

Evaluates: MAX33047E/MAX33048E

General Description

The MAX33047E evaluation kit is a fully assembled and tested board that demonstrates the functionality of the MAX33047E/MAX33048E. These devices are full-duplex RS-485/RS-422 transceivers with $\pm 25V$ fault protection and $\pm 40kV$ human body model (HBM) ESD protection for the A/B and Y/Z data lines. The MAX33047E supports data rates of up to 500kbps, while the MAX33048E supports data rates of up to 20Mbps.

The EV kit includes the MAX33047E installed on the 8-pin SOIC footprint and can also be utilized to evaluate the MAX33048E.

Features

- Easy Evaluation of the MAX33047E/MAX33048E
- Power/Ground Connections Through Screw Terminal Blocks
- Screw Terminal Blocks for RS-485 Signals
- Test Points for Measuring All Signals
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Required Equipment

- MAX33047E EV kit
- +5V, 500mA DC power supply
- Signal/function generator that can generate a 500kHz square wave
- Oscilloscope

Procedure

1. Verify jumpers J3 and J4 are in their default positions for loopback configuration test. See [Table 1](#).
2. With the +5V power supply disabled, connect the positive terminal to the V_{CC} test point. Connect the negative terminal to one of the GND test points.
3. Set the signal/function generator to output a 250kHz (500kbps) square wave between 0V to 5V.
4. Connect the positive terminal of the signal/function generator to DI (TP6) and negative terminal to any GND test point on the board.
5. Turn on the +5V DC power supply, and then enable the function generator output.
6. Connect an oscilloscope probe to RO (TP5) and verify that the signal matches the DI input.

EV Kit Photo

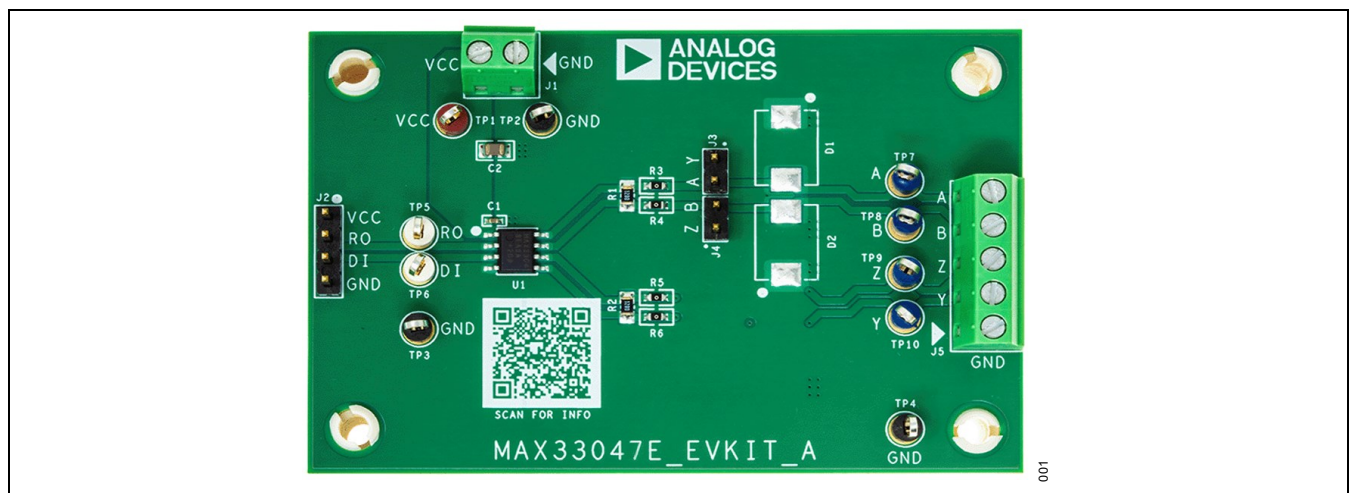


Table 1. MAX33047E EV Kit Jumper Connection Description

JUMPER	SHUNT POSITION	FEATURE
J3	Closed	A is connected to Y (loopback configuration)
	Open	A is not connected to Y
J4	Closed	B is connected to Z (loopback configuration)
	Open	B is not connected to Z

Note: Default options are bold.

Table 2. MAX33047E EV Kit Test Points Description

REFERENCE DESIGNATOR	SIGNAL
TP1	V _{CC}
TP2	GND
TP3	GND
TP4	GND
TP5	RO
TP6	DI
TP7	A
TP8	B
TP9	Z
TP10	Y

Table 3. MAX33047E EV Kit Terminal Blocks and Headers Description

REFERENCE DESIGNATOR	PIN NUMBER	SIGNAL
J1	1	GND
	2	V _{CC}
J2	1	V _{CC}
	2	RO
	3	DI
	4	GND
J5	1	GND
	2	Y
	3	Z
	4	B
	5	A

Detailed Description of Hardware

The MAX33047E EV kit is a fully assembled and tested circuit board for evaluating the MAX33047E/MAX33078E full-duplex RS-485/RS-422 transceiver with $\pm 25\text{V}$ fault protection and $\pm 40\text{kV}$ ESD Human Body Model (HBM) protection. A +3.0V to +5.5V supply can power the EV kit.

The EV kit allows all the input and output functions to be exercised without the need for additional external components. Jumper configurations are shown in [Table 1](#), test points references are listed in [Table 2](#), and screw terminal blocks and headers are listed in [Table 3](#).

Decoupling Capacitors

The MAX33047E EV kit can be powered by connecting a +3.0 to +5.5V power supply to the screw terminals or adjacent test points for V_{CC} and GND at the top of the board. A $0.1\mu\text{F}$ decoupling capacitor is next to the V_{CC} pin of the RS-485 transceiver (U1). In addition, the EV kit comes with a $22\mu\text{F}$ tantalum capacitor is installed right next to J1 terminal block in case of unfiltered supplies.

Input/Output Connections

The MAX33047E EV kit includes connections for data input (DI) and receiver output (RO). Logic I/O is connected through a 0.1in header, J2, allowing jumper wire connections to a microcontroller.

Connections to an RS-485 bus are made with screw terminal block J5 on the right side of the board. There are receiver input signals, A and B, and driver output signals, Y and Z.

Test points are also available on the board and appropriately labeled for all logic and bus I/O signals.

On-Board Termination

A properly terminated RS-485 bus is terminated at each end, and the characteristic impedance of the twisted pair cable is typically 120Ω . The MAX33047E EV kit provides on-board 120Ω termination (R2) between the Y and Z driver outputs and 120Ω (R1) between the A and B receiver inputs. If the EV kit is evaluated with an already terminated system, remove the on-board 120Ω terminations.

External Protection

The MAX33047E has integrated high ESD protection on the driver outputs (Y/Z) and receiver inputs (A/B), with $\pm 40\text{kV}$ Human Body Model (HBM), $\pm 15\text{kV}$ Air-Gap Discharge, and $\pm 10\text{kV}$ Contact Discharge.

The MAX33047E EV kit provides options for added external protection. Swap out the 0Ω series resistors R3–R6 on the A, B, Y, and/or Z lines for other protection components and/or install TVS diodes on D1–D4 footprints.

For applications that require high-voltage transient protection, such as surge transients, external protection is needed on the bus lines. Choose a TVS diode with a clamp voltage below $\pm 30\text{V}$ and ensure external protection added to the bus lines does not slew the signals at the required operating data rate.

Evaluating the MAX33048E

The MAX33047E EV kit is shipped with a MAX33047E installed. To evaluate the MAX33048E, order a MAX33048EASA+ free sample with the MAX33047E EV kit. Remove the MAX33047EASA+ (U1) on the EV kit, and replace it with the MAX33048EASA+.

Evaluating ESD Protection

The MAX33047E EV kit can be used to evaluate ESD performance for the MAX33047E and MAX33048E, based on the IEC 61000-4-2 standard. Without added external protection, the EV kit can verify the ESD performance up to $\pm 10\text{kV}$ Contact Discharge and $\pm 15\text{kV}$ Air-Gap Discharge. Follow the IEC 61000-4-2 ESD guideline for a proper test setup. Apply ESD stresses at the terminal block J5 on the EV kit for signal A, B, Y, and Z. Place a bleeding resistor cable and an earth ground return as close as possible to where the stress is applied on the EV kit. See [Figure 1](#).

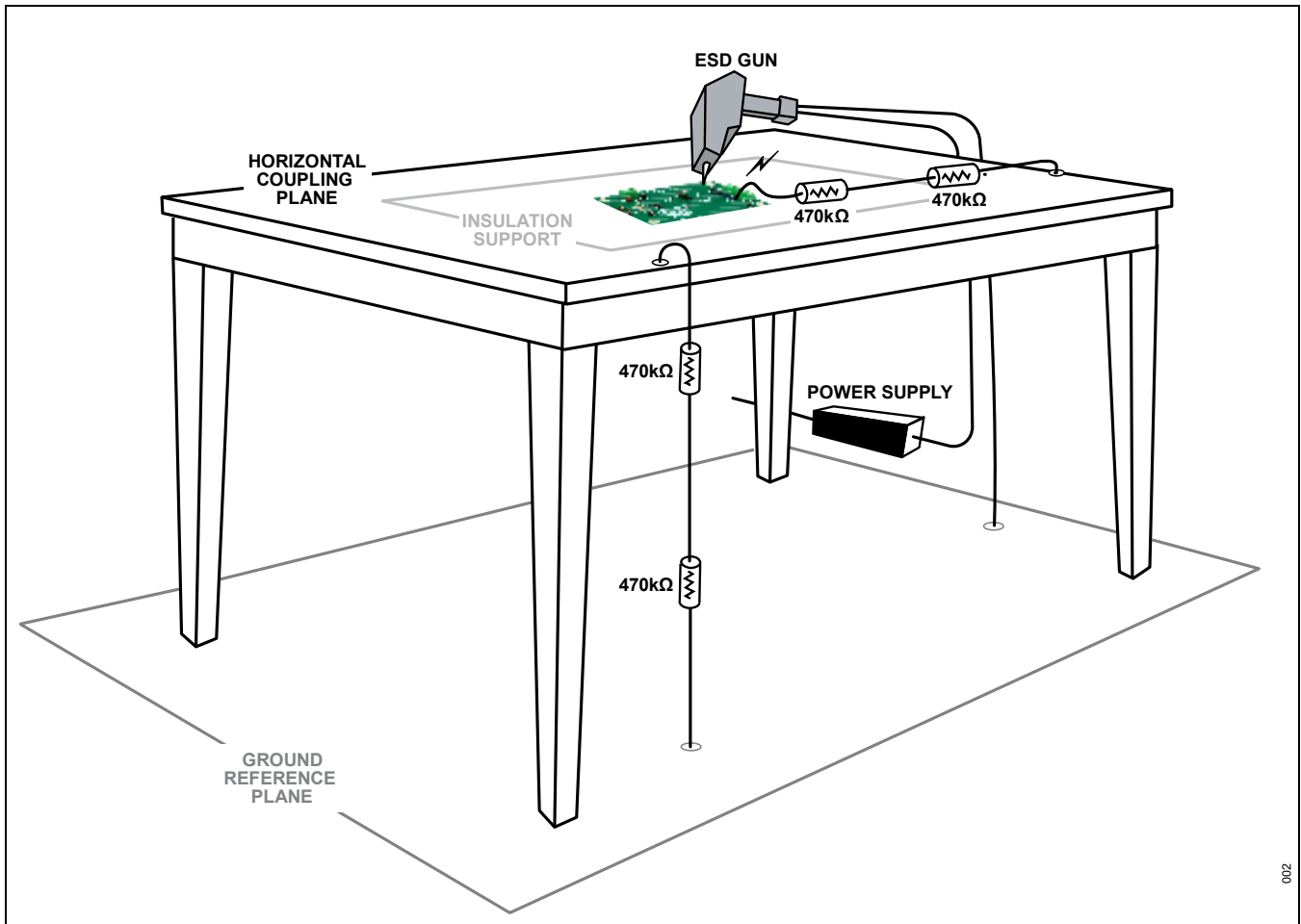


Figure 1. IEC 61000-4-2 ESD Test Setup

Lab Connection

To evaluate full-duplex functionality using only the MAX33047E EV kit, set the EV kit in the loopback configuration by closing J3 (which connects A and Y) and J4 (which connects B and Z). A signal generator connected to DI allows verification of the bus signals and the receiver output. See [Figure 2](#).

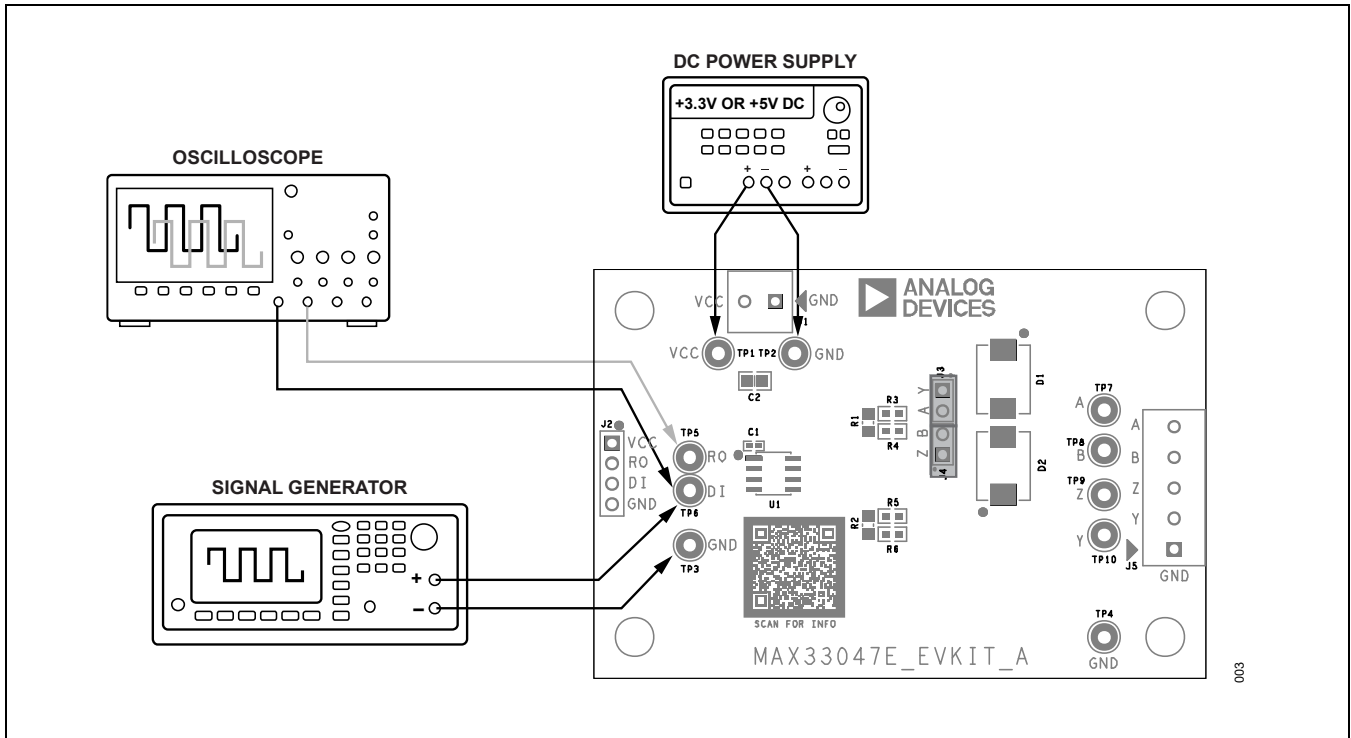


Figure 2. Connection Diagram

Ordering Information

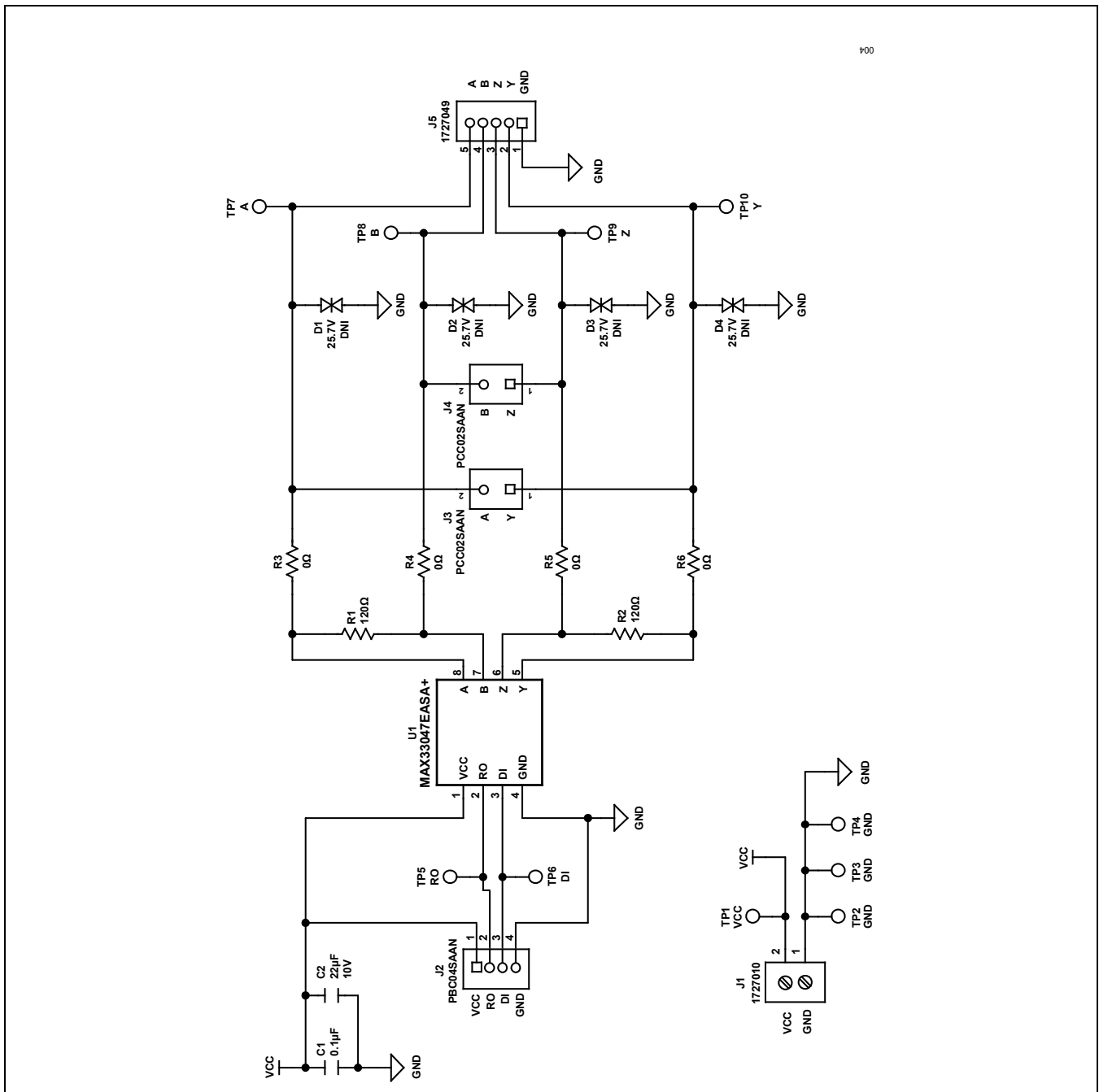
PART	TYPE
MAX33047EEVKIT#	EV Kit

#Denotes RoHS compliance.

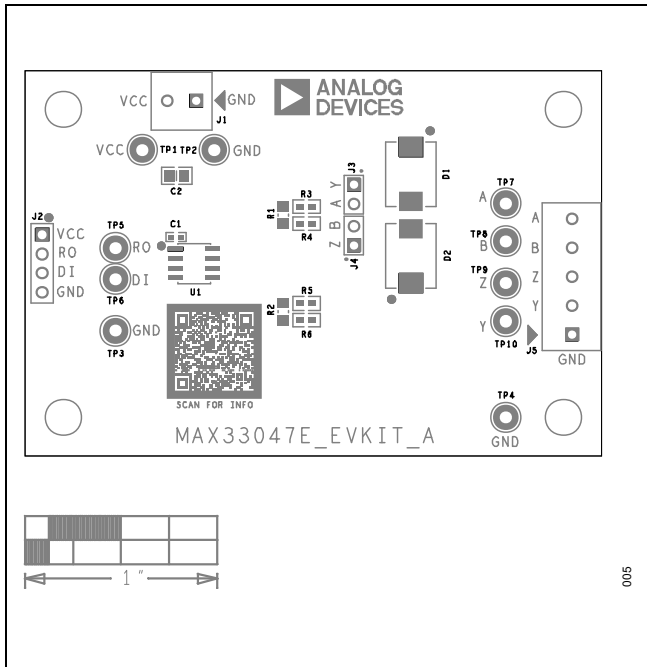
MAX33047E EV Kit Bill of Materials

ITEM	REF DES	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1	1	GCM155L81E104K E02	MURATA	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 25V; X8L; CERAMIC
2	C2	1	GRM21BD71A226M E44	MURATA	22UF	CAP; SMT (0805); 22UF; 20%; 10V; X7T; CERAMIC
3	J1	1	1727010	PHOENIX CONTACT	1727010	CONNECTOR; FEMALE; THROUGH HOLE; GREEN TERMINAL BLOCK; RIGHT ANGLE; 2PINS
4	J2	1	PBC04SAAN	SULLINS ELECTRONICS CORP.	PBC04SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS; -65 DEGC TO +125 DEGC
5	J3, J4	2	PCC02SAAN	SULLINS	PCC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC
6	J5	1	1727049	PHOENIX CONTACT	1727049	CONNECTOR; THROUGH HOLE; GREEN TERMINAL BLOCK; RIGHT ANGLE; 5PINS
7	R1, R2	2	CRCW0805120RFK	VISHAY DALE	120	RES; SMT (0805); 120; 1%; +/- 100PPM/DEGC; 0.1250W
8	R3–R6	4	RC1608J000CS; CR0603-J-000ELF; RC0603JR-070RL	SAMSUNG ELECTRONICS; BOURNS; YAGEO PH	0	RES; SMT (0603); 0; 5%; JUMPER; 0.1000W
9	TP1	1	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
10	TP2–TP4	3	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;
11	TP5, TP6	2	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;
12	TP7–TP10	4	5127	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLUE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
13	U1	1	MAX33047EASA+	MAXIM	MAX33047EASA+	EVKIT PART – IC; MAX33047EASA+; 500KBPS FULL-DUPLEX RS-485/RS-422 TRANSCEIVERS WITH +/-40KV ESD PROTECTION; PACKAGE OUTLINE DRAWING: 21-0041; LAND PATTERN DRAWING: 90-0096; NSOIC8
14	PCB	1	MAX33047E	MAXIM	PCB	PCB:MAX33047E
15	D1–D4	4	SM30T26CAY	ST MICROELECTRONICS	25.7V	DIODE; TVS; SMC (DO-214AB); PIV=25.7V; IF=0.2UA;

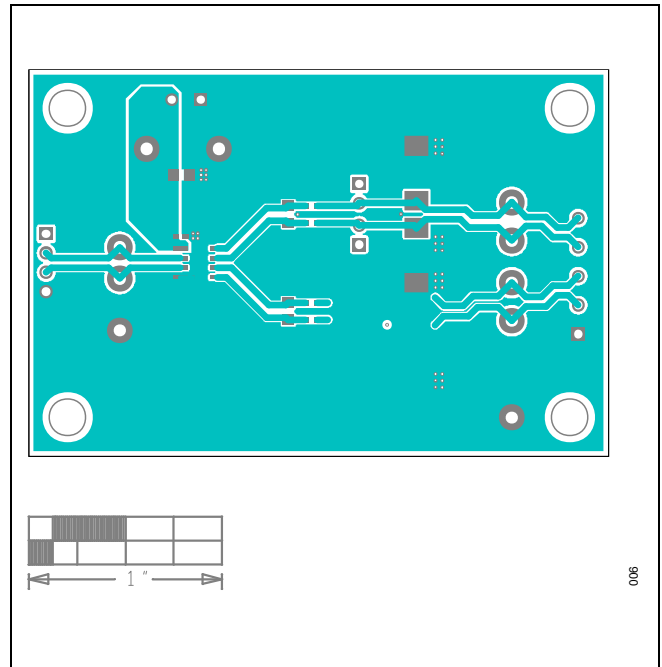
MAX33047E EV Kit Schematic



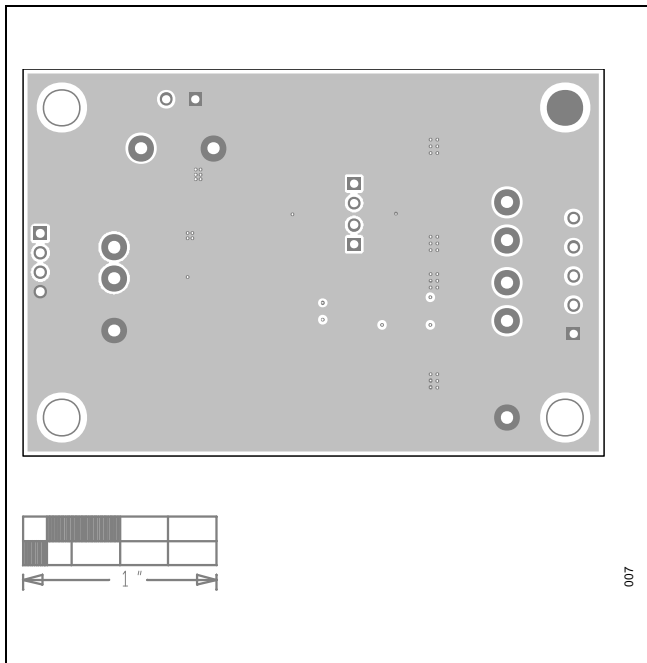
MAX33047E EV Kit PCB Layout



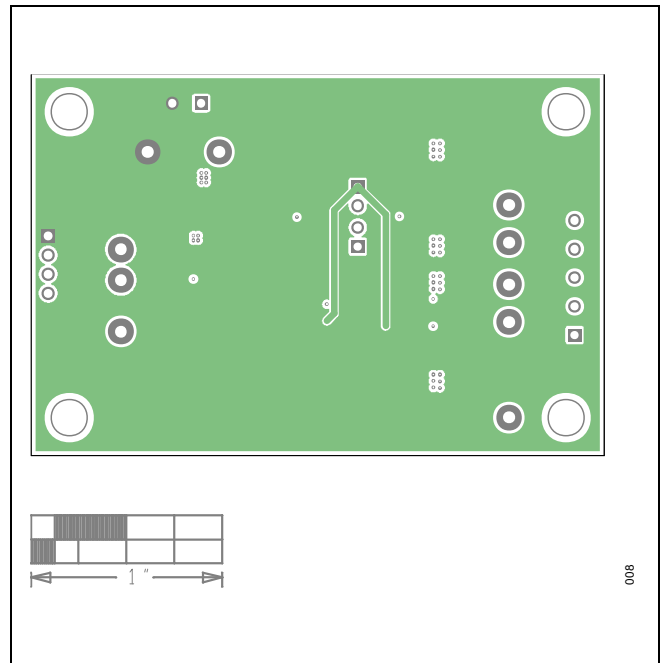
MAX33047E EV Kit—Top Silkscreen



MAX33047E EV Kit PCB Layout—Top Layer

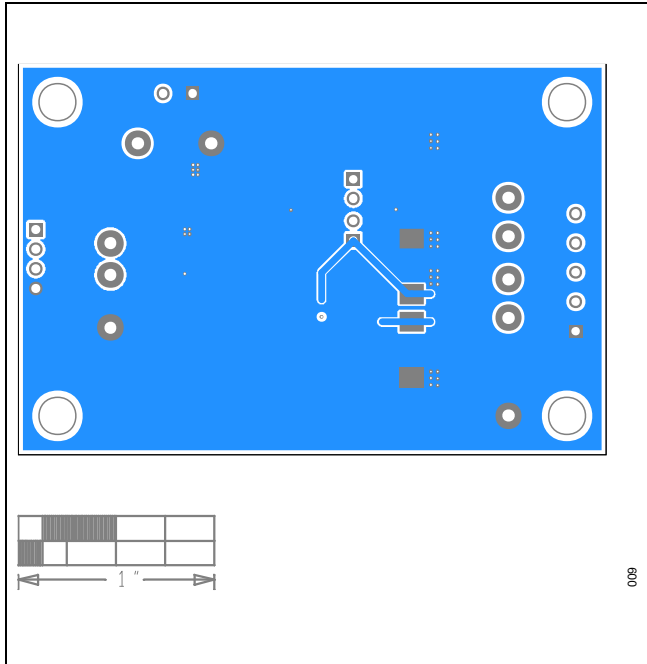


MAX33047E EV Kit PCB Layout—Layer 2 (GND Layer)

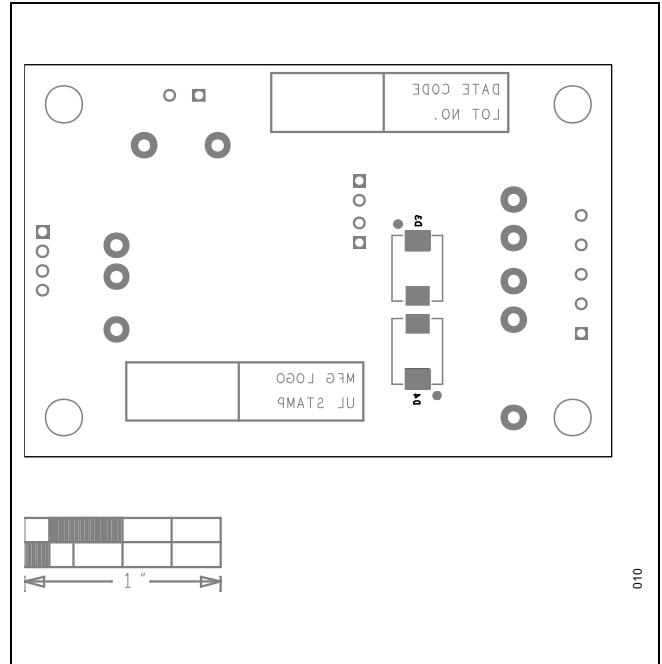


MAX33047E EV Kit PCB Layout—Layer 3 (Vcc Layer)

MAX33047E EV Kit PCB Layout (continued)



MAX33047E EV Kit PCB Layout—Bottom Layer



MAX33047E EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	12/24	Initial release	—

Notes

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