

## MAX22502E Evaluation Kit

Evaluates: MAX22502E/MAX22503E

### General Description

The MAX22502E evaluation kit (EV kit) is a fully assembled and tested PCB that demonstrates the functionality of the MAX22502E and the MAX22503E full-duplex high speed RS-485/RS-422 transceiver. The EV kit includes on-board termination for easy point-to-point evaluation. The EV kit is assembled using MAX22502E in a 12-pin TDFN package, but also provides equivalent functional evaluation for the MAX22503E, which is offered in a 14-pin SOIC package.

### Features

- Configurable to Operate from a Single 3V to 5V Supply
- Separate Logic Supply (VL) to Interface with Logic Signals as Low as 1.6V
- Terminal Block and RJ45 Connectors for Easy RS-485/RS-422 Evaluation
- Fully Assembled and Tested

### Quick Start

#### Required Equipment

- MAX22502E EV kit
- 5V, 500mA DC power supply
- 80MHz signal/function generator
- Oscilloscope

### Startup Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

- 1) Ensure that all jumpers are in their default positions (see [Table 1](#)).
- 2) Set the DC power supply to 5V and connect the DC power supply to the V<sub>CC</sub> test point. Connect the ground terminal of the 5V supply to the GND test point.
- 3) Turn on the power supply.
- 4) Set the signal/function generator to output a 30MHz 0-to-5V square wave.
- 5) Connect the signal/function generator to the DI test point.
- 6) Using the oscilloscope, verify that the Y, Z, and RO outputs switch as the DI signal toggles.

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

## Detailed Description of Hardware

The MAX22502E EV kit is a fully assembled and tested circuit board for evaluating the MAX22502E high speed full-duplex RS-485/RS-422 transceiver (U1). The EV kit can be powered from a single supply and can be used for standalone evaluation or can be connected (using the on-board terminal block) to an RS-485/RS-422 network for easy in-system evaluation. The MAX22503E does not feature preemphasis or have a separate logic supply input pin ( $V_L$ ). To emulate the functional performance of the MAX22503E set switch SW1 to the OFF position and close the J4 jumper to operate with a single supply voltage.

### Powering the Board

The MAX22502E includes two supplies: VCC and VL, allowing the device to interface with logic signals as low as 1.6V. To operate the EV kit with a single supply, close the J4 jumper to connect VL to VCC ( $V_L = 5V$ ), to operate the EV kit with a single supply. Close the J4 jumper for equivalent functional performance with the MAX22503E.

Open the J4 jumper and connect a separate logic supply to the VL testpoint (TP6) to operate with a logic supply that is not equal to the VCC voltage.

Ensure that VCC = 5V, when operating the EV kit with preemphasis enabled. When preemphasis is disabled, connect a supply voltage between 3V and 5V to VCC.

### Driver and Receiver Enable

The EV kit features three jumpers (J3, J5, and J8) to enable/disable the driver and receiver outputs. Set J3 to low (2-3) to enable the receiver. Set J3 to high (1-2) to enable the driver.

To actively control both enables, remove the J2 and J3 jumpers and close J8, which connects DE and  $\overline{RE}$  together.

### Setting the Preemphasis (MAX22502E only)

The MAX22502E features integrated driver preemphasis circuitry for reliable communication higher data rates over longer distances. Preemphasis is set with by connecting a resistor between PSET and ground. The MAX22502E EV kit includes a 15k $\Omega$  to set the preemphasis for a 30Mbps data rate. Set the switch (SW1) to the ON position to enable preemphasis. To disable preemphasis, set SW1 to the OFF position. Disabling preemphasis and closing the J4 jumper provides equivalent functional performance with the MAX22503E.

## Loopback Configuration

To test the MAX22502E in a loopback configuration, close the J6 and J15 jumpers. J6 connects the A input to the Y output. J15 connects the B input to the Z output.

### Termination for an End-of-Line Transceiver

The MAX22502E EV kit includes 120 $\Omega$  termination resistors between the Y and Z driver outputs (R6) and between the A and B receiver inputs (R7) on the MAX22502E.

**Table 1. Jumper Table (J3-J6, J8, J14)**

JUMPER	SHUNT POSITION	DESCRIPTION
J3	1-2	$\overline{RE}$ is high. The RS-485 receiver is disabled.
	2-3*	$\overline{RE}$ is low. The RS-485 receiver is enabled.
J4	Open	VL is not connected to VCC. Connect an external supply to VCC and to VL.
	Closed*	VL is connected to VCC.
J5	1-2*	DE is high. The RS-485 driver outputs are enabled.
	2-3	DE is low. The RS-485 driver outputs are disabled.
J6	Open	A is not connected to Y.
	Closed*	A is connected to Y.
J8	Open*	DE and $\overline{RE}$ are not connected together.
	Closed	DE and $\overline{RE}$ are connected together.
J15	Open	B is not connected to Z.
	Closed*	B is connected to Z.

\*Default position.

## Ordering Information

PART	TYPE
MAX22502EEVKIT#	EV Kit

#Denotes RoHS compliant.

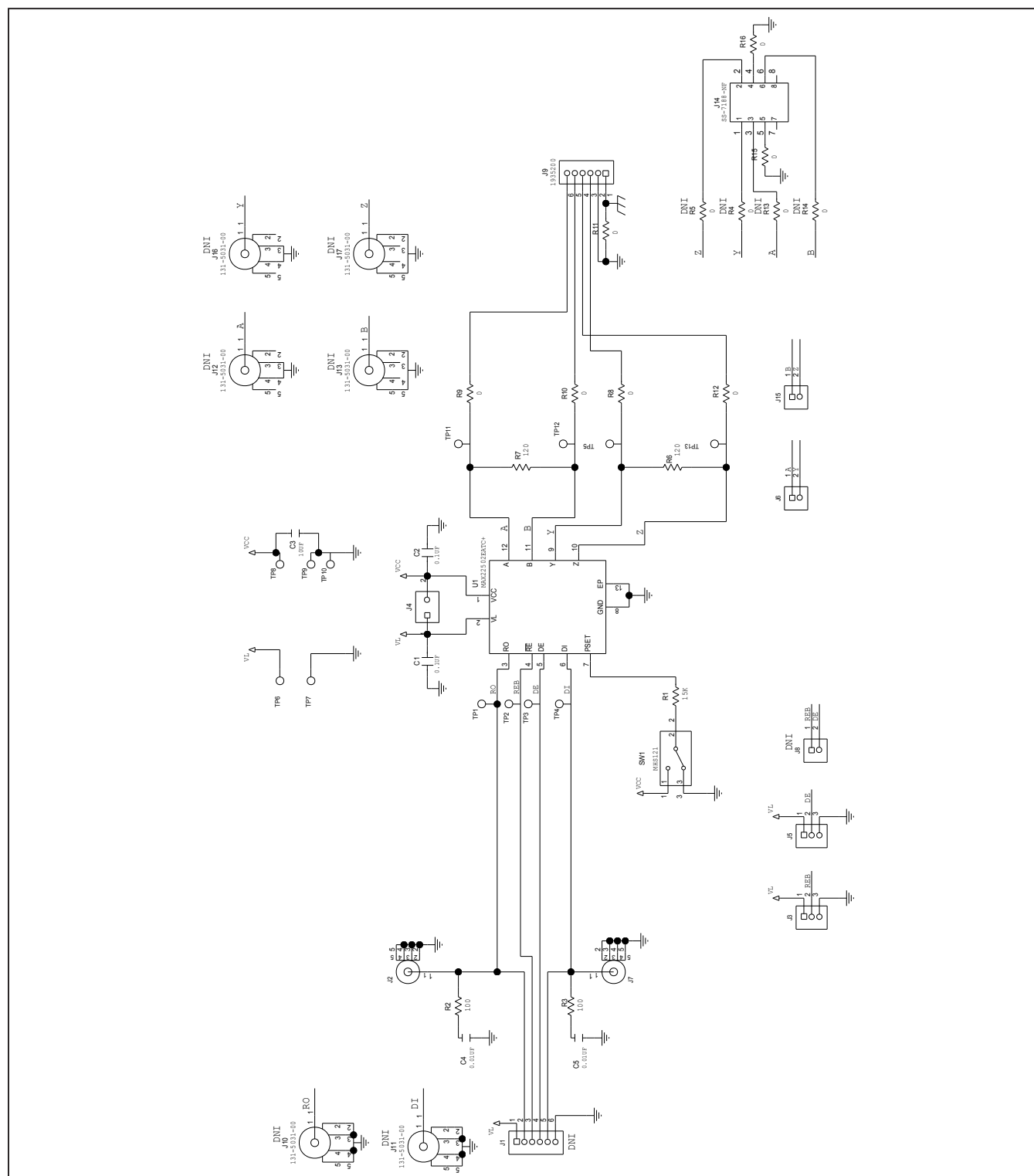
## MAX22502E EV Kit Bill of Materials

ITEM	REF_DES	DN/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1, C2	-	2	C0603C104K5RAC; C1608X7R1H104K	KEMET; TDK	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R;	
2	C3	-	1	GRM21BR61A106KE19L; ECJ-2FB1A1; CL21A106KPCQLQNC; GRM219R61A106KE4	MURATA; PANASONIC; SAMSUNG ELECTRONICS	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 10V; TOL=10%; MODEL=; TG=- 55 DEGC TO +85 DEGC; TC=X5R	
3	C4, C5	-	2	C0402C103K5RAC; GRM155R71H103KA88	KEMET/MURATA	0.01UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
4	J2, J7	-	2	5-1634503-1	TE CONNECTIVITY	5-1634503-1	CONNECTOR; FEMALE; THROUGH HOLE; LOW PROFILE BNC PCB SOCKET; STRAIGHT; 5PINS	
5	J3, J5	-	2	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC	
6	J4, J6, J15	-	3	PCC02SAAN	SULLINS	PCC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC	
7	J9	-	1	1935200	PHOENIX CONTACT	1935200	CONNECTOR; FEMALE; THROUGH HOLE; GREEN TERMINAL BLOCK; STRAIGHT; 6PINS	
8	J14	-	1	SS-7188-NF	STEWART CONNECTOR	SS-7188-NF	CONNECTOR; FEMALE; THROUGH HOLE; UNSHIELDED CAT 5/5E NON-FLANGE JACK; RIGHT ANGLE; 8PINS	
9	R1	-	1	CRCW060315K0FK	VISHAY DALE	15K	RESISTOR, 0603, 15K OHM, 1%, 100PPM, 0.10W, THICK FILM	
10	R2, R3	-	2	CRCW0402100RFFK; 9C04021A1000FL; RC0402FR-07100RL	VISHAY DALE; PANASONIC; YAGEO PHYCOMP	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.063W; THICK FILM	
11	R6, R7	-	2	CRCW0805120RFFK	VISHAY DALE	120	RESISTOR; 0805; 120 OHM; 1%; 100PPM; 0.125W; THICK FILM	
12	R8-R12, R15, R16	-	7	CRCW06030000ZS; MCR03EZPJ000; ERJ- 3GEY0R00	VISHAY DALE/ ROHM/PANASONIC	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM	
13	SW1	-	1	MHS121	COPAL ELECTRONICS INC	MHS121	SWITCH; SPDT; THROUGH HOLE; STRAIGHT; 12V; 0.2A; MHS SERIES; RCOIL=500 OHM; RINSULATION=100M OHM	

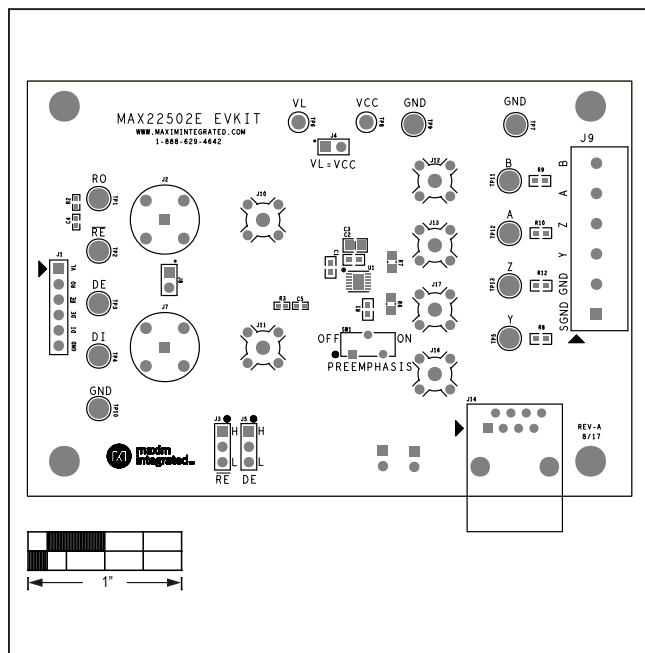
## MAX22502E EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
14	TP1-TP5, TP11-TP13	-	8	5014	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
15	TP6, TP8	-	2	5010	KEYSTONE	N/A	TESTPOINT WITH 1.80MM HOLE DIA, RED, MULTIPURPOSE;	
16	TP7, TP9, TP10	-	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;	
17	U1	-	1	MAX22502EATC+	MAXIM	MAX22502EATC+	EVKIT PART-IC; TDFN12-EP; HIGH SPEED HALF-DUPLEX RS-485 TRANSCIEVER FOR LONG CABLE LENGTH; PACKAGE CODE: TD1233+1C; PACKAGE OUTLINE: 21-0664	
18	PCB	-	1	MAX22502E	MAXIM	PCB	PCB:MAX22502E	-
19	J1	DNP	0	PBC06SAAN	SULLINS ELECTRONICS CORP.	PBC06SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 6PINS; -65 DEGC TO +125 DEGC	
20	J8	DNP	0	PCC02SAAN	SULLINS	PCC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC	
21	J10-J13, J16, J17	DNP	0	131-5031-00	TEKTRONIX	131-5031-00	CONNECTOR; WIREFORM; 3 GHZ 20X LOW CAPACITANCE PROBE; STRAIGHT; 5PINS	
22	R4, R5, R13, R14	DNP	0	CRCW06030000ZS; MCR03EZPJ000; ERJ- 3GEY0R00	VISHAY DALE/ ROHM/PANASONIC	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM	
TOTAL			42					

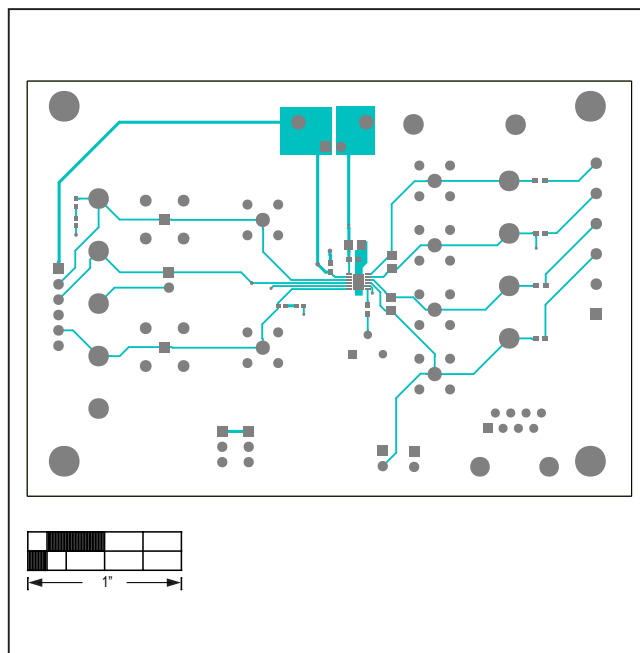
## MAX22502E EV Kit Schematic



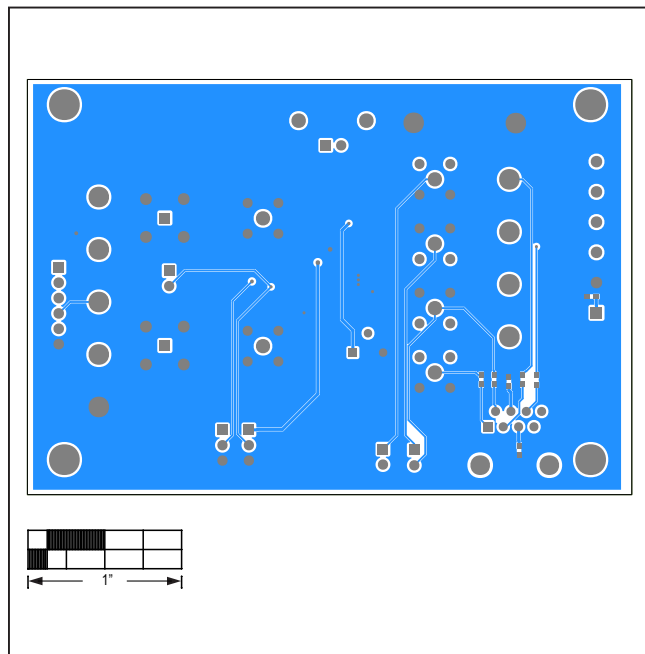
## MAX22502E EV Kit PCB Layout Diagrams



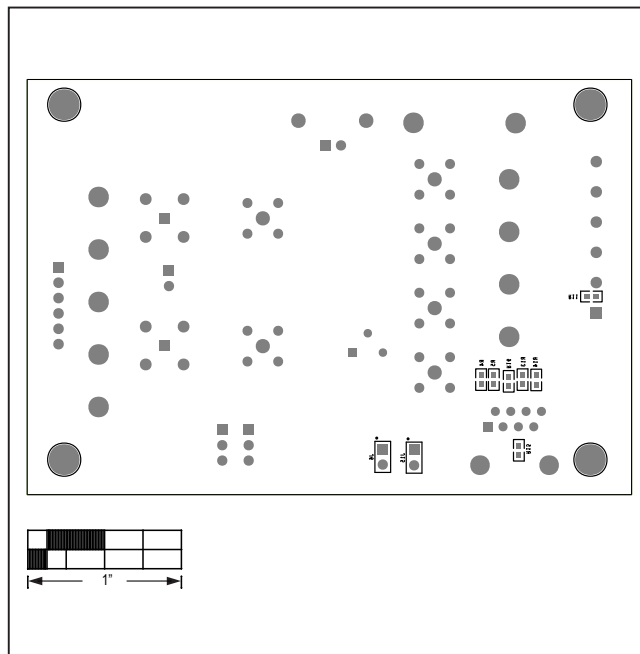
MAX22502E EV Kit—Top Silkscreen



MAX22502E EV Kit—Top



MAX22502E EV Kit—Bottom



MAX22502E EV Kit—Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/17	Initial release	—
1	5/19	Updated the title, and the <i>General Description</i> , <i>Detailed Description</i> , <i>Powering the Board</i> , and <i>Setting the Preemphasis (MAX22502E only)</i> sections	1–7

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