*Click **here** for production status of specific part numbers.*

MAX33040E Shield Evaluation Kit

Evaluates: MAX33040E

General Description

The MAX33040E shield evaluation kit (EV kit) is a fully assembled and tested printed circuit board (PCB) that demonstrates the functionality of the MAX33040E controller area network (CAN) transceiver with ±40V fault protection extended ±25V common-mode input range and ±40kV ESD human body model (HBM). The EV kit features a digital isolator, which is used as a level translator between the CAN transceiver and the controller interface.

Features

- Easy Evaluation of the MAX33040E
- I/O Interface Compatibility from 1.71V to 5.5V
- Proven PCB Layout
- Mbed™/Arduino® Platform +
- Fully Assembled and Tested

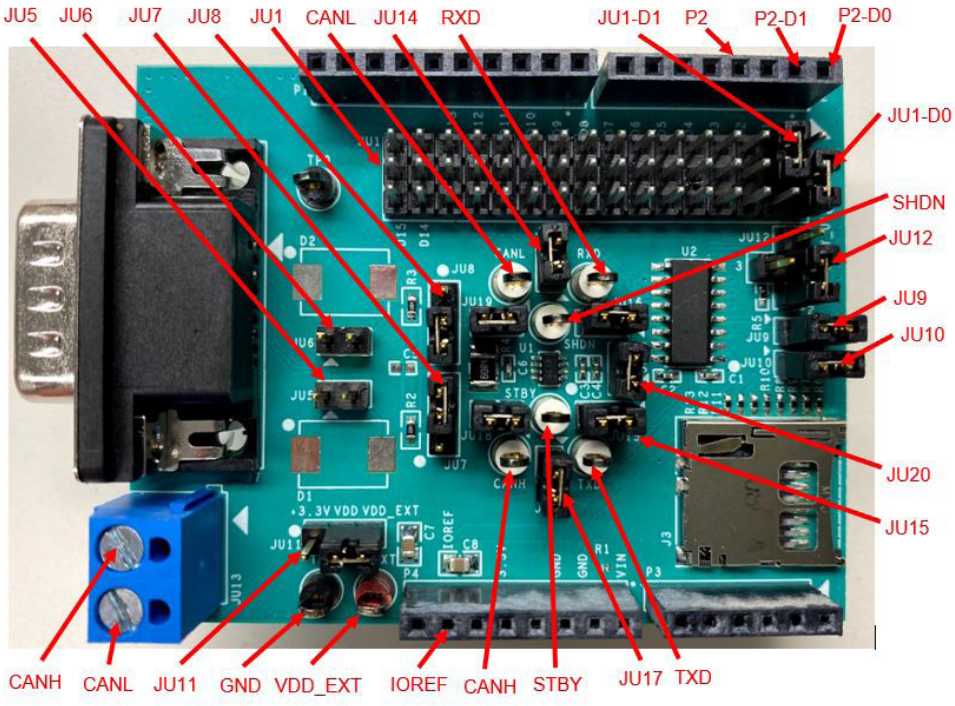
Quick Start

Required Equipment

- MAX33040E shield EV kit
- 3.3V, 500mA DC power supply
- Signal/function generator that can generate 2.5MHz square wave signal
- Oscilloscope

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

EV Kit Photo with Jumper and Test Point Positions



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Procedure

The following procedure can be used to test the MAX33040E shield EV kit as a standalone evaluation board.

1) Place the MAX33040E shield EV kit 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 +3.3V power supply disabled, connect the positive terminal to the VDD_EXT test point and IOREF (pin 7 of P4). Connect the negative terminal to the GND test point.
4) Connect the positive terminal of the function generator to the D1 (pin 2 of P2) and negative terminal to any GND test point on the shield. D1 is connected to MAX33040E's TXD pin through the digital isolator (U2).
5) Set function generator to the output a 2.5MHz square wave between 0V and 3.3V, and then enable function generator output.
6) Turn on the +3.3V 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 MAX33040E shield EV kit is a fully assembled and tested circuit board for evaluating the MAX33040E fault-protected high-speed CAN transceiver (U1) with ±40V of fault protection. The EV kit is designed to evaluate the MAX33040E alone or in a CAN system. The MAX33040E shield EV kit 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 jumper JU15 to apply the transmitter input signal directly on the TXD test point. Likewise, disconnect jumper JU16 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 EV kit also features footprints for TVS diodes (D1 and D2) that can be connected to the CANH and CANL lines using JU5 and JU6, respectively.

Powering the Board

The MAX33040E shield EV kit requires two power supplies: one 3V–3.6V supply for the MAX33040E (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 EV kit board is used with an Arduino/Mbed board, the power supply for U1 can also come from the Arduino/Mbed board's 3.3V 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 MAX33040E shield EV kit 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 MAX33040E shield EV kit 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 MAX33040E 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 MAX33040E shield EV kit has a DB9 connector to CANH and CANL (pins 7 and 2, respectively).

The MAX33040E shield EV kit allows multiple points of connection to the MAX33040E transceiver. The EV kit 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, CANL signals are connected to a terminal block (JU13) to easily connect to a twisted pair cable. These signals are also routed to a DB9 connector (CANH and CANL on pins 7 and 2, respectively). Alternately, the CANH and CANL test points can be used.w

SD Card

The MAX33040E shield EV kit 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 and 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 3.3V 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
JU14	1-2*	Connects SHDN to U2
	Open	Disconnects SHDN from U2
JU15	1-2*	Connects TXD to U2
	Open	Disconnects TXD from U2
JU16	1-2*	Connects RXD to U2
	Open	Disconnects RXD from U2
JU17	1-2*	Connects STBY to JU12
	Open	Disconnects STBY from JU12
JU18	1-2*	Connects CANH to JU5 and JU7
	Open	Disconnects CANH from JU5 and JU7
JU19	1-2*	Connects CANL to JU6 and JU8
	Open	Disconnects CANL from JU6 and JU8
JU20	1-2*	Connects VDD pin of U1 to VDD supply rail
	Open	Disconnects VDD pin of U1 to VDD supply rail

**Indicates default jumper state.*

Table 2. TXD and RXD Jumper Setting

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

**Indicates default jumper state.*

Ordering Information

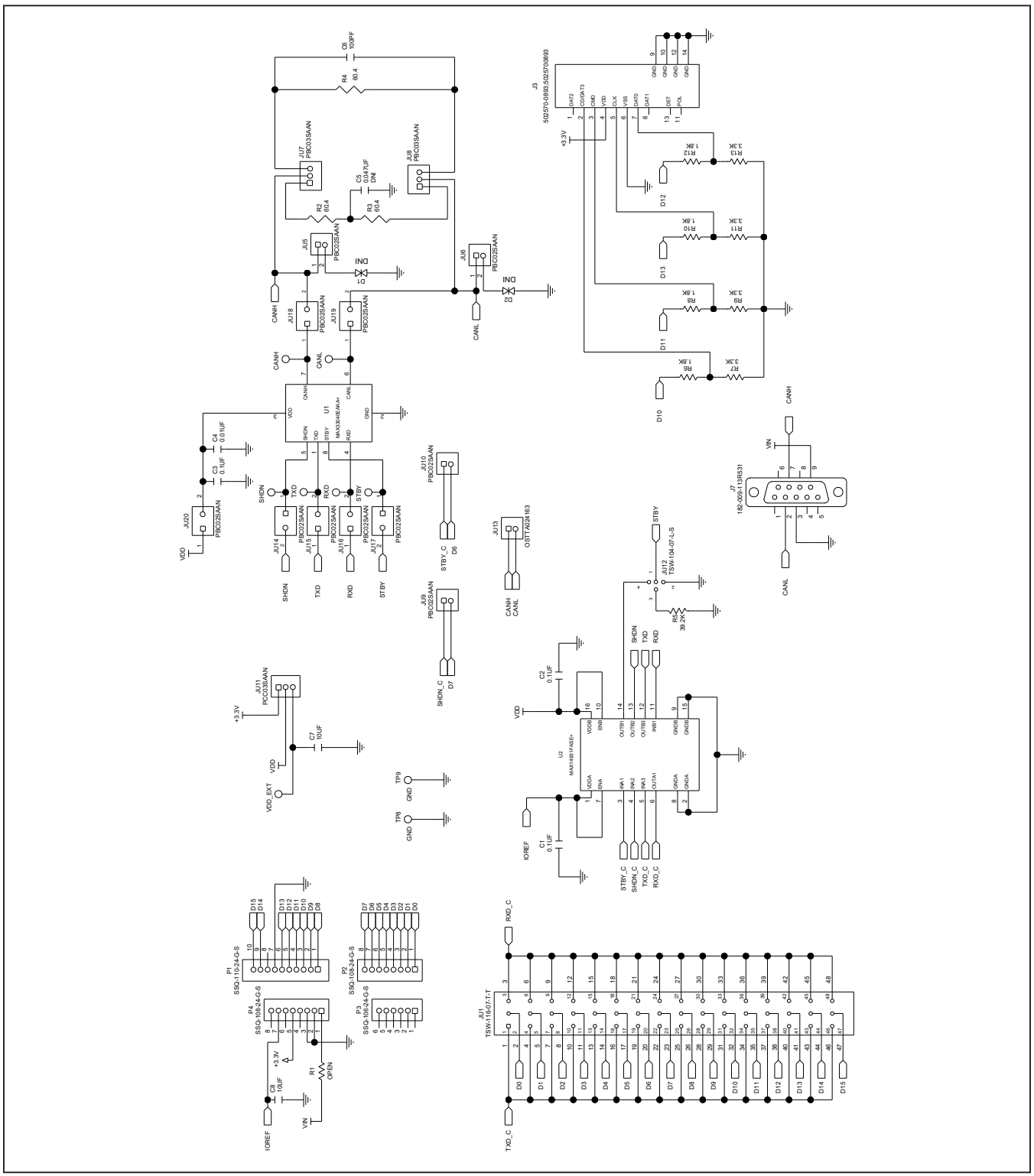
PART	TYPE
MAX33040ESHLD#	Shield

#Denotes RoHS compliance.

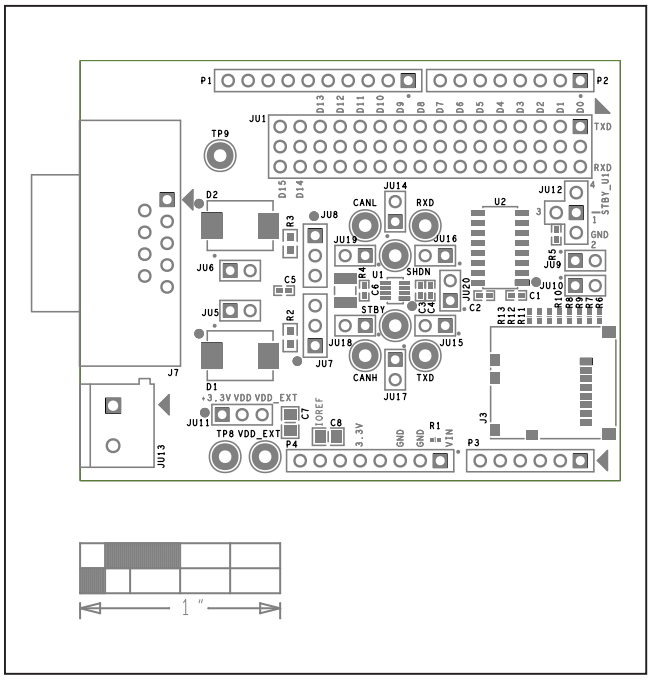
MAX33040E Shield EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1-C3	-	3	C0402C104J4RAC; GCM155R71C104JA55	KEMET;MURATA	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=5%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R
2	C4	-	1	C0402X7R160-103JNP; X7R0402CTT; 0402YC103JAT2A	VENKEL LTD; KOA SPEER ELECTRONICS INC; AVX	0.01UF	CAPACITOR; SMT; 0402; CERAMIC; 0.01uF; 16V; 5%; X7R; -55degC to + 125degC; 0 +/-15% degC MAX.
3	C6	-	1	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050BA; CGA2B2C0G1H101J050BA	KEMET; NIC COMPONENTS CORP.; YAGEO PHICOMP;MURATA; TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G
4	C7, C8	-	2	GRM21BR61A106KE19; ECJ-2FB1A106; CL21A106KPCLQNC; GRM219R61A106KE44	MURATA;PANASONIC; SAMSUNG ELECTRONICS; MURATA	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R
5	CANH, CANL, RXD, SHDN, STBY, TXD	-	6	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;
6	J3	-	1	502570-0893;5025700893	MOLEX;MOLEX	502570-0893;5025700893	CONNECTOR; FEMALE; SMT; MICROSD CARD CONNECTOR; RIGHT ANGLE; 10PINS
7	J7	-	1	182-009-113R531	NORCOMP	182-009-113R531	CONNECTOR; MALE; THROUGH HOLE; D-SUBMINIATURE CONNECTOR; RIGHT ANGLE; 9PINS
8	JU1	-	1	TSW-116-07-T-T	SAMTEC	TSW-116-07-T-T	CONNECTOR; MALE; THROUGH HOLE; 0.025IN SQ POST HEADER; STRAIGHT; 48PINS
9	JU5, JU6, JU9, JU10, JU14-JU20	-	11	PBC02SAAN	SULLINS ELECTRONICS CORP.	PBC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
10	JU7, JU8	-	2	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC
11	JU11	-	1	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
12	JU12	-	1	TSW-104-07-L-S	SAMTEC	TSW-104-07-L-S	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS
13	JU13	-	1	OSTTA024163	ON-SHORE TECHNOLOGY INC.	OSTTA024163	CONNECTOR; FEMALE; THROUGH HOLE; 5.08MM TERM BLOCK CONNECTOR; STRAIGHT; 2PINS; -30 DEGC TO +105 DEGC
14	P1	-	1	SSQ-110-24-G-S	SAMTEC	SSQ-110-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 10PINS ;
15	P2, P4	-	2	SSQ-108-24-G-S	SAMTEC	SSQ-108-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 8PINS ;
16	P3	-	1	SSQ-106-24-G-S	SAMTEC	SSQ-106-24-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025INCH SQ POST SOCKET; STRAIGHT; 6PINS ;
17	R2, R3	-	2	CRCW060360R4FK	VISHAY DALE	60.4	RESISTOR; 0603; 60.4 OHM; 1%; 100PPM; 0.10W; THICK FILM
18	R4	-	1	CRCW121060R4FKEAHP	VISHAY DRALORIC	60.4	RES; SMT (1210); 60.4R; 1%; +/-100PPM/DEGK; 0.75W
19	R5	-	1	ERJ-2RKF3922	PANASONIC	39.2K	RESISTOR; 0402; 39.2K OHM; 1%; 100PPM; 0.10W; METAL FILM
20	R6, R8, R10, R12	-	4	CRCW04021K80FK; RC0402FR-071K8L	VISHAY DALE; YAGEO PHICOMP	1.8K	RESISTOR, 0402, 1.8K OHM, 1%, 100PPM, 0.0625W, THICK FILM
21	R7, R9, R11, R13	-	4	CRCW04023K30FK	VISHAY DALE	3.3K	RESISTOR, 0402, 3.3K OHM, 1%, 100PPM, 0.0625W, THICK FILM
22	TP8, TP9	-	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;
23	U1	-	1	MAX33040EAKA+	MAXIM	MAX33040EAKA+	EVKIT PART - IC; MAX33040EAKA+; +3.3V; 5MBPS CAN TRANSCEIVER WITH +/-40V FAULT PROTECTION; +/-25VCMR AND +/-25KV ESD; PACKAGE OUTLINE DRAWING: 21-0078; PACKAGE CODE: K8CN+2; LAND PATTERN DRAWING: 90-0176
24	U2	-	1	MAX14931FASE+	MAXIM	MAX14931FASE+	IC; DISO; 3/1 CHANNEL; 150MBPS; DEFAULT LOW; 2.75KVRMS DIGITAL ISOLATOR; NSOIC16 150MIL
25	VDD_EXT	-	1	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
26	PCB	-	1	MAX33040ESHIELD	MAXIM	PCB	PCB:MAX33040ESHIELD
27	C5	DNP	0	C1005X7R1E473K050BC; GRM155R71E473K; GCM155R71E473KA55	TDK;MURATA;MURATA	0.047UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.047UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC
28	D1, D2	DNP	0	SM15T30CA	ST MICROELECTRONICS	25.6V	DIODE; TVS; SMC (DO-214AB); VRM=25.6V; IPP=36A
29	R1	DNP	0	N/A	N/A	OPEN	RESISTOR; 0402; OPEN; FORMFACTOR
TOTAL			54				

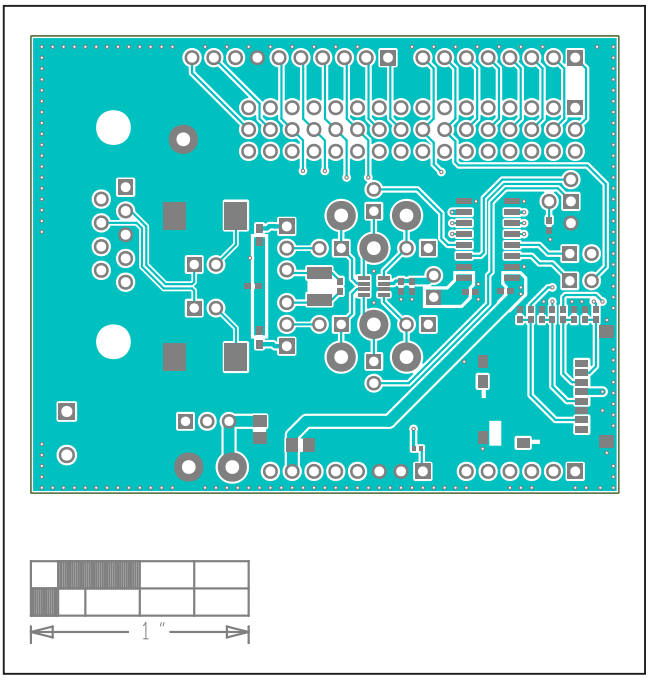
MAX33040E Shield EV Kit Schematics



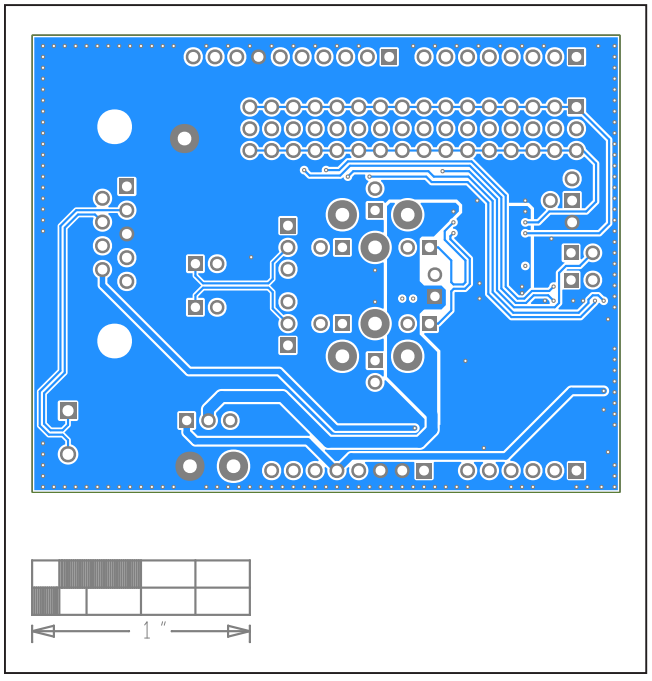
MAX33040E Shield EV Kit PCB Layouts



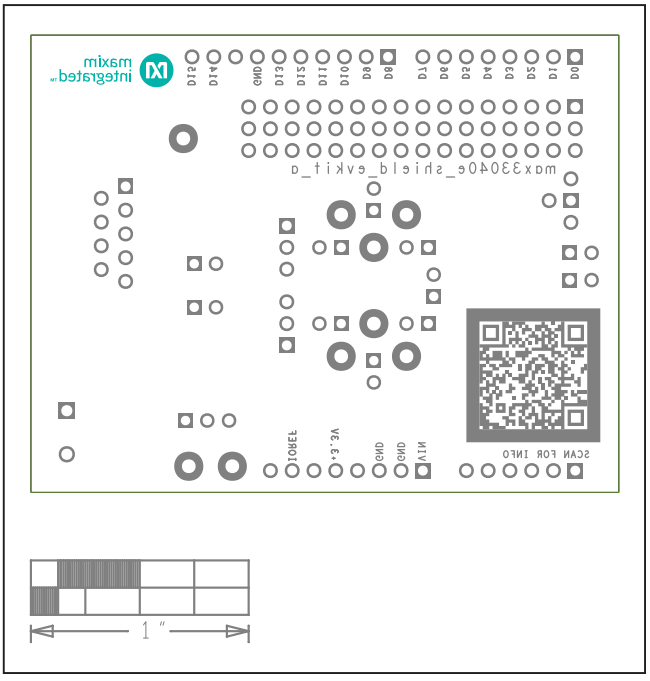
MAX33040E Shield Component Placement Guide—Top Silkscreen



MAX33040E Shield PCB Layout—Top



MAX33040E Shield PCB Layout—Bottom



MAX33040E Shield Component Placement Guide—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/20	Initial release	—

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