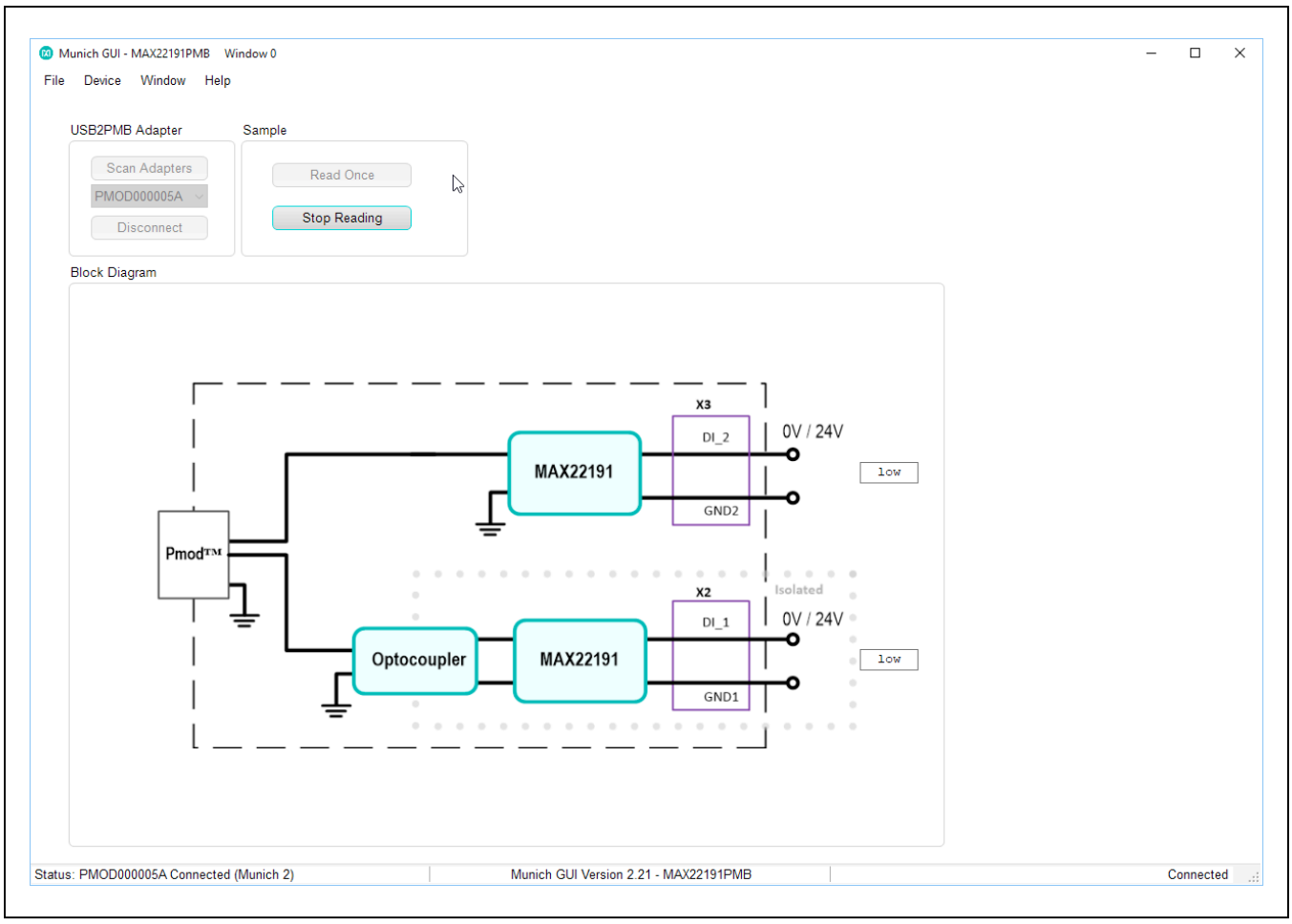


Figure 7a. MAX22191PMB# Software (Munich GUI–Both Inputs Low)

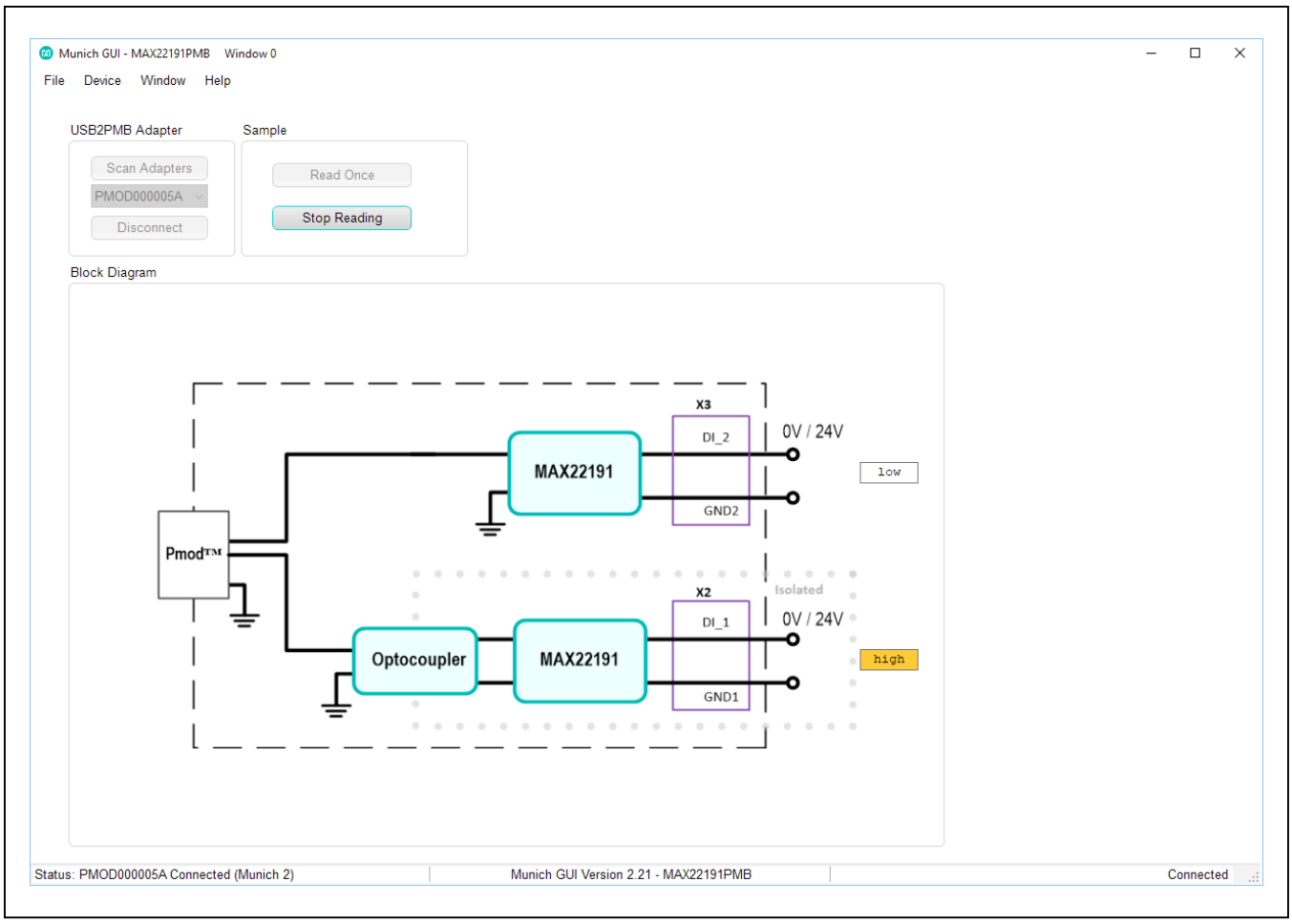


Figure 7b. MAX22191PMB# Software (Munich GUI–Input 2 High)

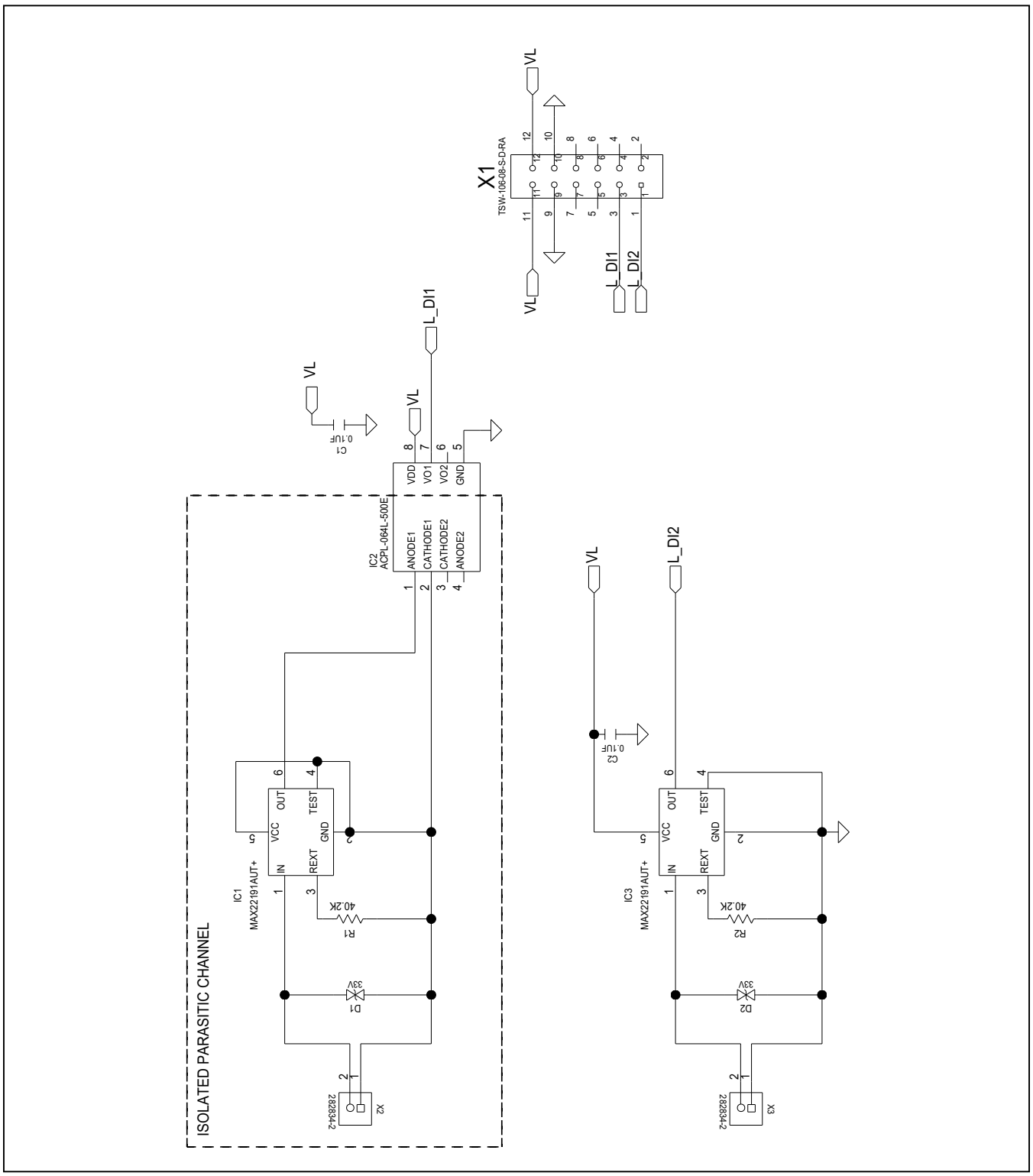
Ordering Information

PART	TYPE
MAX22191PMB#	Peripheral Module

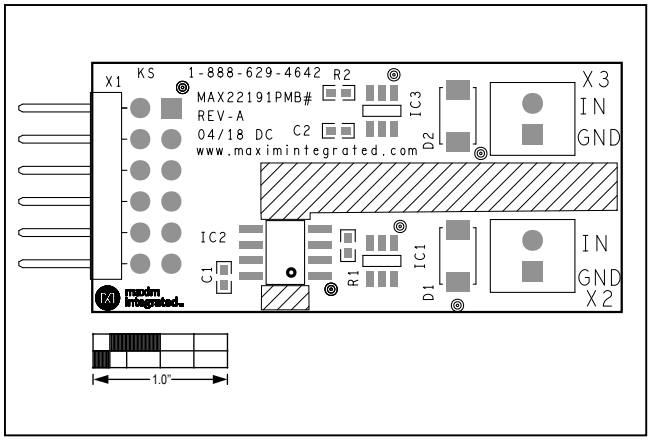
MAX22191PMB# EV Kit Bill of Materials

ITEM	REF_DES	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C2	2	C0402C104J4RAC	KEMET	0.1UF	CAPACITOR; SMT; 0402; CERAMIC; 0.1uF; 16V; 5%; X7R; -55°C to + 125°C; 0 ±15% degC MAX.
2	D1, D2	2	SMAJ33CA	VISHAY GENERAL SEMICONDUCTOR	33V	DIODE; TVS; SMA (DO-214AC); VRM = 33V; IPP = 7.5A
3	IC1, IC3	2	MAX22191AUT+	MAXIM	MAX22191AUT+	EVKIT PART-IC; PARASITICALLY POWERED TYPE 3 DIGITAL INPUT; PACKAGE DWG NO.: 21-0058; PACKAGE LAND PATTERN: 90-0175; SOT23-6
4	IC2	1	ACPL-064L-500E	AVAGO TECHNOLOGIES	ACPL-064L-500E	IC; OPTO; ULTRA LOW POWER 10MBD DIGITAL CMOS OPTOCOUPLER; NSOIC8
5	R1, R2	2	ERJ-2RKF4022	PANASONIC	40.2K	RESISTOR; 0402; 40.2KΩ; 1%; 100PPM; 0.1W; THICK FILM
6	X1	1	TSW-106-08-S-D-RA	SAMTEC	TSW-106-08-S-D-RA	CONNECTOR; THROUGH HOLE; POST TERMINAL STRIP ASSEMBLY; RIGHT ANGLE; 12PINS;
7	X2, X3	2	282834-2	TE CONNECTIVITY	282834-2	CONNECTOR; FEMALE; THROUGH HOLE; 2.54MM PITCH; SIDE WIRE ENTRY STACKING TERMINAL BLOCK ; STRAIGHT; 2PINS; -40°C TO + 105°C
8	PCB	1	MAX22191PMB_DEMO_A	MAXIM	PCB	PCB:MAX22191PMB_DEMO_A
TOTAL		13				

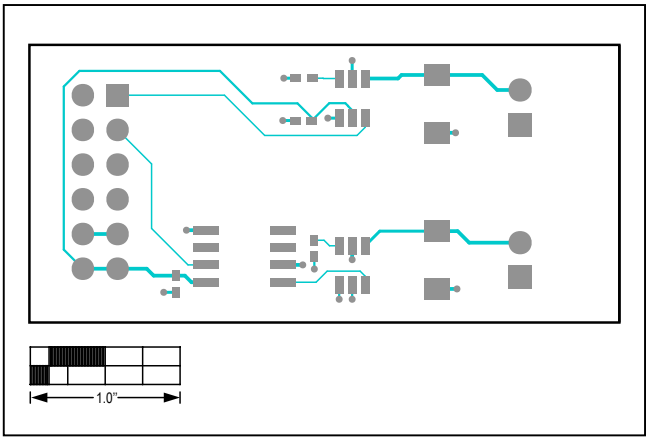
MAX22191PMB# EV Kit Schematic



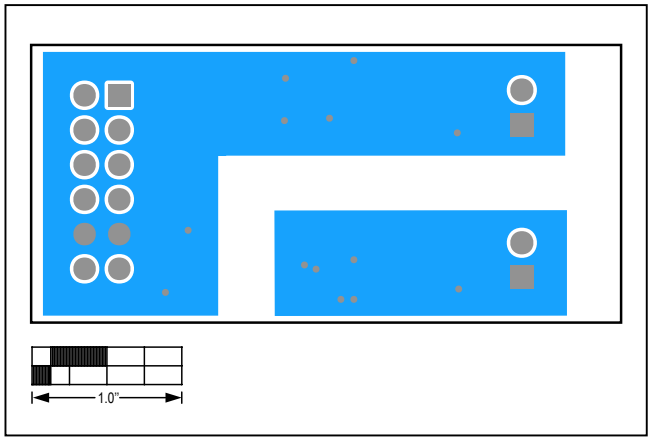
MAX22191PMB# EV Kit PCB Layout Diagrams



MAX22191PMB# EV Kit Component Placement Guide—Top Silkscreen



MAX22191PMB# EV Kit PCB Layout—Top Layer



MAX22191PMB# EV Kit PCB Layout—Bottom Layer

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/18	Initial release	—

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

Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.