Click here for production status of specific part numbers.

MAX31341 Evaluation Kit

Evaluates: MAX31341B

General Description

The MAX31341 evaluation kit (EV kit) is a fully assembled and tested PCB to evaluate the MAX31341B, low-current, real-time clock with I2C interface and power management. The EV kit operates from a single supply and the onboard crystal provides a 32.768 kHz clock signal. This device is accessed through an I2C serial interface.

The MAX31341 EV kit provides the hardware and software user interface (GUI) necessary to evaluate the MAX31341B. The EV kit includes a MAX31341B installed. The EV kit connects to the PC through a DS3900H2 I2C circuit board and a mini-USB cable.

Features

- Easy Evaluation of the MAX31341B
- +1.6V to 3.6V Single-Supply Operation
- Proven PCB Layout
- Fully Assembled and Tested

EV Kit Contents

- Assembled MAXIM DS3900H2 I2C circuit board
- Mini-USB cablec
- Assembled circuit board including MAX31341B

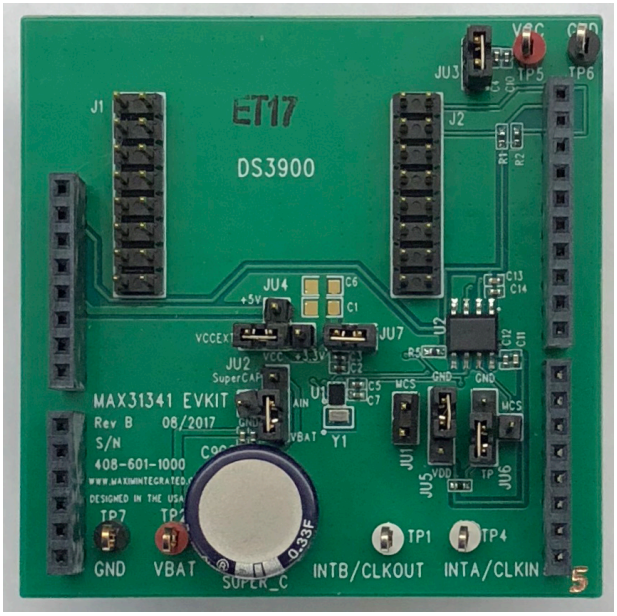
***Ordering Information* appears at end of data sheet.**

Quick Start

Required Equipment

- One DC power supply capable of supplying +1.6 to +3.6V (typical 3.0V used in the following instructions)
- One pico ammeter for measuring the current
- One oscilloscope
- One mini-USB cable
- One assembled DS3900H2 I2C circuit board
- One MAX31341 EV kit

EV Kit Photo



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Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

1) Place the MAX31341 EV kit on a nonconductive surface to ensure that nothing on the PCB gets shorted to the workspace.
2) Set the jumpers of JU2, JU3 JU4, JU5, JU6, and JU7, as shown on (Figure 1). Leave JU1 open.
3) With the output of the power supply set to +3.0V and disabled, connect the positive terminal of the DC supply to the **VCC** and negative terminal to the **GND** of the EV kit.
4) Connect the **DS3900H2 I²C Circuit Board** to the EV kit at the location shown as DS3900 (Figure 2).
5) Connect the mini-USB cable between the **DS3900H2 Circuit Board** and PC/laptop.
6) Turn on the +3.0V DC power supply.
7) Visit **here** to download the latest version of the MAX31341 real-time clock EV kit software, and run the control software.
8) Open the MAX31341 real-time clock EV kit software. MAX31341 Real-Time Clock EV Kit Software Monitor page will be opened and it shows USB Connected (Figure 3).
9) At power up, MAX31341B is in idle mode; no clock is running yet. On the **Monitor** page and under the **Real Time Clock Configuration** section, press the **Read** button and then the **Write** button to start the clock. Verify clock has started counting by pressing Start RTM button in the Real-Time Clock Configuration section. Press Stop RTM to go back to configuration view.

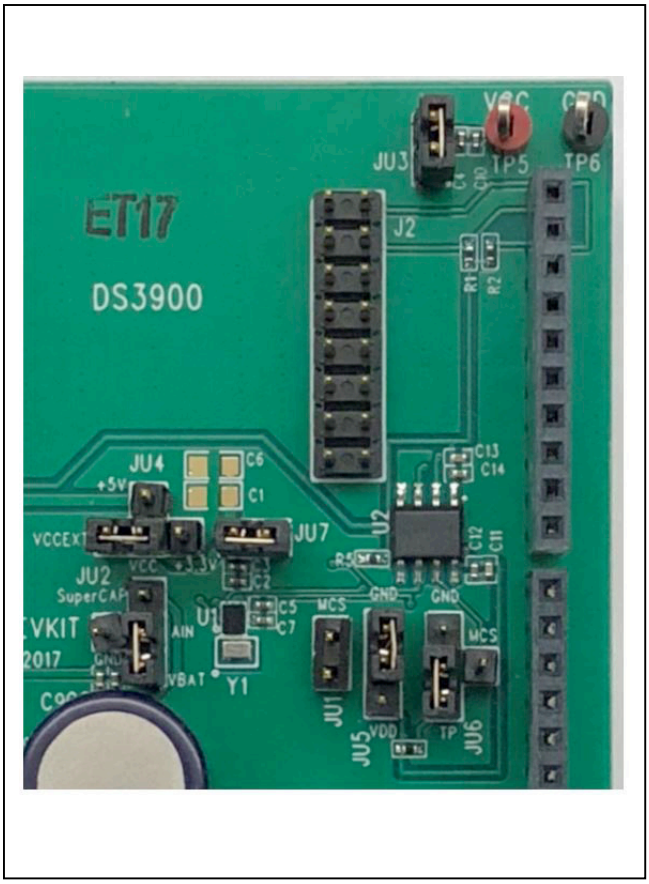


Figure 1. Jumpers Position

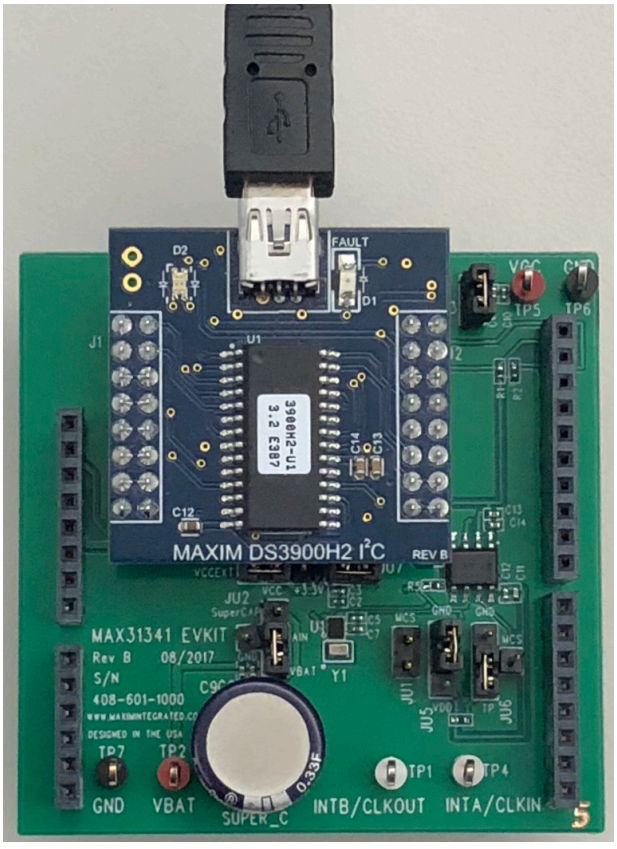


Figure 2. USB Connection

Detailed Description

The MAX31341B low-current real-time clock (RTC) is timekeeping device that provides an extremely low

timekeeping current, which permits longer life from a power supply. The MAX31341B supports 6pF high-ESR crystals, which broaden the pool of usable crystals for the devices. This device is accessed through an I^2C serial interface. The device features one digital Schmitt trigger inputs and one programmable threshold analog input. The device generates an interrupt output on a falling or rising edge of the digital input (D1), or when the analog input (AIN) voltage crosses a programmed threshold in either direction.

Other features include two time-of-day alarms, interrupt outputs, a programmable square-wave output, a serial bus timeout mechanism and a 64-byte RAM for user data storage. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The MAX31341B also includes an input for synchronization. When a reference clock (e.g., 32kHz, 50Hz/60Hz Power Line, GPS 1PPS) is present at the CLKIN pin and the enable external clock input bit (ECLK) is set to 1, the MAX31341B RTC is frequency-locked to the external clock and the clock accuracy is determined by the external source. In case of external clock failure, the clock is switched to the crystal oscillator.

Functional Test Procedure

Current Draw at Time-Keeping Operation

1) To measure the current draw under normal Real-Time Clock conditions without any interrupt or clock input/output, do the following:
   - On **Clock Configuration** window, press the **Read** button,
   - Uncheck **Enable** of **CLKIN** and **CLKOUT**,
   - Select **1Hz** for **Frequency**,
   - Press **Write** button.
2) Connect the Pico Ammeter between 3.0V power supply and V_{CC} of the EV kit.
3) Remove the jumper from JU3 and connect another 3.0V supply to the upper-side of the JU3. This supplies power to the I2C interface of DS3900H2. This setup allows measurements of current draw from MAX31341B only.
4) On Registers Page (Figure 5), under Register Map window, press Read button and make sure that the value of register 0 (Config_reg1) shows 0x41. Otherwise, set it to 0x41 and press Write button. Now the reading in the picometer is the current from MAX31341B only. It should be around 210nA.

Note: All instruments need to be disconnected from the I/O ports of the IC, since any loading would add current consumption. Also, make sure the waiting duration from power up to the current reading is long enough (30min) due to on-board capacitor charging.

5) Disconnect the additional 3.0V from **JU3**, put the jumper on **JU3**, remove the Pico Ammeter, and connect 3.0V power supply directly to the **VCC** of the EV kit.

Setting the Clock

Under **Real Time Clock Configuration** section, enter the start point of date and time, and then click **Write**. The clock starts to count from the set point after the log shows Write successful. Click **Start RTM** to verify the clock counting from the written start date and time.

Clock Output measurement

Under the **Clock Configuration** section and **CLKOUT** sub-section, check the **Enable** box and the desired frequency. Then click **Write**. The clock output can be monitored using an oscilloscope connected to **INTB/CLKOUT**. A frequency counter can also be used to measure the clock frequency accurately.

Alarm Interrupt Output

Under **Alarm 1 Configuration** section select the **Repetition Rate** to set the alarm scenario (such as Min, Sec match at 02:00). Check **Enable Interrupt** box and then click **Write**. Under the **Flag Status** section of the **Interrupts/Flags** page, press the **Read** button twice to clear alarm flag bit if it has been previously set. When the Real-Time clock reaches the alarm time set in Alarm 1 Configuration, alarm output at **INTA/CLKIN** will go from high to low. It will change to high again by clicking the **Read** button on the **Flags Status** window. The interrupt status can also be checked by pressing **Read** button under **Flags Status** section in the **Interrupts/Flags** window. Repeat the same steps for Alarm2, but measure the alarm interrupt output at **INTB/CLKOUT**.

Note: When testing alarm interrupts, CLKIN and CLKOUT, under Clock Configuration section need to be disabled.

Analog Interrupt

Go to **Interrupts/Flags Page** (Figure 4), under **Analog Input (AIN)** section, check the **Enable Intr** box. Select the polarity (rising edge for example) and threshold for AIN. Then, click **Write Interrupts/Timer**. Clear all previously set Interrupt bits by pressing **Read** button under **Flags Status** section. Now apply a voltage slightly above the selected threshold to **Analog IN** (JU2-AIN). The interrupt output at **INTA/CLKIN** should go from high to low. It will change back to High by pressing **Read** button under **Flags Status** section.

Digital Interrupt

Under **Digital Input (D1)** section, check the **Enable Intr** box. Select the **Rising Edge** under polarity and click **Write Interrupts/Timer**. Then apply V_{CC} to **D1** input by changing jumper **JU5** to lower side. The interrupt output at **INTA/CLKIN** should go from high to low. It will change back to high by pressing **Read** button under **Flags Status** section. Disable/uncheck Enable Intr for both **Analog Input and Digital Input** and click **Write Interrupts/Timer**.

Timer Interrupt

Clear all interrupt bits by pressing **Read** button under **Flags Status** section. Enable the Timer and Interrupt by checking **Timer Enable** and **Enable Intr** under **Timer Configuration** section. Select **16Hz** on **Timer Frequency**. Set the **Timer Init** number such as 200. Click **Write Interrupts/Timer**. When the **Timer Count** reading reaches to 0 from 200, the interrupt output at **INTA/CLKIN** should go from high to low.

Power Mode Select

Under **Power Mode Configuration** section, **Comparator Operation Mode** sub-section there are two selections: **AIN Interrupt Mode** for normal I/O operation; **Power Mgmt & Trickle Charger** mode for Power management and Trickle Charger mode for charging the on-board super capacitor as a backup battery.

In **Power Mgmt & Trickle Charger** mode, the **Power Supply Mode** can be used to select the source of power supply. **Force VCC** means the IC uses main supply, **Force VBACK** means the IC gets supply from backup battery, from either the on-board super capacitor or external backup supply injected from **JU5**. In **Auto mode**, supply switches between **VCC** and **VBACK** automatically based on the threshold set under the Analog Interrupt section. To verify which supply is utilized, Clock Output can be monitored while changing power supply mode with VCC and VBACK in different voltages. Also, super capacitor voltage at **Analog IN** (JU2-AIN) can be charged to “VCC minus diode drop voltage” at selectable rate in the pull-down table.

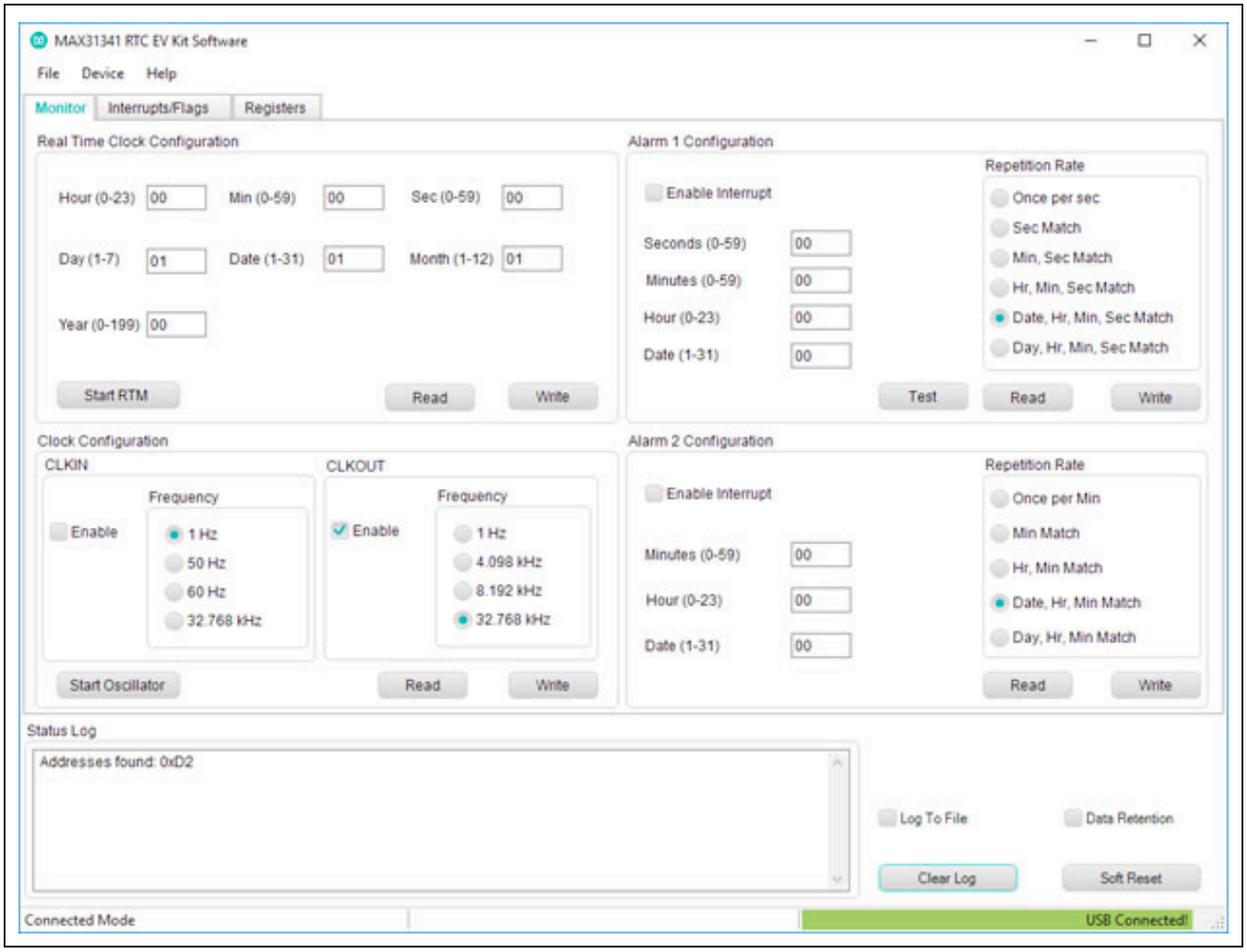


Figure 3. MAX31341 RTC EV Kit Software—Monitor Page

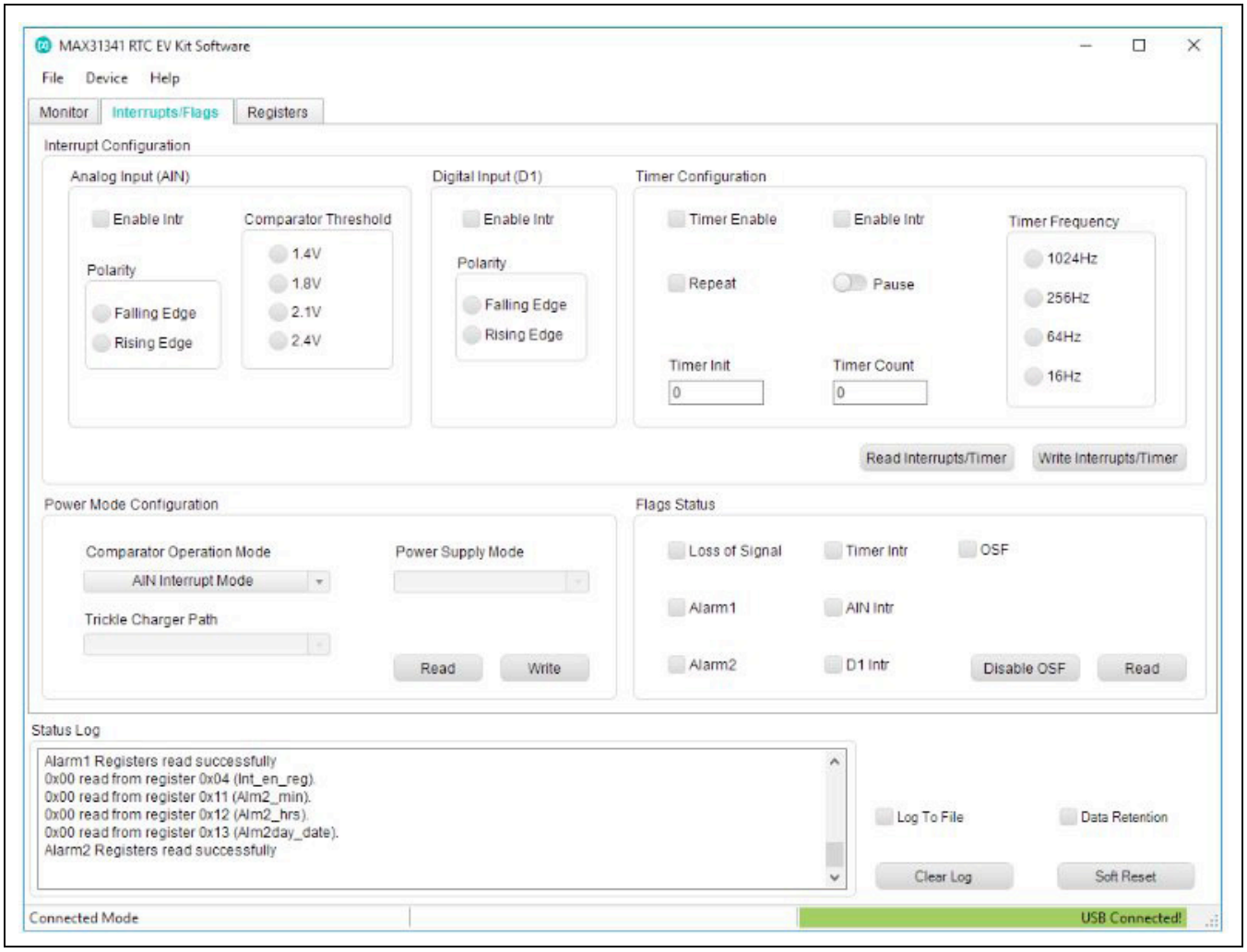


Figure 4. MAX31341 RTC EV Kit Software—Interrupts/Flags Page

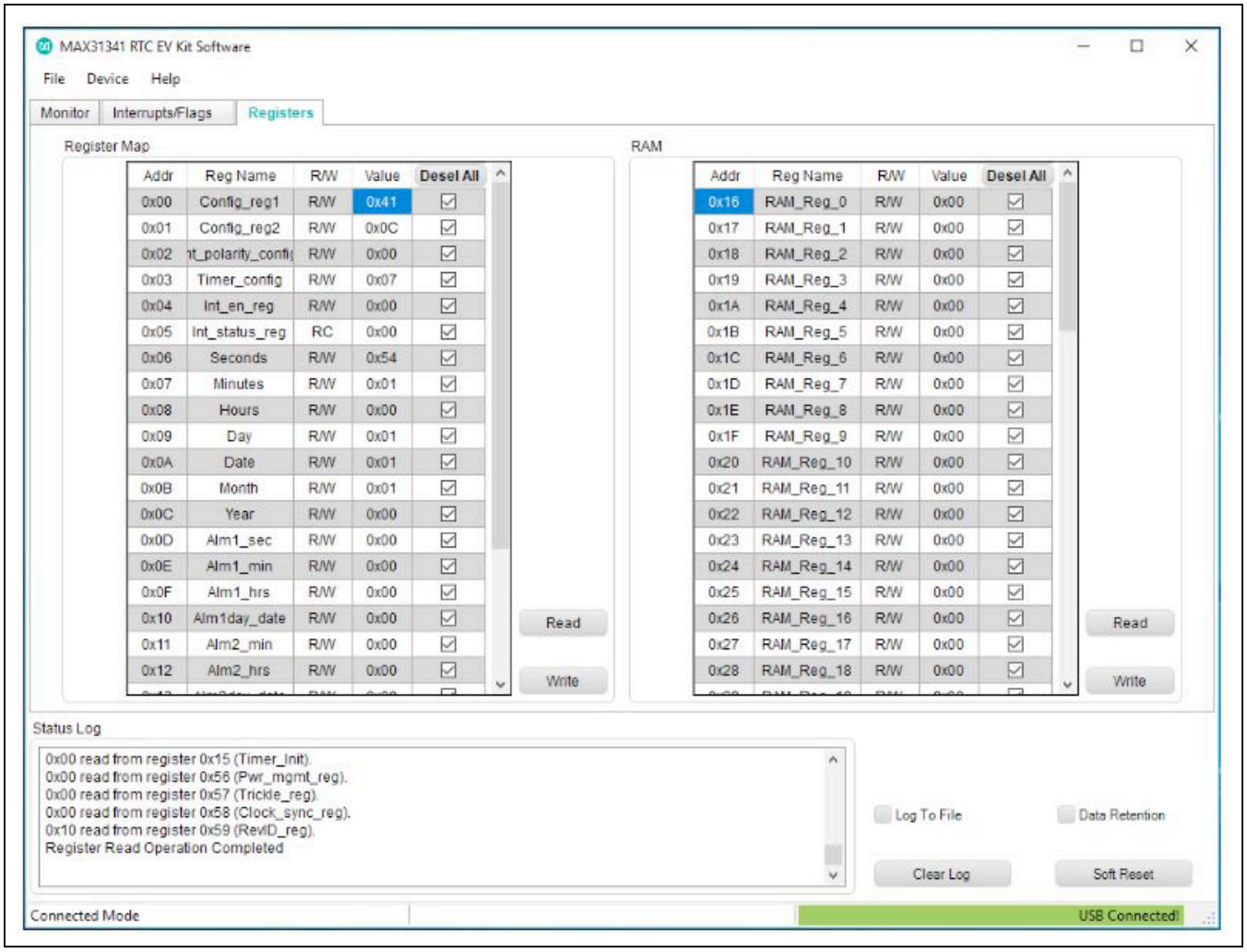


Figure 5. MAX31341 RTC EV Kit Software—Registers Page

Component Suppliers

SUPPLIER	WEBSITE
Murata	http://www.murata.com/
Yageo	http://www.yageo.com/
Eaton	http://www.eaton.com/
Amphenol FCI	http://www.fci.com/
Samtec	https://www.samtec.com/
TE Connectivity	http://www.te.com/usa-en/home.html
Keystone Electronics	http://www.keyelco.com/
ECS	https://www.ecsxtal.com/
ON Semiconductor	http://www.onsemi.com/

Note: *Indicate that you are using the MAX31341 when contacting these component suppliers.*

Ordering Information

PART	TYPE
MAX31341EVKIT#	EV Kit

#Denotes RoHS compliant.

MAX31341 EV Kit Bill of Materials

Item	Qty	Reference	Part #	Manufacturer	Description	Value	PCB DECAL	Notes
1	2	C1, C6	NL		10UF_10%_TR\TAJR\610AVX_0805	NL	805	805
2	4	C2, C4-C5, C8	GRM155R70J105KA12	Murata	1µF ±10% 6.3V Ceramic Capacitor X7R 0402 (1005 Metric)	1µF	0402\GRP15\MURAA	0402\GRP15\MURAA
3	6	C3, C7, C9-10, C12, C14	GRM155R70J104KA01	Murata	0.1µF ±10% 6.3V Ceramic Capacitor X7R 0402 (1005 Metric)	100nF	0402\GRP15\MURAA	0402\GRP15\MURAA
4	2	C11, C13	GRM15XR71C103KA86	Murata	10nF ±10% 16V Ceramic Capacitor X7R 0402 (1005 Metric)	10nF	0402\GRP15\MURAA	0402\GRP15\MURAA
5	3	R1-R2, R5	RC0402FR-0710K	YAGEO	10 kOhms ±1% 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	10 kOhm	RES1005	RES1005
6	1	R13	RC0402FR-074K7	YAGEO	4.7 kOhms ±1% 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	4.7 kOhm	RES1005	RES1005
7	2	J1-J2	67997-116HLF	Amphenol FCI	2x8 pin Headers		HEADER16	
8	1	J3	SSQ-110-04-G-S	Samtec	10 PIN POLARIZED HEADER		HEADER10	HEADER10
9	1	J4	SSQ-106-04-G-S	Samtec	6 PIN POLARIZED HEADER		HEADER6	HEADER6
10	2	J6-7	SSQ-108-04-G-S	Samtec	8 PIN POLARIZED HEADER		HEADER8	HEADER8
11	3	JU1, JU3, JU7	9-146280-0-02	TE Connectivity	2 Positions Header		SIP\2P	
12	1	JU5	9-146280-0-03	TE Connectivity	3 Positions Header		SIP\3P	
13	3	JU2, JU4, JU6	9-146280-0-03	TE Connectivity	3 Positions Header		SIP\3P	
			9-146280-0-01	TE Connectivity	1 Positions Header		SIP\1P	
14	2	TP1, TP4	5012	Keystone Electronics	Test Point- White		MTHOLE_1	
15	2	TP2, TP5	5010	Keystone Electronics	Test Point- Red		MTHOLE_1	
16	2	TP6, TP7	5011	Keystone Electronics	Test Point- Black		MTHOLE_1	
17	1	SUPER_C	KW-5R5C334-R	Eaton	Super cap		KW-5R5C334-R	
18	1	Y1	ECS-.327-6-12-TR	ECS	Crystal, 32.768kHz ±20ppm, 6pF 90 kOhms 2-SMD, No Lead	ECS-.327-6-12-TR	ECS-.327-6-12-TR	
19	1	U1	MAX31341BEWC+	Maxim	RTC IC; 12WLP		12WLP	
20	1	U2	NLSX4373DR2G	ON Semiconductor	Buffer ; 1.5V- 5.5V; TRANSLATOR 2BIT DUAL BIDIR 8SOIC		8-SOIC	
21	1	DS3900H2	DS3900H2	Maxim	Controller board			

MAX31341 EV Kit Schematic

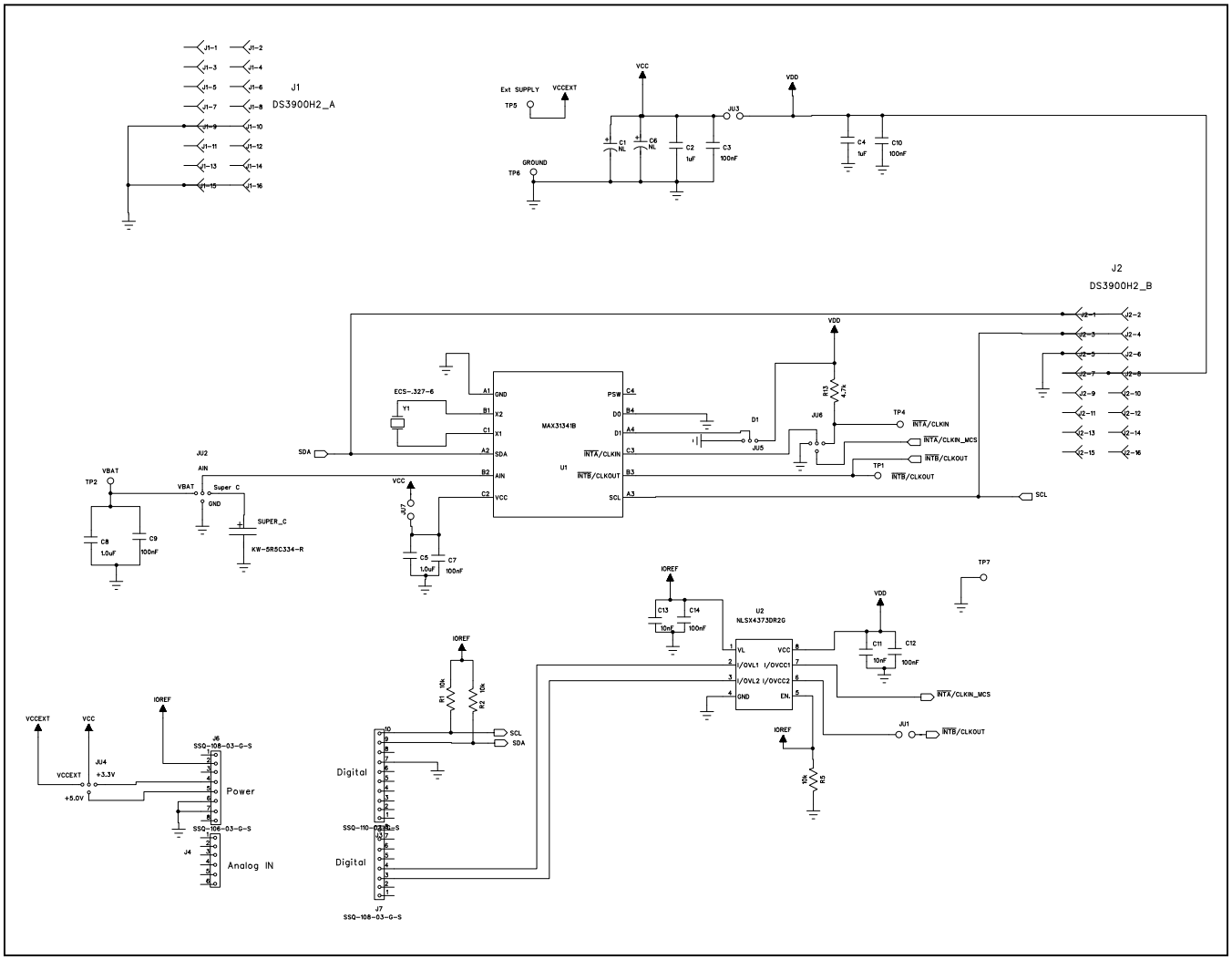
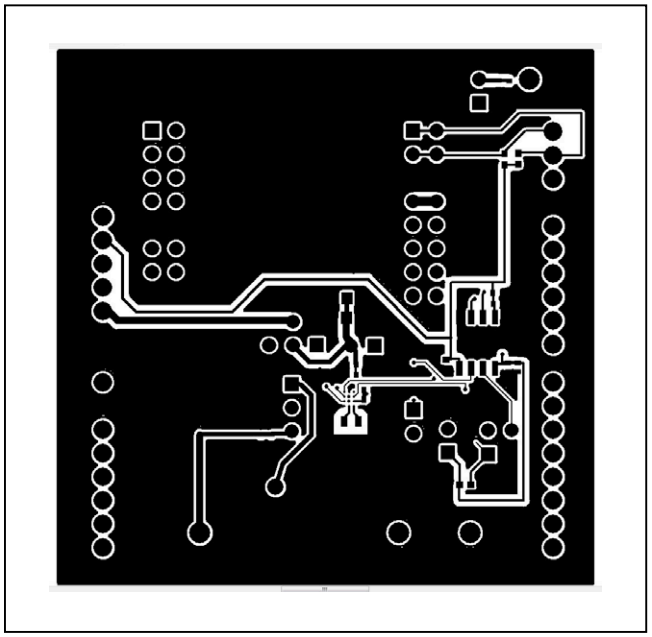
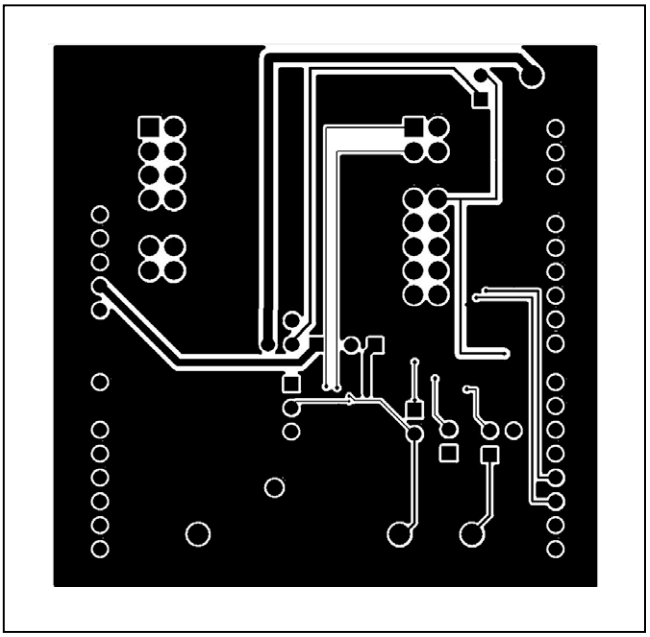


Figure 6. MAX31341 EV Kit Schematic

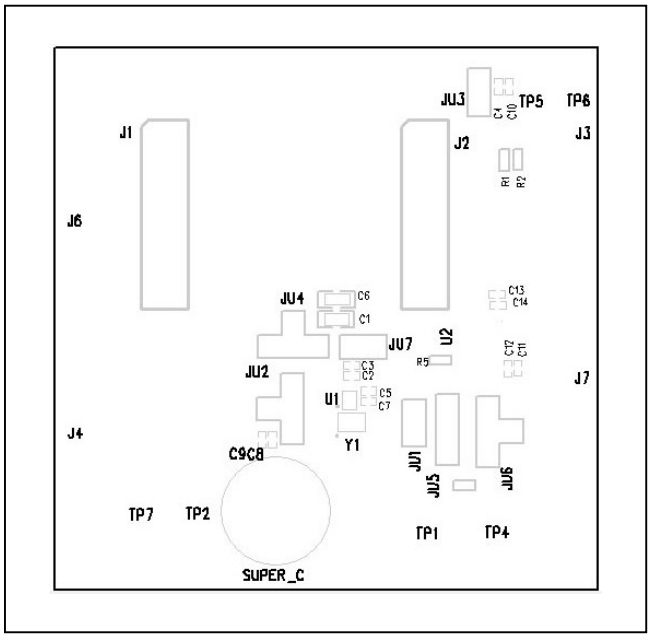
MAX31341 EV Kit PCB Layout Diagrams



MAX31341 EV Kit—PCB Top Layer



MAX31341 EV Kit—PCB Bottom Layer



MAX31341 EV Kit—Assembly Top

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/18	Initial release	—
1	2/19	Updated data sheet figures, BOM, and PCB layout diagrams	1–12
2	3/19	Updated title to include MAX31341B, updated BOM and schematic	1–12

