General Description

The MAXQ7667 evaluation kit (EV kit) demonstrates distance measurement with the MAXQ7667.

The EV kit includes Windows XP®-, Windows Vista®-, and Windows® 7-compatible software for distance measurements data acquisition through a USB cable.

Features

- Windows XP-, Windows Vista-, and Windows 7-Compatible Software
- USB-PC Connection (Cable Included)
- USB Powered (External Power Supply Not Required)
- Real-Time Data Acquisition through the USB

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

Quick Start

The EV kit board is a plug-n-play, ultrasound echo acquisition kit that connects to the PC through a USB cable. The EV kit produces an ultrasound burst and samples the echo and sends the information back to the PC. Distance to multiple objects can be calculated from the echo. The board does not require external power; it is powered through the USB. The USB-to-serial driver can be downloaded from www.ftdichip.com/Drivers/VCP.htm.

The EV kit is preloaded with default firmware that communicates with the MAXQ7667 evaluation software. Software can be installed and run on any Windows-based system.
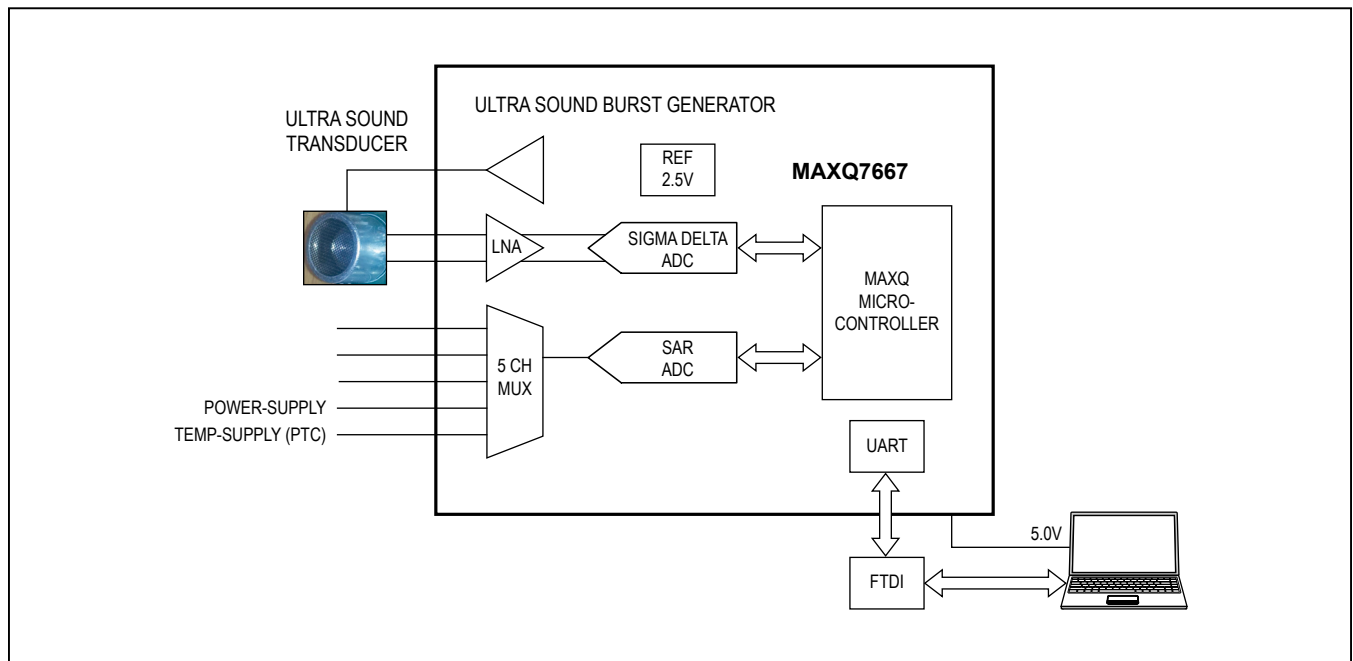

Figure 1. MAXQ7667 EV-Kit Block Diagram

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Detailed Description

The MAXQ7667 EV kit board is loaded with the MAXQ7667, Maxim's integrated ultrasound acquisition system. It integrates a microcontroller, ultrasound burst generator, and ultrasound echo receive path. It also integrates power management, a 5-channel 12-bit SAR ADC as auxiliary analog input, brown-out detection, GPIOs, UART, SPI port, timers, and a watchdog.

On the EV kiit, the MAXQ7667 communicates through UART to a USB-to-UART bridge.

This USB-to-UART bridge communicates to the PC. A GUI that shows the echoes and allows control over the part is available.

The MAXQ7667 microcontroller is preloaded with firmware that communicates with the MAXQ7667 GUI application. Upon receiving the logging command from the GUI, it sends an ultrasound burst and then acquires the echo using the echo receive path and the Sigma-Delta ADC. The data is sent back to the PC through UART for display and further analysis.

Components of the EV Kit

The EV kit comes with the following components:

1) MAXQ7667 evaluation board

2) USB cable

3) MAXQ7667 GUI application

Data Acquisition through the EV Kit

The following steps are needed to acquire data through the EV kit:

1) Connect the EV kit board to the PC through the USB cable. The EV kit board receives power from the USB.

2) Install and run the MAXQ7667 GUI application.

3) The GUI automatically detects the EV kit and starts sending bursts and receiving the echoes. The echo is displayed as a graph.
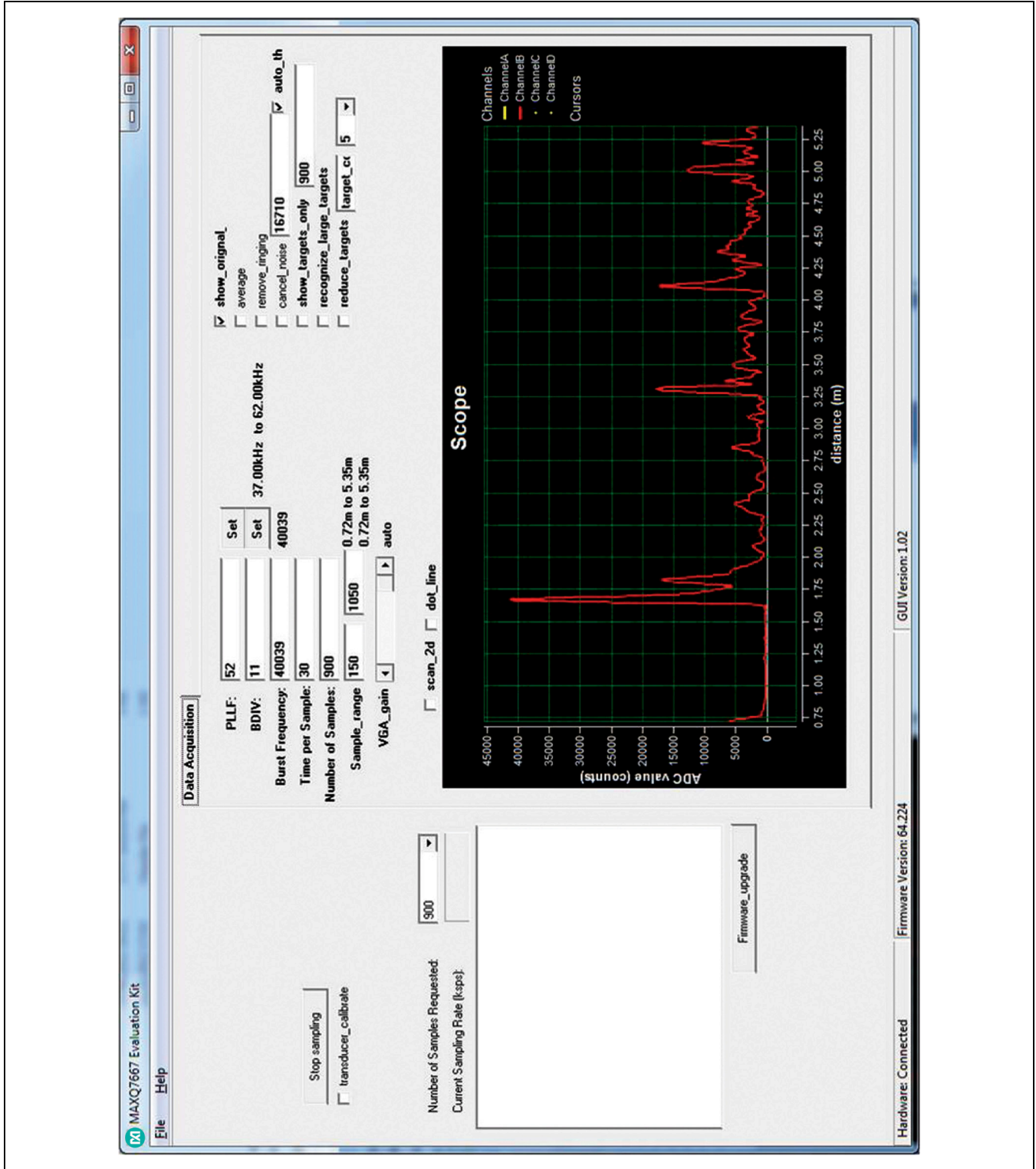
Figure 2. MAXQ7667 GUI Application

EV Kit Extended Features

The EV kit includes options for a single transducer or a dual transducer. The MAXQ7667 allows the user to work with one transducer (for transmit and receive) or with two transducers (one for transmit and one for receive). Using one transducer is cheaper and the solution becomes smaller; however, the transducer cannot receive while it is still ringing from the excitation during transmit. There are different transducers on the market with different ring times, but typically when using one transducer you cannot measure distances smaller than appriximately 20cm to 40cm (the EV kit transducer is ringing for ~ 40cm).

To use one transducer, make sure only TRANSD1 is mounted and TRANSD2 is not mounted on the PCB. R21 and R22 must also be populated with 0Ω resistors and R23 left open.

To use two transducers, make sure TRANSD1 and TRANSD2 are populated. R21 and R22 have to be open and R23 has to be populated.

The MAXQ7667 can be powered with an external supply voltage up to 25V. To do that, make sure thar R1 and R2 are open (not populated). You can then supply external supply to JP1.

Table 1. EV Kit Connector JP1 Description

JP1 PIN #	LABEL	FUNCTION
1	V+	If R2 is not mounted, 6V to 25V supply. If R2 is mounted, 5V supply
2	GND	Ground pin.

Table 2. EV Kit Connector JP2 Description

JP2 PIN #	LABEL	FUNCTION
1	+	External transducer 1 + (only if on-board transducer is removed). If R21 and R22 are populated, then transmit and receive. Do not mount transducer 2 in that case (R23 should not be populated in that mode).
2	-	External transducer 1 - (only if on-board transducer is removed). If R21 and R22 are populated, then transmit and receive. Do not mount transducer 2 in that case (R23 should not be populated in that mode).

Table 3. EV Kit Connector JP3 Description

JP3 PIN #	LABEL	FUNCTION
1	+	External transducer 2 + (only if on-board transducer is removed). Use transducer 2 only if R22 is mounted and R21 and R22 are not mounted.
2	-	External transducer 2 - (only if on-board transducer is removed). Use transducer 2 only if R22 is mounted and R21 and R22 are not mounted.

Table 4. EV Kit Connector J5 Description

J5 PIN #	LABEL	FUNCTION
1	DVDDIO	5V DVDDIO supply (output up to ~150mA)
2	AVDD	3.3V AVDD supply (output up to ~30mA)
3	P1.4 / MOSI	GPIO port 1 bit 4 or SPI MOSI
4	AIN1	Analog In 1 for SAR ADC
5	P1.5 / MISO	GPIO port 1 bit 5 or SPI MISO
6	AIN0	Analog In 0 for SAR ADC
7	P1.6 / SCLK	GPIO port 1 bit 6 or SPI SCLK
8	P0.2	GPIO port 0 bit 2
9	P1.7 / SS	GPIO port 1 bit 7 or SPI CS
10	P0.3 / T0 / ADCCTL	GPIO port 0 bit 3 or Timer0 or ADC control input
11	P0.4 / T0B	GPIO port 0 bit 4 or Timer0
12	GND	Ground pin

Table 5. EV Kit Connector JTAG Description

JTAG PIN #	LABEL	FUNCTION
1	TCK	Test clock
2	GND	Digital ground pin
3	TDO	Test data output
4	+5	Supply voltage for reference only
5	TMS	Test mode select
6	RST	Microcontroller MAXQ610 reset pin
7	N.C.	No connect
8	N.C.	No connect
9	TDI	Test data Input
10	GND	Digital ground pin

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C4	2	10µF ±10%, 16V X5R ceramic capacitors (0805)
C2, C3, C6, C7, C11–C18, C31	13	0.1µF ±10%, 16V X7R ceramic capacitors (0603)
C5	1	2.2µF ±10%, 25V X5R ceramic capacitor (0805)
C19, C20	2	0.47µF ±10%, 25V X7R ceramic capacitors (0805)
C21	1	330pF ±10%, 50V X7R ceramic capacitor (0603)
C22	1	0.033µF ±10%, 16V X5R ceramic capacitor (0603)
C23, C24	2	470pF ±10%, 200V ceramic capacitors (0805)
C25, C26	2	0.01µF ±5%, 25V C0G ceramic capacitors (0603)

DESIGNATION	QTY	DESCRIPTION
C27, C28	2	470pF ±5%, 50V C0G ceramic capacitors (0603)
C29, C30	2	22pF ±5%, 25V NP0 ceramic capacitors (0603)
D2	1	BAS28 high-speed dual diode (SOT143)
D4	1	MBRS140T3G Schottky diode (SMB)
IC1	1	Ultrasound PSoC Maxim MAXQ7667AACM/V+
IC2	1	FT232RQ FTDI USB-to-UART (QFN)

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
LED1	1	Green LED LG L29K-G2J1-24-Z
LED2	1	Yellow LED LY L29K-H1K2-26-Z
LED3	1	Red LED LS L29K-G1J2-1-Z
PTC	1	4.7kΩ ERA-S27J472V Panasonic PTC 0805
Q1	1	16MHz crystal Package: FA-20H
R1–R4, R9, R10, R23	7	0Ω resistors (0603)
R5–R7	3	3.24kΩ ±1%, resistors (0402)
R8	1	100Ω ±1% resistor (0603)
R9–R10	2	0Ω ±1% resistors (0603)
R11	1	10kΩ ±5% resistor (0603)

DESIGNATION	QTY	DESCRIPTION
R12	1	Res, ±5%, 6.8kΩ, 0603
R13	1	8.25kΩ ±1% resistor (0603)
R14	1	1.78kΩ ±1% resistor (0603)
R15	1	24.0kΩ ±1% resistor (0603)
R16, R17	2	0Ω resistors (1206)
R24	1	49.9Ω ±1% resistor (0805)
R25	1	1.00kΩ ±1% resistor (0603)
T1	1	BSP129 n-channel MOSFET (SOT223)
T2	1	IRLML6346PBF n-channel MOS-FET (SOT23)
TRANSD1, TRANSD2	2	16mm, 40kHz transducers
TR1	1	K4000004 transformer
X2	1	MINI-USB connector (Type B)
RESET	1	6.2mm x 6.5mm SMD button
—	1	PCB: MAXQ7667 EV Kit
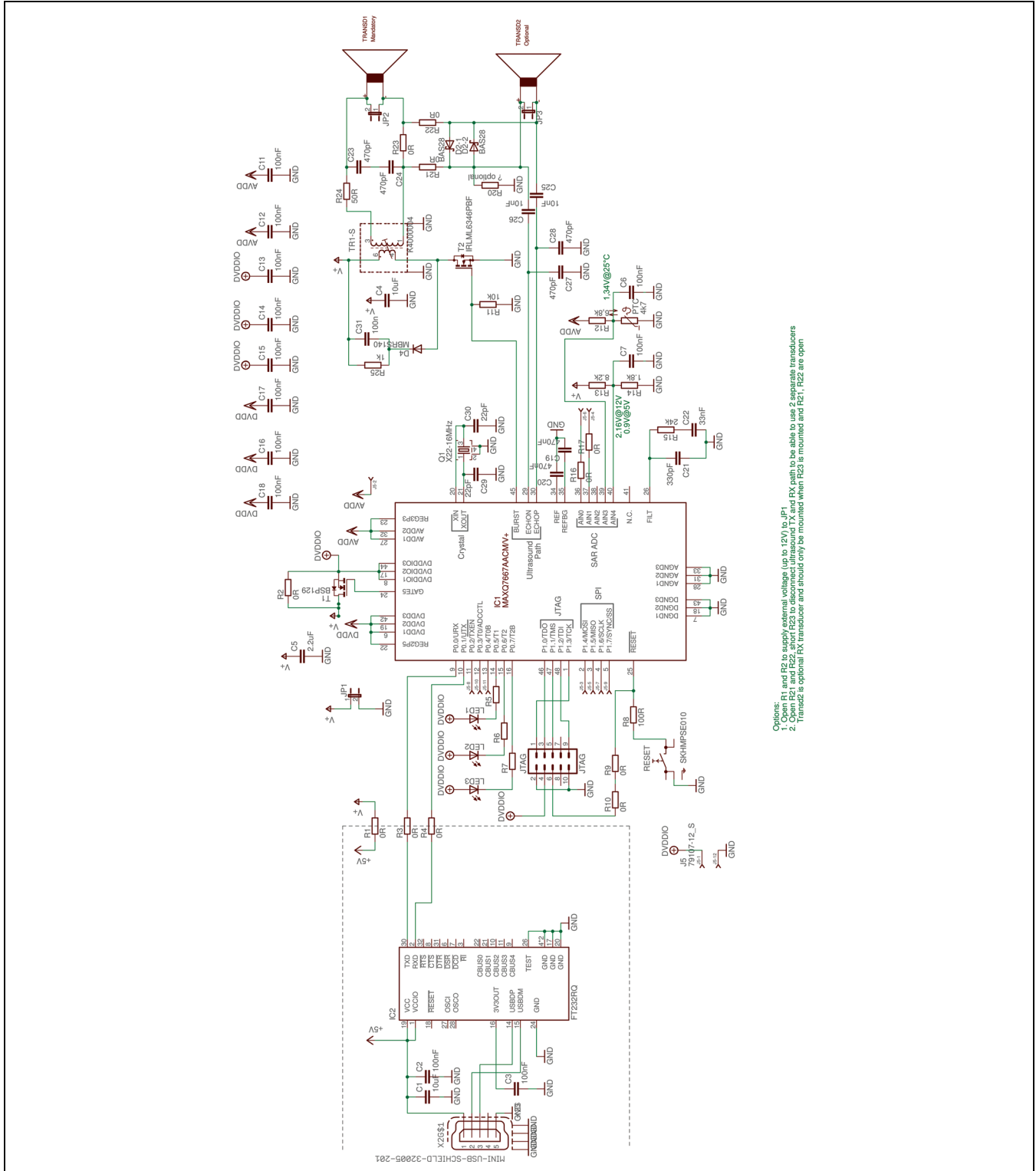
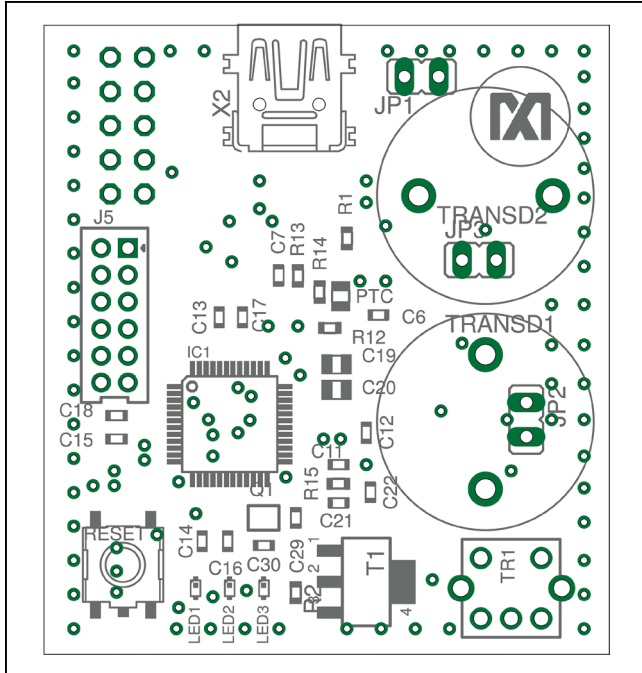Figure 3. MAXQ7667 EV Kit Schematic

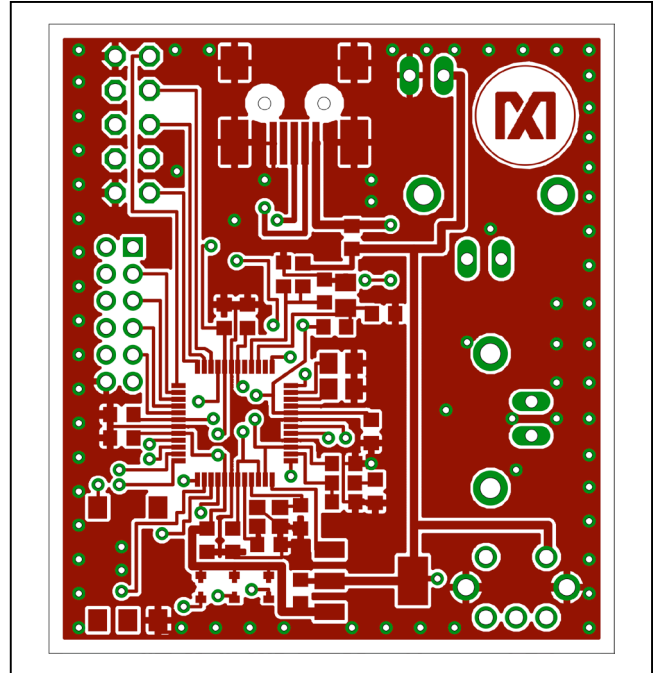Figure 4. MAXQ7667 Component Placement Guide—Component Side

Figure 6. MAXQ7667 PCB Layout—Component Side

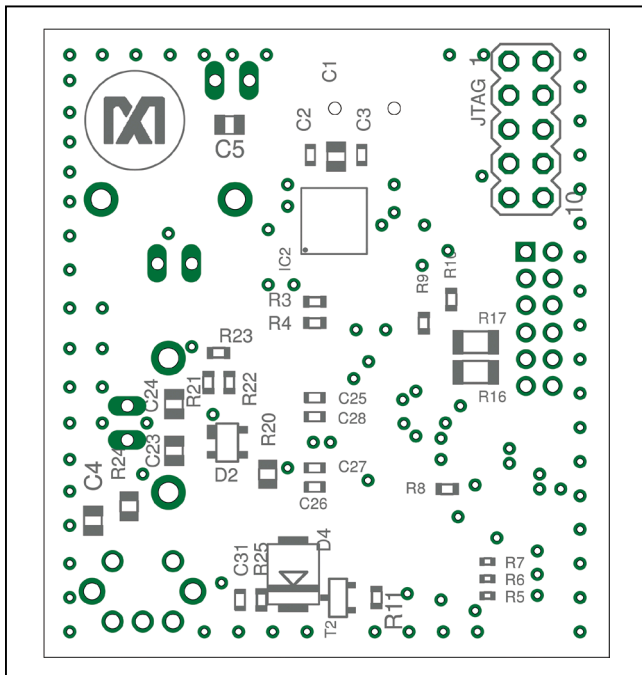

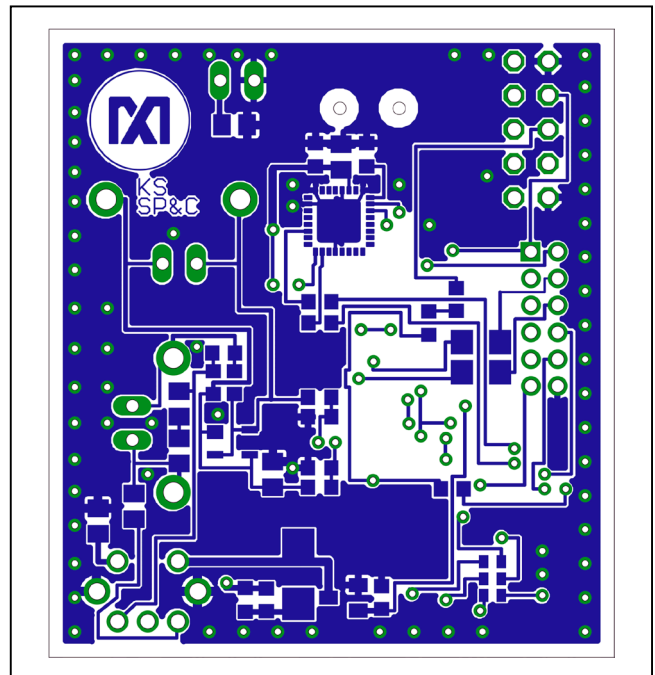Figure 5. MAXQ7667 Component Placement Guide—Solder Side

Figure 7. MAXQ7667 PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAXQ7667EVKIT+	EV Kit

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

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/13	Initial release	—
1	5/14	New version of data sheet	All

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