



MAX3345E Evaluation Kit

General Description

The MAX3345E evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board that evaluates the MAX3345E USB level translator. The EV kit includes TSSOP and UCSP™ versions of the MAX3345E IC, which are configured as a master and slave unit, respectively. The EV kit is designed to be driven by the on-board single-ended/differential driver, or directly connected to a microcontroller (μC) or application-specific integrated circuit (ASIC).

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Features

- ◆ USB 1.1 Full-Speed Compliant (12Mbps)
- ◆ Single-Supply Operation
- ◆ Low-Profile (1.0mm max) Design
- ◆ On-Board Oscillator
- ◆ Included USB A-B Cable
- ◆ Jumper-Selectable Master/Slave Configuration
- ◆ Fully Assembled and Tested
- ◆ Also Evaluates MAX3344E

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX3345EEVKIT	0°C to +70°C	16 TSSOP, 16 UCSP

Note: To evaluate the MAX3344E, request a MAX3344EEUD and a MAX3344EEBE free sample with the MAX3345EEVKIT.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3	2	10μF ±20%, 20V tantalum capacitors (B case) AVX TAJB106M020
C2, C4	2	10μF ±20%, 10V tantalum capacitors (B case) AVX TAJB106M010 or AVX TAJB106M016
C5–C14	10	1.0μF, 10V X7R ceramic capacitors (0603) TDK C1608X5R1A105K or TDK C1608X7R1A105K
D1	1	Green surface-mount LED
J1, J3	2	16-pin headers
J2	1	USB A connector Assmann Electronics AU-Y1006
J4	1	USB B connector Assmann Electronics AU-Y1007
JU1, JU2, JU3, JU6	4	2-pin headers
JU4, JU5, JU7–JU14	10	3-pin headers
R1, R2	2	15kΩ ±5% resistors (0603)

DESIGNATION	QTY	DESCRIPTION
R3–R6	4	23.7Ω ±1% resistors (0603)
R7	1	620Ω ±5% resistor (1206)
R8	1	374kΩ ±1% resistor (0603)
R9	1	750kΩ ±1% resistor (0603)
U1	1	MAX3345EEUE (16-pin TSSOP)
U2	1	MAX3345EEBE (16-pin UCSP)
U3	1	MAX603ESA (8-pin SO)
U4	1	MAX604ESA (8-pin SO)
U5	1	Fairchild NC7SZ14P5 (5-pin SC70)
U6	1	Fairchild NC7WZ17P6 (6-pin SC70)
U7	1	Fairchild NC7SZ05M5 (5-pin SOT23)
Y1	1	6.000MHz crystal oscillator module
D+M, D-M, D+S, D-S	4	Scope probe connectors (3.5mm diameter) Tektronics 131-4244-00 [Qty 100] 131-5031-00 [Qty 25]
None	14	Shunts (for JU1–JU14)
None	1	USB A-B cable (5ft or 1.5m)
None	1	MAX3345E EV kit PC board



MAX3345E Evaluation Kit

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
3M	888-364-3577	800-321-6329	www.3m.com
Assmann Electronics	877-277-6266	480-897-7255	www.usa-assmann.com
AVX	843-946-0238	843-626-3123	www.avxcorp.com
Fairchild	888-522-5372	408-721-1635	www.fairchildsemi.com
TDK	847-803-6100	847-390-4405	www.component.tdk.com

Note: Indicate that you are using the MAX3345E when contacting these component suppliers.

Quick Start Slave Driving Master

Required equipment:

- DC power supply capable of supplying between +6V and +9V at 1A
- Oscilloscope (>100MHz)
- Two 3.5mm scope probes
- Function generator capable of providing a 6MHz square wave with an amplitude of 1.8V_{P-P} to 3.3V_{P-P}

The MAX3345E EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Do not turn on the power supply until all connections are completed:**

- 1) Ensure that the jumpers are in their default positions. See Table 1 for shunt positions.
- 2) Connect the positive output of the function generator to pin 8 of header J3.
- 3) Connect the ground of the function generator to pins 9 and 16 of header J3.
- 4) Connect the DC power supply to the user pads marked VSUP and GND.
- 5) Connect a scope probe to the D+M and the D-M scope jacks.
- 6) Set the DC power supply to +6V.
- 7) Turn on the DC power supply.
- 8) Plug the USB cable into the USB A socket.
- 9) Plug the other end of the USB cable into the USB B socket.
- 10) The green LED turns on, confirming that a connection between the master and slave has been made.
- 11) Turn on the function generator and set it to generate a 6MHz square wave, with an amplitude of 1.8V_{P-P}.
- 12) Verify with the oscilloscope that a +3.3V differential signal is being received on the D+M and D-M lines.

Table 1. Default Shunt Positions (Slave Driving Master)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	ON	15k Ω resistor on D- line enabled
JU2	ON	15k Ω resistor on D+ line enabled
JU3	OFF	Driver disconnected from VPO line of master (U1)
JU4	OFF	Driver disconnected from VMO line of master (U1)
JU5	1-2	Secondary power supply set to 1.8V
JU6	ON	Secondary power supply connected to circuit
JU7	1-2	Master receive selected
JU8	2-3	Internal 1.5k Ω resistor is disconnected from the master D+ line
JU9	1-2	Master inputs in differential mode
JU10	2-3	Master suspend disabled
JU11	2-3	Slave transmit selected
JU12	1-2	Internal 1.5k Ω resistor is disconnected from the slave D+ line
JU13	2-3	Slave inputs in single-ended mode
JU14	2-3	Slave suspend disabled

Master Driving Slave

Required equipment:

- DC power supply capable of supplying between +6V and +9V at 1A
- Oscilloscope (>100MHz)
- Two 3.5mm scope probes

The MAX3345E EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Do not turn on the power supply until all connections are completed:**

MAX3345E Evaluation Kit

Evaluates: MAX3344E/MAX3345E

- 1) Ensure that the jumpers are in their default positions. See Table 2 for shunt positions.
- 2) Connect the DC power supply to the user pads marked VSUP and GND.
- 3) Connect a scope probe to the D+S and the D-S scope jacks.
- 4) Set the DC power supply to +6V.
- 5) Turn on the DC power supply.
- 6) Plug the USB cable into the USB A socket.
- 7) Plug the other end of the USB cable into the USB B socket.
- 8) The green LED turns on, confirming that a connection between the master and slave has been made.
- 9) Verify with the oscilloscope that a +3.3V differential signal is being received on the D+S and D-S lines.

Detailed Description

The MAX3345E EV kit provides a proven PC board layout to evaluate the MAX3345E. When connecting the MAX3345E EV kit to an ASIC or μ C, it must be interfaced to appropriate timing signals for proper operation.

Table 2. Shunt Positions (Master Driving Slave)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	ON	15k Ω resistor on D- line enabled
JU2	ON	15k Ω resistor on D+ line enabled
JU3	OFF	Driver disconnected from VPO line of master (U1)
JU4	OFF	Driver disconnected from VMO line of master (U1)
JU5	1-2	Secondary power supply set to 1.8V
JU6	ON	Secondary power supply connected to circuit
JU7	1-2	Master receive selected
JU8	2-3	Internal 1.5k Ω resistor is disconnected from the master D+ line
JU9	1-2	Master inputs in differential mode
JU10	2-3	Master suspend disabled
JU11	2-3	Slave transmit selected
JU12	1-2	Internal 1.5k Ω resistor is disconnected from the slave D+ line
JU13	2-3	Slave inputs in single-ended mode
JU14	2-3	Slave suspend disabled

Connect the DC power supply to the VSUP pad, and connect the ground return to the GND pad. See the MAX3344E/MAX3345E EV kit schematic (Figure 1). Refer to the MAX3344E/MAX3345E data sheet for timing requirements.

On-Board Single-Ended/Differential Driver

The MAX3345E EV kit is shipped with an on-board (master driving slave) single-ended/differential driver. This driver is used to evaluate the MAX3345E's switching characteristics without the user providing their own μ C or ASIC. The signal is provided by a crystal oscillator (Y1), which is fed into an inverter (U5) and a buffer (U6) with Schmitt trigger inputs. The buffer has been added to equalize the propagation delays from the crystal oscillator to the differential inputs VPO and VMO. Jumpers JU3 and JU4 control the operation of the on-board driver. See Table 3 for shunt positions.

Note: When operated in differential mode, the on-board differential driver may generate a small skew between the D+/D- lines. For improved performance, drive the VPO and VMO pins of the MAX3345E with a precision differential data source at pins J1-8 (VPO) and J1-9 (VMO).

On-Board Power Supplies

The MAX3345E EV kit contains two on-board power supplies, that take an unregulated voltage of +6V to +9V DC and produce a regulated +5V (500mA max) and a jumper-selectable regulated +1.8V/+3.3V (500mA max). The +5V supply powers the USB bus, while the +1.8V/+3.3V supply is an alternative to a user-supplied μ C/ASIC logic power supply. Jumpers JU5 and JU6 control the +1.8V/+3.3V power supply. See Table 4 for shunt positions.

Table 3. On-Board Driver Jumper

JUMPER	SHUNT POSITION	DESCRIPTION
JU3 JU4	OFF OFF	Driver is disconnected from circuit
JU3 JU4	OFF 2-3	VPO is left for the user to drive, VMO is grounded
JU3 JU4	OFF 1-2	Invalid jumper setting
JU3 JU4	ON 1-2	Driver is operating in differential mode
JU3 JU4	ON 2-3	Driver is operating in single-ended mode

MAX3345E Evaluation Kit

Table 4. 1.8V/3.3V Power-Supply Jumper

JUMPER	SHUNT POSITION	DESCRIPTION
JU5	1-2	Output voltage is +1.8V
JU5	2-3	Output voltage is +3.3V
JU6	ON	Power supply connected to circuit
JU6	OFF	Power supply disconnected from circuit. NOTE: User must supply power through the user pads marked VUP and GND.

On-Board Resistive Loads

The MAX3345E EV kit also contains two built-in 15k Ω loads, which are located on the D+ and D- lines of the master IC (U1). Jumpers JU1 and JU2 connect these loads to the line. See Table 5 for shunt positions.

Table 5. Resistive Load Jumper

JUMPER	SHUNT POSITION	DESCRIPTION
JU1, JU2	ON	Master resistive load enabled
JU1, JU2	OFF	Master resistive load disabled

IC Control Jumpers

The MAX3345E EV kit contains jumpers, which allow the user to manipulate various functions on both the master and slave (U1 and U2). Jumpers JU7 through JU14 set the output enable, enumerate, mode, and suspend functions on the master and slave (U1 and U2), respectively.

Suspend Mode

Jumpers JU10 and JU14 control the suspend function on the master and slave. See Table 6 for shunt positions.

Table 6. Suspend Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU10	1-2	Suspend function on master enabled
JU10	2-3	Suspend function on master disabled
JU14	1-2	Suspend function mode on slave enabled
JU14	2-3	Suspend function mode on slave disabled

Mode Select

Jumpers JU9 and JU13 control the mode functions on the master and slave. See Table 7 for shunt positions.

Table 7. Mode Select Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU9	1-2	Master inputs (VPO and VMO) differential mode
JU9	2-3	Master inputs (VPO and VMO) single-ended mode
JU13	1-2	Slave inputs (VPO and VMO) differential mode
JU13	2-3	Slave inputs (VPO and VMO) single-ended mode

Enumerate Jumper Settings

Jumper JU8 connects an internal 1.5k Ω pullup resistor from the master D+ line to +3.3V. Jumper JU12 connects an internal 1.5k Ω pullup resistor from the slave D+ line to +3.3V. See Table 8 for shunt positions.

Table 8. Enumerate Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU8	1-2	1.5k Ω resistor is connected to the master D+ line
JU8	2-3	1.5k Ω resistor is disconnected from the master D+ line
JU12	1-2	1.5k Ω resistor is connected to the slave D+ line (full-speed operation)
JU12	2-3	1.5k Ω resistor is disconnected from the slave D+ line

Note: The MAX3345E is not compatible with low-speed devices.

Output Enable Jumper Settings

The output enable jumper selects between a transmit mode or receive mode. Jumpers JU7 and JU11 control the output enable for the master and slave. See Table 9 for shunt positions.

MAX3345E Evaluation Kit

Evaluating the MAX3344E

The MAX3345E EV kit is also capable of evaluating the pin-compatible MAX3344E. To evaluate the MAX3344E, replace U1 with a MAX3344EEUD and replace U2 with a MAX3344EEBE.

16-Pin Data Connectors J1, J3

The MAX3345E EV kit contains two 16-pin headers for interfacing with an ASIC or μ C. Table 10 lists the function of each pin. Each header is identical with the exception that J1 is connected to the master (U1) and J3 is connected to the slave (U2). Use a 3M connector with part number CHG-1016-001010-KEP (or equivalent) to interface with this header. See the *Component Suppliers* section for contact information. Inputs and outputs are relative to the EV kit.

Table 9. Output Enable Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU7	1-2	Master receive selected
JU7	2-3	Master transmit selected
JU11	1-2	Slave receive selected
JU11	2-3	Slave transmit selected

Table 10. J1, J3 Data Connector

PIN	SIGNAL	I/O	FUNCTION
1	SUSPEND	I	0 = normal operation 1 = suspend operation
2	RCV	O	Receiver output (single-ended)
3	VPI	O	Single-ended output (D+)
4	VMI	O	Single-ended output (D-)
5	USB_DET	O	USB detect: 0 = device is not connected to the USB bus 1 = device is connected to the USB bus
6	MODE	I	Mode: 0 = VPO/VMO operate as single-ended inputs 1 = VPO/VMO operate as differential inputs
7	ENUMERATE	I	Enumerate: 0 = 1.5k Ω resistor disconnected from the D+ line 1 = 1.5k Ω resistor connected to the D+ line (full-speed operation)
8	VPO	I	Single-ended input (D+)
9	VMO	I	Single-ended input (D-)
10	$\overline{OE}$	I	Output enable: 0 = transmitter enabled 1 = transmitter disabled
11	V _L	—	+1.8V/+3.3V on-board power supply
12–16	GND	—	Ground

Evaluates: MAX3344E/MAX3345E

MAX3345E Evaluation Kit

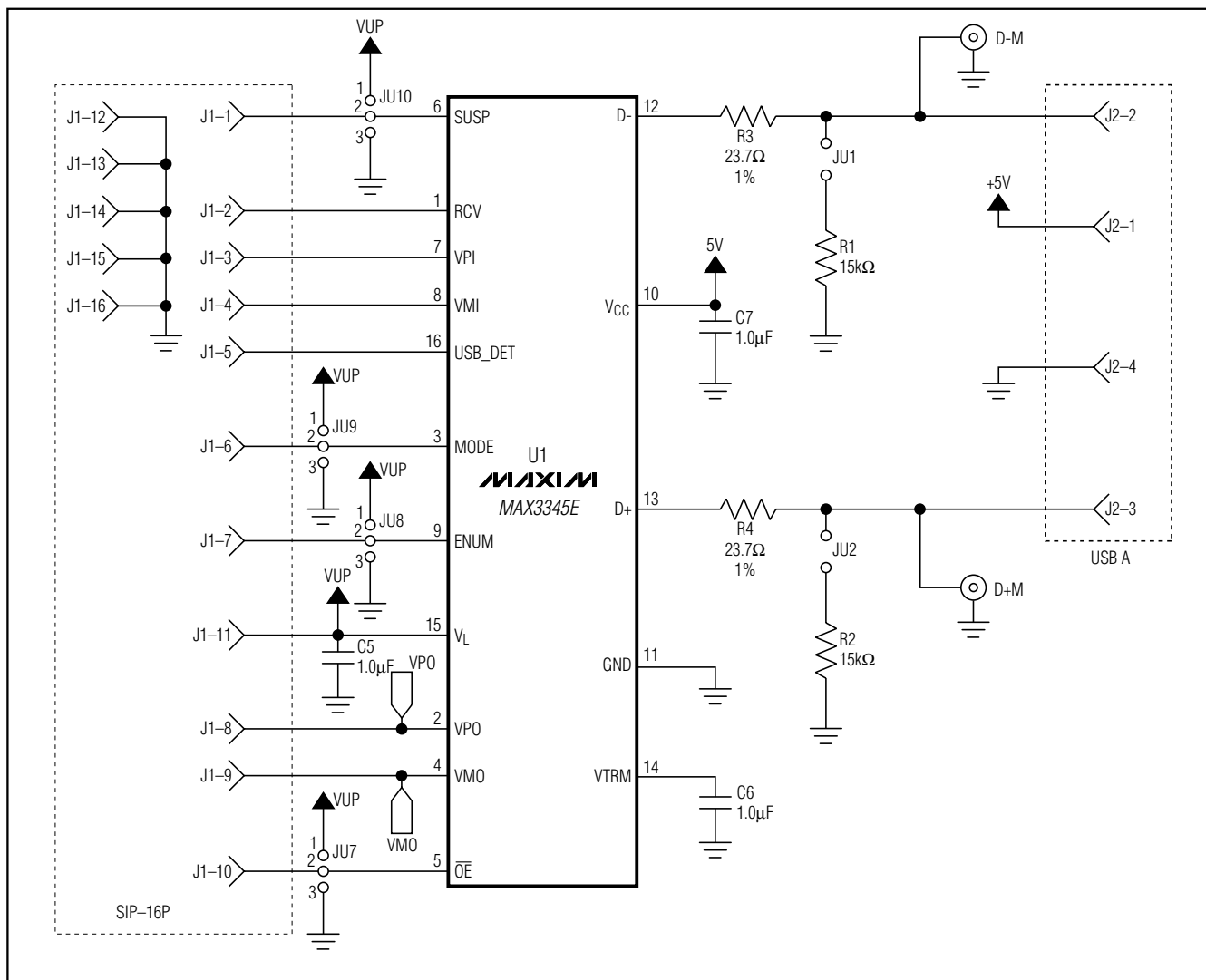


Figure 1. MAX3345E EV Kit Schematic (Sheet 1 of 3)

MAX3345E Evaluation Kit

Evaluates: MAX3344E/MAX3345E

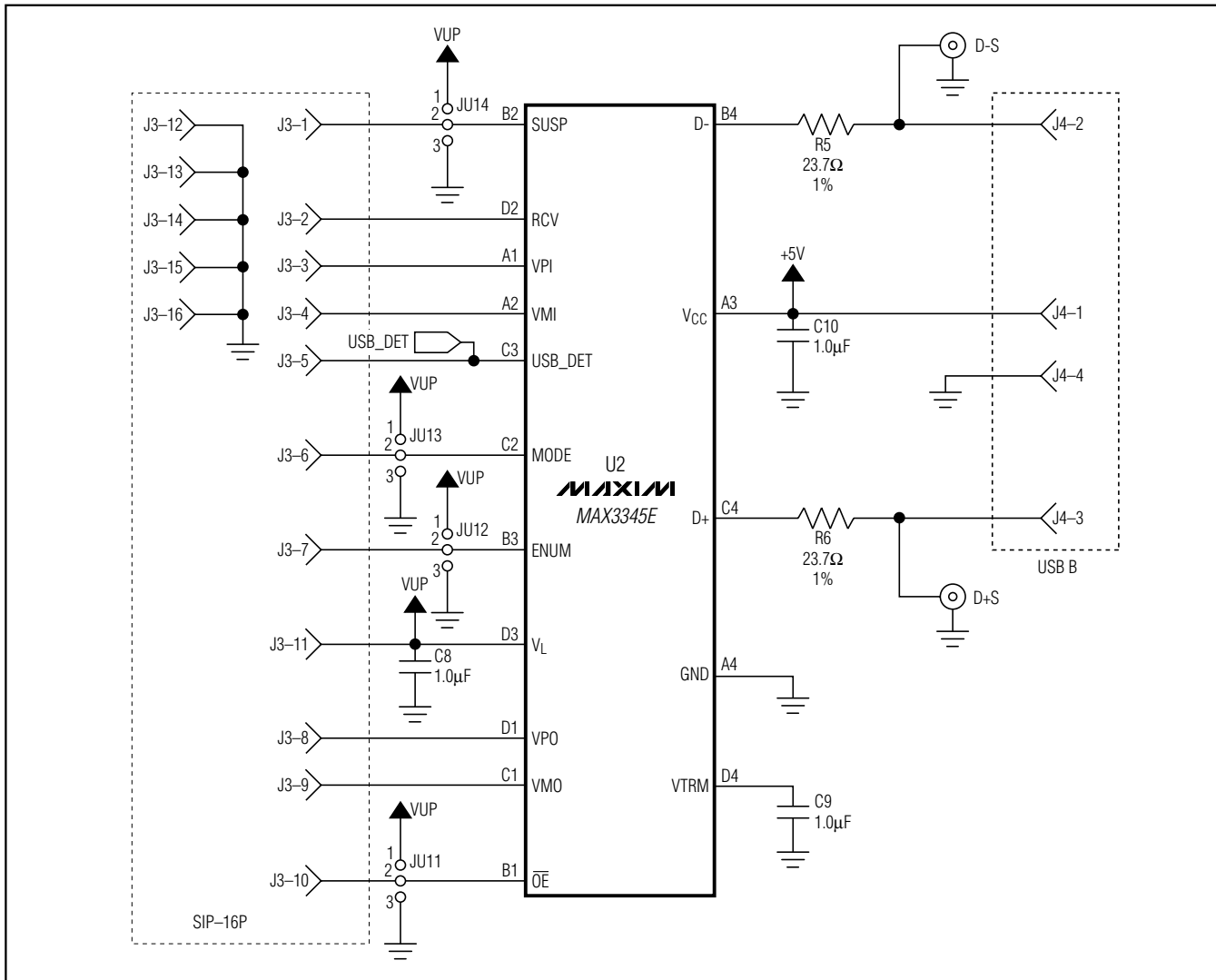
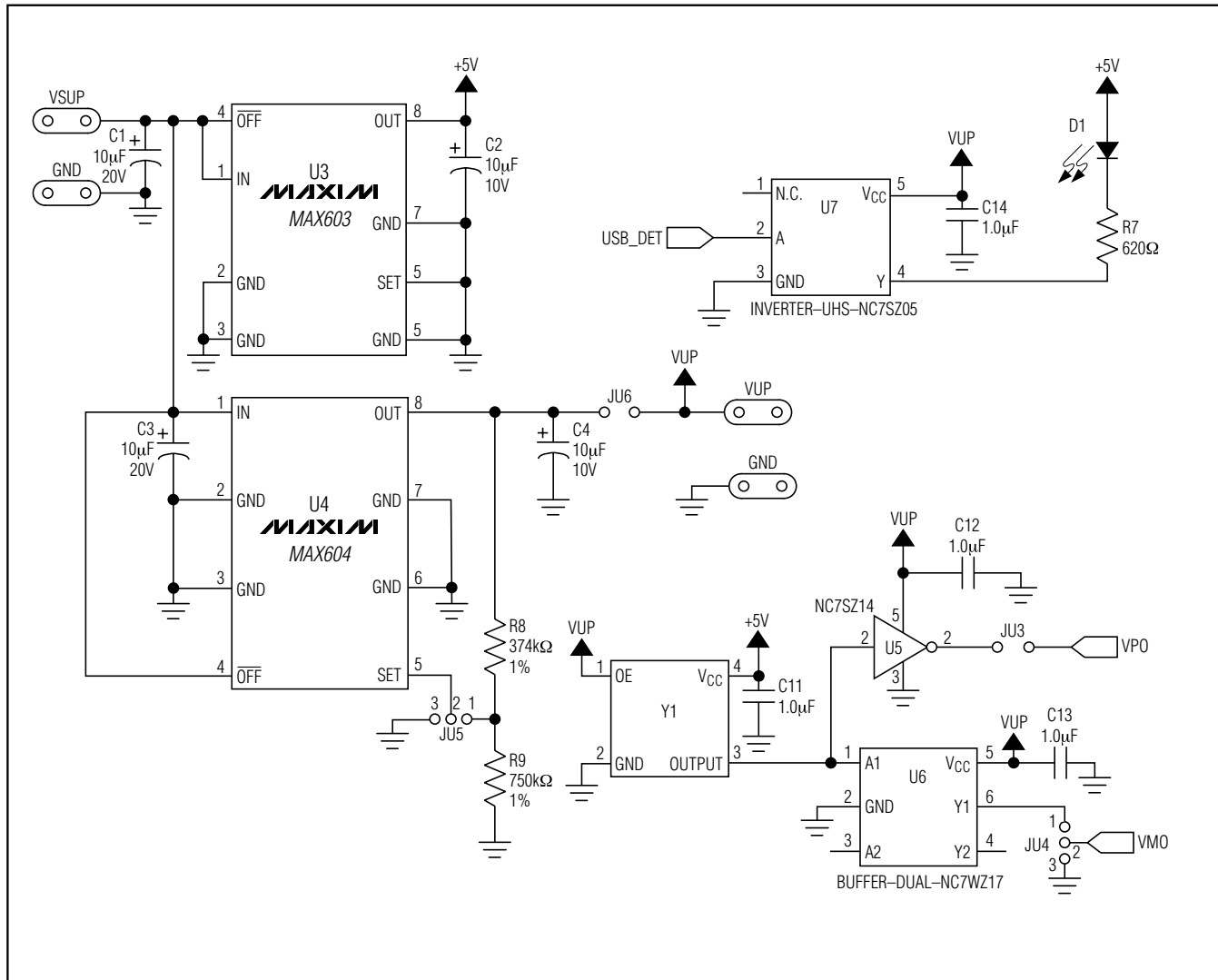


Figure 1. MAX3345E EV Kit Schematic (Sheet 2 of 3)

Evaluates: MAX334E/MAX3345E



MAX3345E Evaluation Kit

Evaluates: MAX3344E/MAX3345E

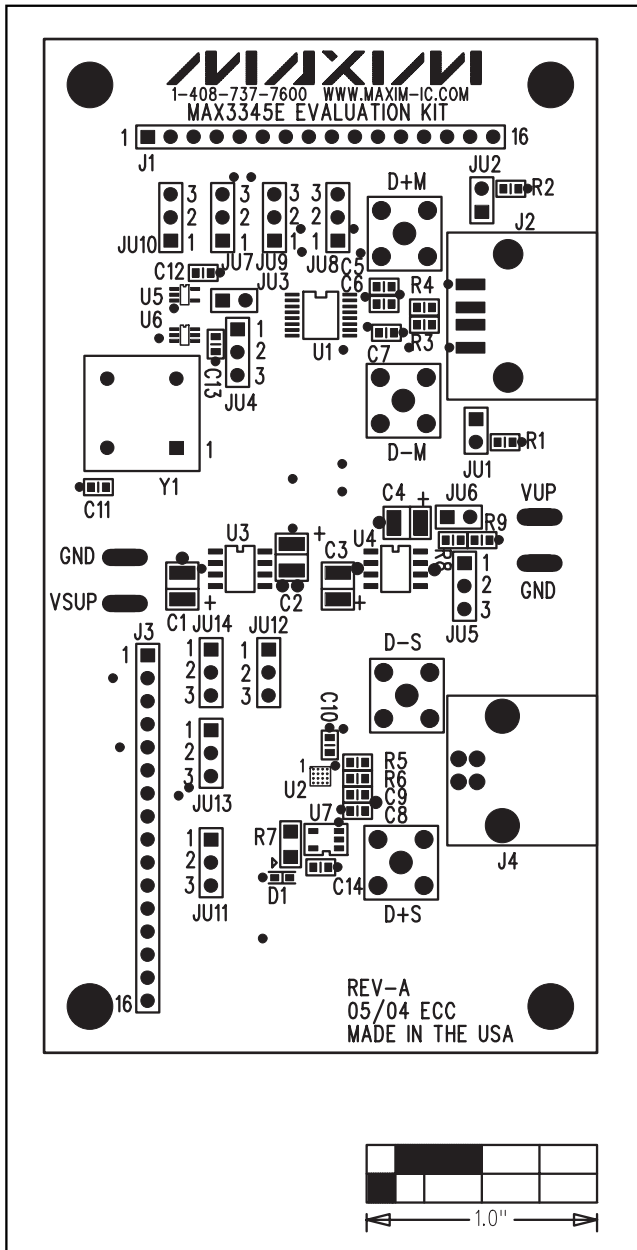


Figure 2. MAX3345E EV Kit Component Placement Guide—Component Side

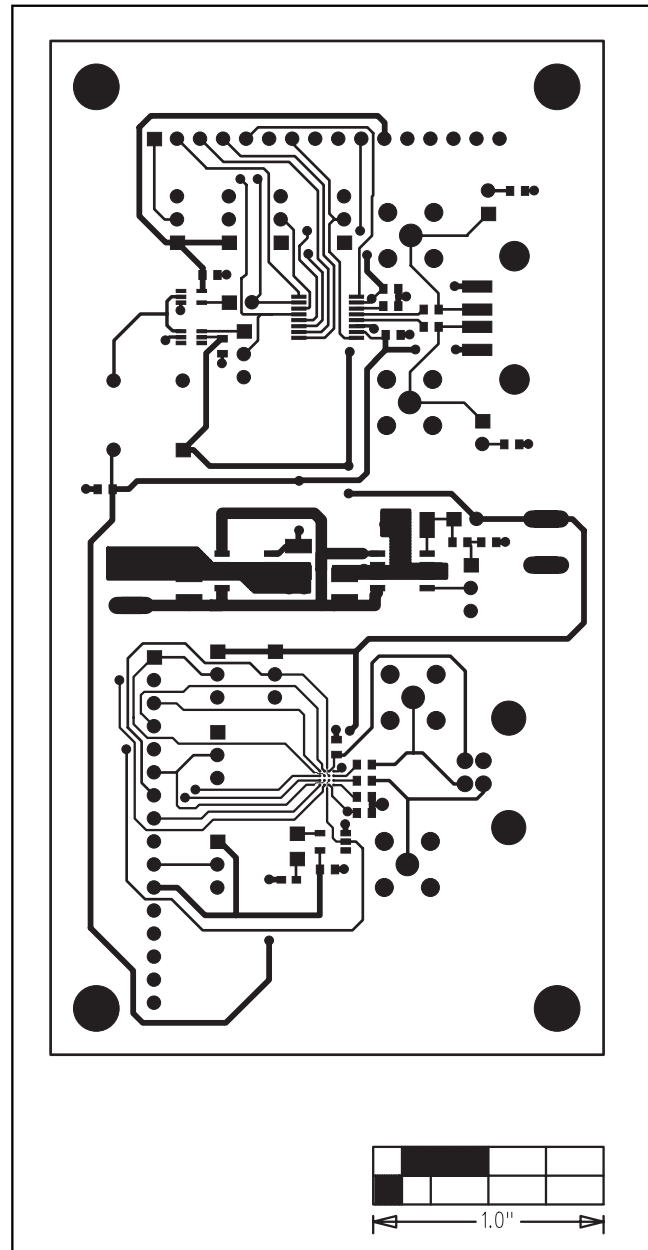


Figure 3. MAX3345E EV Kit PC Board Layout—Component Side

MAX3345E Evaluation Kit

Evaluates: MAX3344E/MAX3345E

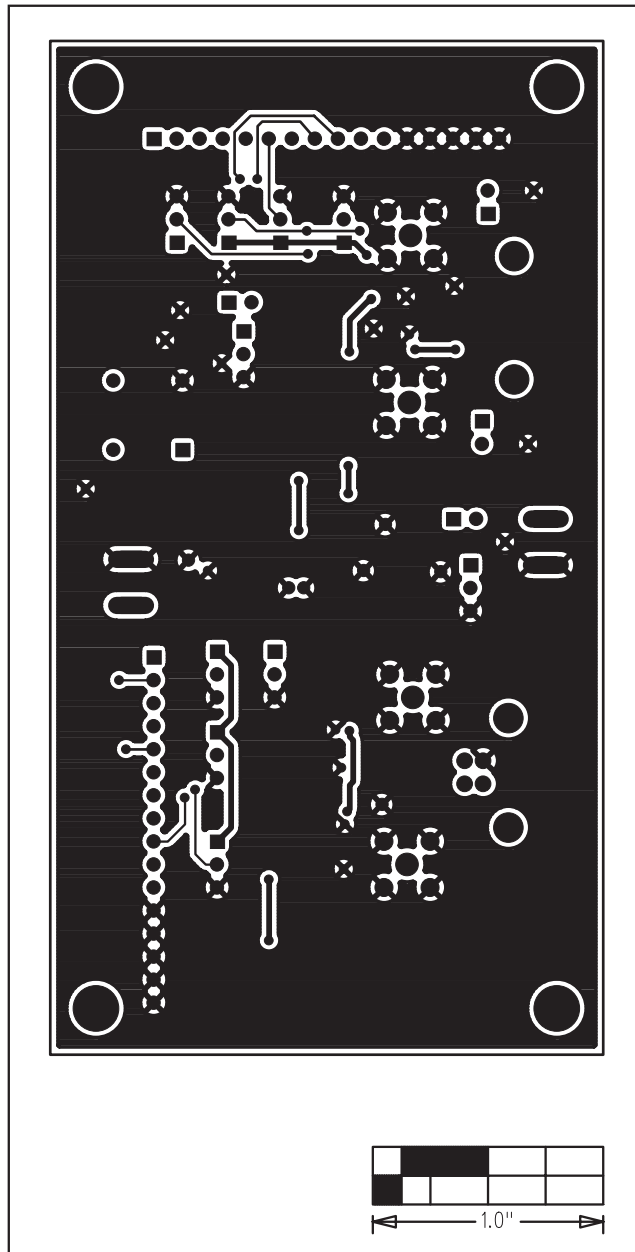


Figure 4. MAX3345E EV Kit PC Board Layout—Solder Side

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