Evaluation Board User Guide

MAX42500 Evaluation Kit

Evaluates: MAX42500

General Description

The MAX42500 evaluation kit (EV kit) is a fully assembled and tested application circuit designed for the MAX42500 seven-input industrial power system monitor. The board provides accessible test points for the seven monitored voltages, reset output, and other input signals. The evaluation board connects directly to the SDP Arduino®-compatible shield connector, allowing the MAX42500 to interface directly with the SDP controller, which serves as the main system controller.

This user guide contains the MAX42500 ACE plugin, which provides a user-friendly graphical user interface (GUI) that streamlines the evaluation and testing of the MAX42500 evaluation board or EV kit. It allows engineers and system developers to interact with the device without the need for extensive programming knowledge or custom firmware. By simplifying configuration and offering real-time performance insights, the software accelerates the understanding of the device's behavior and suitability for the intended application, ultimately reducing the overall evaluation time.

Analog Devices' Analysis, Control, Evaluation (ACE) software is available for use with the EV kit and can be downloaded from ADI's website.

Features

- Easy Access Inputs
  - IN1-IN7, with INM Pin for Remote Ground of IN6 and IN7
- ADDR Pin and Jumper for Different I^2C Address Settings
- EN0 and EN1 Jumpers for Easy Configuration
- RC Footprints on Monitoring Pins, with Jumpers for Resistor Bypass

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

Quick Start

Hardware Requirements

- MAX42500 EV kit
- SDP-K1 evaluation board
- Type-C USB connector
- PC/Laptop
- Adjustable DC supplies

Software Requirements

- ACE installer
- MAX42500 ACE plugin
- SDP EEPROM programmer

Procedure

Follow the steps to install the EV kit plugin, make the required hardware connections, and start operation of the kit. The ACE software can be launched without the hardware attached. It automatically recognizes the hardware when connections are made. Note that once communication is established with the hardware, it must be configured correctly for proper operation.

1) Download and install ACE software on the PC or laptop via this *link*.
2) The ACE launches automatically after installation and can also be launched by clicking its icon in the Windows Start menu.
3) Visit *MAX42500* product page under the software resources section to download the ACE plug-in board.max42500.<version>.
4) Install the plug-in board.max42500.<version>.This copies the program files to the designated local project folder.

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Detailed Description of the Hardware

The evaluation setup may require sets of SMUs or power supplies, which depends on the number of channels a user wishes to use. To connect the individual supplies to the EV kit's monitoring input channels, use alligator or test clips. The MAX42500 EV kit supply voltage 5V is provided by the SDP board available at the header P8 pin 5 by default, and it can be supplied by an external source through V_{SUP} pin. The I^2C communication lines are available at P11 header pin 9 (SDA_0) and 10 (SCL_0). Default jumper settings are summarized in *Table 1*. Nominal voltages for individual channels are set on their trimmed voltage settings. See the nominal voltage settings of the EV kit with the installed MAX42500ATEDA+T variant, as shown in *Table 2*.

Procedure

This evaluation kit is used with the following documents:

- MAX42500 data sheet
  - Registers and address details are found in the MAX42500 data sheet.

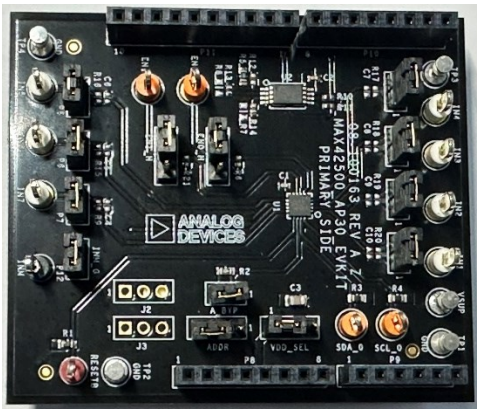


Figure 1. MAX42500 EV Kit

Table 1. Jumper Connection Guide

JUMPER	DEFAULT CONNECTION	FEATURES
J3	Shunt not installed	EN0 pin configuration
J2	Shunt not installed	EN0 pin configuration
ADDR	Shunt on pin 2 to pin 3	Shorts ADDR to ground for default address
A_BYP	Shunt installed	Bypass the series 100kΩ on the ADDR pin
P12	Shunt installed	Connects INM to PCB ground
P1-P7	Shunt installed	Bypass the series resistance for the RC filter
VDD_SEL	Shunt on pin 1 to pin 2	Connects V_{DD} to SDP_5V
EN0_H	Shunt on pin 1 to pin 2	Connects EN0 to V_{DD}
EN1_H	Shunt on pin 1 to pin 2	Connects EN1 to V_{DD}

Table 2. MAX42500 Nominal Voltages

INPUT	IN1	IN2	IN3	IN4	IN5	IN6	IN7
Nominal Voltage (V)	1.2	1.1	1.8	3.3	5.0	0.85	0.85

Change in nominal voltages, thresholds, reset mapping, watchdog timings, and other register-level configurations through the evaluation software GUI.

The *SDP-K1* features an STM32F469NIH6 Arm® Cortex®-M4 microcontroller, providing peripheral communication interfaces accessible to Arduino® Uno-compatible headers to MAX42500. The SDP-K1 can be powered by USB and/or an external power supply.

Setup and Operation

Mount the MAX42500 EV kit on top of the SDP controller board. Then connect the USB Type-C connector from SDP_K1 to a PC or laptop. The MAX42500 EV kit comes preprogrammed with default values stored in one-time programmable (OTP) memory.

Table 3. SDPK1 to MAX42500 Connection

SDP-K1	NAME	MAX42500 EV KIT PIN	NAME
P3_Pin 4	3V3	P8_Pin 4	3V3
P3_Pin 5	5V	P8_Pin 5	SDP_5V
P6_Pin 7, P3_Pin 6 and 7	GND	P11_Pin 7, P8_Pin 6 and 7	GND
P6_Pin 10	SCL	P11_Pin 10	SCL
P6_Pin 9	SDA	P11_Pin 9	SDA

Power-Up and Hardware Setup

To begin, configure the hardware setup as shown in *Figure 2*. The setup includes the following components:

- MAX42500 EV kit
- SDP-K1 controller board
- USB connector from SDP-K1 controller to PC/laptop

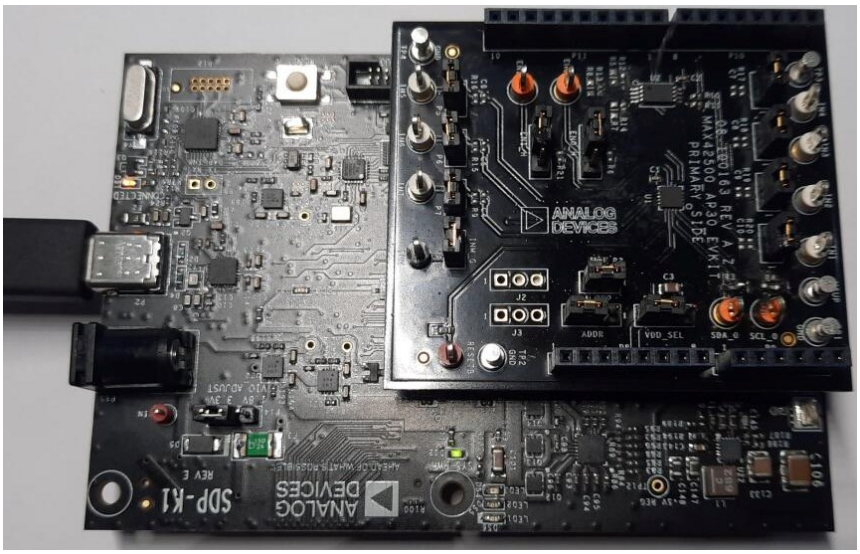


Figure 2. Evaluation Setup

Device Identification via EEPROM

The MAX42500 EV kit contains an EEPROM IC and should be programmed with a unique ID. This ID allows Analog Devices' ACE software to automatically detect and recognize the MAX42500 EV kit once it is properly programmed.

Important: If the EEPROM is not correctly programmed, the ACE software does not detect the EV kit. This programming step is required only once and remains valid for all future evaluation sessions. See the *EEPROM Programming Procedure* section.

Evaluation Procedure

Open the ACE software by double-clicking the ACE icon on the desktop or by selecting it from the Start menu.

1) Upon startup, the ACE software automatically detects the connected MAX42500 hardware.
2) Ensure that the SDP controller and EV kit are properly connected.
3) Once detected, the MAX42500 block appears in the workspace.
4) Double-click the block to open the device thumbnail and launch the graphical user interface (GUI).

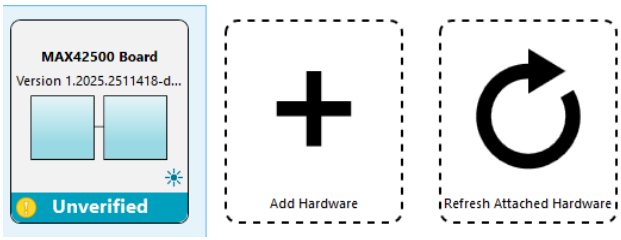


Figure 3. ACE Software with MAX42500 as detected hardware.

5) Check the **State** status located at the bottom left of the GUI; it should display **Good** to indicate that the GUI has loaded and is running correctly.

Figure 4. Evaluation Software State Status

Main Interface Layout

A simplified block diagram of the MAX42500 is included within the GUI. This provides a quick visual reference of the device's internal architecture, helping the user to understand the relationships between different subsystems. The GUI is divided into multiple sections, each corresponding to specific register groups, including:

- General configuration settings
- Registers for the following subsystems:
  - Voltage monitor
  - Flexible power sequence recorder
  - Watchdog

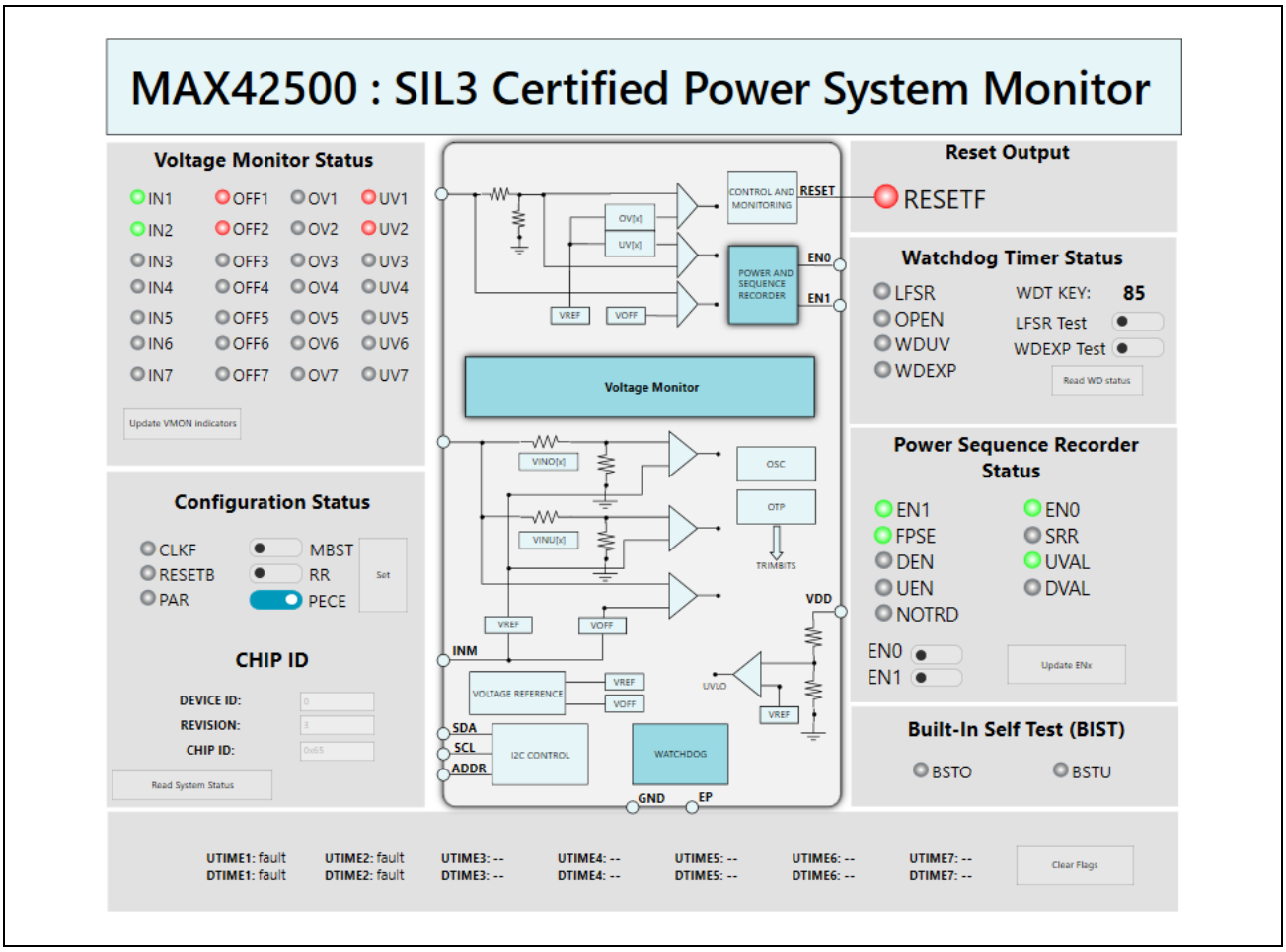


Figure 5. MAX42500 Evaluation Software GUI

Voltage Monitoring

The **Voltage Monitor Status** section is located within the main GUI and provides real-time monitoring of seven input channels (IN1–IN7). Each channel includes indicators for the following conditions:

- OFF – The monitored channel is below the off threshold of 0.25V.
- Overvoltage (OV) – Input exceeds the configured upper threshold.
- Undervoltage (UV) – Input falls below the configured lower threshold.

Indicator Colors

- Green: Normal operation
- Red: Fault detected

Accessing Configuration Settings

To configure the voltage monitor:

1) Double-click the **Voltage Monitor** block in the GUI.
2) The configuration tab opens, allowing the user to:
   - Enable or disable individual channels.
   - Set nominal voltage values.
   - Adjust OV/UV thresholds.
   - Map channels to specific reset outputs.

Flexible Power Sequence Recorder

The **Flexible Power Sequence Recorder Status** panel is located on the right side of the GUI. It displays real-time information about monitored voltage sequencing events. The recording is triggered by level changes or transitions on the EN0 pin and can also be configured to respond to the EN1 pin. Manual intervention on the setup may be required to execute transition of the EN pins. The EN0 and EN1 pins on the EV kit have a provision to connect to V_{CC} and GND through a jumper connection.

Key Indicators:

- UVAL – Indicates a valid power-up sequence
- DVAL – Indicates a valid power-down sequence

Additional fault status registers are also displayed.

Timestamps:

- UTIME and DTIME registers show the recorded timestamps for power-up and power-down events.
- These are located at the bottom section of the GUI.

Accessing Configuration Settings:

To configure the recorder settings:

1) Double-click the **Flexible Power Sequence Recorder** block in the GUI.
2) In the configuration tab, select the preferred recording time from the dropdown menu.

Watchdog Subsystem

The **Watchdog Status** panel is also located on the right side of the GUI and provides visual indicators for watchdog-related faults.

Status Indicators:

- WDUV – No watchdog update received
- LFSR – Incorrect LFSR key detected
- WDEXP – Watchdog update expired

Simulating Faults:

Two test buttons are provided to simulate watchdog fault conditions:

- LFSR Test – Simulates an invalid LFSR key; triggers the LFSR indicator.
- WDEXP Test – Simulates a missed watchdog update; triggers the WDEXP indicator.

Note: Both tests will assert the $\overline{\text{RESET}}$ output for the duration of the configured reset timeout period. This may not be visible for the $\overline{\text{RESET}}$ output indicator as a fault, as the $\overline{\text{RESET}}$ timeout period is within the millisecond range. This can be validated through scope measurement to validate the status. Use 1000ms watchdog period as default settings for optimal performance of the GUI.

Accessing Configuration Settings:

To adjust watchdog settings:

1) Double-click the **Watchdog** block in the GUI.
2) In the configuration tab, the user can:
    - Enable or disable the watchdog
    - Select the mode of operation:
        - Simple-windowed
        - Challenge-response
    - Set the $\overline{\text{RESET}}$ hold-up time

The MAX42500 Plugins

Memory Map

The evaluation software has a memory map that lists all the OTP registers. This can be viewed side-by-side with the GUI for easy debugging. The user has the option to download and upload the configured settings for future use and documentation.

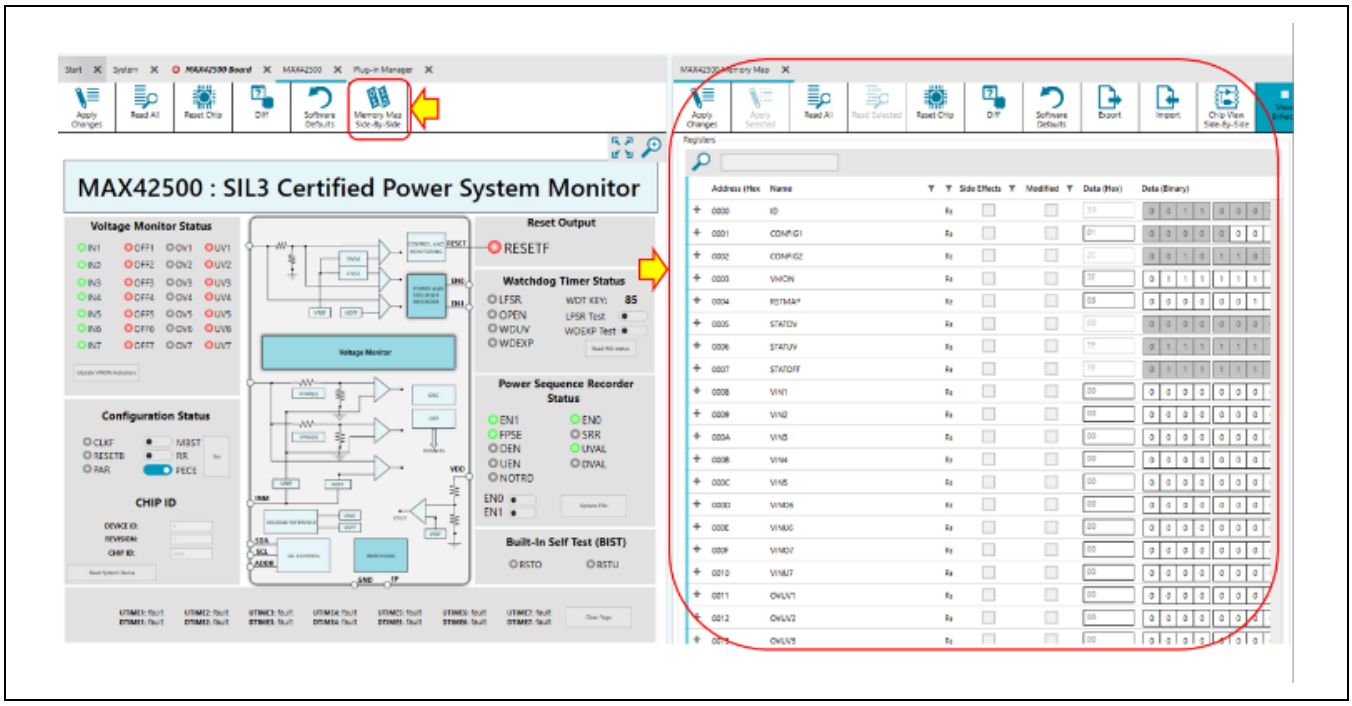


Figure 6. MAX42500 Memory Map

Managing Plug-ins and Updates

The evaluation software features a plug-in manager that helps users easily manage software components and stay up-to-date.

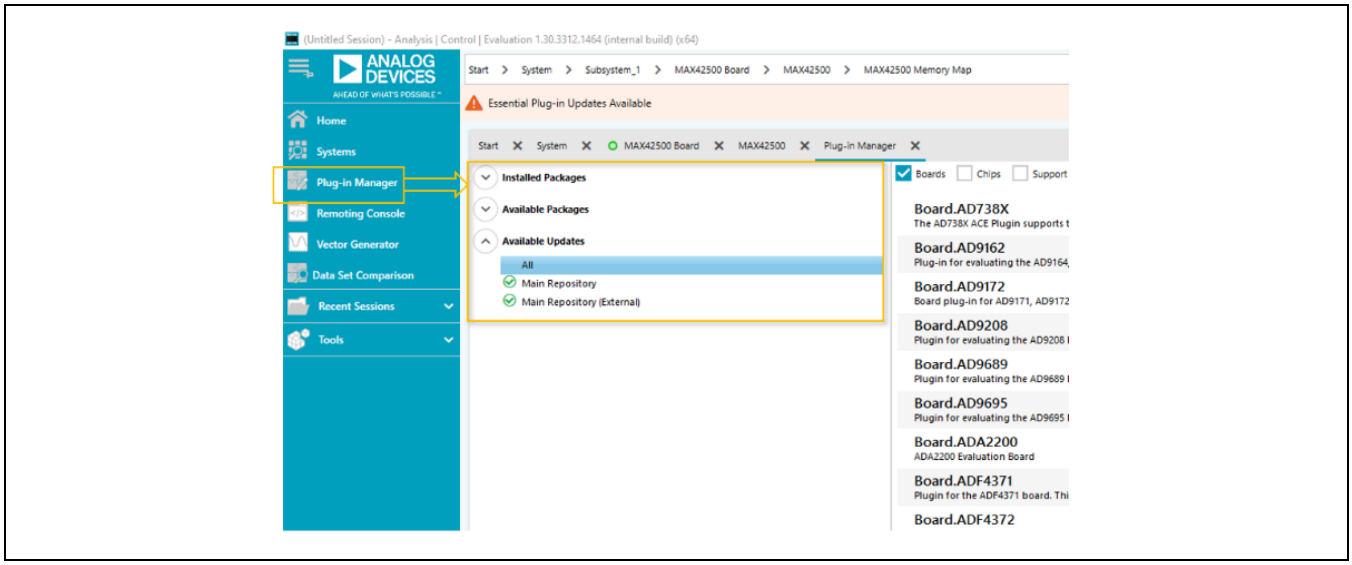


Figure 7. Plug-Ins Manager

Key Functions:

1) View installed plug-ins: See all currently installed packages.
2) Manage available plug-ins: Browse and install additional supported plug-ins.
3) Check for updates: Automatically identify available updates for installed packages.
4) Simplified updating: Install plug-in updates with just a few clicks.

Tip: *Regularly checking the plug-in manager ensures the evaluation tools are using the latest supported features and improvements.*

EEPROM Programming Procedure

Note: All EV kits should have EEPROM data once ordered, this procedure should be done only if the EEPROM data is incorrect or corruptted.

Requirements:

1) SDP drivers – *SDPDrivers.exe*.
2) SDP EEPROM programmer software – *SDPEEPROMProgrammerInstall_1.0.97.0.exe*.
3) SDP-K1 controller board – *SDP-K1 Evaluation Board | Analog Devices*.
4) SDP-K1 firmware – *SDP_K1_1.14.0.1.hex*.
5) MAX42500 EV kit into which the EEPROM contents should be written.

Installing SDP Drivers

1) Download the SDP driver from this link: *SDPDrivers.exe*.
   Note: Disconnect all the SDP boards and close the SDP EEPROM programmer application before installing the SDP drivers.
2) Run the downloaded SDPDrivers.exe file.
3) Accept the software license agreement and then click Next.
4) Leave the components selection to the default and click Next.
5) Leave the installation location to the default and click Install.

Installing SDP EEPROM Programmer

1) Download link: *SDPEEPROMProgrammerInstall_1.0.97.0.exe*.
2) Run the SDPEEPROMProgrammerInstall_1.0.97.0.exe file.
3) Click the **Next** button in the installer window.

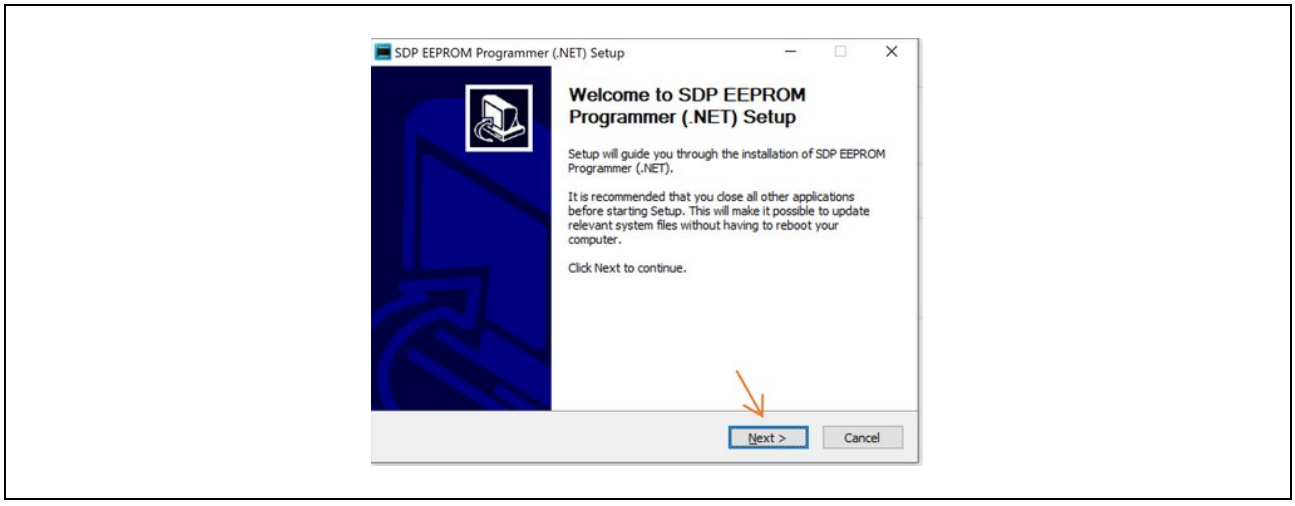


Figure 8. SDP EEPROM Programmer Setup

4) Agree to the software license agreement.

5) Change the destination folder if required, or leave it as the default. Then click the **Install** button.

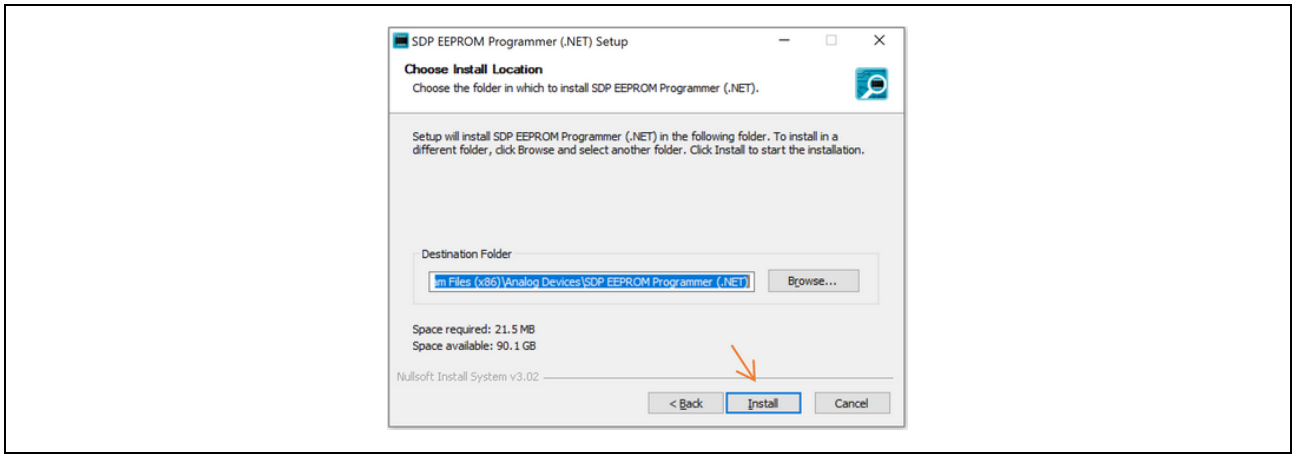


Figure 9. SDP EEPROM Programmer Installation

6) After the installation is complete, click the **Close** button.

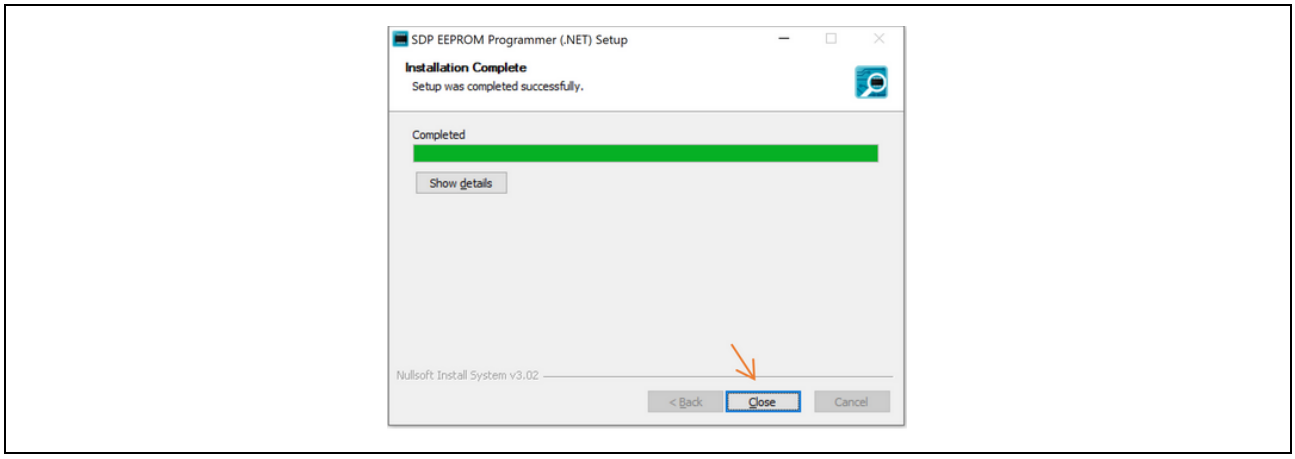


Figure 10. SDP EEPROM Programmer Complete Installation

7) The **SDP EEPROM Programmer (.NET)** launcher appears in the Apps list in the Start menu.

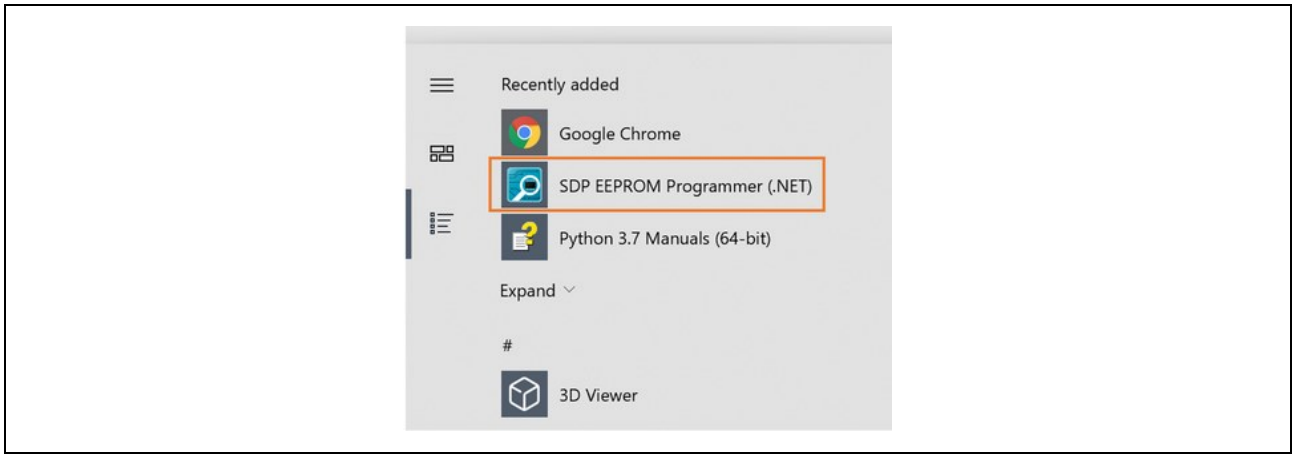


Figure 11. SDP EEPROM Programmer Available from Start Menu

Setting Up the SDP-K1, Daughter Board, and SDP EEPROM Programmer.

1) Connect the SDP-K1 board to the PC via USB and open the SDP EEPROM programmer application. Then click **Connect**.

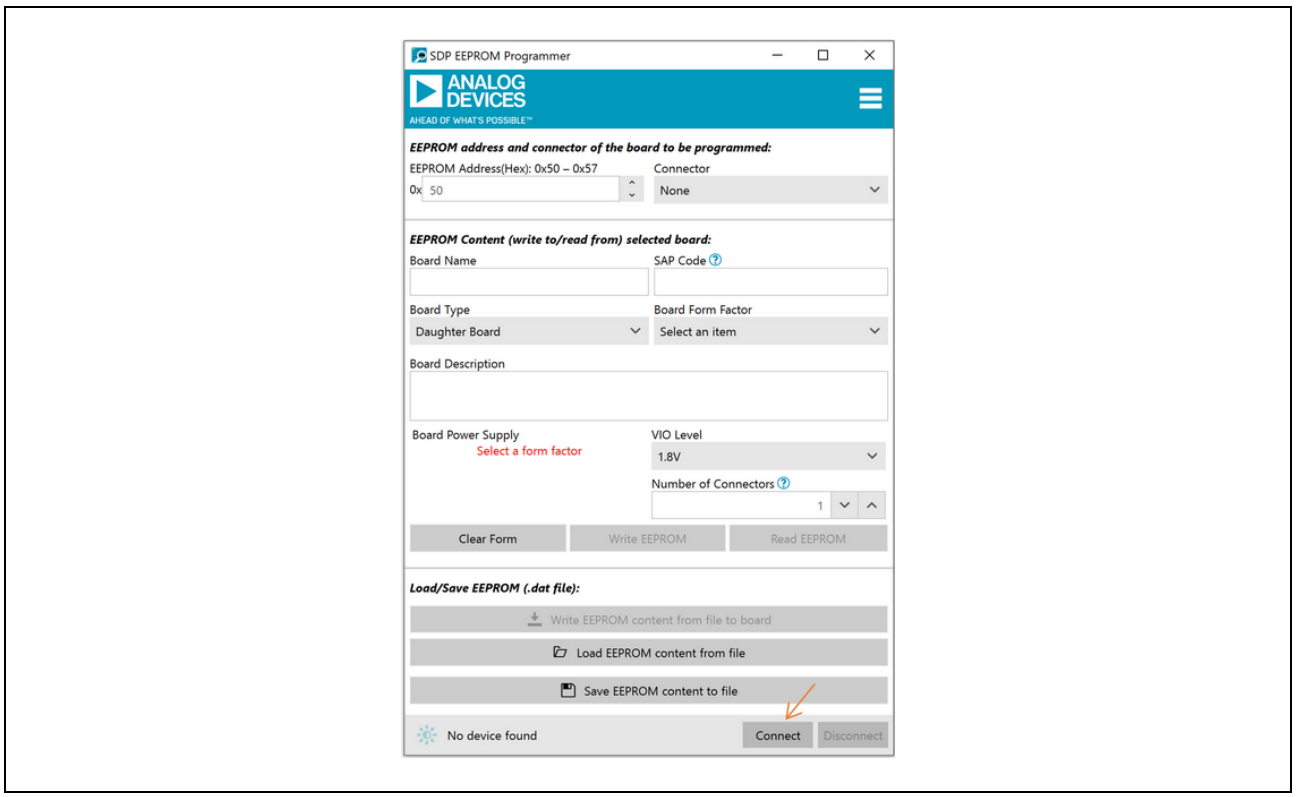


Figure 12. EEPROM Programming GUI

2) On successful connection, the details of the connected controller board appear at the bottom.

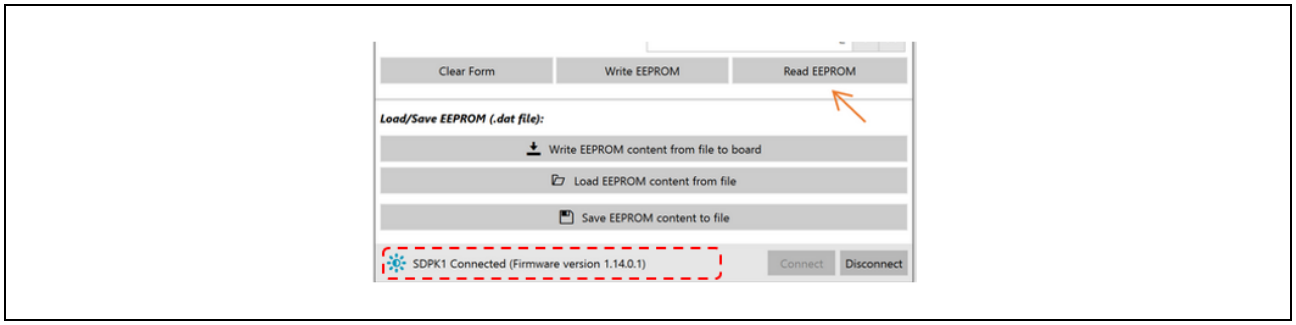


Figure 13. EEPROM Programming Connectivity Status

Writing EEPROM Data

1) Select the **EEPROM address** and **Connector** type of the daughter board.

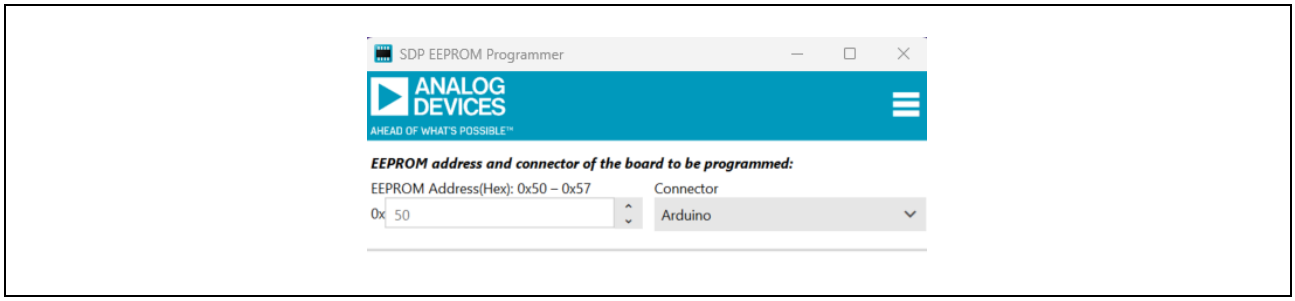


Figure 14. Setting EEPROM Address and Connector Type

2) Enter custom data in the fields provided. Do not leave any field empty.

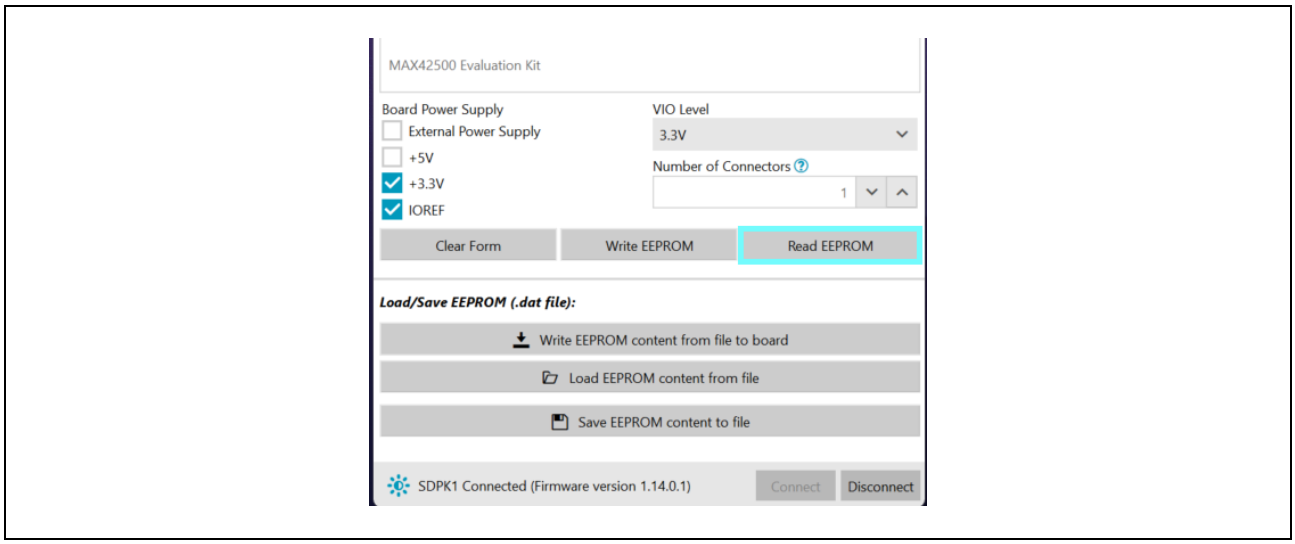


Figure 15. Reading EEPROM Content

3) Click the **Write EEPROM** button.

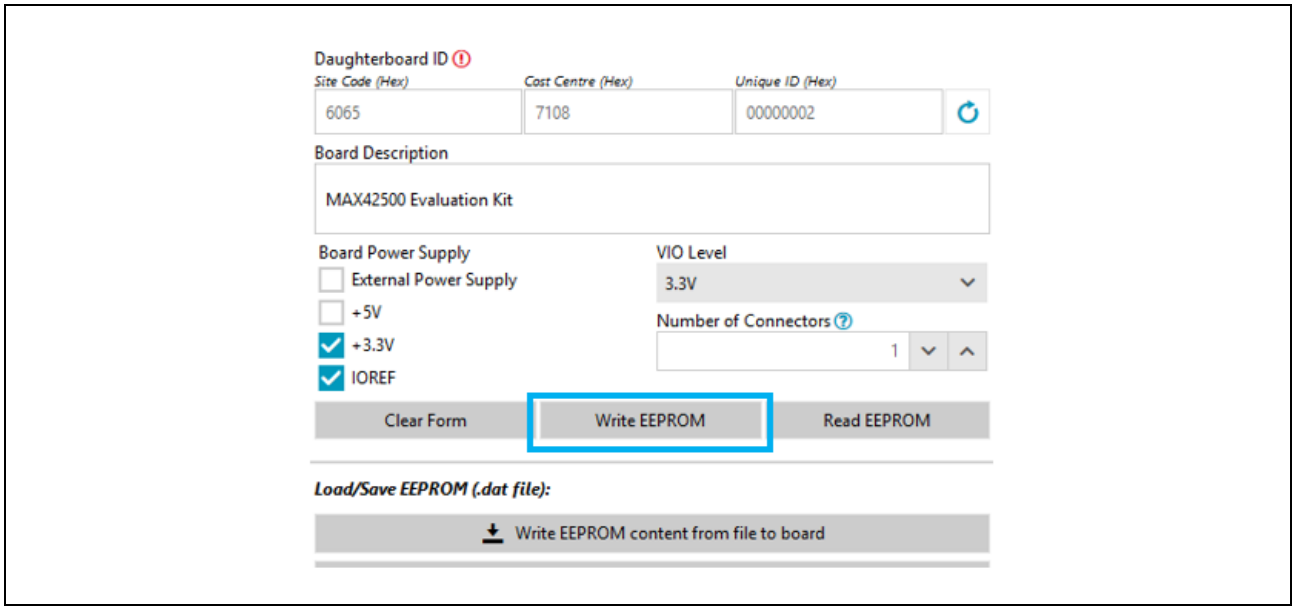


Figure 16. EEPROM Writing Button

4) On successfully writing the EEPROM, a dialog with a completion message pops up, as shown in *Figure 17*.

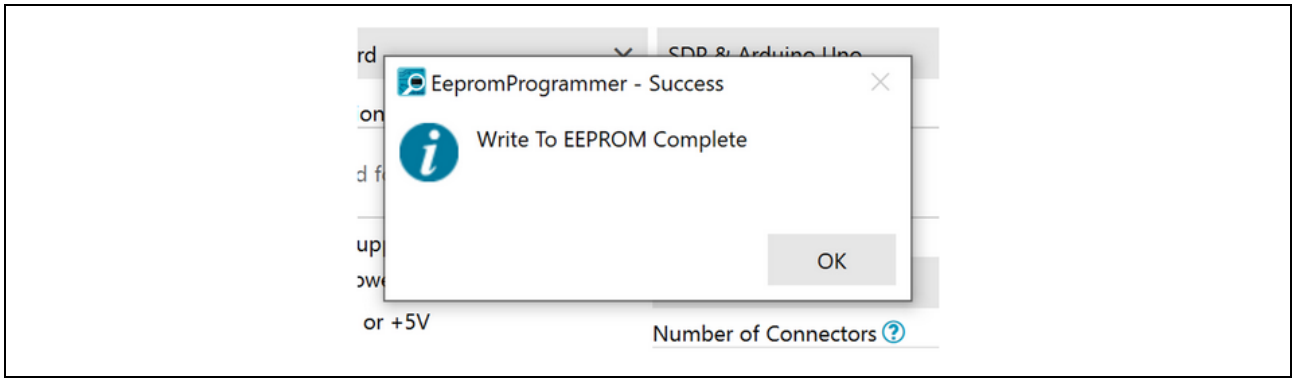


Figure 17. EEPROM Writing Completed Prompt

Ordering Information

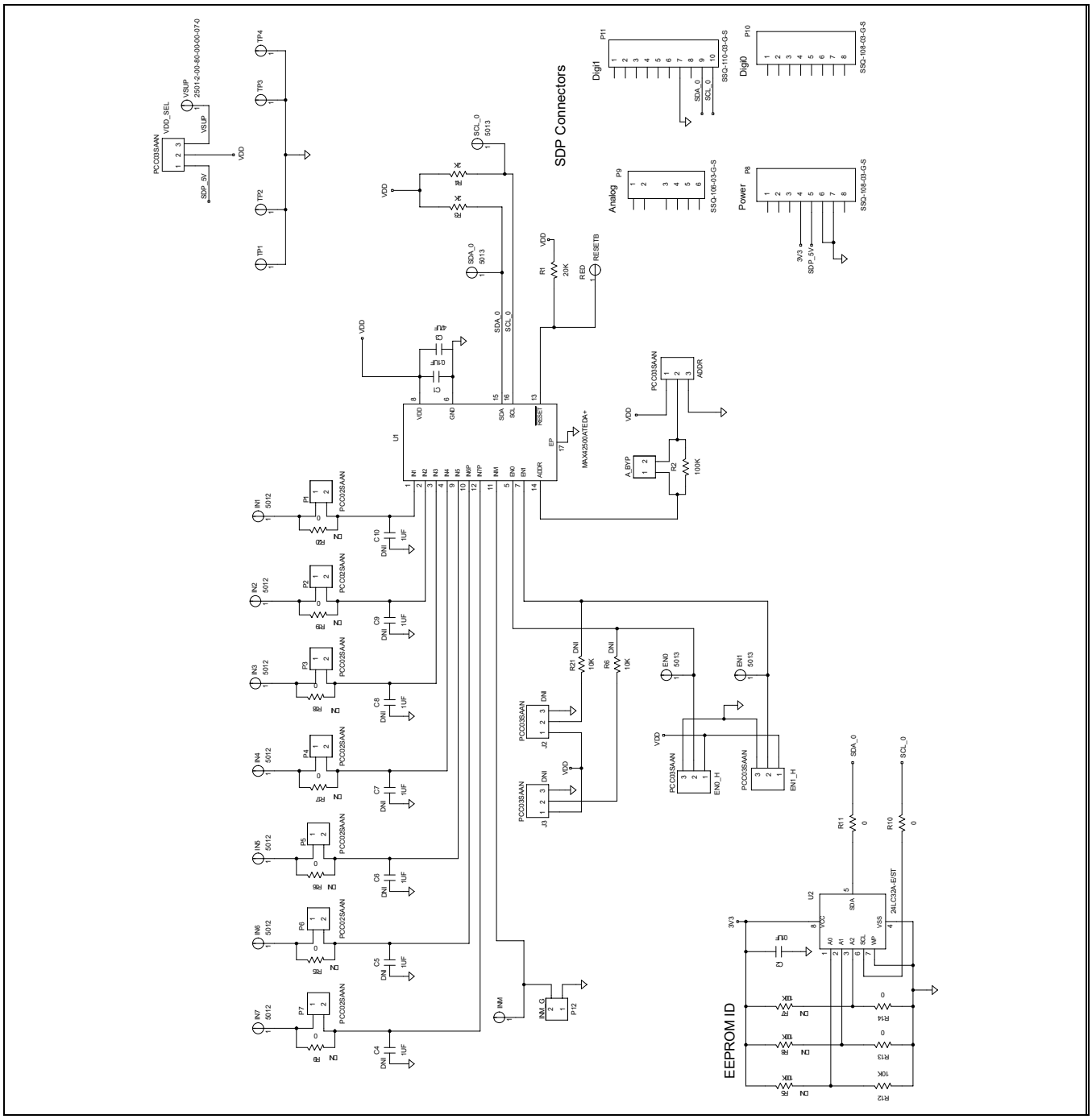
PART	TYPE
MAX42500EVKIT#	EV Kit

#Denotes RoHS compliance.

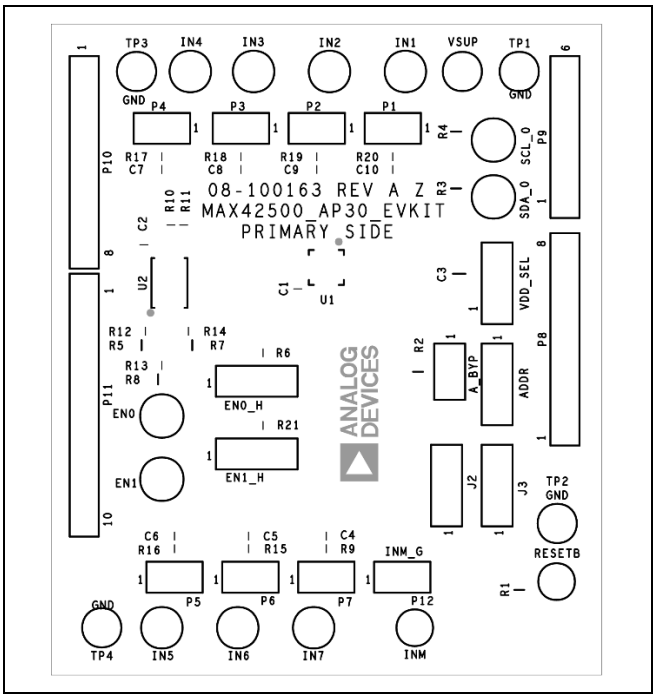
MAX42500 EV Kit Bill of Materials

QTY	PART REFERENCE	VALUE	DESCRIPTION	MANUFACTURER PART NUMBER	MANUFACTURER
1	N/A	N/A	PCB	N/A	PCB MANUFACTURING
4	ADDR, EN0_H, EN1_H, VDD_SEL	PCC03SAAN	CONNECTOR, MALE, THROUGH HOLE, BREAKAWAY, STRAIGHT THROUGH, 3PINS	PCC03SAAN	SULLINS
9	A_BYP, P1, P2, P3, P4, P5, P6, P7, P12	PCC02SAAN	CONNECTOR, MALE, THROUGH HOLE, BREAKAWAY, STRAIGHT THROUGH, 2PINS	PCC02SAAN	SULLINS
2	C1, C2	0.1µF	CAPACITORS CERAMICS, 0.1µF, 10V, 10%, X7R 0402	0402ZC104KAT2A	AVX CORPORATION
1	C3	4.7µF	CAPACITOR CERAMIC, SMT (0805), 4.7µF, 10%, 10V, X7R, AUTO	CGA4J3X7R1A475K125AB	TDK
4	EN0, EN1, SCL_0, SDA_0	5013	TEST POINT, PIN DIA = 0.125INCHES, TOTAL LENGTH = 0.445INCHES, BOARD HOLE = 0.063INCHES, ORANGE, PHOSPHOR BRONZE WIRE SILVER PLATE FINISH	5013	KEYSTONE
7	IN1, IN2, IN3, IN4, IN5, IN6, IN7	5012	CON, TP, TH, 1P, PIN DIA = 0.125INCHES, TOTAL LENGTH = 0.445INCHES, BOARD HOLE = 0.063INCHES, WHITE, PHOSPHOR BRONZE WIRE SILVER PLATE FINISH	5012	KEYSTONE
1	INM	BLK	CONN-PCB TEST POINT BLACK	5011	KEYSTONE ELECTRONICS
2	P8, P10	SSQ-108-03-G-S	CONNECTOR, FEMALE, THROUGH HOLE, .025INCHES, SQ POST SOCKET, STRAIGHT, 8PINS	SSQ-108-03-G-S	SAMTEC INC
1	P11	SSQ-110-03-G-S	CONN-PCB RCPT 25MIL SQ POST 2.54MM PITCH	SSQ-110-03-G-S	SAMTEC
1	P9	SSQ-106-03-G-S	CONN-PCB RCPT 25MIL SQ POST 2.54MM PITCH	SSQ-106-03-G-S	SAMTEC
1	R1	20K	RESISTOR, SMT (0603), 20kΩ, 1%, ±100PPM/°C, 0.1000W	MCR03EZPFX2002	ROHM
4	R10, R11, R13, R14	0	RESISTORS, SMD 0Ω JUMPER 1/16W 0402 AEC-Q200	AC0402JR-070RL	YAGEO
1	R12	10K	RESISTOR, SMT (0402), 10kΩ, 1%, ±100PPM/°C, 0.0630W	CRG0402F10K	TE CONNECTIVITY
1	R2	100K	RESISTOR, SMT (0603), 100kΩ, 0.10%, ±25PPM/°C, 0.1000W	ERA-3AEB104	YAGEO
2	R3, R4	2K	RESISTORS, SMT (0603), 2KΩ, 1%, ±100PPM/°K, 0.2500W	CRCW06032K00FKEAHP	VISHAY
1	$\overline{\text{RESET}}$	RED	CONN-PCB TEST POINT RED	5010	KEYSTONE ELECTRONICS
5	TP1, TP2, TP3, TP4, V_{SUP}	2501-2-00-80-00-00-07-0	CONN-PCB SOLDER TERMINAL TEST POINT TURRET 0.094 MTG. HOLE PCB 0.062 INCH THK	2501-2-00-80-00-00-07-0	MILL-MAX
1	U1	MAX42500ATEDA+	IC, FOUR- TO SEVEN-INPUT INDUSTRIAL POWER SYSTEM MONITOR FAMILY, TQFN-EP	MAX42500ATEDA+	ANALOG DEVICES
1	U2	24LC32A-E/ST	IC, EEPROM, SMD, TSSOP, 8P, 32-KBIT I2C SERIAL EEPROM, 2.5V TO 5.5V, AEC-Q100	24LC32A-E/ST	MICROCHIP TECHNOLOGY

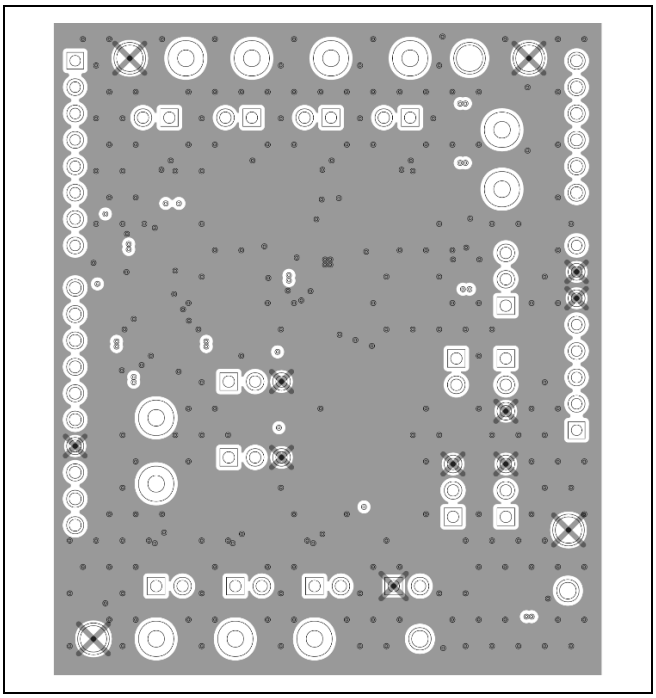
MAX42500 EV Kit Schematic



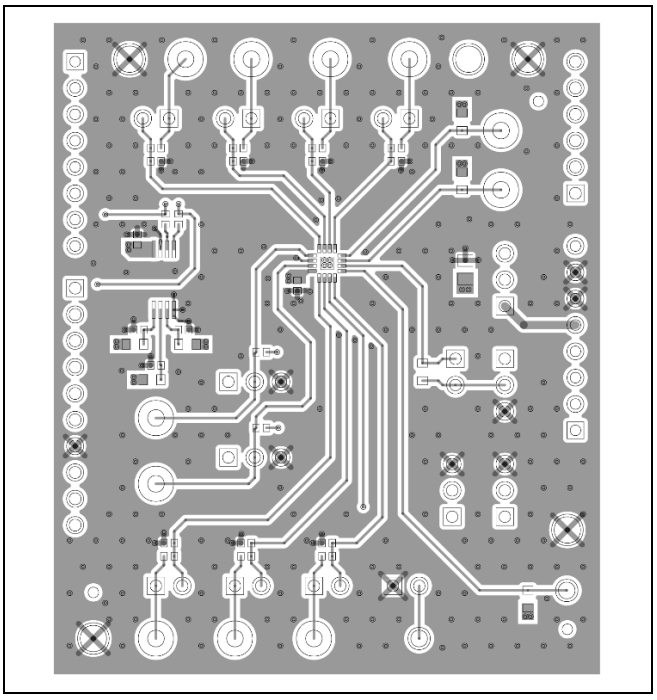
MAX42500 EV Kit PCB Layout



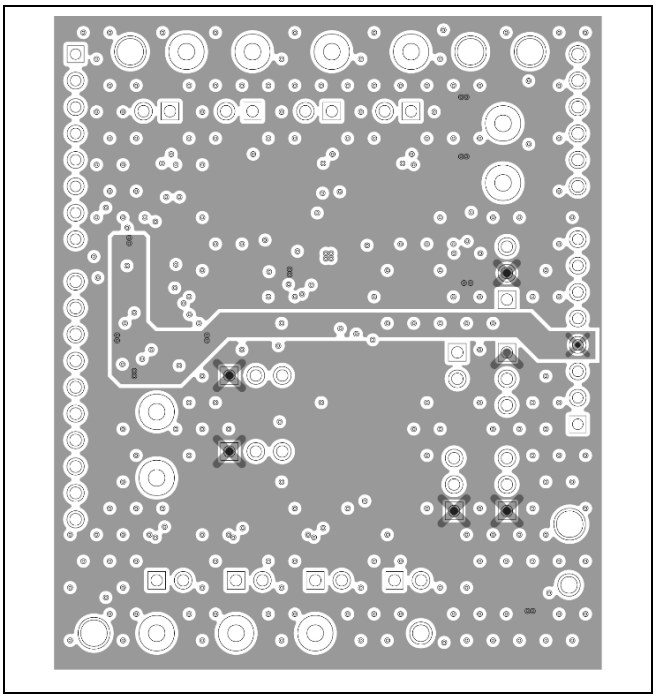
MAX42500 EV Kit Component Placement Guide—Top Silkscreen



MAX42500 EV Kit PCB Layout—Layer 2

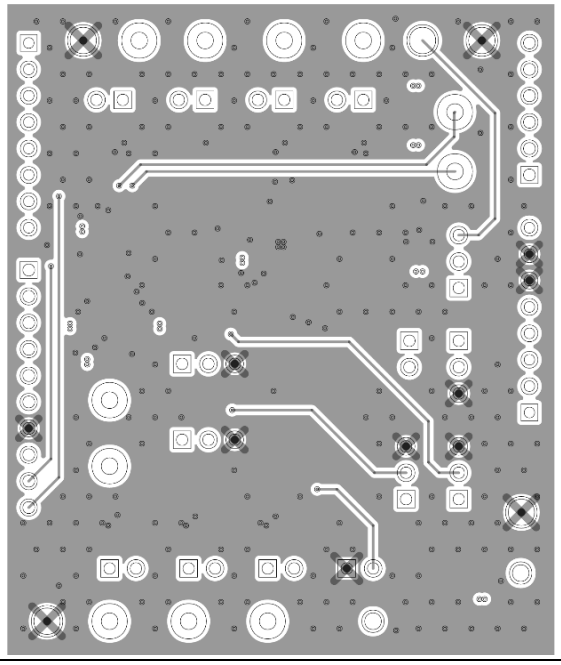


MAX42500 EV Kit PCB Layout—Top

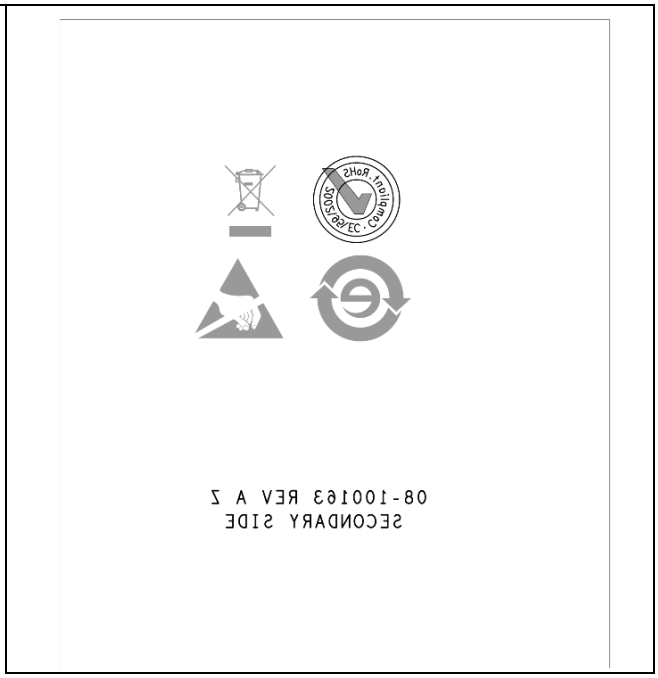


MAX42500 EV Kit PCB Layout—Layer 3

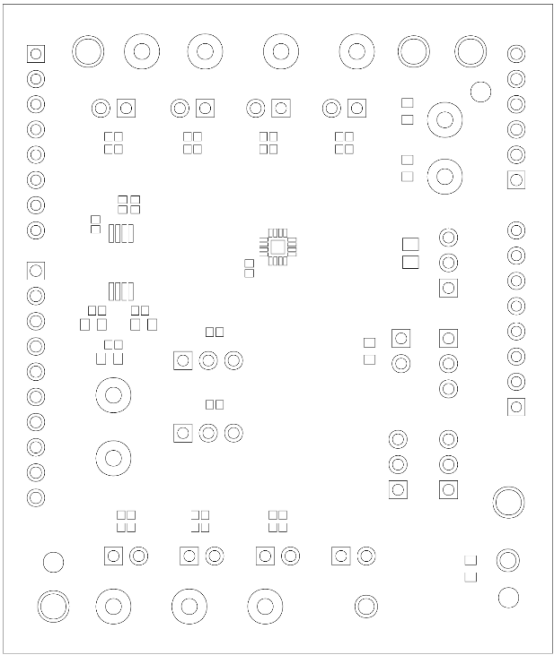
MAX42500 EV Kit PCB Layout (continued)



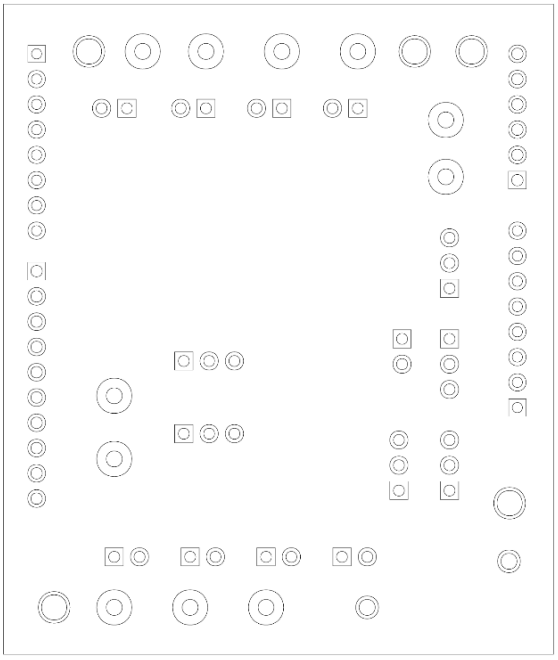
MAX42500 EV Kit PCB Layout—Bottom



MAX42500 EV Kit Component Placement Guide—Bottom Silkscreen



MAX42500 EV Kit PCB Layout—Top Mask



MAX42500 EV Kit PCB Layout—Bottom Mask

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/23	Initial release	–
1	5/26	Included ACE plug-in evaluation procedures to reflect the new EV kit design	1–17

Notes