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

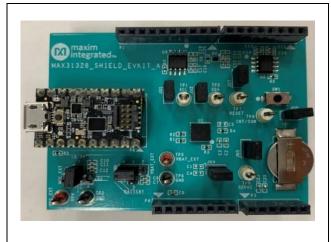
- Easy Evaluation of the MAX31328
- +2.3V to +5.5V Single-Supply Operation
- Proven PCB Layout
- Fully Assembled and Tested

Shield Contents

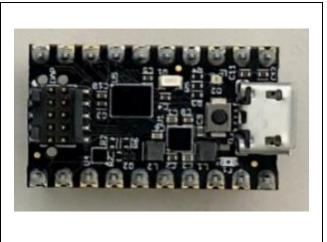
- Assembled MAX32625 PICO controller board
- Micro-USB cable
- Assembled circuit board including MAX31328NELB+

<u>Ordering Information</u> appears at end of data sheet.

Shield Photo



PICO Board Photo



Proprietary and Confidential. Preliminary Information - subject to change without notice.



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
11.14	1-2*	Connect SCL for I2C communication
JU1	Open	Disconnect SCL
JU2	1-2*	Connect SDA for I2C communication
J02	Open	Disconnect SDA
JU4	1-2*	Connect VCC to MAX31328 IC
JU4	Open	Disconnect VCC to MAX31328 IC
JU5	1-2*	Connect 32kHz output for Arduino [®] /Mbed™
305	Open	Disconnect 32kHz output
JU6	1-2*	Connect square wave output or interrupt for Arduino/Mbed
300	Open	Disconnect square wave output
JU7	1-2*	Connect reset pinout for Arduino/Mbed
307	Open	Disconnect reset pinout
	1-2	Connect VCC supply to external DC supply
JU8	1-3*	Connect VCC supply to +3.3V on board supply
JU0	1-4	Connect VCC supply to +5.0V on board supply
	Open	VCC open
	1-2	Connect VBAT supply to external DC supply
JU9	1-3	Connect VBAT supply to +3.0V coin cell battery
108	1-4*	Connect VBAT supply to ground
	Open	VBAT open

*Default position

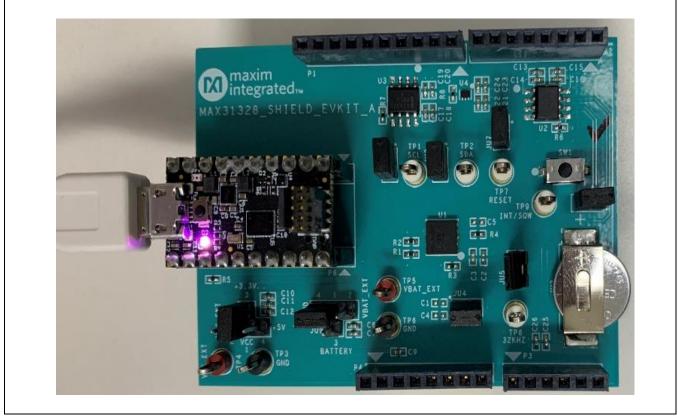


Figure 1. Connection and Setup

Detailed Description of Hardware

The MAX31328 shield is a low-cost, extremely accurate, I²C real-time clock (RTC) with an integrated temperaturecompensated 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 longterm 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) Remarks 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).

Configuration & Time	Registers		Real Time Monitoring
Date/Time Configuration		Alarm 1 Configuration	_
12Hr 24H Hour (0-23) M	Ir AM PM in (0-59) Sec (0-59) 0 • 1 •	Repetition Rate Date, Time Match	0:04:45 Auto Upda Sunday, January 01, 2000 Read
Month (1-12) D	ate (1-31) Year (0-199)	Hour (0-23) Min (0-59) Sec (0-59)	Temperature Monitoring
Day (Sun-Sat) Sunday (1)	Read Set	0 • 0 • 0 • Date (1-31) • Read Set	(C°) Hex Auto Upda Measured: 0 C° Read
RTC Configuration		Alarm 2 Configuration	Flags
Oscillator Enab		Repetition Rate Date, Hr, Min Match v	Disable 32kHz 32kHz
1 Hz	SQW Enable	AM D PM	Clear Alarm1 Flag
 1.024 kHz 4.096 kHz 	Alarm1 Interrupt	Date (1-31) Hour (0-23) Min (0-59)	Clear Alarm2 Flag
• 8.192 kHz	Alarm2 Interrupt		Clear OSF Flag OSF
	Read	Read Set	Read Flags
Status Log			
0x00 read from register 0: Flag status read and upd 0x1C read from register 0 0x18 written to register 0x SGW enabled. INTB disat 0x00 read from register 0x 0x08 written to register 0x 32kHz Output enabled.	ated. x0E (Control). DE (Control). Jed. x0F (Control/Status).		Log To File Clear Log

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

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Registers Tab

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

Configuration	& Time	Registers					Real Time Monitoring	
Re	gister Map						0:03:12	🗸 Auto Update
	Addr	Reg Name	R/W	Value	Desel All	^		
	0x00	Seconds	R/W	0x55		1	Sunday, January 01, 2000	Read
	0x01	Minutes	R/W	0x01				
	0x02	Hours	R/W	0x00			Temperature Monitoring	
	0x03	Day	R/W	0x01				
	0x04	Date	R/W	0x01			(C°) 🕖 Hex	🗸 Auto Update
	0x05	Month/Century	R/W	0x01			Measured: 24.25 C°	Read
	0x06	Year	R/W	0x00			measured. 24.20 C	Reau
	0x07	Alarm 1 Seconds	R/W	0x00				
	0x08	Alarm 1 Minutes	R/W	0x00			Flags	
	0x09	Alarm 1 Hours	R/W	0x00				
	0x0A	Alarm 1 Day/Date	R/W	0x02			Disable 32kHz	32kHz
	0x0B	Alarm 2 Minutes	R/W	0x00				Alexand de
	0x0C	Alarm 2 Hours	R/W	0x00			Clear Alarm1 Flag	Alarm 1
	0x0D	Alarm 2 Day/Date	R/W	0x00			Clear Alarm2 Flag	Alarm 2
	0x0E	Control	R/W	0x1C			Ciear Alaim2 Hag	Autiliz
	0x0F	Control/Status	R/W	0x08			Clear OSF Flag	OSF
	0x10	Aging Offset	R/W	0x00				
	0x11	MSB of Temp	R	0x18	\checkmark	~	Read Flag	s
tatus Log								
Addresses for	und: 0vD0							
MAX31328 I20 0x88 read from 0x08 written to OSF Flag clea	C slave detecto n register 0x0 o register 0x0F n successfully n register 0x0	F (Control/Status). (Control/Status). / F (Control/Status).						Log To File

Figure 3. MAX31328 RTC Shield Software—Registers Page

Ordering Information

PART	TYPE
MAX31328SHLD#	Shield

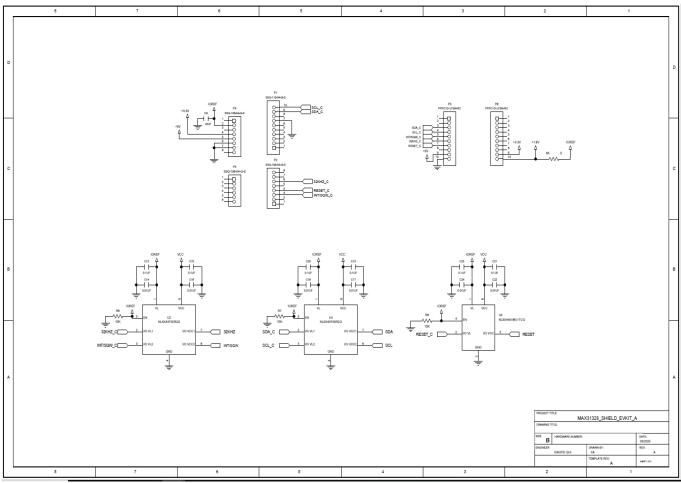
#Denotes RoHS compliance.

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 +8 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	
ТРЗ, ТР6	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	

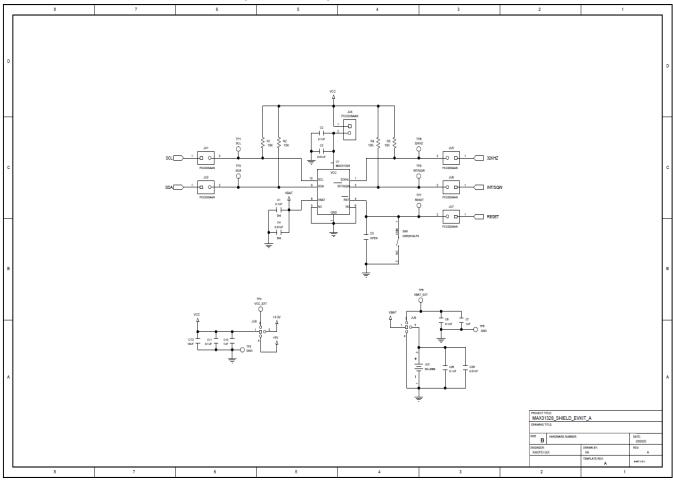
Evaluates: MAX31328

MAX31328 Shield Schematics

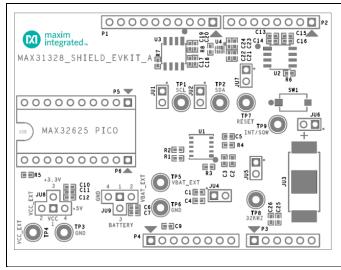


Evaluates: MAX31328

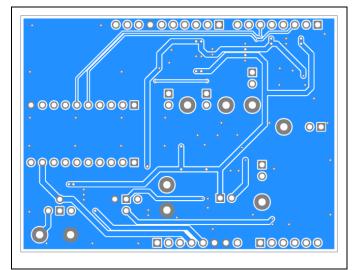
MAX31328 Shield Schematics (continued)



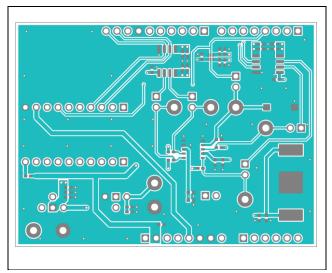
MAX31328 Shield PCB Layouts



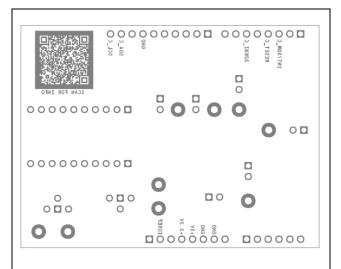
MAX31328 Shield PCB Layout—Top Silkscreen



MAX31328 Shield PCB Layout—Bottom



MAX31328 Shield PCB Layout—Top



MAX31328 Shield PCB Layout— Bottom Silkscreen

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Revision History

EVISION UMBER	REVISION DATE	DESCRIPTION			
0	12/20	Initial release	_		

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