19-5162; Rev 0; 3/10

MAX3107 Evaluation Kit

Evaluates: MAX3107

General Description

The MAX3107 evaluation kit (EV kit) provides a proven design to evaluate the MAX3107 advanced universal asynchronous receiver-transmitter (UART) with 128 words each of receive and transmit first-in/first-out (FIFO) that can be controlled through I²C or high-speed SPI™. The EV kit also includes Windows XP®-, Windows Vista®- and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX3107.

The EV kit comes with a MAX3107EAG+ installed.

Features

- **On-Board Microcontroller Generates I²C- and SPI-Compatible Signals**
- **On-Board RS-232 and RS-422/RS-485 Transceivers**
- **Headers for User-Supplied Digital Signals**
- **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**
- **RS-232 Connection (Cable Included)**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX3107EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
AGND, DGND (x3)	4	Test points, black
AVDD, DVDD, VIN	3	Test points, red
C1, C2, C3, C6, C7, C8, C14	7	10µF ±10%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M
C4, C5	2	1µF ±10%, 10V X7R ceramic capacitors (0603) Murata GRM188R71A105K
C9–C12, C15–C20, C25–C28, C30	15	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GCM188R71C104K
C13	1	4.7µF ±10%, 6.3V X5R ceramic capacitor (0603) Murata GRM188R60J475K
C21, C22	2	12pF ±10%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H120J
C23, C24	2	18pF ±10%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H180J
C29	0	Not installed, capacitor (0603)
D1, D2, D3	3	Diodes
JIO, JUART	2	8-pin (2 x 4) headers
JL	1	16-pin (2 x 8) header
JTAG	1	20-pin (2 x 10) header
J1, J2, J232	3	Female RS-232 DB9 connectors
J485	1	4-position terminal block
JU1–JU23, JU30, JU31	25	3-pin headers
JU24–JU29, JU32–JU37, JU39, JU40, JU41	15	2-pin headers
JU38	0	Not installed, 2-pin header
Q1, Q2	2	npn transistors (SOT23)
R1, R2, R3, R5–R12, R18, R20, R21	14	10kΩ ±5% resistors (0603)
R4	1	120Ω ±5% resistor (0603)
R13	1	560kΩ ±5% resistor (0603)
R14	0	Not installed, resistor (0603)
R15, R17	2	33kΩ ±5% resistors (0603)
R16	1	22kΩ ±5% resistor (0603)
S1	1	Pushbutton switch

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For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

MAX3107 Evaluation Kit

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
S2	0	Not installed, switch
VEXT, V18	2	Test points, white
U1	1	I²C/SPI UART (24 SSOP) Maxim MAX3107EAG+
U2	1	RS-485/RS-422 transceiver (14 SO) Maxim MAX3076EASD+
U3	1	RS-232 transceiver (20 TSSOP) Maxim MAX13235EEUP+
U4	1	Linear regulator (16 TSSOP) Maxim MAX1793EUE33+
U5	1	Microcontroller (64 LQFP) NXP LPC2138FBD64

DESIGNATION	QTY	DESCRIPTION
U6	1	RS-232 transceiver (18 SO) Maxim MAX3222CWN+
Y1	1	3.6864MHz oscillator
Y2	1	32.768kHz crystal
Y3	1	12MHz crystal Hong Kong X'tals SSM1200000E18FAE
—	1	DB9 M/F serial 2m extension cable
—	40	Shunts
—	1	PCB: MAX3107 EVALUATION KIT+

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Keil	800-348-8051	www.keil.com
Murata Electronics North America Inc.	770-436-1300	www.murata-northamerica.com
Hong Kong X'tals Ltd	852-35112388	www.hongkongcrystal.com

Note: *Indicate that you are using the MAX3107 when contacting these component suppliers.*

MAX3107 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
DATALOGGER.EXE	Application program
Test_loopback.cli	Loopback test script file
UNINST.INI	Uninstalls the EV kit software

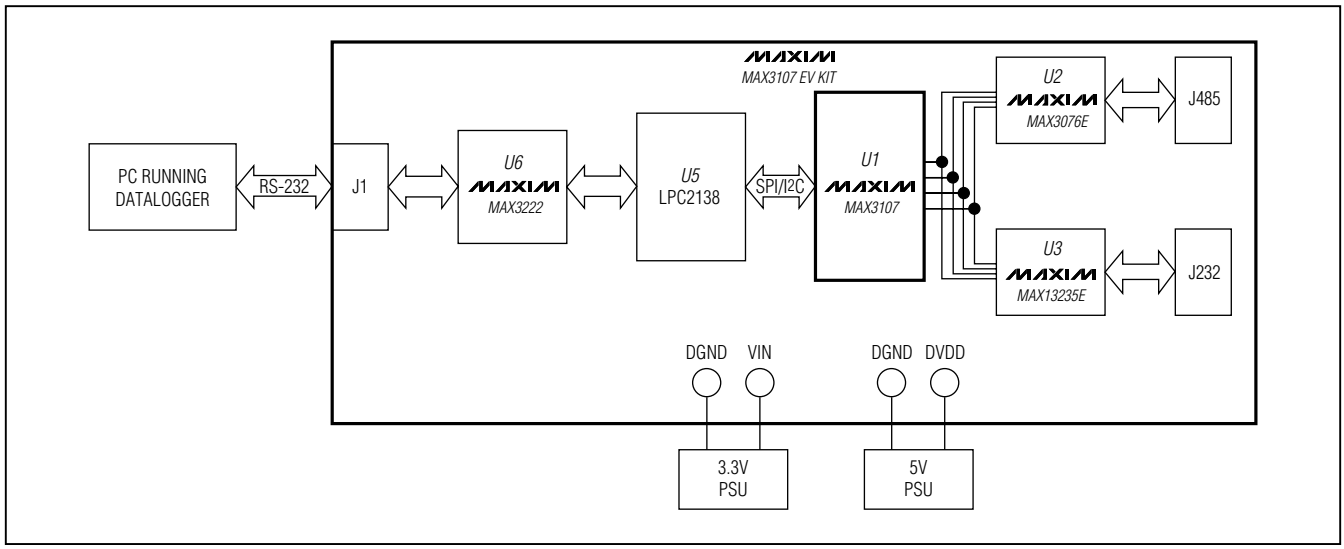


Figure 1. MAX3107 EV Kit Block Diagram

Quick Start

Description of Quick Start

The *Quick Start* (Figure 1) implements a local loopback of the data that the MAX3107 IC sends out through the RS-232 transceiver. The characters “Hello World!” are successively loaded into the transmit FIFO and automatically sent out by the IC at 115kBd with 8E1 formatting. The internal oscillator is used and the PLL is enabled for 6x multiplication. The baud-rate generator divides the reference clock by 2 to result in 115kBd in the standard 1x mode. The IC is controlled with the SPI interface at 13MHz. The receive FIFO is read out successively to show the hex values of the “Hello World!” string in the command line.

Required Equipment

- MAX3107 EV kit (COM port cable included)
- 5V DC power supply
- 3.3V DC power supply
- User-supplied Windows XP, Windows Vista, or Windows 7 PC with a spare RS-232 port

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The MAX3107 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed.**

1) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 3107Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
2) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows **Start | Programs** menu.
3) Verify that all jumpers are in their default positions, as shown in the Tables 3, 4, and 5.
4) Connect the COM port from the PC to the J1 connector on the EV kit board.
5) Connect the positive terminal of the 5V power supply to the VIN connector.
6) Connect the negative terminal of the 5V power supply to the DGND connector.
7) Connect the positive terminal of the 3.3V power supply to the DVDD connector.
8) Connect the negative terminal of the 3.3V power supply to the DGND connector.

9) Turn on the power supplies.
10) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 2.
11) If a COM port on the PC other than COM1 is connected to the EV kit, click on the **Configuration** menu and click on the **Target COM Settings…** menu item. Enter the appropriate COM port number into the **Port #** edit box (leave everything else unchanged), and press the **OK** button.
12) Press the **Start** button in the main window.
13) Under the **View** menu item, select **CLI** and the **Target-CLI** sub-window appears, as shown in Figure 3.
14) In the **Script** group box, press the browse button (**…**).
15) Select the Test_loopback.cli file from **C:\Program File\MAX3107**.
16) Press the **go** button in the **Script** group box. The EV kit software GUI commands the microcontroller to have the IC send out the string "Hello World!" These characters are converted to RS-232 levels by the MAX13235E and looped back by jumper JU35. The IC receives the data back at RX and saves it in its RxFIFO. The microcontroller reads the data out of RxFIFO and sends it to the software.
17) Verify the received string is "Hello World!" in hex.

Detailed Description of Software

The main window of the evaluation software (Figure 2) provides a command-line interface (**CLI**) to control the MAX3107 IC. Press the **Start** button to establish a communication session between the PC and the EV kit. After a communication session is established, the software changes its appearance, as shown in Figure 3. See Table 1 for the list of commands. All the commands starting with "ru36" are used to configure the IC.

To execute a single command, enter the command into the **Command Entry** edit box and press the Enter key. The result of the command is displayed in the **Command Result** box.

The user can also write a sequence of commands into a script file (*.CLI). To run the script file, press the browse button (**…**) in the **Script** group box to select the script file, and press the **go** button to execute. The **Delay** edit box defines the delay in milliseconds between each command in the script.



Figure 2. MAX3107 Evaluation Kit Software Main Window

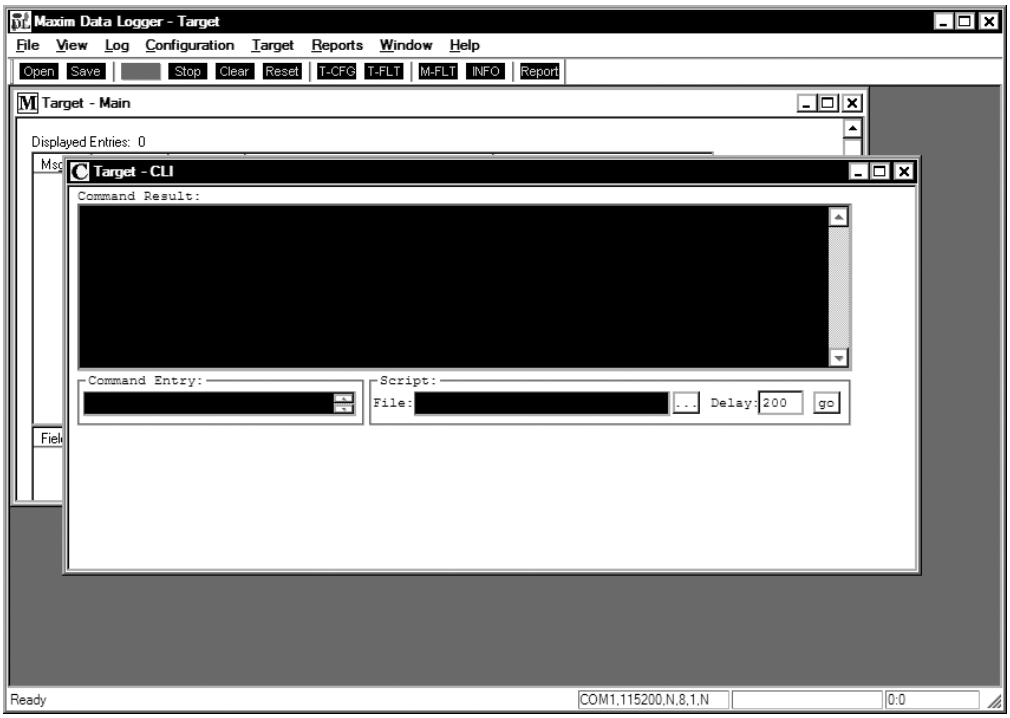


Figure 3. MAX3107 Evaluation Kit Software (Target - CLI Window)

Table 1. Command List

CONTROL COMMAND	DESCRIPTION
util chg_clk_cfg 48000000	Set the microprocessor's clock to the maximum frequency (48MHz).
ru36 rd [addr]	Reads data from a selected register.
ru36 wrt [addr]	Writes data to a selected register.
ru36 gpio_cfg_dir [GPIO #] [dir]	Configures the direction (input or output) of an IO pin.
ru36 gpio_cfg_odrvr [GPIO #] [driver]	Configures the output driver (push-pull or open drain) of an IO pin.
ru36 gpio_rd [GPIO #]	Reads the logic level of an IO pin.
ru36 gpio_wrt [GPIO #] [level]	Writes the logic level of an IO pin.
ru36 hw_spi	Switches device driver to SPI.
ru36 spi_freq [frequency Hz]	Changes the SPI bus frequency. Frequency range = 189kHz to 24MHz. The microprocessor's clock must be set to the maximum frequency prior to using this command.
ru36 hw_i2c	Switches device driver to I²C.
ru36 i2c_addr [7-bit address]	Sets the I²C address.
ru36 i2c_br [bit rate Hz]	Sets the I²C clock rate.
tm set_test_msg [message]	Test manager command. Sets test message in ASCII format. Maximum message length = 65 characters. Example: tm set_test_msg Hello World!
tm start_data2_src	Test manager command. Microprocessor continuously and repeatedly writes the test message to the TxFIFO until terminated by the "tm stop" command.
tm start_data2_snk	Test manager command. Microprocessor continuously empties the RxFIFO until terminated by the "tm stop" command.
tm stop	Test manager command. Stops the test manager command start_data2_snk or start_data2_src.

Note: *Dir: 1 = Output, 0 = Input*
GPIO #: 0 = GPIO0, 1 = GPIO1, 2 = GPIO2, 3 = GPIO3
Level: 0 = Logic-level low, 1 = Logic-level high
Driver: 1 = Push-pull, 0 = Open drain

_Detailed Description of Hardware

The MAX3107 EV kit provides a proven design to evaluate the MAX3107 IC advanced UART with 128 transmit/receive FIFOs that can be controlled through I²C or high-speed SPI. An on-board RS-485/RS-422 transceiver, RS-232 transceiver, and easy-to-use RS-232-to-PC connection are included on the EV kit.

Transceivers

The UART signals of the IC can be connected to either the RS-485/RS-422 transceiver (U2) or the RS-232 transceiver (U3). See Tables 3 and 4 to select the appropriate transceiver.

Connectors

The EV kit has three connectors (J1, J485, and J232) and three headers (JUART, JIO, and JL). See Table 2 for the details about the connectors.

User-Supplied Digital I/O and I2C/SPI Interface

To use the MAX3107 EV kit with a user-supplied digital I/O and an $\overline{I2C}$/SPI interface, first move the shunts of JU2–JU8 to the 2-3 position, and remove the shunt on JU1. Next, connect the user-supplied SPI/$\overline{I2C}$, $\overline{RST}$, DOUT/SDA, SCLK/SCL, $\overline{CS}$/A0, DIN/A1, $\overline{IRQ}$, and LDOEN signals to the corresponding pins on the JL header.

Power Supply

The on-board microprocessor and transceivers are powered by the on-board LDO. Apply a 3.6V to 5V supply to the VIN and DGND connectors to power the LDO.

The VL, VA, and VEXT inputs of the MAX3107 can be supplied separately by connecting the individual supplies to the DVDD, AVDD, and VEXT connectors, respectively. To connect VL, VA, and VEXT together, install the shunts on JU40 and JU41.

Table 2. Connector Descriptions

CONNECTOR	DESCRIPTION
JIO	A 2 x 4 header that connects to the GPIOs of the MAX3107
JL	A 2 x 8 header that connects to the digital signals ($\overline{I2C}$/SPI, $\overline{RST}$, DOUT/SDA, SCLK/SCL, $\overline{CS}$/A0, DIN/A1, $\overline{IRQ}$, and LDOEN) of the MAX3107
JUART	A 2 x 4 header that connects to the UART signals of the MAX3107
J1	The PC communicates with the on-board microprocessor through this DB9 connector
J232	The DB9 connector that connects to the RS-232 signals of the on-board RS-232 transceiver
J485	The 4-position terminal block that connects to the RS-485/RS-422 signals of the RS-485/RS-422 transceiver

Table 3. Jumper Descriptions

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	MAX3107's $\overline{I2C}$/SPI signal connected to VL (SPI interface selected)
	2-3	MAX3107's $\overline{I2C}$/SPI signal connected to GND (I^2C interface selected)
JU2	1-2*	MAX3107's $\overline{RST}$ signal connected to the on-board microcontroller
	2-3	Connects the external $\overline{RST}$ signal to the JL connector (JL-3)
JU3	1-2*	See JU19
	2-3	Connects the external DOUT/SDA signal to the JL connector (JL-5)
JU4	1-2*	See JU21
	2-3	Connects the external SCLK/SCL signal to the JL connector (JL-7)
JU5	1-2*	See JU18
	2-3	Connects the external $\overline{CS}$/A0 signal to the JL connector (JL-9)
JU6	1-2*	See JU20
	2-3	Connects the external DIN/A1 signal to the JL connector (JL-11)
JU7	1-2*	MAX3107's $\overline{IRQ}$ signal connected to the on-board microcontroller
	2-3	Connects the external $\overline{IRQ}$ signal to the JL connector (JL-13)
JU8	1-2*	MAX3107's LDOEN signal connected to the on-board microcontroller
	2-3	Connects the external LDOEN signal to the JL connector (JL-15)
JU9	1-2*	MAX3107's GPIO0 signal connected to the on-board microcontroller
	2-3	Connect the external GPIO0 signal to the JIO connector (JIO-1)
JU10	1-2*	MAX3107's GPIO1 signal connected to the on-board microcontroller
	2-3	Connects the external GPIO1 signal to the JIO connector (JIO-3)
JU11	1-2*	MAX3107's GPIO2 signal connected to the on-board microcontroller
	2-3	Connects the external GPIO2 signal to the JIO connector (JIO-5)
JU12	1-2*	MAX3107's GPIO3 signal connected to the on-board microcontroller
	2-3	Connects the external GPIO3 signal to the JIO connector (JIO-7)
JU13	1-2*	See the *TX/RX Jumper Settings* section
	2-3	Connects the external TX signal to the JUART connector (JUART-1)
JU14	1-2*	See the *TX/RX Jumper Settings* section
	2-3	Connects the external RX signal to the JUART connector (JUART-3)
JU15	1-2*	See JU28
	2-3	Connects the external $\overline{RTS}$/CLKOUT signal to the JUART connector (JUART-5)
JU16	1-2*	See JU29
	2-3	Connects the external $\overline{CTS}$ signal to the JUART connector (JUART-7)

**Default position.*

Table 3. Jumper Descriptions (continued)

JUMPER	SHUNT POSITION	DESCRIPTION
JU17	1-2*	MAX3107's XIN input is connected to the on-board 3.6864MHz oscillator
	2-3	MAX3107's XIN input is connected to the on-board XIN pad
JU18	1-2*	MAX3107's $\overline{CS}$/A0 signal connected to the on-board microcontroller
	2-3	See JU22
JU19	1-2*	MAX3107's DOUT/SDA connected to the MISO input of the on-board microcontroller
	2-3	MAX3107's DOUT/SDA connected to the SDA signal of the on-board microcontroller
JU20	1-2*	MAX3107's DIN/A1 signal connected to the on-board microcontroller
	2-3	See JU23
JU21	1-2*	MAX3107's SCLK/SCL connected to the SCLK signal of the on-board microcontroller
	2-3	MAX3107's SCLK/SCL connected to the SCL signal of the on-board microcontroller
JU22	1-2	MAX3107's $\overline{CS}$/A0 connected to VL
	2-3*	MAX3107's $\overline{CS}$/A0 connected to GND
JU23	1-2	MAX3107's DIN/A1 connected to VL
	2-3*	MAX3107's DIN/A1 connected to GND
JU28	1-2*	MAX3107's $\overline{RTS}$/CLKOUT signal is connected to the T2IN input of the MAX13235E RS-232 transceiver
	Open	MAX3107's $\overline{RTS}$/CLKOUT is disconnected from the MAX13235E RS-232 transceiver
JU29	1-2*	MAX3107's $\overline{CTS}$ signal is connected to the R2OUT output of the MAX13235E RS-232 transceiver
	Open	MAX3107's $\overline{CTS}$ is disconnected from the MAX13235E RS-232 transceiver
JU30	1-2*	The driver output enable signal (DE) of the MAX3076E RS-485 transceiver is connected to +3.3V
	2-3	The driver output enable signal (DE) of the MAX3076E RS-485 transceiver is connected to the $\overline{RTS}$/CLKOUT signal of the MAX3107
JU31	1-2*	The receiver output enable signal ($\overline{RE}$) of the MAX3076E RS-485 transceiver is connected to the GND
	2-3	The receiver output enable signal ($\overline{RE}$) of the MAX3076E RS-485 transceiver is connected to the $\overline{RTS}$/CLKOUT signal of the MAX3107
JU32	1-2*	The noninverting driver output (Y) of the MAX3076E RS-485 transceiver is connected to the noninverting receiver input (A) (for loopback test)
	Open	The noninverting driver output (Y) of the MAX3076E RS-485 transceiver is disconnected from the noninverting receiver input (A)
JU33	1-2*	The inverting driver output (Z) of the MAX3076E RS-485 transceiver is connected to the noninverting receiver input (B) (for loopback test)
	Open	The noninverting driver output (Z) of the MAX3076E RS-485 transceiver is disconnected from the noninverting receiver input (B)
JU34	1-2*	The T2OUT of the MAX13235E RS-232 transceiver is connected to the R2IN (for loopback test)
	Open	The T2OUT of the MAX13235E RS-232 transceiver is disconnected from the R2IN
JU35	1-2*	The T1OUT of the MAX13235E RS-232 transceiver is connected to the R1IN (for loopback test)
	Open	The T1OUT of the MAX13235E RS-232 transceiver is disconnected from the R1IN

**Default position.*

Table 3. MAX3107 EV Kit Jumper Descriptions (continued)

JUMPER	SHUNT POSITION	DESCRIPTION
JU37	1-2*	To update the firmware for the on-board microcontroller through the COM port, install the shunts on JU37 and JU39
JU39	1-2*	To update the firmware for the on-board microcontroller through the COM port, install the shunts on JU37 and JU39
JU40	1-2*	MAX3107's analog supply (VA) connected to the digital logic supply (VL)
	Open	Disconnects the analog supply (VA) from the digital logic supply (VL)
JU41	1-2*	MAX3107's analog supply (VA) connected to the transceiver interface level supply (VEXT)
	Open	Disconnects the analog supply (VA) from the transceiver interface level supply (VEXT)

**Default position.*

TX/RX Jumper Settings

Table 4. TX Signal

JUMPER	SHUNT POSITION	DESCRIPTION
OPTION 1		
JU24	Open*	MAX3107's TX signal connected to the T1IN input of the MAX13235E RS-232 transceiver
JU25	1-2*	
OPTION 2		
JU24	1-2	MAX3107's TX signal connected to the DI input of the MAX3076E RS-485 transceiver
JU25	Open	

**Default position.*

Table 5. RX Signal

JUMPER	SHUNT POSITION	DESCRIPTION
OPTION 1		
JU26	Open*	MAX3107's RX signal connected to the R1OUT output of the MAX13235E RS-232 transceiver
JU27	1-2*	
OPTION 2		
JU26	1-2	MAX3107's RX signal connected to the RO output of the MAX3076E RS-485 transceiver
JU27	Open	

**Default position.*

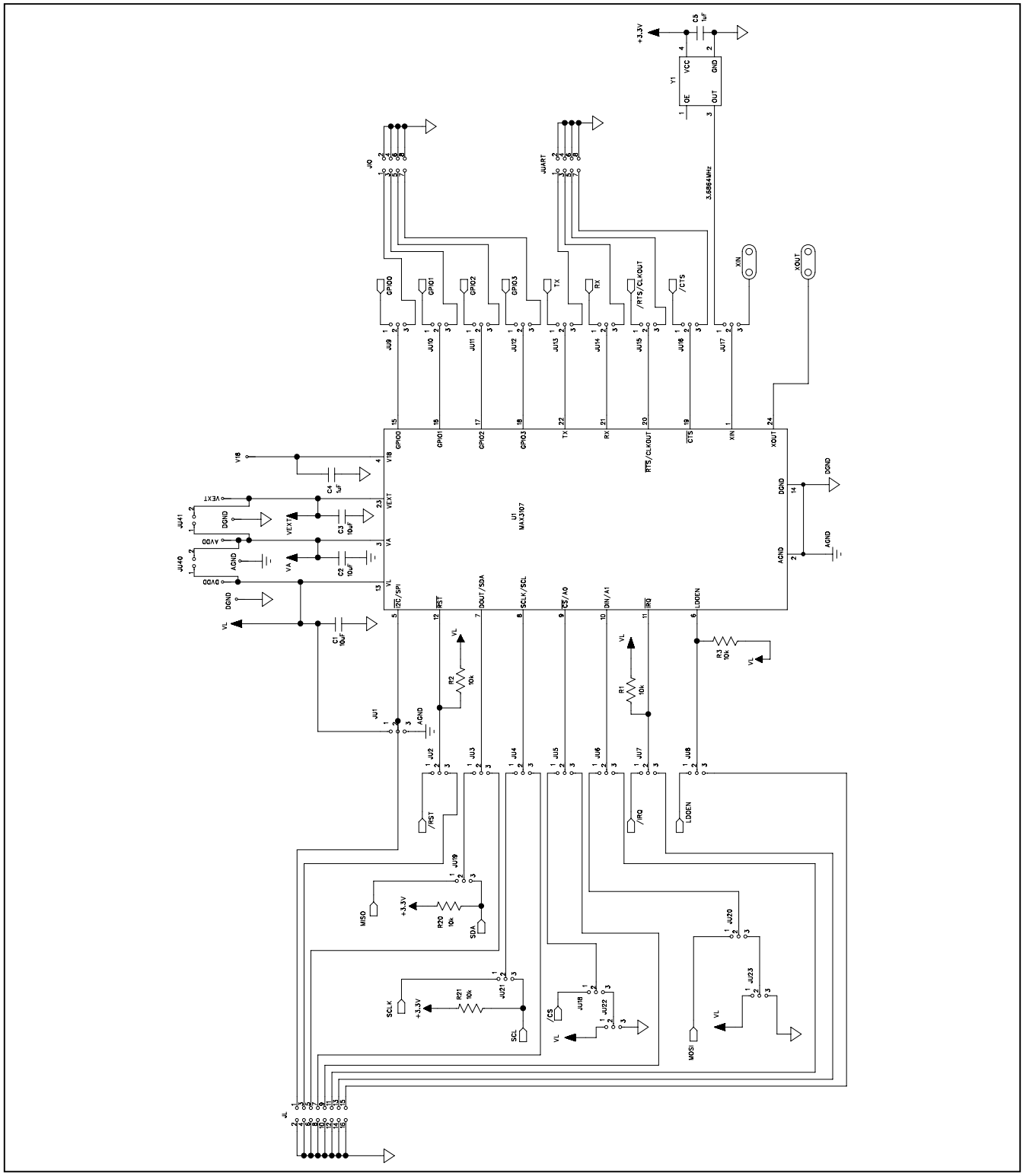


Figure 4a. MAX3107 EV Kit Schematic (Sheet 1 of 3)

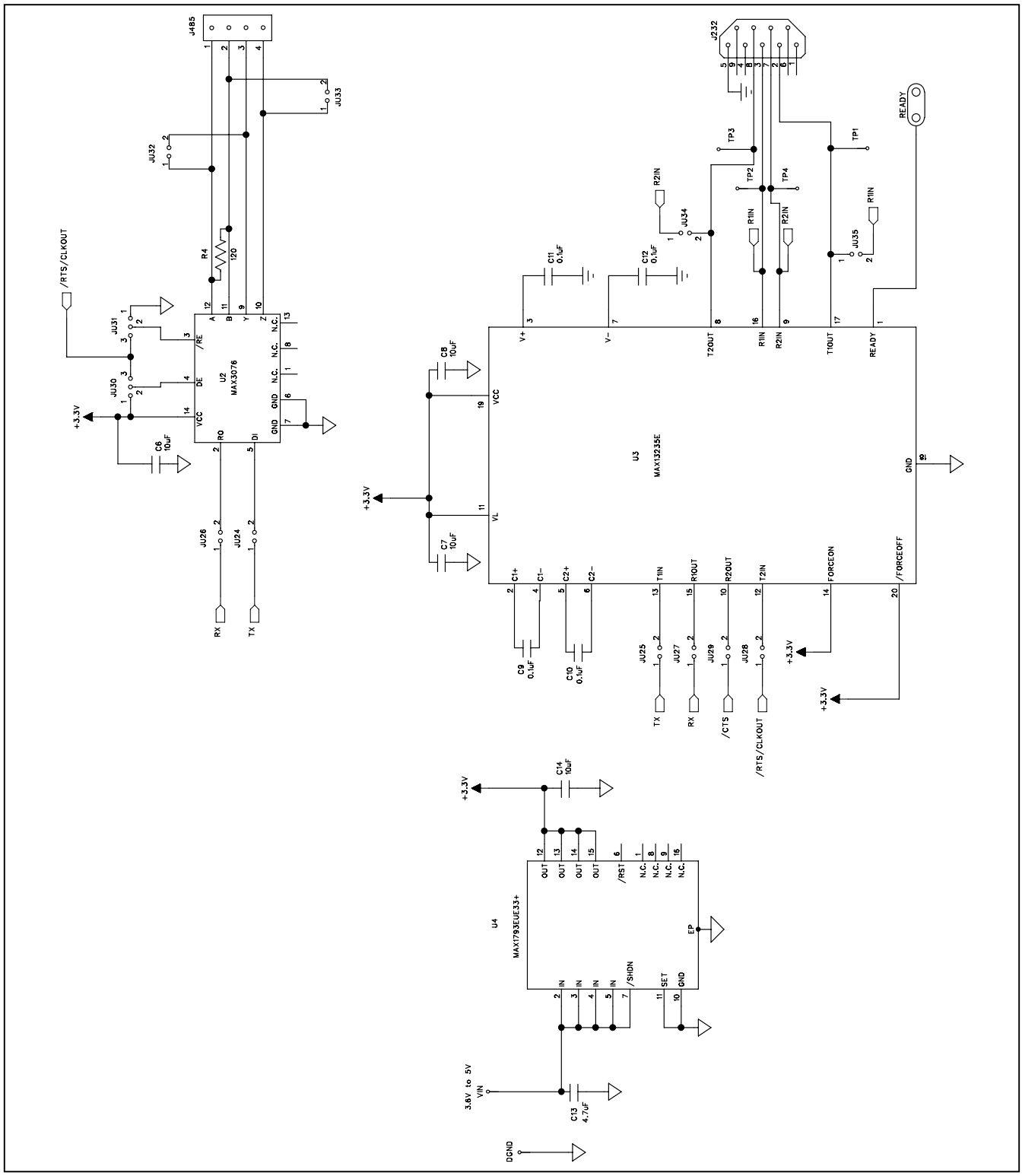


Figure 4b. MAX3107 EV Kit Schematic (Sheet 2 of 3)

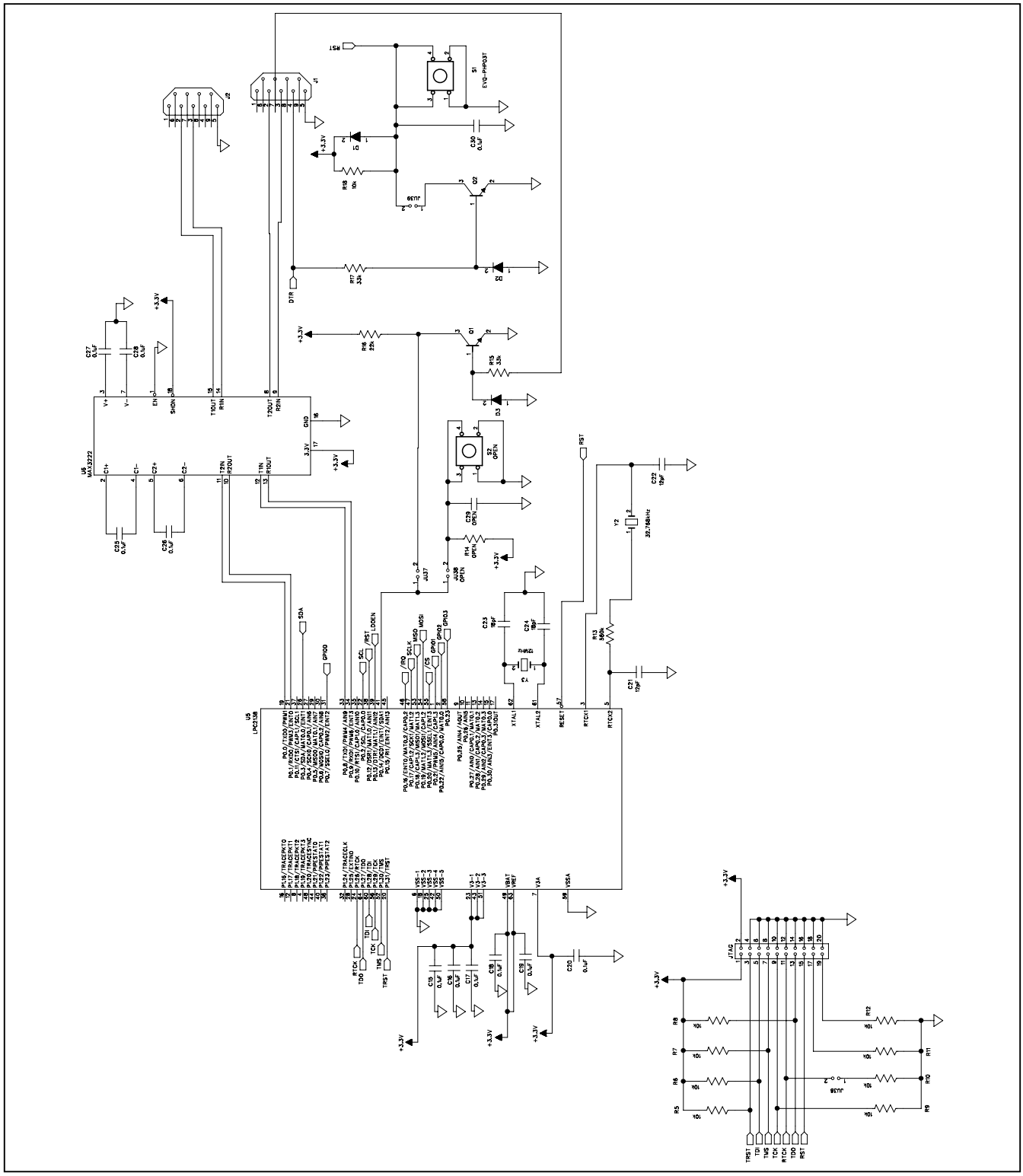


Figure 4c. MAX3107 EV Kit Schematic (Sheet 3 of 3)

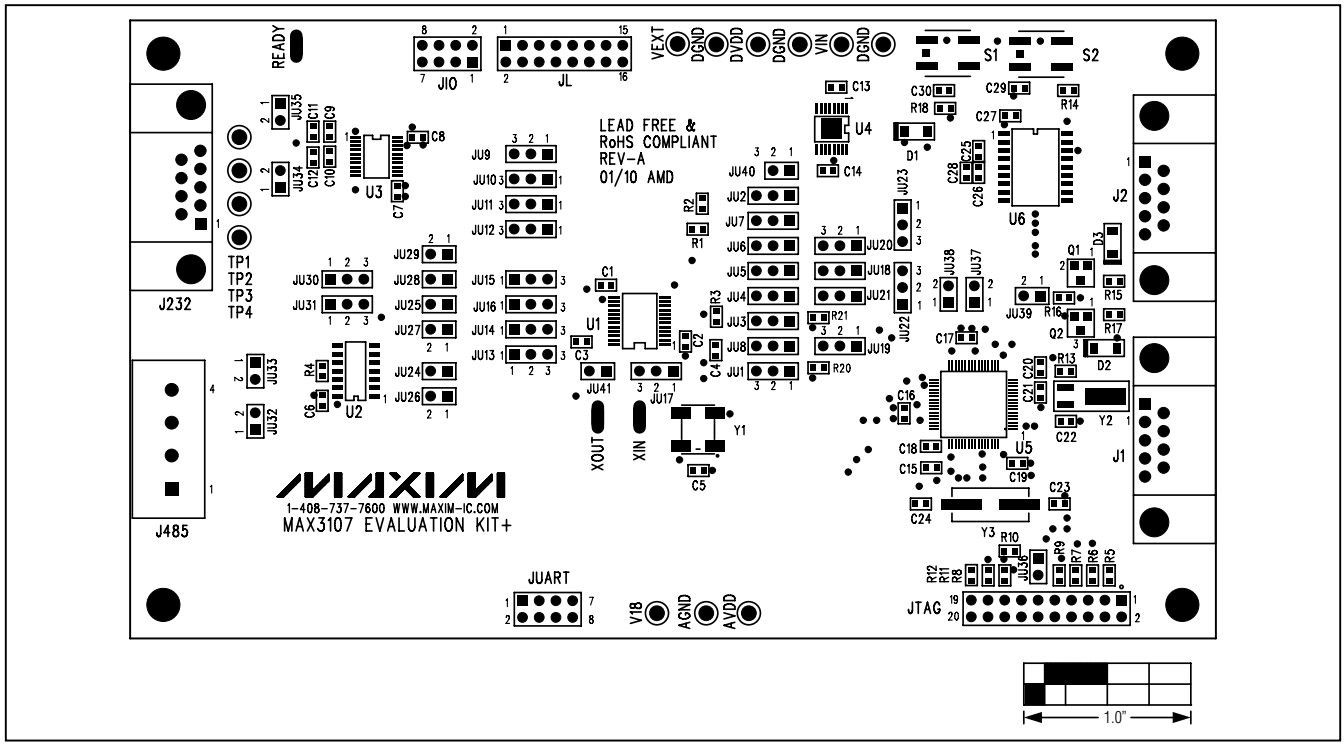


Figure 5. MAX3107 EV Kit Component Placement Guide—Component Side

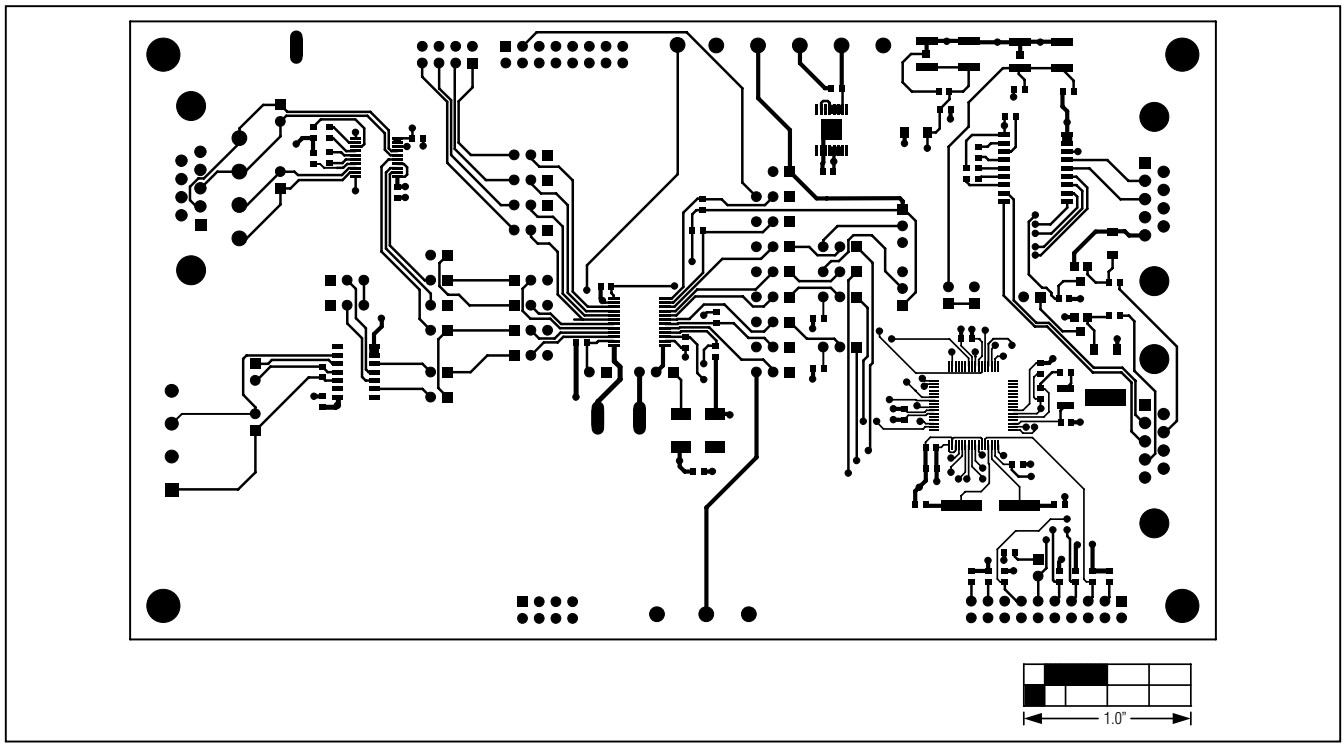


Figure 6. MAX3107 EV Kit PCB Layout—Component Side

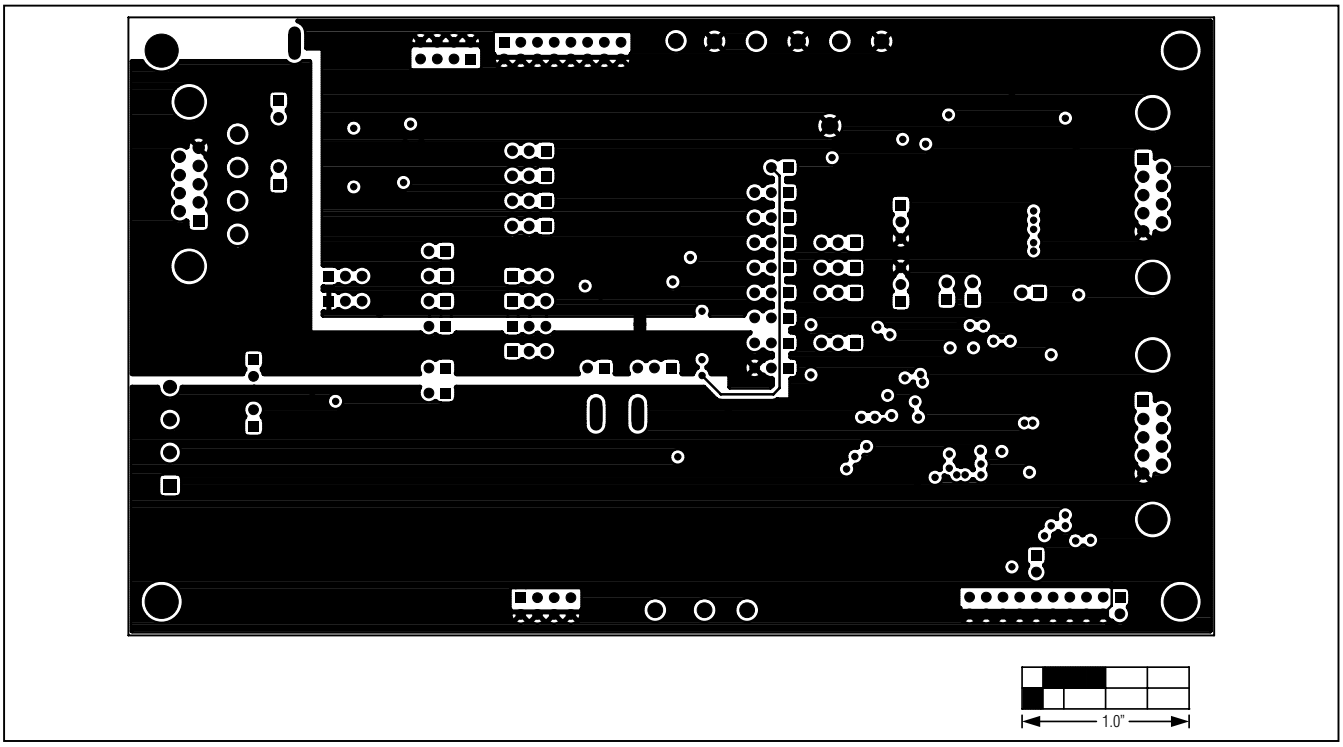


Figure 7. MAX3107 EV Kit PCB Layout—Layer 2

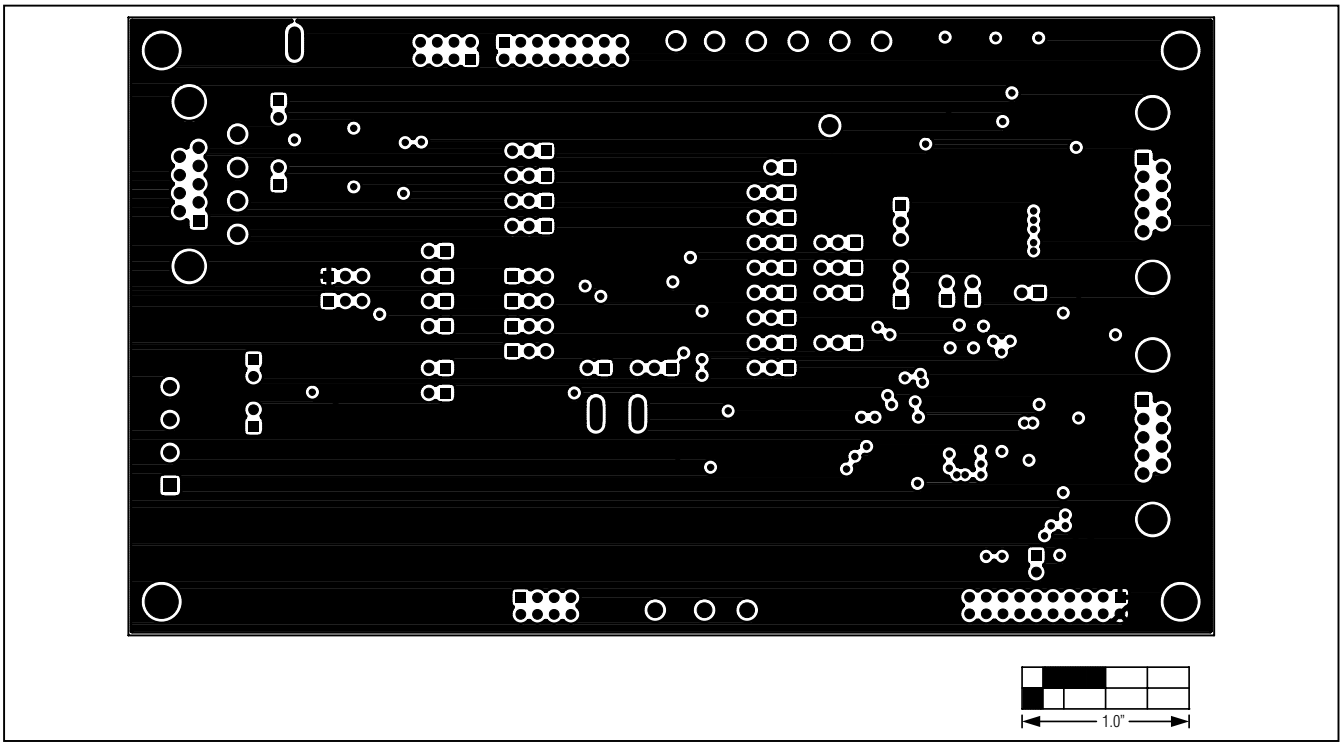


Figure 8. MAX3107 EV Kit PCB Layout—Layer 3

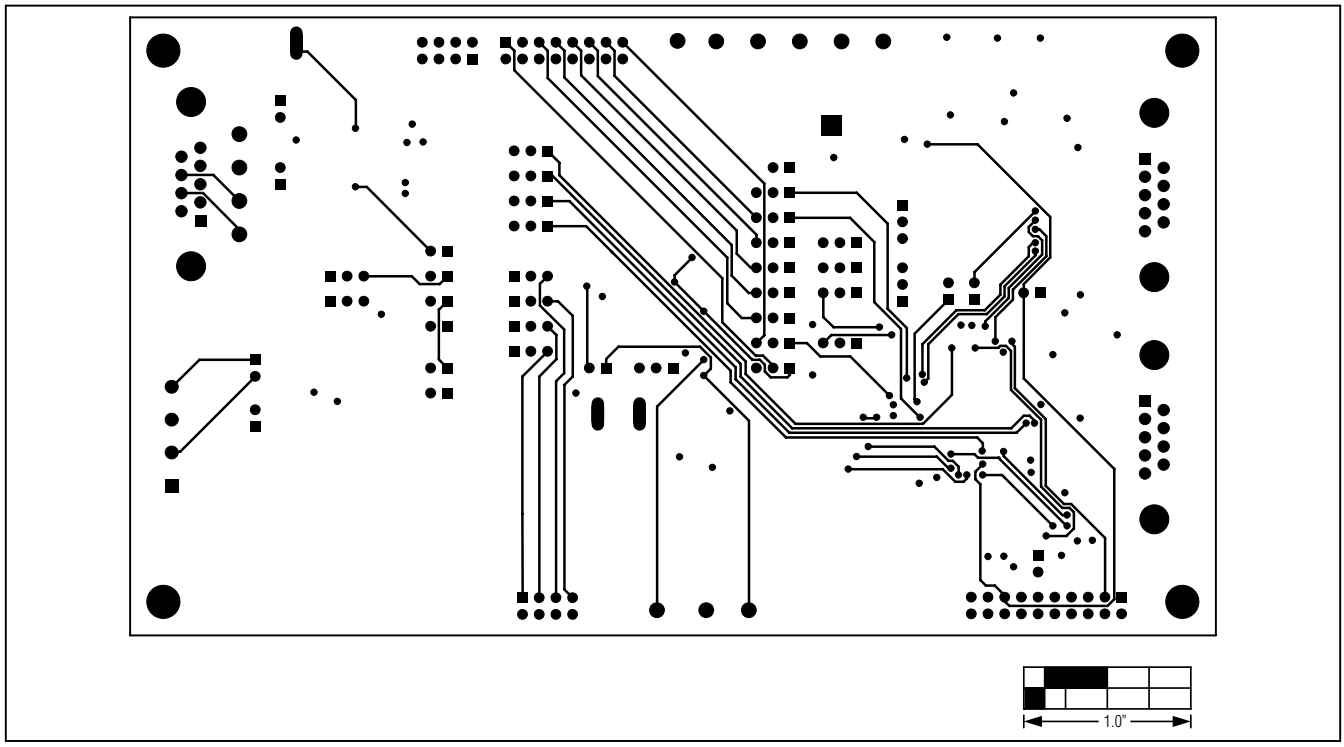


Figure 9. MAX3107 EV Kit PCB Layout—Solder Side

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