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MAX31328 Shield

Evaluates: MAX31328

General Description

The MAX31328 shield is a fully assembled and tested PCB to evaluate the MAX31328. The MAX31328 is a low-cost, extremely accurate, I²C real-time clock (RTC) with an integrated temperature compensated crystal oscillator (TCXO) and crystal. The shield operates from a single supply, either from USB or external power supply. The device incorporates a battery input and maintains accurate timekeeping when the main power to the device is interrupted. The integration of the crystal resonator enhances the long-term accuracy of the device and eliminates the external crystal requirement in the system. This device is accessed through an I²C serial interface provided by a MAX32625 PICO board.

The shield provides the hardware and software user interface (GUI) necessary to evaluate the MAX31328. It connects to the PC through a MAX32625 PICO board and a Micro-USB cable.

Features

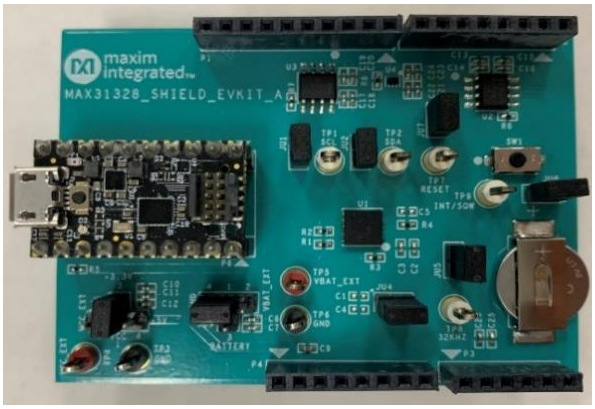
- Easy Evaluation of the MAX31328
- +2.3V to +5.5V Single-Supply Operation
- Proven PCB Layout
- Fully Assembled and Tested

Shield Contents

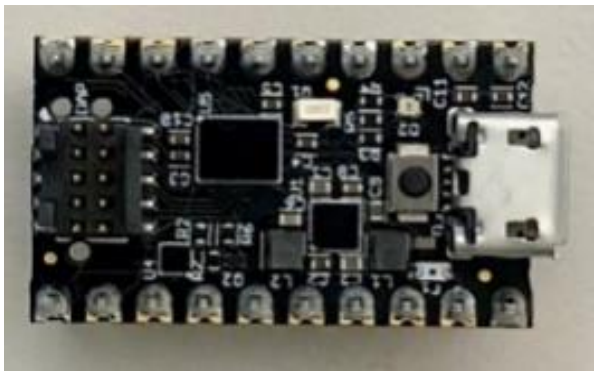
- Assembled MAX32625 PICO controller board
- Micro-USB cable
- Assembled circuit board including MAX31328NELB+

Ordering Information appears at end of data sheet.

Shield Photo



PICO Board Photo



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Quick Start

Required Equipment

- One pico ammeter for measuring the current
- One oscilloscope and one oscilloscope probe
- One PC or laptop with Microsoft Windows® 7 or later
- One USB A male to micro B male cable
- One assembled and programmed MAX32625 PICO board
- One MAX31328 shield

Procedure

The shield is fully assembled and tested. Use the following steps to verify board operation.

1. Place the MAX31328 shield on a nonconductive surface to ensure that nothing on the PCB gets shorted to the workspace.
2. Verify that all jumpers are in their default position as shown on Table 1.
3. Connect the MAX32625 PICO board to the shield at the location shown as MAX32625 PICO (Figure 1).
4. Connect the USB A male to micro B male cable between the MAX32625 PICO board and PC/Laptop.
5. Go to the MAX31328 shield product page to download and install the latest version of MAX31328 RTC SHIELD Software.
6. Open the MAX31328 RTC SHIELD Software, shown as Figure 2.

Table 1. Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Connect SCL for I2C communication
	Open	Disconnect SCL
JU2	1-2*	Connect SDA for I2C communication
	Open	Disconnect SDA
JU4	1-2*	Connect VCC to MAX31328 IC
	Open	Disconnect VCC to MAX31328 IC
JU5	1-2*	Connect 32kHz output for Arduino®/Mbed™
	Open	Disconnect 32kHz output
JU6	1-2*	Connect square wave output or interrupt for Arduino/Mbed
	Open	Disconnect square wave output
JU7	1-2*	Connect reset pinout for Arduino/Mbed
	Open	Disconnect reset pinout
JU8	1-2	Connect VCC supply to external DC supply
	1-3*	Connect VCC supply to +3.3V on board supply
	1-4	Connect VCC supply to +5.0V on board supply
	Open	VCC open
JU9	1-2	Connect VBAT supply to external DC supply
	1-3	Connect VBAT supply to +3.0V coin cell battery
	1-4*	Connect VBAT supply to ground
	Open	VBAT open

**Default position*

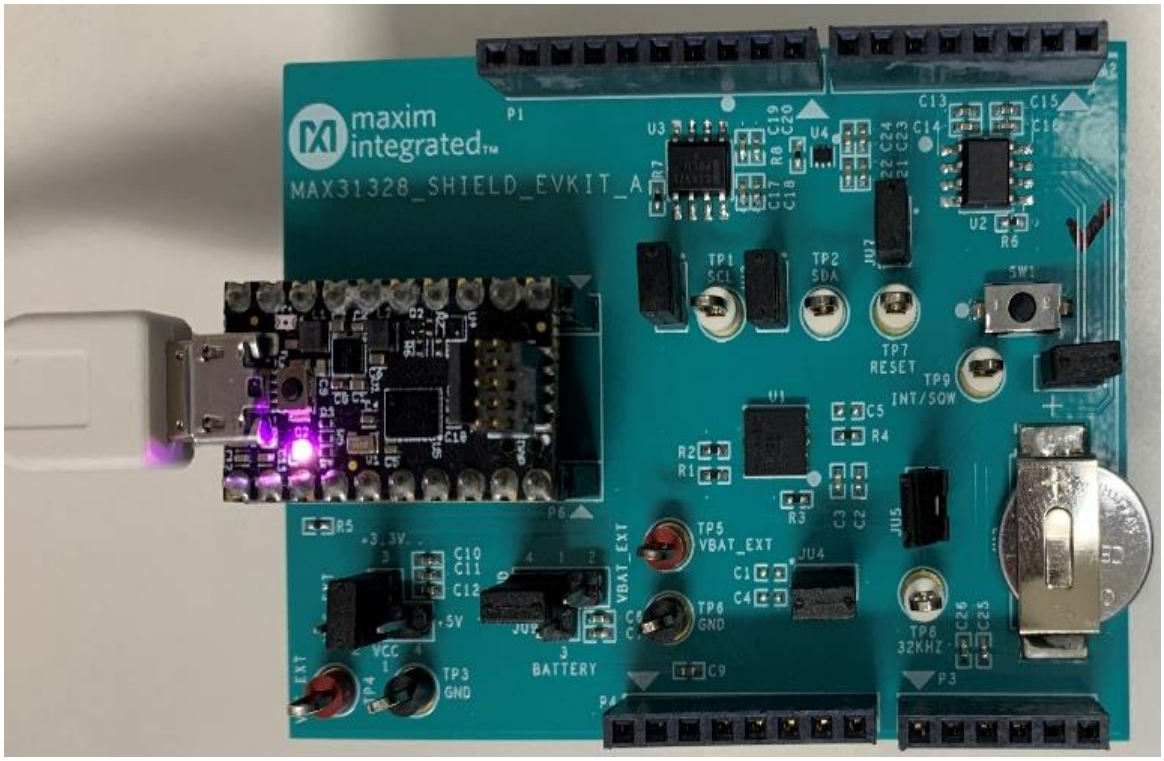


Figure 1. Connection and Setup

Detailed Description of Hardware

The MAX31328 shield is a low-cost, extremely accurate, I²C real-time clock (RTC) with an integrated temperature-compensated crystal oscillator (TCXO) and crystal. The device incorporates a battery input and maintains accurate timekeeping when the main power to the device is interrupted. The integration of the crystal resonator enhances the long-term accuracy of the device and eliminates the external crystal requirement in the system. The MAX31328 is available in a 10-pin LGA package.

The RTC maintains 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 clock operates in either 24-hour or 12-hour format with an AM/PM indicator. Two programmable time-of-day alarms and a programmable square-wave output are provided. Address and data are transferred serially through an I²C bidirectional bus. A precision temperature-compensated voltage reference and comparator circuit monitors the status of V_{CC} to detect power failures and automatically switch to the backup supply when necessary. Additionally, the $\overline{RST}$ pin is monitored as a pushbutton input for generating a microprocessor reset.

Detailed Description of Software

Real Time Monitoring

To monitor the time and date, on **Configuration & Time** page, under **RTC Configuration** group box, enable **Oscillator Enable** toggle button**,** and under **Real Time Monitoring** group box, check **Auto Update** checkbox for continuous reading.

Battery current draw in Time-Keeping Mode

To measure the battery current draw under normal real-time clock conditions, without any interrupt or CLKO output:

1) Remove the jumper from JU9.
2) Connect the negative terminal of the pico ammeter to the pin 3 of the JU9 (marked as a white dot) and the positive terminal to pin 1 of JU9.
3) On the **Configuration & Time** tab, in the **RTC Configuration** group box, make sure interrupt pin **INT** is selected. In the **Real Time Monitoring** group box**,** uncheck the **Auto Update** check box. In the **Temperature Monitoring** group box**,** uncheck the **Auto Update** check box. In the **Flags** group box**,** click **Disable 32kHz** to disable the output 32kHz.
4) Remove the jumper from JU4, to disconnect the IC from V_{CC} and connect to battery supplied mode.
5) The reading in the pico ammeter is the battery current consumed by the MAX31328 IC only. It should be around 660nA.

32kHz Output Frequency

On the **Configuration & Time** tab of the software, under the **Flags** group box, click the **Enable 32kHz** button. The clock output can be monitored using an oscilloscope connected to 32kHz test point (TP8). A frequency counter can also be used to measure the clock frequency accurately.

Alarm and Timer Configuration

Use the **Alarm 1 Configuration** and **Alarm 2 Configuration** to configure Alarm 1 and Alarm 2 (See Figure 2).

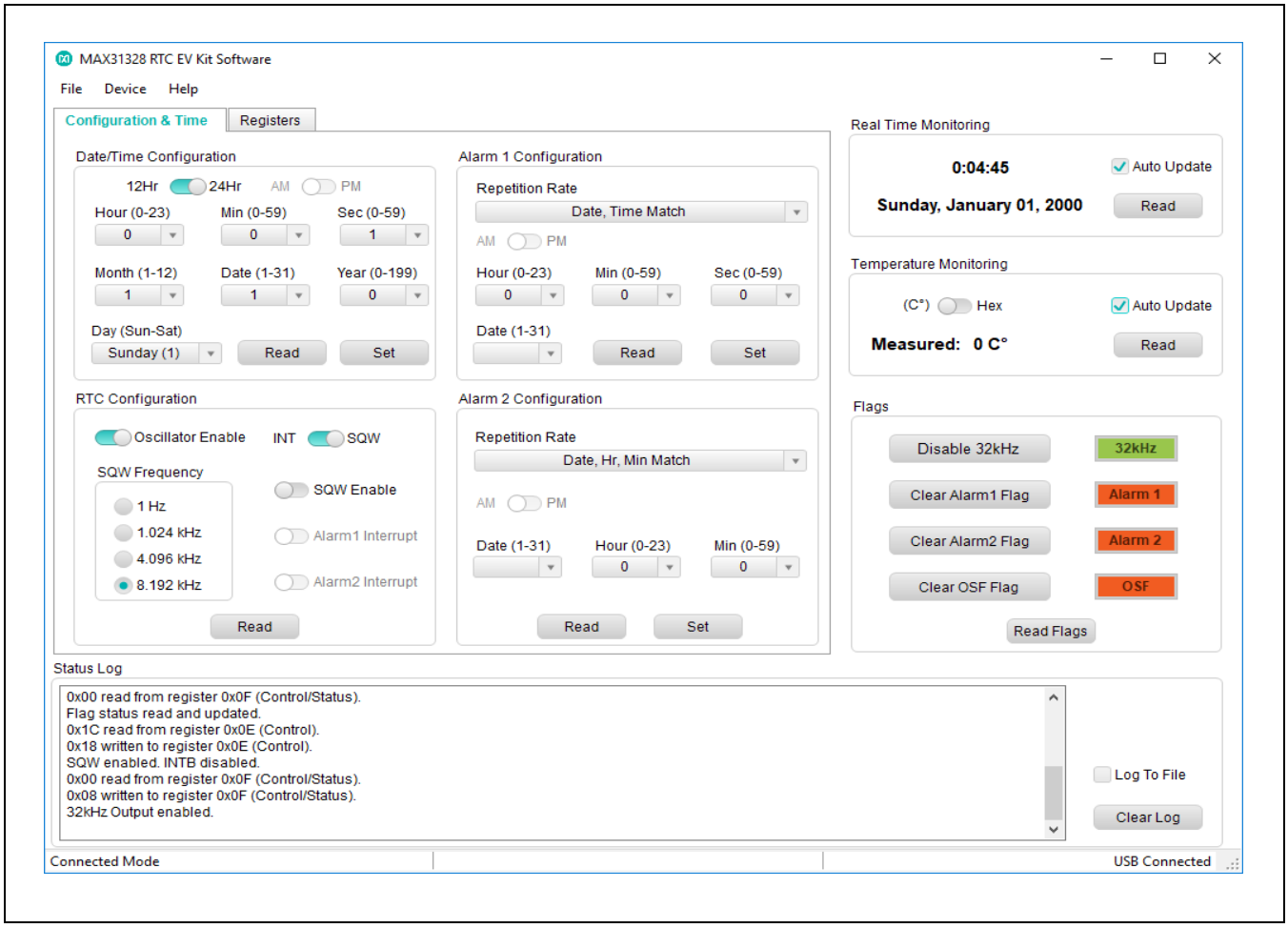


Figure 2. MAX31328 RTC Shield Software—Configuration & Time Page

Registers Tab

Write and read the MAX31328 IC register map in the **Registers** tab (See Figure 3).

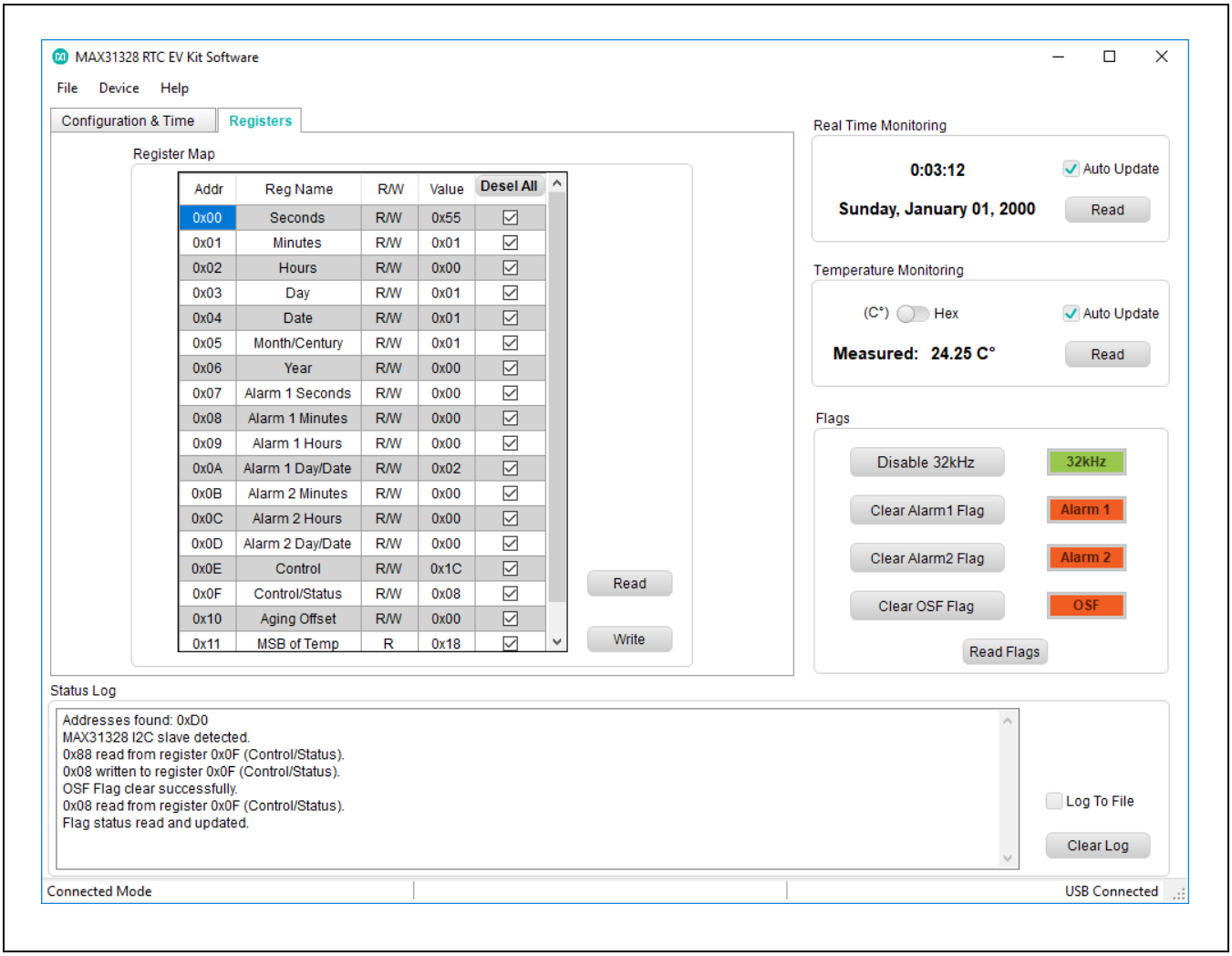


Figure 3. MAX31328 RTC Shield Software—Registers Page

Ordering Information

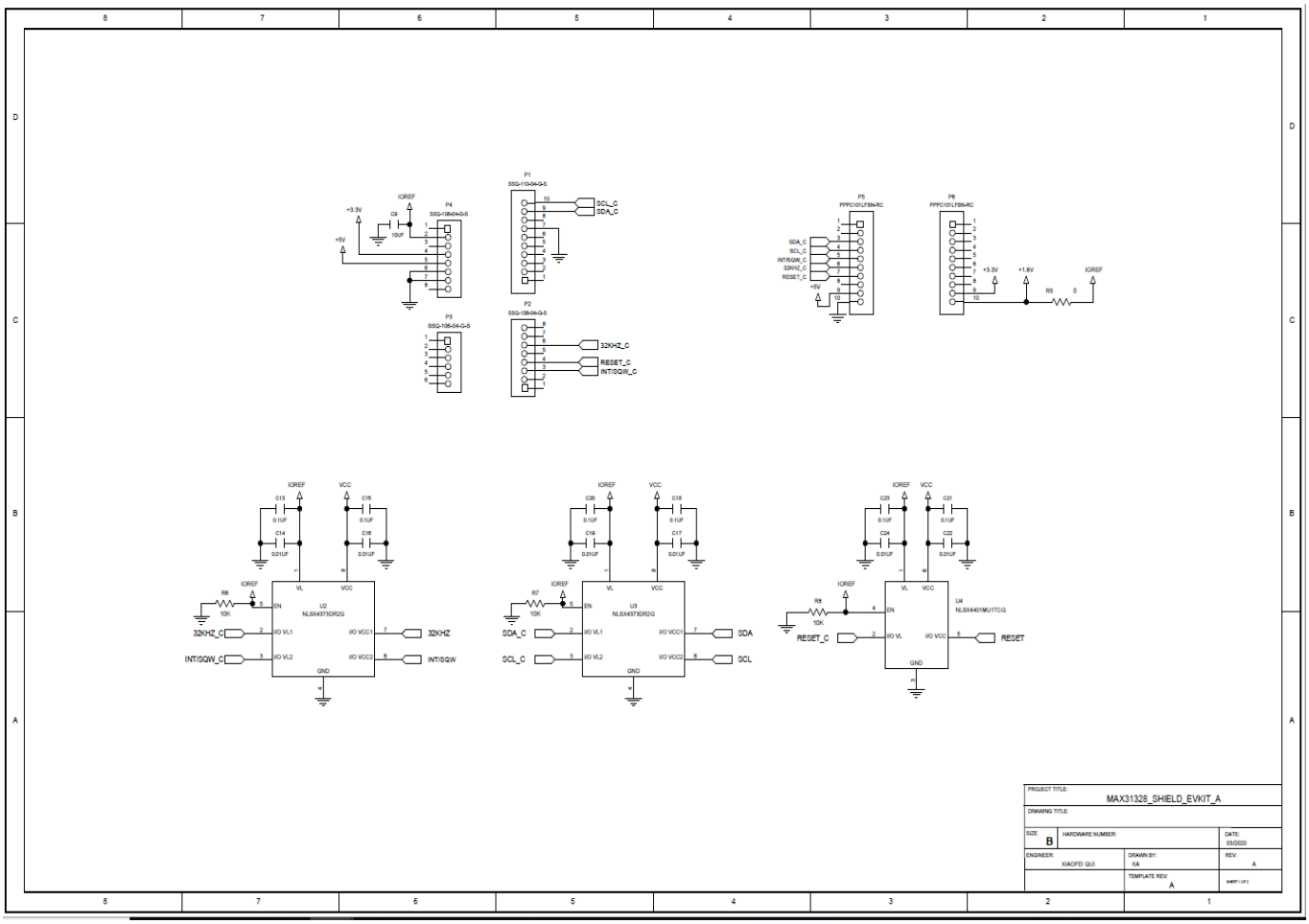
PART	TYPE
MAX31328SHLD#	Shield

#Denotes RoHS compliance.

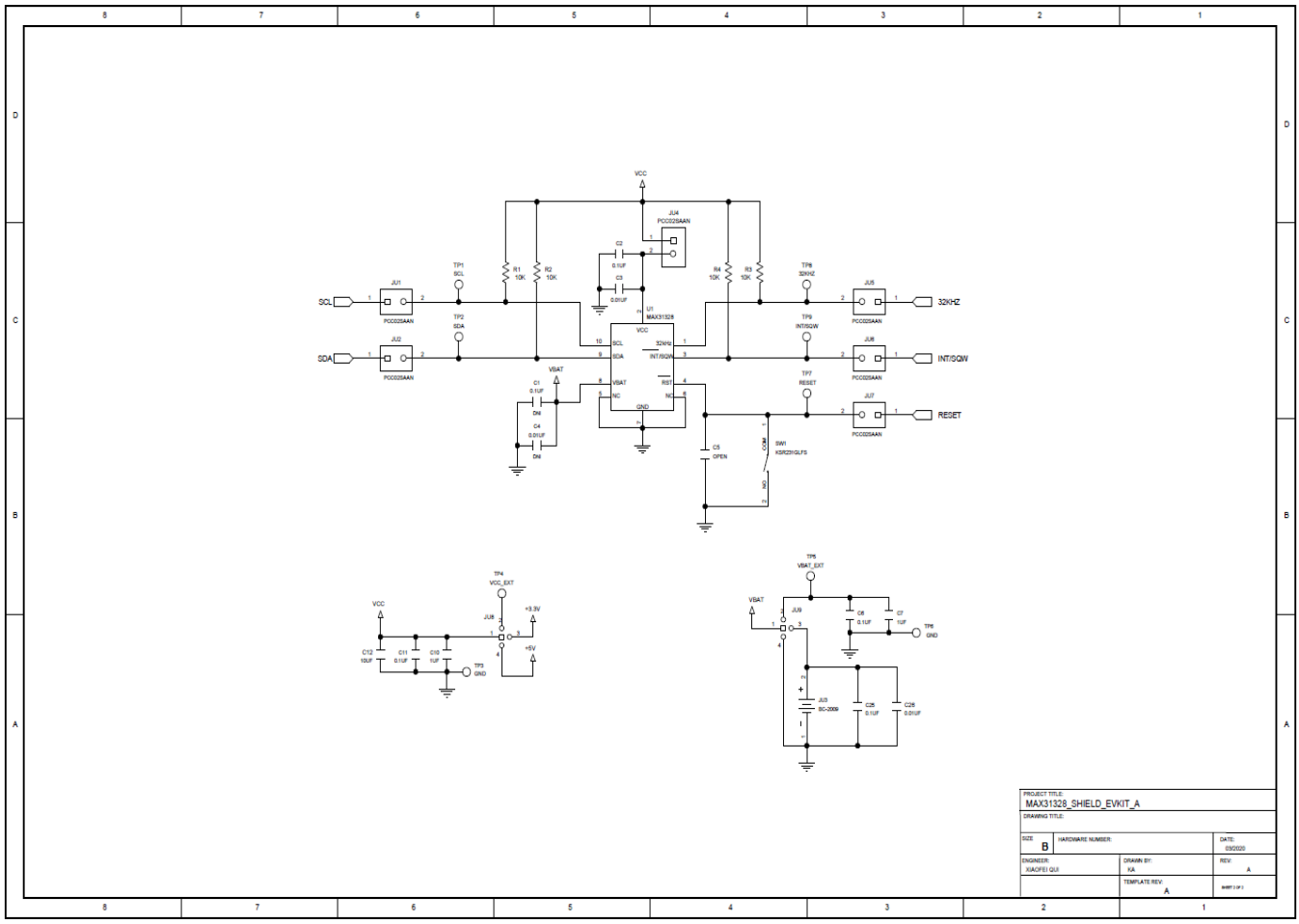
MAX31328 Shield Bill of Materials

PART	QTY	DESCRIPTION
C2, C6, C11, C13, C15, C18, C20, C21, C23, C25	10	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
C3, C14, C16, C17, C19, C22, C24	7	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 25V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=X7R
C7, C10	2	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 6.3V; TOL=5%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C9	1	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 10V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C12	1	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C26	1	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 16V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R
JU1, JU2, JU4-JU7	6	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC
JU3	1	BATTERY HOLDER; SMT; CR1225 BATTERY STRAP
JU8, JU9	2	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS
P1	1	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 10PINS ;
P2, P4	2	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 8PINS
P3	1	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 6PINS
P5, P6	2	CONNECTOR; FEMALE; THROUGH HOLE; HEADER CONNECTOR; STRAIGHT; 10PINS
R1-R4, R6-R8	7	RESISTOR; 0402; 10K OHM; 5%; 200PPM; 0.10W; THICK FILM
R5	1	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM
SW1	1	SWITCH; SPST; SMT; 32V; 0.05A; KSR SERIES; SUBMINIATURE TACT SWITCH; RCOIL=0.1 OHM; RINSULATION=10G OHM; C&K COMPONENTS
TP3, TP6	2	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN;
TP4, TP5	2	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN;
TP1-TP2, TP7-TP9	5	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN;
U1	1	EVKIT PART - IC; MAX31328; +/-3.5PPM; I2C RTC WITH INTEGRATED CRYSTAL AND POWER MANAGEMENT; PACKAGE CODE:L1055M-1; PACKAGE OUTLINE DRAWING: 21-100481; PACKAGE LAND PATTERN: 90-100169; LGA10
U2, U3	2	IC; TRANS; 2-BIT 20 MB/S DUAL-SUPPLY LEVEL TRANSLATOR; NSOIC8
U4	1	IC; TRANS; 1-BIT 20 MB/S DUAL-SUPPLY LEVEL TRANSLATOR; UDFN6
CR1225 3V Lithium Battery	1	CR1225 3V Lithium Battery

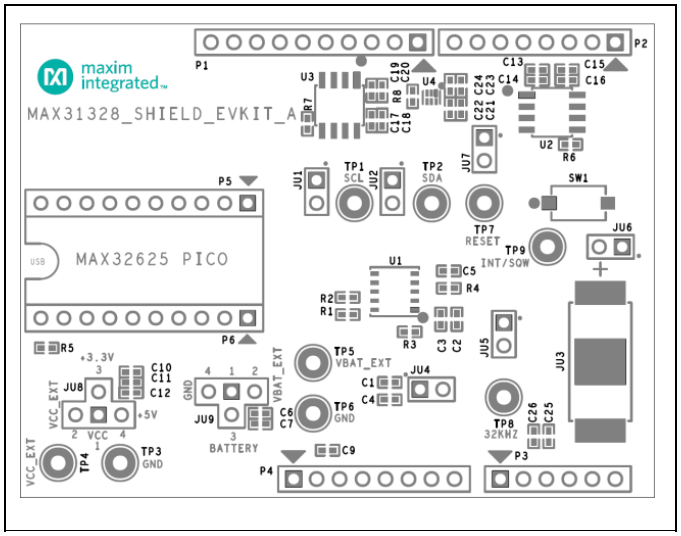
MAX31328 Shield Schematics



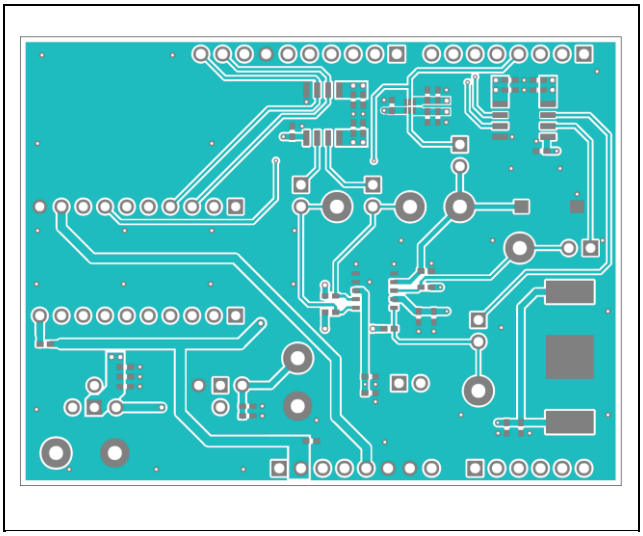
MAX31328 Shield Schematics (continued)



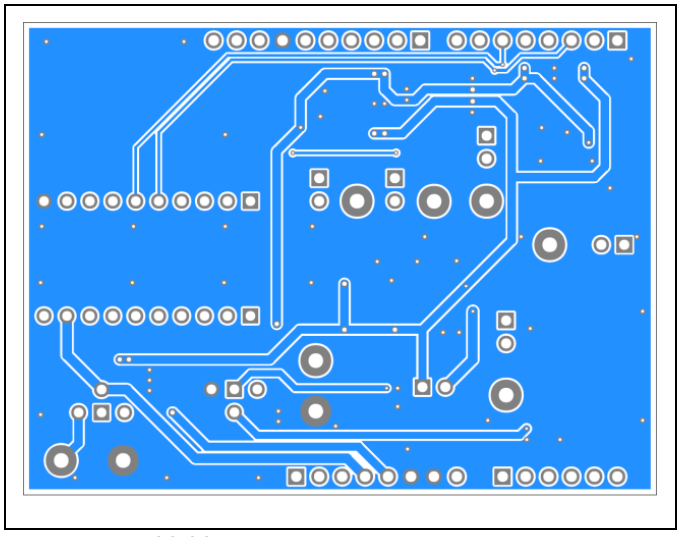
MAX31328 Shield PCB Layouts



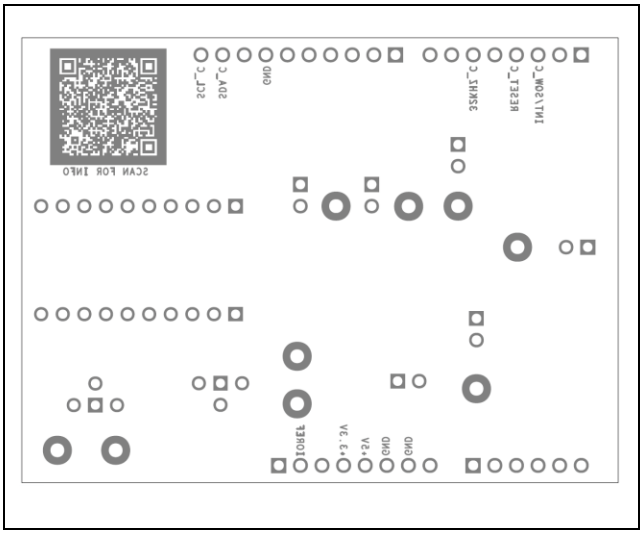
MAX31328 Shield PCB Layout—Top Silkscreen



MAX31328 Shield PCB Layout—Top



MAX31328 Shield PCB Layout—Bottom



MAX31328 Shield PCB Layout— Bottom Silkscreen