# Evaluates: MAX31343

#### **General Description**

The MAX31343 shield is a fully assembled and tested PCB to evaluate the MAX31343, low-cost, extremely accurate, real-time clock (RTC) with an I<sup>2</sup>C interface and power management. The shield operates from a single supply, either from a USB or external power supply, and the integrated microelectromechanical systems (MEMS) resonator enhances the long-term accuracy and eliminates the external crystal requirement in the system. This device is accessed through an I<sup>2</sup>C serial interface provided by a MAX32625 PICO board.

The MAX31343 shield provides the hardware and software user interface (GUI) necessary to evaluate the MAX31343. The shield includes a MAX31343EKA+T. It connects to the PC through a MAX32625 PICO board and a Micro USB cable.

#### **Features**

- Easy Evaluation of the MAX31343
- +1.6V to +5.5V Single-Supply Operation
- Proven PCB Layout
- Fully Assembled and Tested
- Arduino<sup>®</sup>/Mbed<sup>®</sup> Platform Compatible

### **Shield Contents**

- Assembled MAX32625 PICO controller board
- Micro USB cable
- Assembled circuit board including MAX31343EKA+T

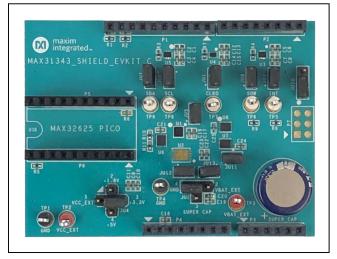
#### **Quick Start**

#### **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 MAX31343 shield

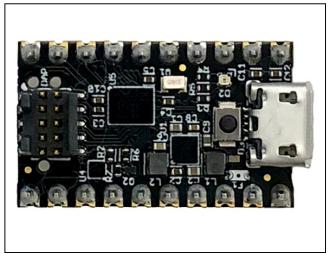
Ordering Information appears at end of data sheet.

### Shield Photo



Arduino is a registered trademark of Arduino, LLC. Mbed is a registered trademark of Arm Limited. Windows is a registered trademark of Microsoft Corporation.

### **PICO Board Photo**





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#### Procedure

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

- 1) Place the MAX31343 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 in Table 1.
- 3) Connect the MAX32625 PICO board to the shield at the location shown as MAX32625 PICO (Figure 1).
- 4) Connect the USB Type A male to Micro-B male cable between the MAX32625 PICO board and PC/laptop.
- 5) Go to the MAX31343 shield product page to download and install the latest version of the MAX31343 RTC SHIELD Software.
- 6) Open the MAX31343 RTC SHIELD Software, shown in Figure 2.

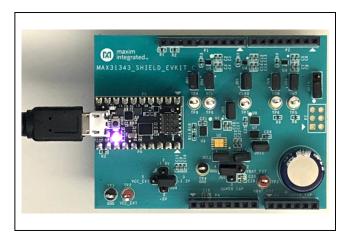


Figure 1. Connection and Setup

JUMPER	SHUNT POSITION	DESCRIPTION					
JU1	1-2*	Connects clock output to pin 6 of P2 Arduino/Mbed connector					
JU1	Open	Disconnects clock output from Arduino/Mbed connector					
	1-2	Connects backup supply to external DC supply					
JU2	1-3	Connects backup supply to supercapacitor					
JUZ	1-4*	Connects backup supply to ground					
	Open	Disconnects backup supply					
JU3	1-2*	Connects interrupt signal to pin 3 of P2 Arduino/Mbed connector					
103	Open	Disconnects interrupt signal from Arduino/Mbed connector					
	1-2	Connects VCC supply to +1.8V on-board supply					
	1-3*	Connects VCC supply to +3.3V on-board supply					
JU4	1-4	Connects VCC supply to +5.0V on-board supply					
	1-5	Connects VCC supply to external DC supply					
	Open	Disconnects VCC					
JU5	1-2*	Connects VCC to MAX31343 IC WLP package (U1)					
105	Open	Disconnects VCC from MAX31343 IC WLP package (U1)					
11.10	1-2*	Connects square-wave output to pin 4 of P2 Arduino/Mbed connector					
JU8	Open	Disconnects square-wave output from Arduino/Mbed connector					
JU10	1-2*	Sets MAX31343 WLP package (U1) IC under test					
JU10	2-3	Sets MAX31343 TDFN package (U2) IC under test					
JU11	1-2*	Connects VCC to MAX31343 IC TDFN package (U2)					
JUTI	Open	Disconnects VCC from MX31343 IC TDFN package (U2)					
11112	1-2*	Connects VBAT to MAX31343 IC WLP package (U1)					
JU12	Open	Disconnects VBAT from MAX31343 IC WLP package (U1)					
JU13	1-2*	Connects VBAT to MAX31343 IC TDFN package (U2)					
3013	Open	Disconnects VBAT from MAX31343 IC TDFN package (U2)					

# Table 1. Jumper Settings

\*Default position

onfiguration & Time Alarms & Timer Registers	RAM		Real Time Monitoring	
ate/Time Configuration	RTC Configuration		Continuous Read	Temp
Day (Sun-Sat) Sunday (1)	Oscillator Enable	SQW	January	00:00:10 01, 2000, Sunday
Hour (0-23) Min (0-59) Sec (0-59) 00 • : 00 • : 10 •	Data Retention	SQW Frequeny	Interrupts & Flags	
Month (1-12) Date (1-31) Year (0-199)	Soft Reset	CLKO Frequeny 32 KHz 💌	Interrupts	Flags
	CLKOUT		Alarm1 Interrupt	Alarm 1
Set Read		Read	Alarm2 Interrupt	Alarm 2
ower Mode Configuration	Temperature Configuration		Timer Interrupt	Timer
Auto     Supply select	Te	emp measurement Interval	Power Fail	Power fail Temp sense flag
Manual Use VCC •	Auto Mode     One Shot	26.25°C	Disable OSF	OSF
Trickle Charger Read		Read	Read	Read
us Log				
ldresses found: 0xD0 AX31343 I2C slave detected.				Log To File Clear Log

Figure 2. MAX31343 RTC SHIELD Software—Configuration & Time Tab

### **Detailed Description**

The MAX31343 shield is a low-cost, extremely accurate RTC. It is driven by an internal temperature-compensated microelectromechanical systems (MEMS) resonator. The oscillator provides a stable and accurate reference clock and maintains the RTC to within  $\pm 0.432$  seconds-perday accuracy from -40°C to +85°C. The RTC device is accessed through an I<sup>2</sup>C serial interface.

The RTC maintains seconds, minutes, hours, day, date, month, year, and century information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year up to the year 2199. The clock operates in the 24-hour format. Other features including two programmable timeof-day alarms, interrupt output, uncompensated programmable clock output, and temperature-compensated programmable square-wave output. A voltage reference and comparator circuit monitor the status of VCC to detect power failures and automatically switch to the backup supply when necessary.

### Detailed Description of Software and Functional Test Procedure

#### **Real Time Monitoring**

To monitor the time and date, on the **Configuration & Time** tab, in the **RTC Configuration** group box, enable the **Oscillator Enable toggle** button, and in the **Real Time Monitoring** group box, check the **Continuous Read** checkbox for continuous reading.

#### **Current Draw in Timekeeping Mode**

To measure the current draw under normal RTC conditions without any interrupt or CLKO output:

- 1) Remove the jumper from JU5.
- With the output set to +3.3V and disabled, connect the negative terminal of the pico ammeter to the pin 1 of JU5 (marked as a white dot) and the positive terminal to pin 2 of JU5.
- 3) On the Configuration & Time tab, in the Date/Time Configuration group box, click the Read button. In the RTC Configuration group box, disable the CLKOUT toggle button, and select 1Hz in SQW Frequency drop-down list. In the Real Time Monitoring section, uncheck the Continuous Read checkbox.
- The reading on the pico ammeter is the current consumed by the MAX31343 IC only. It should be around 940nA.

#### **CLKOUT Frequency**

On the **Configuration & Time** tab of the software, in the **RTC Configuration** group box, enable the **CLKOUT** toggle button and select the desired frequency. The clock output can be monitored using an oscilloscope connected to the CLKO test point (TP7). A frequency counter can also be used to measure the clock frequency accurately.

#### Alarm and Timer Configuration

Use the **Alarm & Timer Configuration** tab to configure Alarm 1, Alarm 2, and timer. (Figure 3)

onfiguration & Time Alarms 8	Timer Registers	RAM			Real Time Monitoring	
arm 1 Configuration		Alarm 2 Conf	iguration		Continuous Read	Temp
Repetition Rate		Repeti	tion Rate			00:00:42
Date, Month, Year, Time M	atch 🔹	Dat	e, Hr, Min Match	¥	January	01, 2000, Sunday
Hour (0-23) Min (0-59)	Sec (0-59)	Hour (0-2	23) Min (0-59)		Interrupts & Flags	
	00 🔻	00			INT Disabled	
Month (1-12) Date (1-31)	Year (0-99)	Date (1-3			Interrupts	Flags
					Alarm1 Interrupt	Alarm 1
	Read			Read	Alarm2 Interrupt	Alarm 2
mer Configuration					Timer Interrupt	Timer
Timer Enable	Timer Frequency		Timer Init		Power Fail	Power fail
Pause		256Hz	(0-255)	0 *	Temp sense flag	Temp sense flag
		16Hz	Timer Count	0	Disable OSF	OSF
🗹 Repeat				Read	Read	Read
us Log						
ldresses found: 0xD0 4X31343 I2C slave detected.						^
						Log To File

Figure 3. MAX31343 RTC SHIELD Software—Alarms & Timer Page

### **Registers Tab**

Write and read the MAX31343 IC register map in the **Register** tab. (Figure 4)

onfigu	ration & Time	Alarms & Timer	Registers	RAM				Real Time Monitoring	
Regis	ster Map							Continuous Read	Temp
Ē	Addr	Reg Name	R/W	Value	Desel All	^			00:00:42
	0x00	status	RC	0x00					
	0x01	Int_en	R/W	0x00				January	01, 2000, Sunday
	0x02	RTC_reset	R/W	0x00				Interrupts & Flags	
	0x03	RTC_config1	R/W	0x0A				INT	
	0x04	RTC_config2	R/W	0x40				Disabled	
	0x05	Timer_config	R/W	0x04					
	0x06	Seconds	R/W	0x42				Interrupts	Flags
ΕĒ	0x07	Minutes	R/W	0x00					
	0x08	Hours	R/W	0x00				Alarm1 Interrupt	Alarm 1
LΓ	0x09	Day	R/W	0x01				Alarm2 Interrupt	Alarm 2
	0x0A	Date	R/W	0x01					
	0x0B	Month	R/W	0x01				Timer Interrupt	Timer
	0x0C	Year	R/W	0x00				Power Fail	Power fail
	0x0D	Alm1_sec	R/W	0x00				Town constant	
	0x0E	Alm1_min	R/W	0x00				Temp sense flag	Temp sense flag
	0x0F	Alm1_hrs	R/W	0x00			Read	Disable OSF	OSF
	0x10	Alm1day_date	R/W	0x00					
	0x11	Alm1_mon	R/W	0x00		~	Write	Read	Read
tus Log	9								
	ses found: 0xD								^
AX313	43 I2C slave d	etected.							
									Log To File

Figure 4. MAX31343 RTC SHIELD Software—Registers Tab

# **Ordering Information**

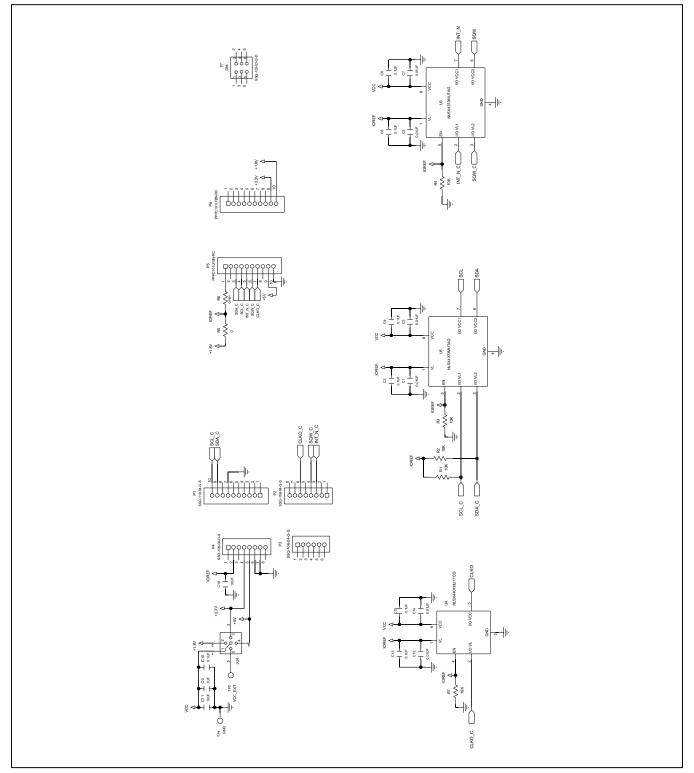
PART	ТҮРЕ
MAX31343SHLD#	Shield

#Denotes RoHS compliance.

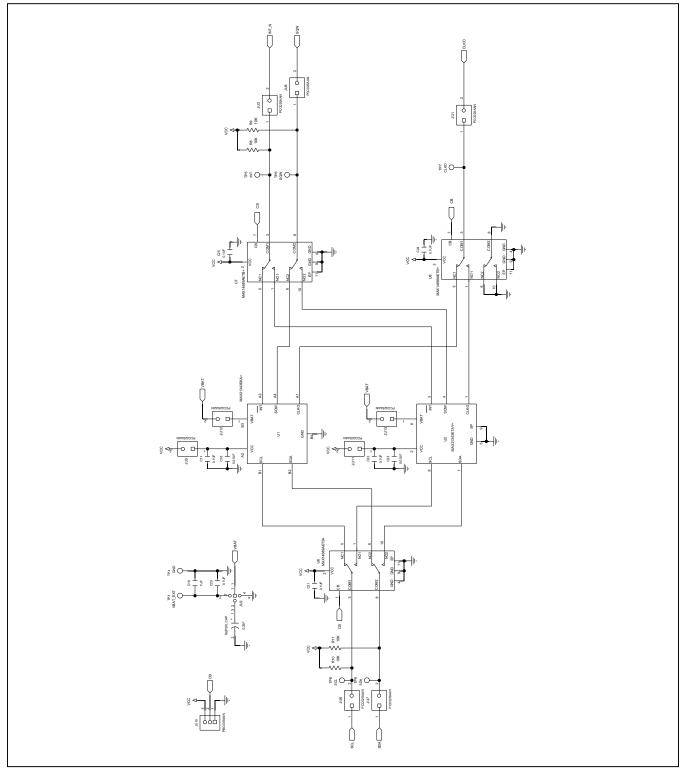
# MAX31343 Shield Bill of Materials

1 (C 2 C10 3 4	I, C3, C5, C7, C12, C14, C16, C23 C2, C4, C6, C8, 10, C13, C15, C17, C20-C22, C24, C25 C9, C19 C11, C18 U1, JU3, JU5-JU8, JU11-JU13	-	8 13 2	C0402C103J3RAC C1005X7R1C104K050BC;ATC530L104KT16; 0402YC104KAT2A;CGA2B1X7R1C104K050BC; GCM155R71C104KA55;C0402X7R160-104KNE; CL05B104K05NNNC;GRM155R71C104KA88; CL005X7L1C104;CC0402KRX7R7BB104;	KEMET TDK;AMERICAN TECHNICAL CERAMICS; AVK;TDK;MURATA;VENKEL LTD.; SAMSUNG ELECTRONICS;MURATA; TDK;YAGEO PHICOMP;TAIYO YUDEN;	0.01UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 25V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=X7R CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=10%;
2 C10 3 4 5 JU:	C2, C4, C6, C8, 10, C13, C15, C17, C20-C22, C24, C25 C9, C19 C11, C18 U1, JU3, JU5-JU8, JU11-JU13	-		0402YC104KAT2A;CGA2B1X7R1C104K050BC; GCM155R71C104KA55;C0402X7R160-104KNE; CL05B104KO5NNNC;GRM155R71C104KA88;	AVK;TDK;MURATA;VENKEL LTD.; SAMSUNG ELECTRONICS;MURATA;		
4 5	C11, C18 U1, JU3, JU5-JU8, JU11-JU13	-	2	EMK105B7104KV;CL05B104KO5	SAMSUNG ELECTRONICS	0.1UF	TG=-55 DEGC TO +125 DEGC; TC=X7R
5 JU:	U1, JU3, JU5-JU8, JU11-JU13	-	_	CL05B105KQ5NQNC; GRM155R70J105KA12	SAMSUNG ELECTRONICS;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 6.3V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
5	JU11-JU13		2	GRM155R61A106ME44;GRM155R61A106ME11; 0402ZD106MAT2A;CL05A106MP5NUNC	MURATA;MURATA;AVX;SAMSUNG	10UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 10V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
6		-	9	PCC02SAAN	SULLINS	PCC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC
	JU2	-	1	PEC04SAAN	SULLINS ELECTRONICS CORP.	PEC04SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS
7	JU4	-	1	TSW-105-07-L-S	SAMTEC	TSW-105-07-L-S	EVKIT PART-CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; SPINS
8	JU10	-	1	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC
9	P1	-	1	SSQ-110-04-G-S	SAMTEC	SSQ-110-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 10PINS ;
10	P2, P4	-	2	SSQ-108-04-G-S	SAMTEC	SSQ-108-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 8PINS ;
11	P3	-	1	SSQ-106-04-G-S	SAMTEC	SSQ-106-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 6PINS ;
12	P5, P6	-	2	PPPC101LFBN-RC	SULLINS ELECTRONICS CORP.	PPPC101LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; HEADER CONNECTOR; STRAIGHT; 10PINS
13 F	R1-R4, R7-R11	-	9	ERJ-2GEJ103	PANASONIC	10K	RESISTOR; 0402; 10K OHM; 5%; 200PPM; 0.10W; THICK FILM
14	R5	-	1	ERJ-2GEOROO	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM
15	SUPER_CAP	-	1	KW-5R5C334-R	EATON POWERING BUSINESS WORLDWIDE	0.33F	CAP; THROUGH HOLE-RADIAL LEAD; 0.33F; +80%/-20%; 5.5V; ALUMINUM-ELECTROLYTIC ;
16	TP1, TP4	-	2	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
17	TP2, TP3	-	2	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
18	TP5-TP9	-	5	5012	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
19	U1	-	1	MAX31343EKA+	махім	MAX31343EKA+	EVKIT PART-IC; MAX31343EKA+; +/-4PPM; I2C REAL-TIME CLOCK WITH INTEGRATED MEMS OSCILLATOR; PACKAGE OUTLINE: 21-100336; PACKAGE CODE: K82A2+1
20	U2	DNI	1	MAX31343ETAY+	MAXIM	MAX31343ETAY+	EVKIT PART-IC; MAX31343ETAY+; +/-4PPM; I2C REAL-TIME CLOCK WITH INTEGRATED MEMS OSCILLATOR; PACKAGE OUTLINE: 21-100322; PACKAGE LAND PATTERN: 90-100121; PACKAGE CODE: T834MKY+1
21	U3, U5	-	2	NLSX4373MUTAG	ON SEMICONDUCTOR	NLSX4373MUTAG	IC; TRANS; 2-BIT 20 MB/S DUAL-SUPPLY LEVEL TRANSLATOR; UDFN8
22	U4	-	1	NLSX4401MU1TCG	ON SEMICONDUCTOR	NLSX4401MU1TCG	IC; TRANS; 1-BIT 20 MB/S DUAL-SUPPLY LEVEL TRANSLATOR; UDFN6
23	U6-U8	-	3	MAX14689AETB+	MAXIM	MAX14689AETB+	IC; ASW; ULTRA-SMALL LOW-RON BEYOND-THE-RAILS DPDT ANALOG SWITCHES; TDFN10-EP
24	PCB	-	1	MAX31343SHIELD	MAXIM	PCB	PCB:MAX31343SHIELD
25	P7	DNP		SSQ-103-03-G-D	SAMTEC	SSQ-103-03-G-D	CONNECTOR; FEMALE; THROUGH HOLE; SSQ SERIES ; STRAIGHT; 6PINS
26 TOTAL	R6	DNP	0 72	N/A	N/A	OPEN	PACKAGE OUTLINE 0402 RESISTOR

# **MAX31343 Shield Schematics**

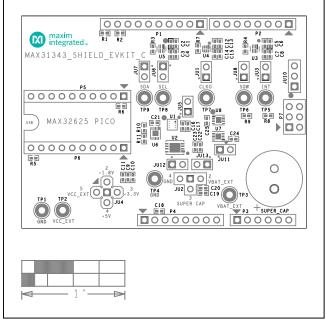


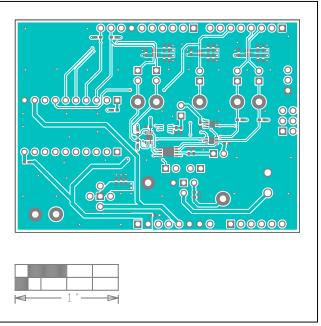
# MAX31343 Shield Schematics (continued)



# Evaluates: MAX31343

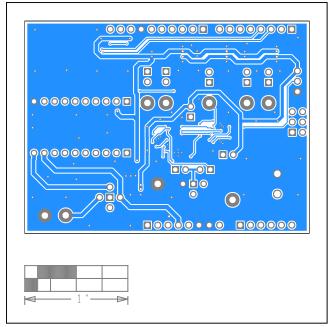
### MAX31343 Shield PCB Layouts



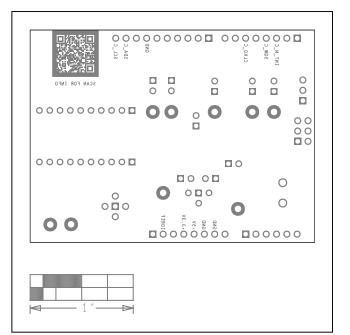


MAX31343 Shield PCB Layout—Top

MAX31343 Shield Component Placement Guide—Top Silkscreen



MAX31343 Shield PCB Layout—Bottom



MAX31343 Shield Component Placement Guide—Bottom Silkscreen

# Evaluates: MAX31343

### **Revision History**

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/20	Initial release	—
1	5/20	Updated title, Features, and Detailed Description of Software and Functional Test Procedure	All

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

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