

General Description

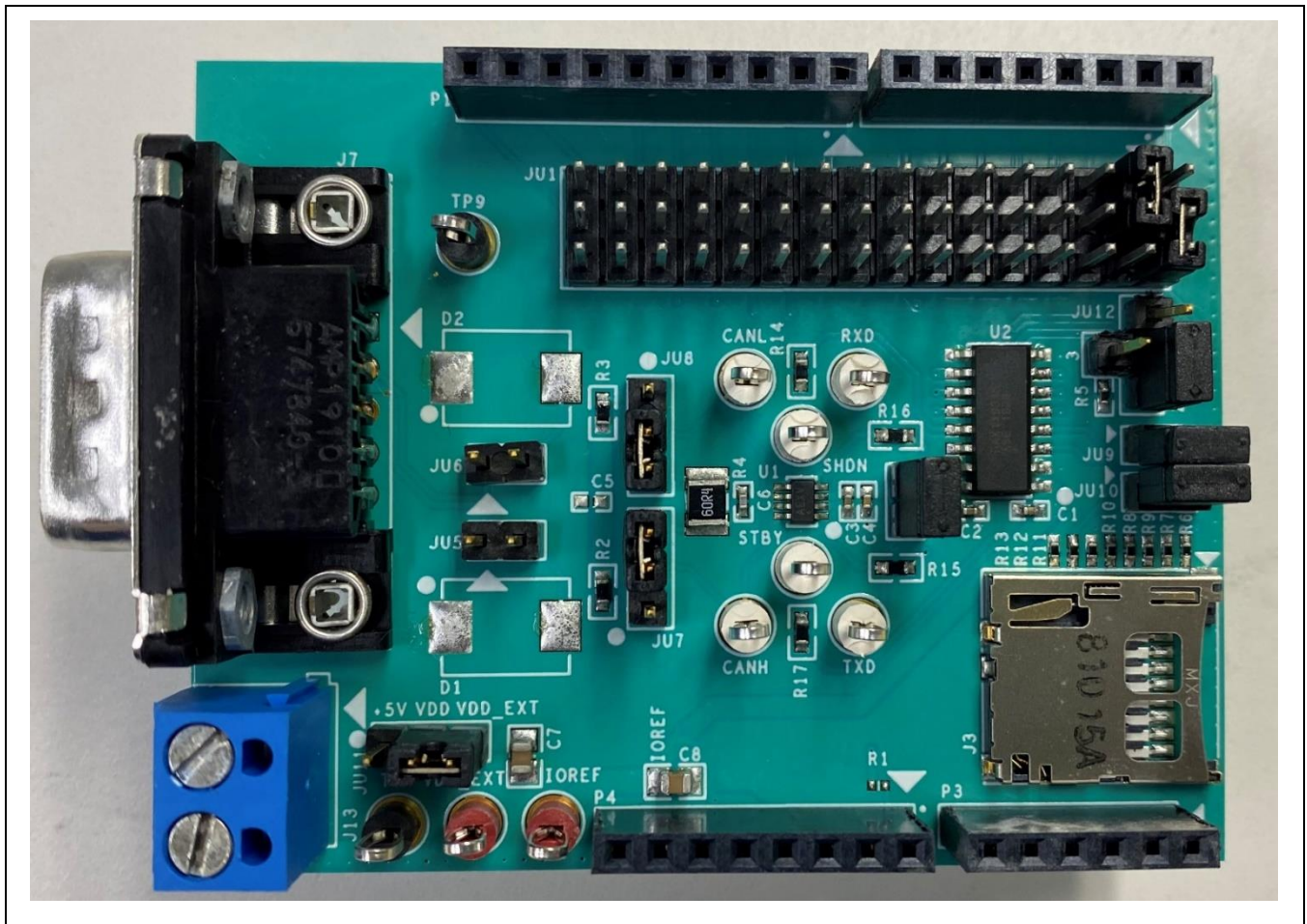
The MAX33042E shield is a fully assembled and tested printed circuit board (PCB) that demonstrates the functionality of the MAX33042E controller area network (CAN) transceiver with $\pm 40\text{V}$ fault protection, extended $\pm 25\text{V}$ common-mode input range, and $\pm 40\text{kV}$ ESD human body model (HBM). The shield features a digital isolator, which is used as a level translator between the CAN transceiver and the controller interface.

Features

- Easy Evaluation of the MAX33042E
- I/O Interface Compatibility from 1.71V to 5.5V
- Proven PCB Layout
- Mbed™/Arduino® Platform Compatible
- Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

EV Kit Photo



Quick Start

Required Equipment

- MAX33042E shield
- 5V, 500mA DC power supply
- Signal/function generator that can generate 2MHz square wave signal
- Oscilloscope

Procedure

The EV kit is fully assembled and tested. The following procedure can be used to test the MAX33042E shield as a standalone evaluation board.

1. Place the MAX33042E shield on a nonconductive surface to ensure that nothing on the PCB gets shorted to the workspace.
2. Set all the jumpers to their default positions as shown in [Table 1](#).
3. With +5V power supply disabled, connect the positive terminal to the VDD_EXT test point and IOREF test point. Connect the negative terminal to the GND test point.
4. Connect the positive terminal of the function generator to D1 (pin 2 of P2) and negative terminal to any GND test point on the shield. D1 is connected to the MAX33042E's TXD pin through the digital isolator (U2).
5. Set function generator to the output a 2MHz square wave between 0V and 5V, and then enable function generator output.
6. Turn on the +5V DC power supply.
7. Connect an oscilloscope probe on D0 (pin 1 of P2) and verify the D0 output signal (RXD) matches the D1 input signal (TXD).

Detailed Description of Hardware

The MAX33042E shield is a fully assembled and tested circuit board for evaluating the high-speed MAX33042E CAN transceiver (U1) with $\pm 40V$ of fault protection. The shield is designed to evaluate the MAX33042E alone or in a CAN system. The MAX33042E shield enables Mbed or Arduino platform to communicate on a CAN bus, or it can be used as a standalone evaluation board. The MAX14931 digital isolator is used as a level translator with a 1.71V to 5.5V supply range. Disconnect the jumper JU15 (resistor R15) to apply the transmitter input signal directly on the TXD test point. Likewise, disconnect the jumper JU16 (resistor R16) to measure the receiver output signal directly on the RXD test point. If external protection is desired beyond the device's built-in protection, the shield features footprints for TVS diodes (D1 and D2) that can be connected to the CANH, and CANL lines using JU5 and JU6, respectively.

This evaluation shield should be used with the following documents:

- MAX33042E data sheet
- MAX33042E shield data sheet (this document)

These documents, or links to them, are included on the MAX33042E shield page. Use the following link for the latest versions of the documents listed above. <http://www.maximintegrated.com/MAX33042ESHLD>

Powering the Board

The MAX33042E shield requires two power supplies: one 4.5V–5.5V supply for the MAX33042E (U1) transceiver applied at the VDD_EXT test point, and one 1.71V–5.5V supply for the microcontroller domain applied at the IOREF test point. When the shield board is used with an Arduino/Mbed board, the power supply for U1 can also come from the Arduino/Mbed board's 5V rail. Place the shunt on 2-3 position of JU11 to connect VDD to the VDD_EXT pin. Place the shunt of JU11 on 1-2 position to connect VDD of U1 to the Arduino/Mbed 3.3V supply rail. In this scenario, IOREF is directly taken from the Arduino/Mbed header.

On-Board Termination

A properly terminated CAN bus is terminated at each end with the characteristic impedance of the cable. For CAT5 or CAT6 cables, this is typically 120Ω on each end for a 60Ω load on the CAN driver. The MAX33042E shield features a selectable 60Ω load and a 60Ω–60Ω split termination circuit between the CANH and CANL driver outputs. The 60Ω–60Ω split termination has a footprint for a capacitor to reduce high-frequency noise and common-mode drift. If the board is evaluated in a system and is connected at the end of the cable, then select the 120Ω (60Ω–60Ω split) termination. The termination resistors on the MAX33042E shield changes to 60Ω with a 100pF load (using JU7 and JU8) to simulate a complete system load during evaluation.

TXD and RXD Configuration

Digital channels for TXD and RXD are selected through JU1. It consists of three columns and 16 rows. The columns labeled TXD and RXD are connected to the MAX33042E through the digital isolator (MAX14931FASE+ (U2)). The middle column is the digital I/O pins, D0 to D15, from the Arduino/Mbed header. This provides flexibility for the user to select different resources on the microcontroller to transmit and receive signals to and from the CAN transceiver. [Table 2](#) shows the list of JU1 jumper options.

DB9 Connector

The MAX33042E shield has a DB9 connector to CANH and CANL (pins 7 and 2, respectively).

The MAX33042E shield allows multiple points of connection to the MAX33042E transceiver. The shield board can be placed on a Arduino/Mbed-compatible board to connect all the digital pins (TXD, RXD, STBY, SHDN) through the P1 and P2 headers. These signals can also be connected directly at their respective test points on the board, bypassing the digital isolator (U2). The CANH and CANL signals are connected to a terminal block (JU13) to easily connect to a twisted pair cable. These signals are routed to a DB9 connector (CANH and CANL on pins 7 and 2, respectively). Alternately, the CANH and CANL test points can be used.

SD Card

The MAX33042E shield has a microSD card socket for easy use in OBD applications. The microSD card is connected to D10–D13 to interface with the Arduino/Mbed board through the SPI interface.

Table 1. Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	-	See Table 2
JU5	1-2	Connects TVS diode (optional, not populated) to CANH
	Open*	Disconnects TVS diode (optional, not populated) from CANH
JU6	1-2	Connects TVS diode (optional, not populated) to CANL
	Open*	Disconnects TVS diode (optional, not populated) to CANL
JU7, JU8	1-2	Connects 120Ω between CANH and CANL
	2-3*	Connects 60Ω between CANH and CANL
	Open	No load is connected between CANH and CANL
JU9	1-2*	Connects SHDN to D7 of P2
	Open	Disconnects SHDN from D7 of P2
JU10	1-2*	Connects STBY to D6 of P2
	Open	Disconnects STBY from D6 of P2
JU11	1-2	VDD is shorted to 5V supply
	2-3*	VDD is shorted to VDD_EXT supply
	Open	VDD is open
JU12	1-2*	Connects STBY to ground
	1-3	Connects STBY to a 39.2kΩ resistor to ground
	1-4	Connects STBY to U2's OUTB1 pin used for Arduino/Mbed interface
	Open	Internal pullup for standby mode
JU20	1-2*	Connects VDD pin of U1 to VDD supply rail
	Open	Disconnects VDD pin of U1 to VDD supply rail

*Default jumper state.

Table 2. TXD and RXD Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2	Connects TXD to D0
	4-5*	Connects TXD to D1
	7-8	Connects TXD to D2
	10-11	Connects TXD to D3
	13-14	Connects TXD to D4
	16-17	Connects TXD to D5
	19-20	Connects TXD to D6
	22-23	Connects TXD to D7
	25-26	Connects TXD to D8
	28-29	Connects TXD to D9
	31-32	Connects TXD to D10
	34-35	Connects TXD to D11
	37-38	Connects TXD to D12
	40-41	Connects TXD to D13

	43-44	Connects TXD to D14
	46-47	Connects TXD to D15
	2-3*	Connects RXD to D0
	5-6	Connects RXD to D1
	8-9	Connects RXD to D2
	11-12	Connects RXD to D3
	14-15	Connects RXD to D4
	17-18	Connects RXD to D5
	20-21	Connects RXD to D6
	23-24	Connects RXD to D7
	26-27	Connects RXD to D8
	29-30	Connects RXD to D9
	32-33	Connects RXD to D10
	35-36	Connects RXD to D11
	38-39	Connects RXD to D12
	41-42	Connects RXD to D13
	44-45	Connects RXD to D14
	47-48	Connects RXD to D15

*Default jumper state.

Ordering Information

PART	TYPE
MAX33042ESHLD#	EV Kit

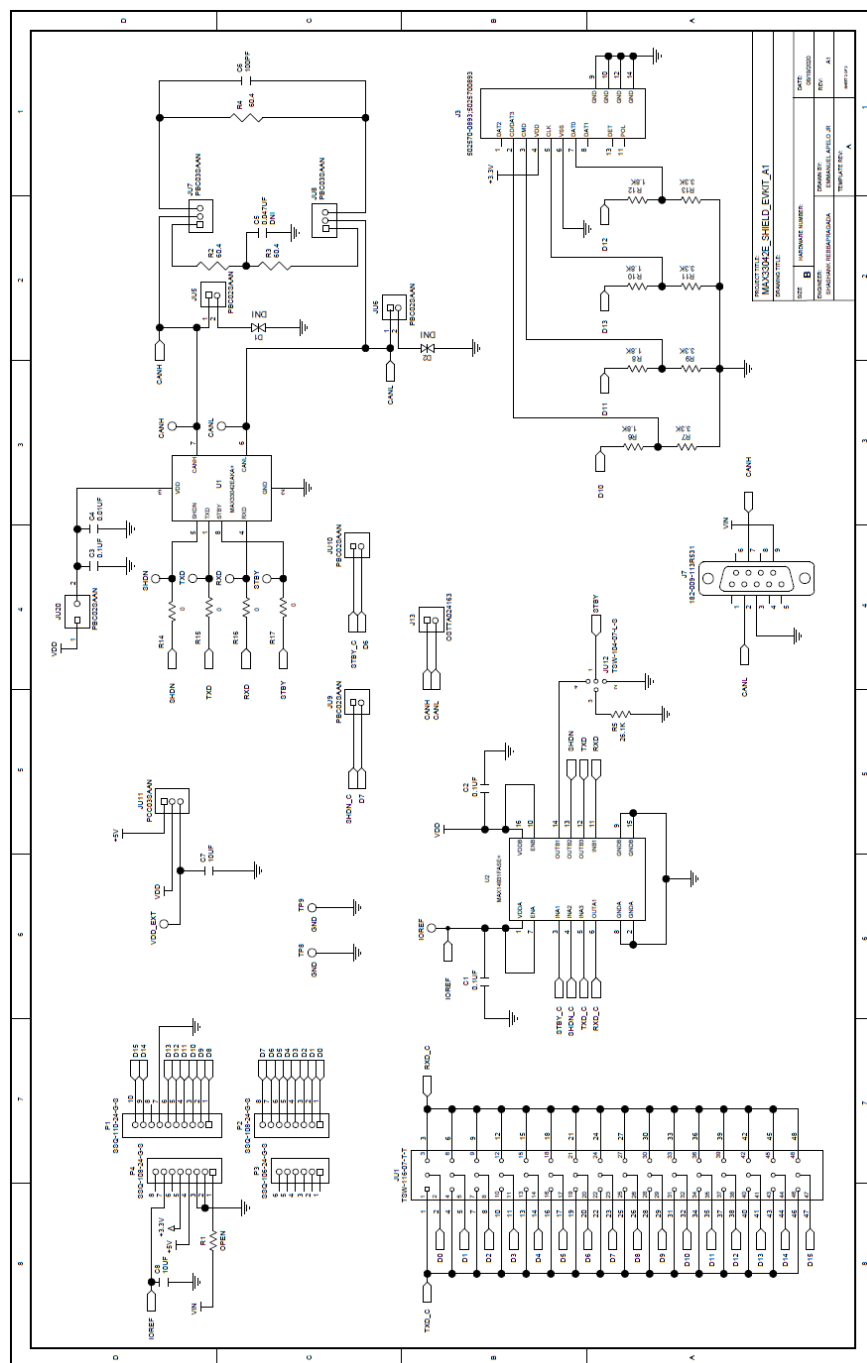
#Denotes RoHS compliance.

MAX33042E Shield Bill of Materials

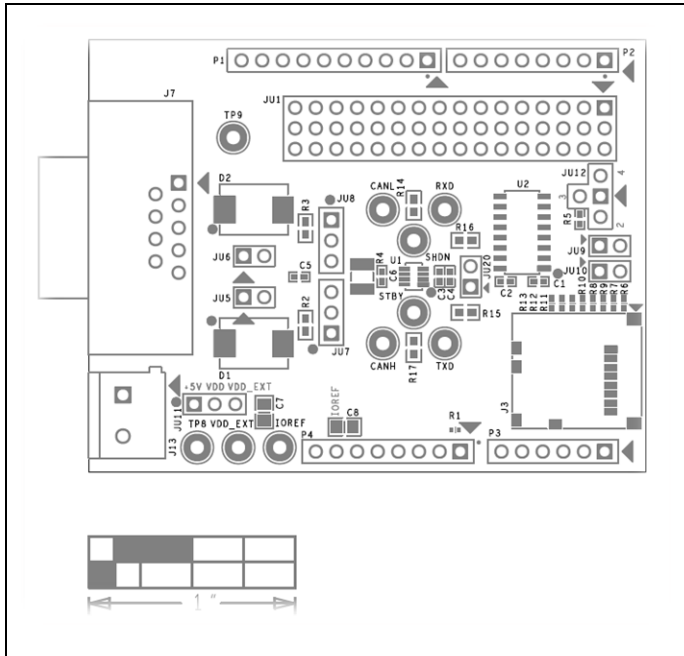
REF DES	QTY	MFG PART #	VALUE	DESCRIPTION
C1-C3	3	C0402C104J4RAC; GCM155R71C104JA55	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=5%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R
C4	1	C0402X7R160-103JNP; X7R0402CTT; 0402YC103JAT2A	0.01UF	CAPACITOR; SMT; 0402; CERAMIC; 0.01uF; 16V; 5%; X7R; -55degC to + 125degC; 0 +/-15% degC MAX.
C6	1	C0402C101J5GAC;NMC0402NPO1 01J;CC0402JRNPO9BN101;GRM1 555C1H101JA01;C1005C0G1H101 J050BA;CGA2B2C0G1H101J050BA	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G
C7, C8	2	GRM21BR61A106KE19; ECJ- FB1A106;CL21A106KPCLQNC; GRM219R61A106KE44	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R
CANH, CANL, RXD, SHDN, STBY, TXD	6	5012	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
IOREF, VDD_EXT	2	5010	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
J3	1	502570-0893;5025700893	502570-0893; 5025700893	CONNECTOR; FEMALE; SMT; MICROSD CARD CONNECTOR; RIGHT ANGLE; 10PINS
J7	1	182-009-113R531	182-009-113R531	CONNECTOR; MALE; THROUGH HOLE; D-SUBMINIATURE CONNECTOR; RIGHT ANGLE; 9PINS
J13	1	OSTTA024163	OSTTA024163	CONNECTOR; FEMALE; THROUGH HOLE; 5.08MM TERM BLOCK CONNECTOR; STRAIGHT; 2PINS; -30 DEGC TO +105 DEGC
JU1	1	TSW-116-07-T-T	TSW-116-07-T-T	CONNECTOR; MALE; THROUGH HOLE; 0.025IN SQ POST HEADER; STRAIGHT; 48PINS
JU5, JU6, JU9, JU10, JU20	5	PBC02SAAN	PBC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
JU7, JU8	2	PBC03SAAN	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC
JU11	1	PCC03SAAN	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
JU12	1	TSW-104-07-L-S	TSW-104-07-L-S	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS

P1	1	SSQ-110-24-G-S	SSQ-110-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 10PINS ;
P2, P4	2	SSQ-108-24-G-S	SSQ-108-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 8PINS ;
P3	1	SSQ-106-24-G-S	SSQ-106-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 6PINS ;
R2, R3	2	CRCW060360R4FK	60.4	RESISTOR; 0603; 60.4 OHM; 1%; 100PPM; 0.10W; THICK FILM
R4	1	CRCW121060R4FKEAHP	60.4	RES; SMT (1210); 60.4R; 1%; +/- 100PPM/DEGK; 0.75W
R5	1	CRCW040226K1FK	26.1K	RESISTOR; 0402; 26.1K OHM; 1%; 100PPM; 0.063W; THICK FILM
R6, R8, R10, R12	4	CRCW04021K80FK; RC0402FR-071K8L	1.8K	RESISTOR, 0402, 1.8K OHM, 1%, 100PPM, 0.0625W, THICK FILM
R7, R9, R11, R13	4	CRCW04023K30FK	3.3K	RESISTOR, 0402, 3.3K OHM, 1%, 100PPM, 0.0625W, THICK FILM
R14-R17	4	RC1608J000CS;CR0603-J/-000ELF;RC0603JR-070RL	0	RESISTOR; 0603; 0 OHM; 5%; JUMPER; 0.10W; THICK FILM
TP8, TP9	2	5011	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
U1	1	MAX33042EAKA+	MAX33042EAKA+	EVKIT PART - IC; MAX33042EAKA+; +5V; 5MBPS CAN TRANSCEIVER WITH +/-40V FAULT PROTECTION; +/-25VCMR; AND +/-40KV ESD; PACKAGE OUTLINE DRAWING: 21-0078; PACKAGE CODE: K8CN+2; LAND PATTERN DRAWING: 90-0176; SOT23-8
U2	1	MAX14931FASE+	MAX14931FASE+	IC; DISO; 3/1 CHANNEL; 150MBPS; DEFAULT LOW; 2.75KVRMS DIGITAL ISOLATOR; NSOIC16 150MIL
PCB	1	MAX33042ESHIELD	PCB	PCB:MAX33042ESHIELD
C5	0	C1005X7R1E473K050BC; GRM155R71E473K; GCM155R71E473KA55	0.047UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.047UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC
D1, D2	0	SM15T30CA	25.6V	DIODE; TVS; SMC (DO-214AB); VRM=25.6V; IPP=36A
R1	0	N/A	OPEN	RESISTOR; 0402; OPEN; FORMFACTOR

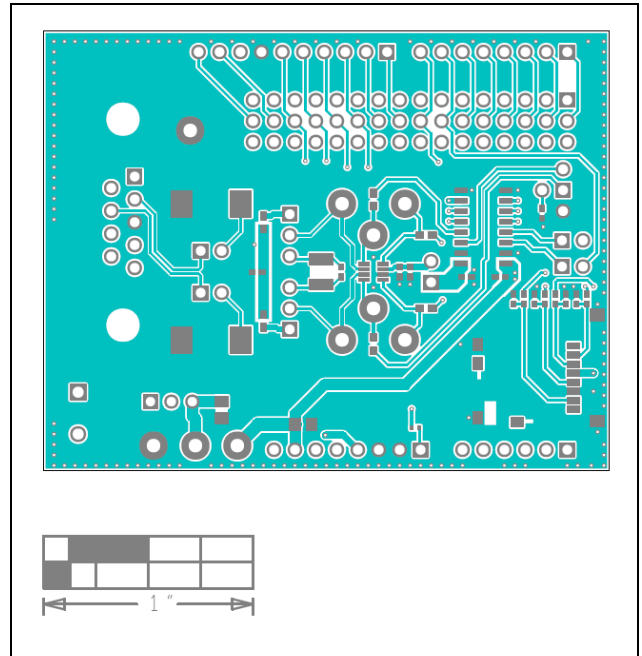
MAX33042E Shield Schematic



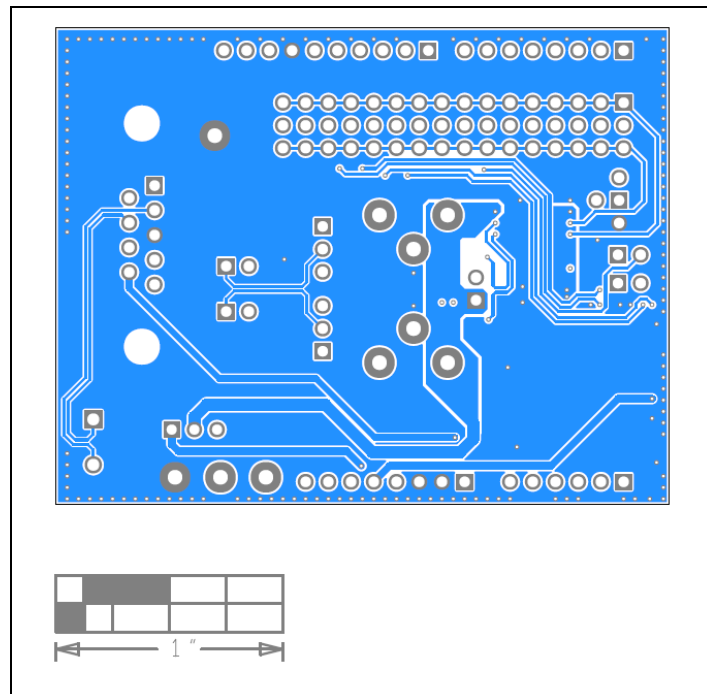
MAX33042E Shield PCB Layouts



MAX33042E Shield Component Placement Guide—Top Silkscreen



MAX33042E Shield PCB Layouts—Top



MAX33042E Shield PCB Layouts—Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	12/20	Initial release	—

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