



MAX8834Y Evaluation Kit

General Description

The MAX8834Y evaluation kit (EV kit) is a fully assembled and tested PCB that demonstrates the highly integrated MAX8834Y adaptive step-up converter with 1.5A flash driver. The MAX8834Y flash driver integrates an adaptive 1.5A PWM step-up DC-DC converter, two 750mA white LED camera flash/movie current regulators, and a 16mA indicator LED current regulator. The EV kit includes a MAXQ2000 microcontroller command module that provides the I²C interface to control individual output on/off, the step-up output voltage, movie/flash current, and flash timer duration settings.

The MAX8834Y evaluation software can be downloaded from www.maxim-ic.com/evkitsoftware. The MAX8834Y EV kit can also evaluate the MAX8834Z. To evaluate the MAX8834Z, order a free sample along with the MAX8834Y EV kit.

Ordering Information

PART	TYPE
MAX8834YEVKIT+	EV Kit

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

Component Lists

Main Circuit

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	10 μ F \pm 10%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A106K or equivalent
C3, C4	2	0.1 μ F \pm 10%, 16V X7R ceramic capacitors (0402) TDK C1005X7R1C104K or equivalent
D1, D2	2	White LED flash OSRAM Opto Semi LW_F65G
D3	1	Red indicator LED OSRAM Opto Semi LS M47K-J2L1-1 OSRAM Opto Semi LS P47F-U1AA-1-1
JU1, JU2, JU4, JU9	4	3-pin headers, 0.1in Sullins PEC36SAAN or equivalent

Features

- ◆ 2.5V to 5.5V Operation Range
- ◆ Step-Up DC-DC Converter
 - 1.5A Guaranteed Output Current
 - Adaptive or I²C-Programmable Output Voltage (3.7V to 5.2V in 16 Steps)
 - Over 90% Efficiency
 - On-Chip Power MOSFET and Synchronous Rectifier
 - Fixed 2MHz and 4MHz PWM Switching-Frequency Option
 - Small 1 μ H to 4.7 μ H Inductor
- ◆ Two Flash/Movie LED Current Regulators
 - I²C-Programmable Flash Output Current (22.44mA to 750mA in 32 Steps)
 - I²C-Programmable Movie Output Current (15.6mA to 125mA in 8 Steps)
 - Low-Dropout Voltage (100mV typ) at 500mA
- ◆ LED Indicator Current Regulator
 - I²C-Programmable Output Current (0.5mA to 16mA in 32 Steps)
 - Ramp and Blink Timers for Indicator Mode
 - Low-Dropout Voltage (75mV typ) at 16mA
- ◆ I²C and/or LED_EN ON/OFF Control for LED Current Regulators
- ◆ I²C-Programmable Flash Safety Timer (50ms to 800ms in 50ms Steps)
- ◆ I²C-Programmable Watchdog Timer (4s to 16s in 4 Steps)
- ◆ MAXQ2000 Command Module for the I²C Control
- ◆ GSM Blank Logic Input Reduces Peak Battery Current
- ◆ Low-Battery Detection (MAXFLASH)
- ◆ Remote Temperature Sensor Input Prevents Finger Burn or Fire
- ◆ Open/Short LED Detection
- ◆ Thermal-Shutdown Protection
- ◆ < 1 μ A Shutdown Current
- ◆ Tiny External Components
- ◆ 20-Bump, 0.5mm Pitch, 2.5mm x 2mm WLP Package
- ◆ Lead(Pb)-Free and RoHS Compliant
- ◆ Fully Assembled and Tested

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Component List (continued)

Main Circuit (continued)

DESIGNATION	QTY	DESCRIPTION
JU3	1	2-pin header, 0.1in Sullins PEC36SAAN or equivalent
L1	1	2.2 μ H inductor Coilcraft LPS6225-222ML (3.9A, 6.2mm x 6.2mm x 2.5mm)
L2	1	1.0 μ H inductor Taiyo Yuden NR4018T1RON (4A, 4.2mm x 4.2mm x 1.8mm)
R1	1	100k Ω \pm 5% NTC thermistor, β = 4550K (0603) TDK NTCG164LH104J

DESIGNATION	QTY	DESCRIPTION
R2, R3	0	Not installed, resistors (0402)
R31	1	0 Ω resistor (0402)
S1	0	Not installed, momentary pushbutton switch Panasonic EVQ-PHP03T Mountain Switch 101-0664-EV
U1	1	Flash driver (20 WLP) MAX8834YEWP+
—	5	Shunts, 2 position Sullins STC02SYAN or equivalent
—	1	PCB: MAX8834Y Evaluation Kit+

Interface Circuit

DESIGNATION	QTY	DESCRIPTION
C5, C6, C7, C10–C14, C25, C26	10	0.1 μ F \pm 10%, 16V X7R ceramic capacitors (0402) TDK C1005X7R1C104K
C8	1	10 μ F \pm 20%, 16V X5R ceramic capacitor (1206) Murata GRM31CR61C106M TDK C3216X5R1C106M
C9, C21, C23	3	10 μ F \pm 20%, 10V X5R ceramic capacitors (0805) TDK C2012X5R1A106M
C15, C16	2	22pF \pm 5%, 50V C0G ceramic capacitors (0402) TDK C1005C0G1H220J
C17, C18	2	10pF \pm 5%, 50V C0G ceramic capacitors (0402) TDK C1005C0G1H100J
C19, C20, C24	3	1 μ F \pm 10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C22	1	0.033 μ F \pm 10%, 25V X7R ceramic capacitor (0402) TDK C1005X7R1E333K
D4	1	Green LED (0603) Panasonic LNJ308G8TRA

DESIGNATION	QTY	DESCRIPTION
J1	1	USB type-B receptacle Assmann AU-Y1007-R AMP/Tyco 292304-1 Molex 67068-9000
J2	1	Not installed, dual-row (2 x 5) 10-pin header with pin 7 removed
JU5	1	2 x 4-pin header, 0.1in
JU6	1	3-pin header, 0.1in Sullins PEC36SAAN or equivalent
JU7, JU8, JU10	3	2-pin headers, 0.1in Sullins: PEC36SAAN or equivalent
L3	1	Ferrite bead TDK MMZ1608R301A (0603)
R4–R8	0	Not installed, resistors—PCB short (0402)
R9, R10	2	27_ \pm 5% resistors (0402)
R11	1	1.5k_ \pm 5% resistor (0402)
R12, R17	2	470_ \pm 5% resistors (0402)
R13	1	2.2k_ \pm 5% resistor (0402)
R14	1	10k_ \pm 5% resistor (0402)
R15, R25	2	196k_ \pm 1% resistors (0402)
R16, R20	2	100k_ \pm 1% resistors (0402)
R18, R19, R26–R29	0	Not installed, resistors (0402)

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Component List (continued) Interface Circuit (continued)

DESIGNATION	QTY	DESCRIPTION
R21	1	36.5k_ ±1% resistor (0402)
R22	1	61.9k_ ±1% resistor (0402)
R23	1	374k_ ±1% resistor (0402)
R24	1	594k_ ±1% resistor (0402)
R30	1	10k_ ±1% resistor (0402)
U2	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U3	1	USB-to-UART converter (32 TQFP) FTDI FT232BL
U4	1	93C46 type 3-wire EEPROM (8 SO) Atmel AT93C46A-10SU-2.7

*EP = Exposed pad.

DESIGNATION	QTY	DESCRIPTION
U5, U7	2	Adjustable output LDO regulators (5 SC70) Maxim MAX8512EXK+T
U6	1	LDO regulator (5 SC70) Maxim MAX8511EXK25+T
U8	1	Bidirectional level translator (14 TDFN-EP*) Maxim MAX3378EETD+
Y1	1	16MHz crystal Vishay XT9S20ANA6M
Y2	1	6MHz crystal Vishay XT9S20ANA16M384
—	5	Shunts, 2 position Sullins STC02SYAN or equivalent

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Atmel Corporation	408-441-0311	www.atmel.com
Digi-Key Corp.	800-344-4539	www.digikey.com
Future Technology Devices International Ltd.	503-547-0988	www.ftdichip.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
OSRAM Opto Semiconductor	888-446-7726	www.osram-os.com
Panasonic Corp.	800-344-2112	www.panasonic.com
Philips Lumileds Lighting Company	408-964-2900	www.philipslumileds.com
Sullins Electronics Corp.	760-744-0125	www.sullinselectronics.com
Taiyo Yuden	847-925-0888	www.yuden.co.jp
TDK Corp.	800-348-2496	www.component.tdk.com
Vishay	402-563-6866	www.vishay.com

Note: Indicate that you are using the MAX8834Y when contacting these component suppliers.

MAX8834Y EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX8834Y.EXE	Application program
UNINST.INI	Uninstalls the EV kit software
TROUBLESHOOTING_USB.PDF	USB driver installation help file

MAX8834Y Evaluation Kit

Quick Start

Recommended Equipment

- One variable 6V power supply capable of supplying 4A of output current
- One voltmeter
- A user-supplied Windows® 2000/XP®- or Windows Vista®-compatible PC with a spare USB 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 MAX8834Y EV kit is a fully assembled and tested surface-mount board. Follow the steps below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed.**

- 1) Verify that the jumpers on the MAX8834Y EV kit are configured as shown in Table 1.
- 2) Preset the power supply to 3.6V. Turn off the power supply.
- 3) Connect the positive lead of the 3.6V power supply to the IN pad. Connect the negative lead of the 3.6V power supply to the PGND pad.
- 4) Visit www.maxim-ic.com/evkitsoftware to download the latest version of the EV kit software, 8834Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 5) 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.
- 6) Connect the USB cable from the PC to the USB receptacle J1 on the EV kit board. A **Building Driver Database** window pops up in addition to a **New Hardware Found** message if this is the first time the EV kit board is connected to the PC. If a window is not seen that is similar to the one described above after 30s, remove the USB cable from the board and reconnect it. Administrator privileges are required to install the USB device

driver on Windows. Refer to the TROUBLESHOOTING_USB.PDF document included with the software if there are any problems during this step.

- 7) Follow the directions of the **Add New Hardware Wizard** to install the USB device driver. Choose the **Search for the best driver for your device** option. Specify the location of the device driver to be **C:\Program Files\MAX8834** (default installation directory) using the **Browse** button.
- 8) Turn on the power supply.
- 9) Start the MAX8834Y program by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1. Verify that the green LED (D4) turns on.
- 10) Normal device operation is verified when **Command Module Connected, Device Connected** is displayed at the top-left side of the MAX8834Y EV kit main window (Figure 1).
- 11) Press the **Boost converter ON** button to turn on the step-up converter. Choose **by BOOST_CNTL** from the **BOOST_MODE** drop-down list and set **BOOST_CNTL** to 4.5V.
- 12) Verify that the voltage is 4.5V at the OUT pad.
- 13) Switch to the **FLED1/2** tab, as shown in Figure 2. Choose **Enable FLED1 / FLED2** from the **MOVIE** drop-down list in the **FLASH/MOVIE Control** group box.
- 14) Verify that the white LEDs, D1 and D2, turn on.
- 15) Switch to the **INDLED** tab, as shown in Figure 3. Select **Enable** from the **INDLED Control** drop-down list.
- 16) Verify that the red LED (D3) turns on.

Detailed Description of

Table 1. Default Jumper Settings (JU1–JU10)

JUMPER	SHUNT POSITION
JU1	1-2
JU2	1-2
JU3	Closed
JU4	1-2
JU5	JU5.2 closed
JU6	2-3
JU7	Closed
JU8	Closed
JU9	1-2
JU10	Closed

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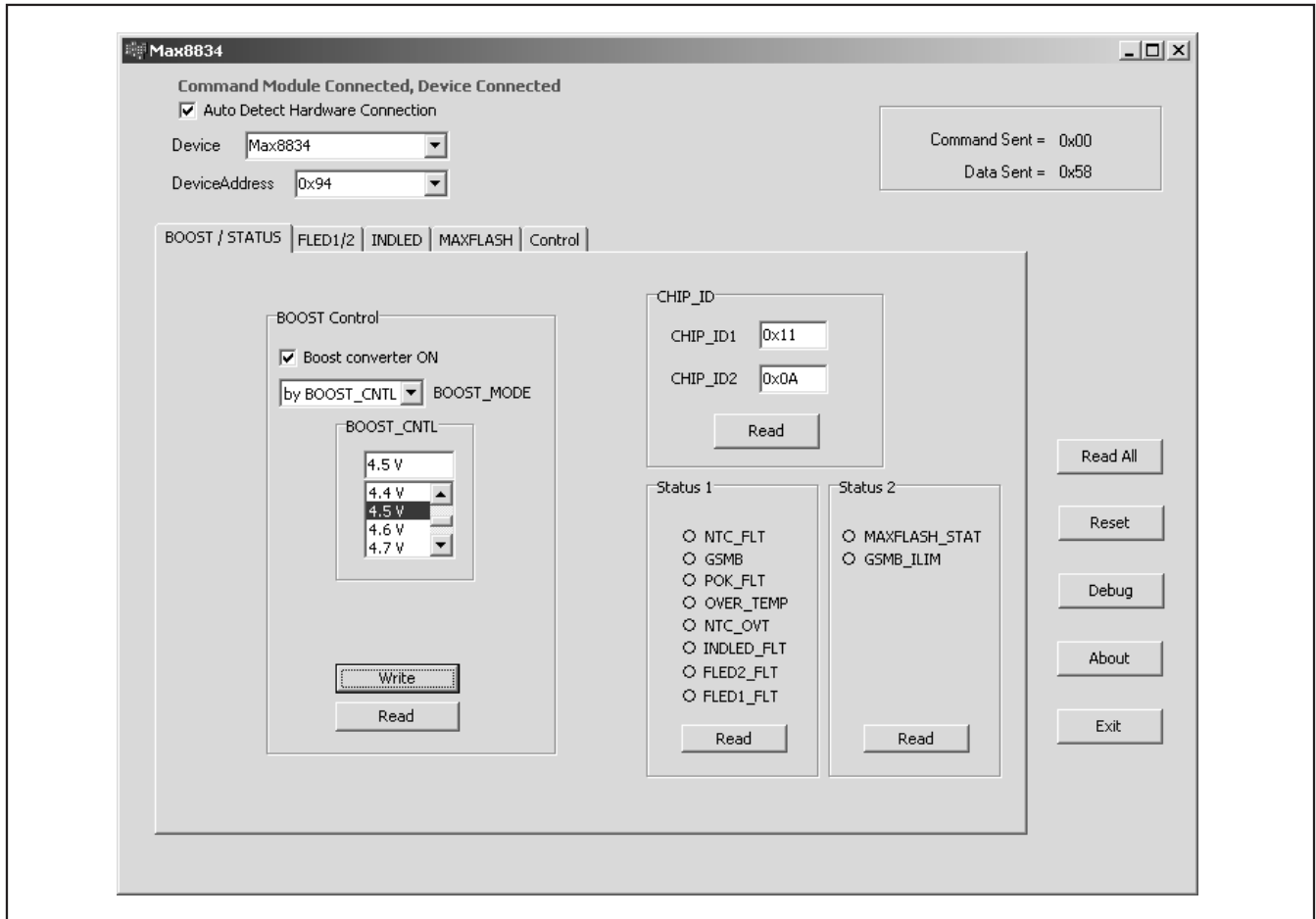


Figure 1. MAX8834 EV Kit Software Main Window

Software

User-Interface Panel

The MAX8834Y EV kit includes a MAXQ2000 microcontroller command module that provides the I²C interface to control the MAX8834Y configuration. The main window of the MAX8834Y EV kit software (Figure 1) displays five tabs to set the MAX8834Y configuration: **BOOST / STATUS**, **FLED1/2**, **INDLED**, **MAXFLASH**, and **Control**. Changes to the controls result in a write operation that updates the appropriate registers of the MAX8834Y. After any write or read operation, the related command and data sent are shown in the top-right box of the main window.

BOOST / STATUS Tab

The MAX8834Y includes a 2MHz PWM step-up converter that supplies power to the flash LEDs or other loads. Using the EV kit software, the MAX8834Y can be configured in boost mode, dropout mode, or adaptive mode through the **BOOST_MODE** drop-down list. The output voltage is programmable from 3.7V to 5.2V (in 100mV steps) when in boost mode. See Figure 1 for details.

The **Status 1** and **Status 2** read-only registers monitor the MAX8834Y operating state and fault status. They indicate any short/open LED, overtemperature, power-OK, finger-burn, GSMB, or MAXFLASH status. The **Status 1** and **Status 2** indicators require a **READ** if a fault or event has occurred, in which case the corresponding indicator flag turns red. A second **READ** clears the status bit if the fault or event is no longer present.

The **CHIP_ID** registers provides the manufacturer die type and mask revision information.

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FLED1/2 Tab

The **FLED1/2** tab sheet provides the FLED1 and FLED2 configuration. The FLED1/FLED2 current is regulated to I²C-programmable levels for movie mode up to 125mA and flash mode up to 750mA. The flash or movie mode can be enabled through I²C or LED_EN. LED_EN can also be set to logic 0 or logic 1 through the software buttons (**LED_EN Low** or **LED_EN High**) in the **LED_EN** group box when the shunt is installed across jumper JU1 pins 1-2 on the EV kit. See Figure 2 for details.

The MAX8834Y includes a programmable input current limit that is invoked using the GSMB control to reduce the total current drawn from the battery cell during events like PA transmit. The GSM blank function (GSMB)-related

parameters (**GSM Blank Polarity**, **ILIM**, and **HC_TMR**) can be chosen in the **GSMB_CUR** group box. Refer to the MAX8834Y/MAX8834Z IC data sheet for more information.

INDLED Tab

Choose the **INDLED** tab to set the indicator LED (INDLED). The INDLED current (**IND**) is regulated to I²C programmable levels up to 16mA. Programmable control is provided for (optional) **Ramp Up Timer** (off to on) and **Ramp Down Timer** (on to off), as well as **Off Blink Timer**, and **On Blink Timer**. The user can choose to enable or disable the ramp time and blink rate features. See Figure 3 for the **INDLED** tab sheet. Refer to the MAX8834Y/MAX8834Z IC data sheet for more information.

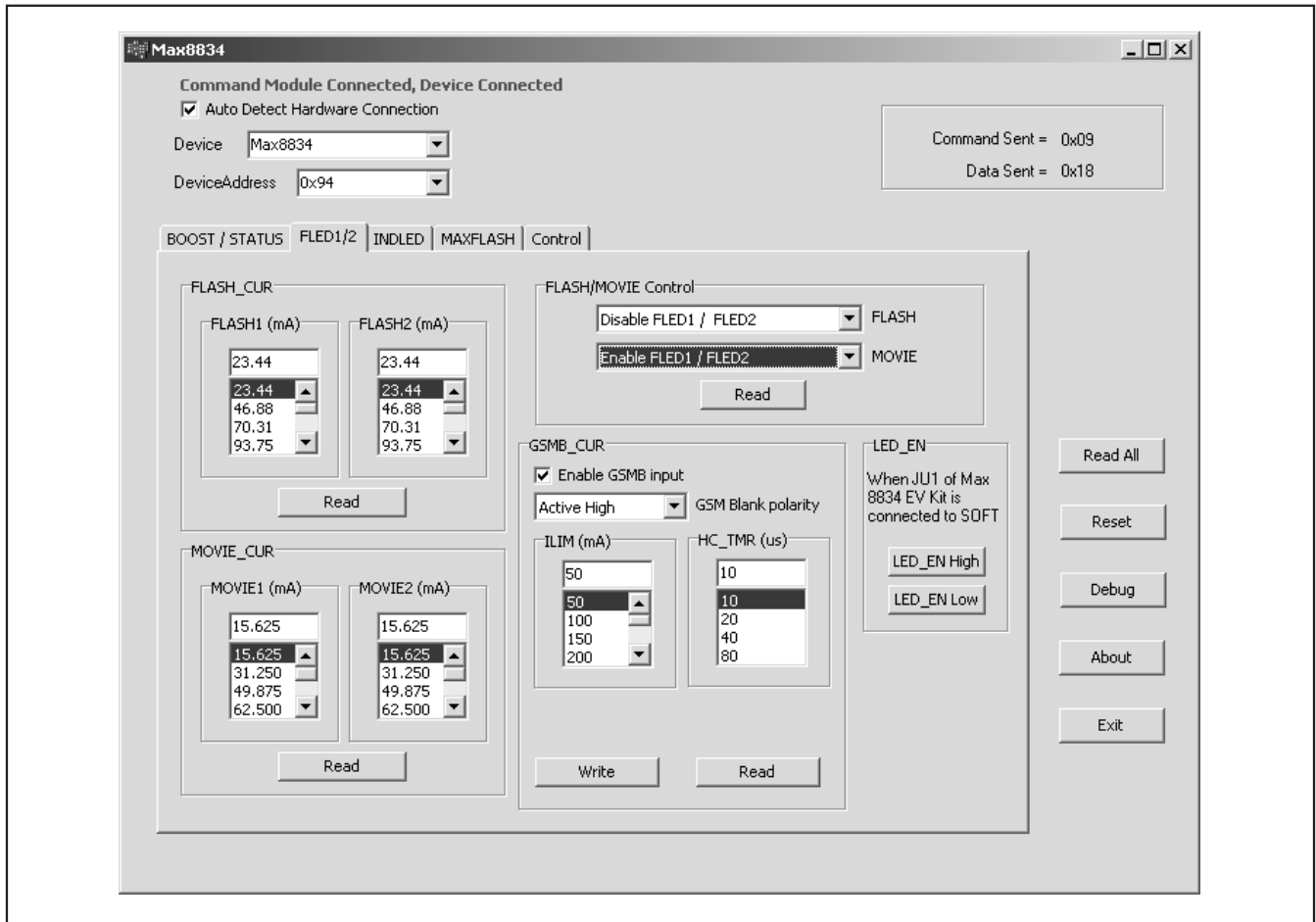


Figure 2. FLED1/2 Tab

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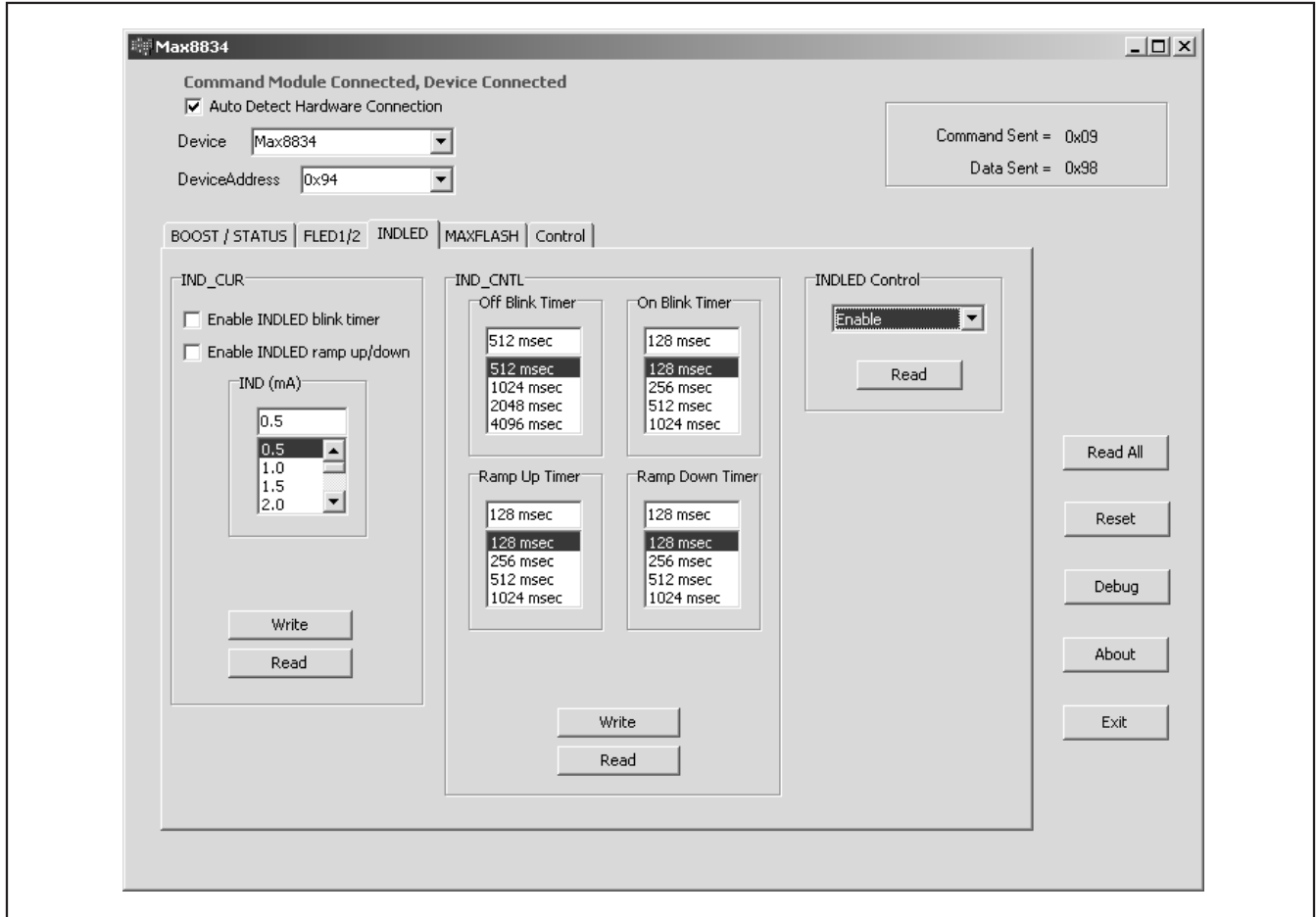


Figure 3. INDLED Tab

MAXFLASH Tab

The MAX8834Y features a **MAXFLASH** function that can be programmed to reduce flash current during low-battery conditions to help prevent system undervoltage lock-up from occurring. Check the **Enable low battery function** checkbox to enable the MAXFLASH function. Three related parameters (**LB_CNTL**, **LB_HYS**, and **LB_TMR**) are defined in the **MAXFLASH** group box. See Figure 4 for **MAXFLASH** setup. Refer to the MAX8834Y/MAX8834Z IC data sheet for more information.

Control Tab

The **Control** tab allows the user to set watchdog and flash safety timer-control values, and NTC function control values. See Figure 5 for details.

The flash **Safety Timer Duration**, programmable from 50ms to 800ms through I²C, limits the duration of the flash mode in case LED_EN is stuck high or I²C has not changed within the programmed flash safety timer duration. This timer can be configured to operate as **One Shot Timer** or **Maximum Flash Timer** through the **Safety Timer Control** drop-down list.

The **Watch Dog Timer** function can be programmed from 4s to 16s with a 4s step. Check the **Enable Watch Dog Timer** checkbox to allow the system to enter safe mode after the watchdog timer expires. In safe mode, the MAX8834Y disables all current regulators and the step-up converter to prevent potential damage to the system. Check the **Reset Watch Dog Timer** checkbox to revert the MAX8834Y back to the state present before entering safe mode.

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The finger-burn protection feature can be enabled by checking the **Enable NTC Function** checkbox in the **NTC_CNTL** group box. Verify the NTC function by changing the resistor R1 temperature. Refer to the MAX8834Y/MAX8834Z IC data sheet for more information.

The other control in the **Control** tab is for the GSMB input polarity. GSMB can be set to logic 0 or logic 1 through the **GSMB High** or **GSMB Low** buttons in the **GSMB** group box when a shunt is installed across jumper JU2 pins 1-2 on the EV kit.

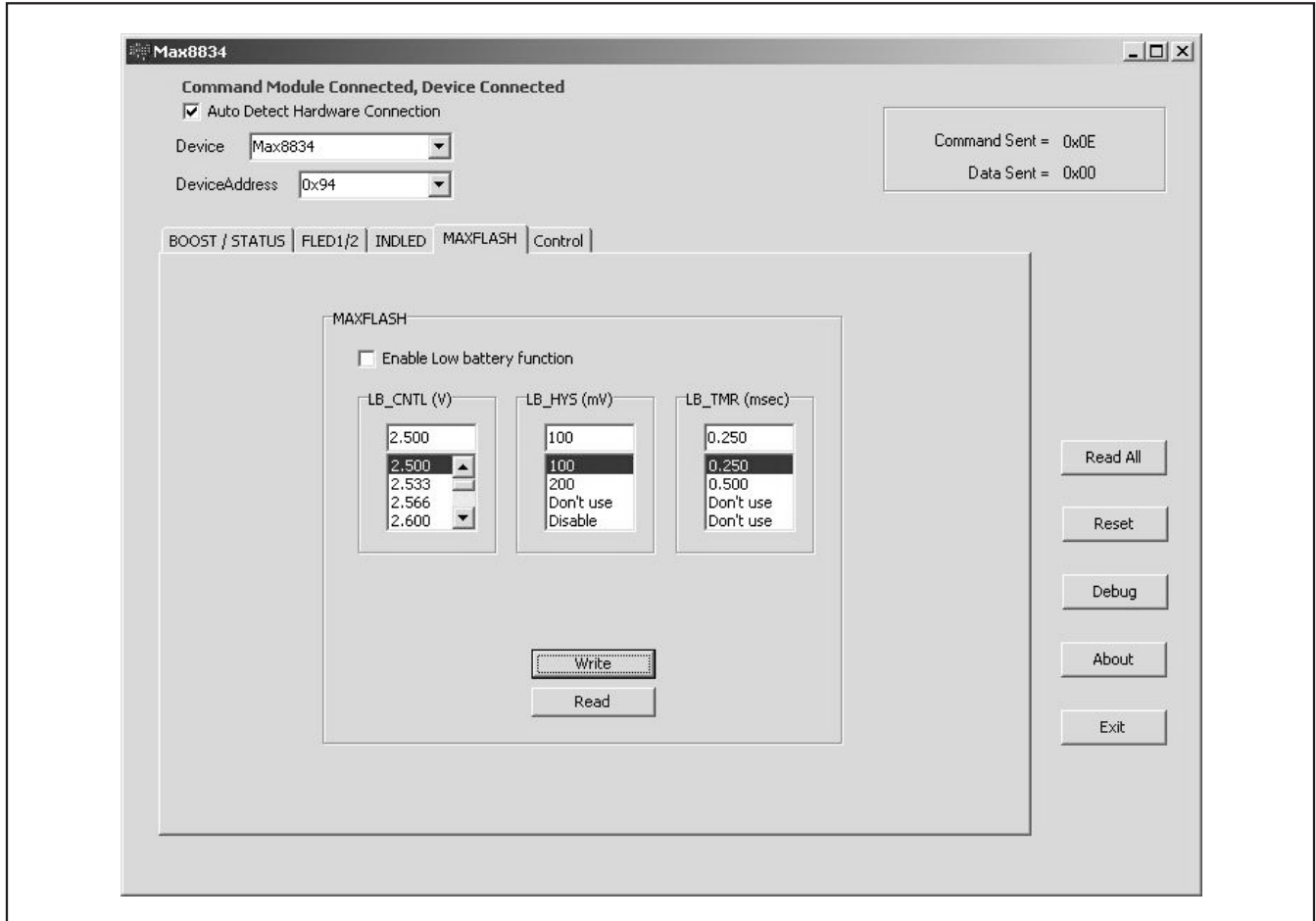


Figure 4. MAXFLASH Tab

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Evaluates: MAX8834Y/MAX8834Z

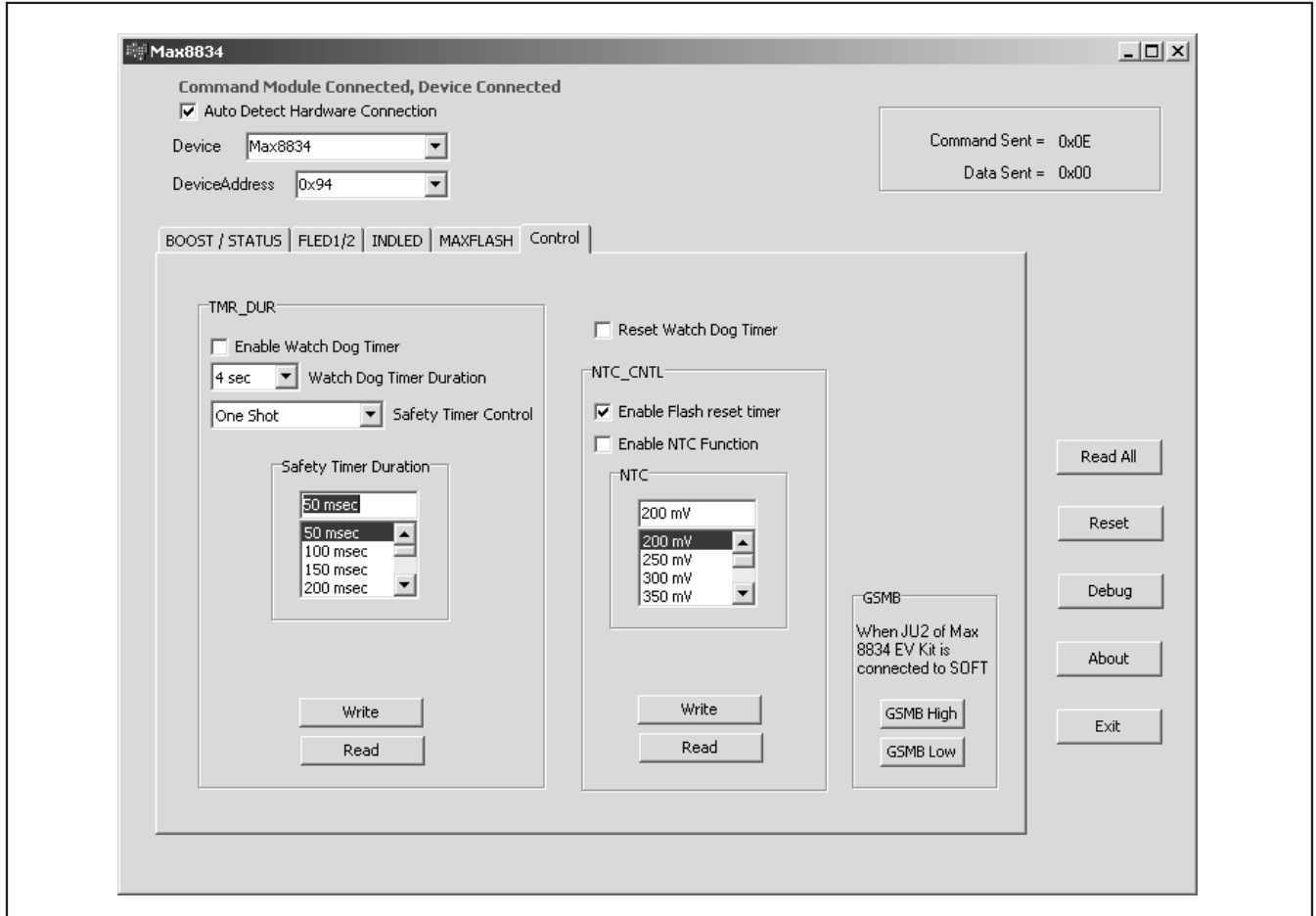


Figure 5. Control Tab

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Simple I²C/SMBus Commands

There are two methods for communicating with the MAX8834Y: through the normal user-interface panel (Figure 1) or through the SMBus commands available by pressing the **Debug** button in the main window. The **Maxim Command Module Interface** window (Figure 6) pops up and includes a **2-wire interface** tab that allows

for execution of the **SMBusSendByte()** command. Refer to the MAX8834Y/MAX8834Z IC data sheet for command-byte format. The **SMBus dialog** boxes accept numeric data in binary, decimal, or hexadecimal. Hexadecimal numbers should be prefixed by \$ or 0x. Binary numbers must be exactly eight digits. See Figure 6 for an illustration of this tool.

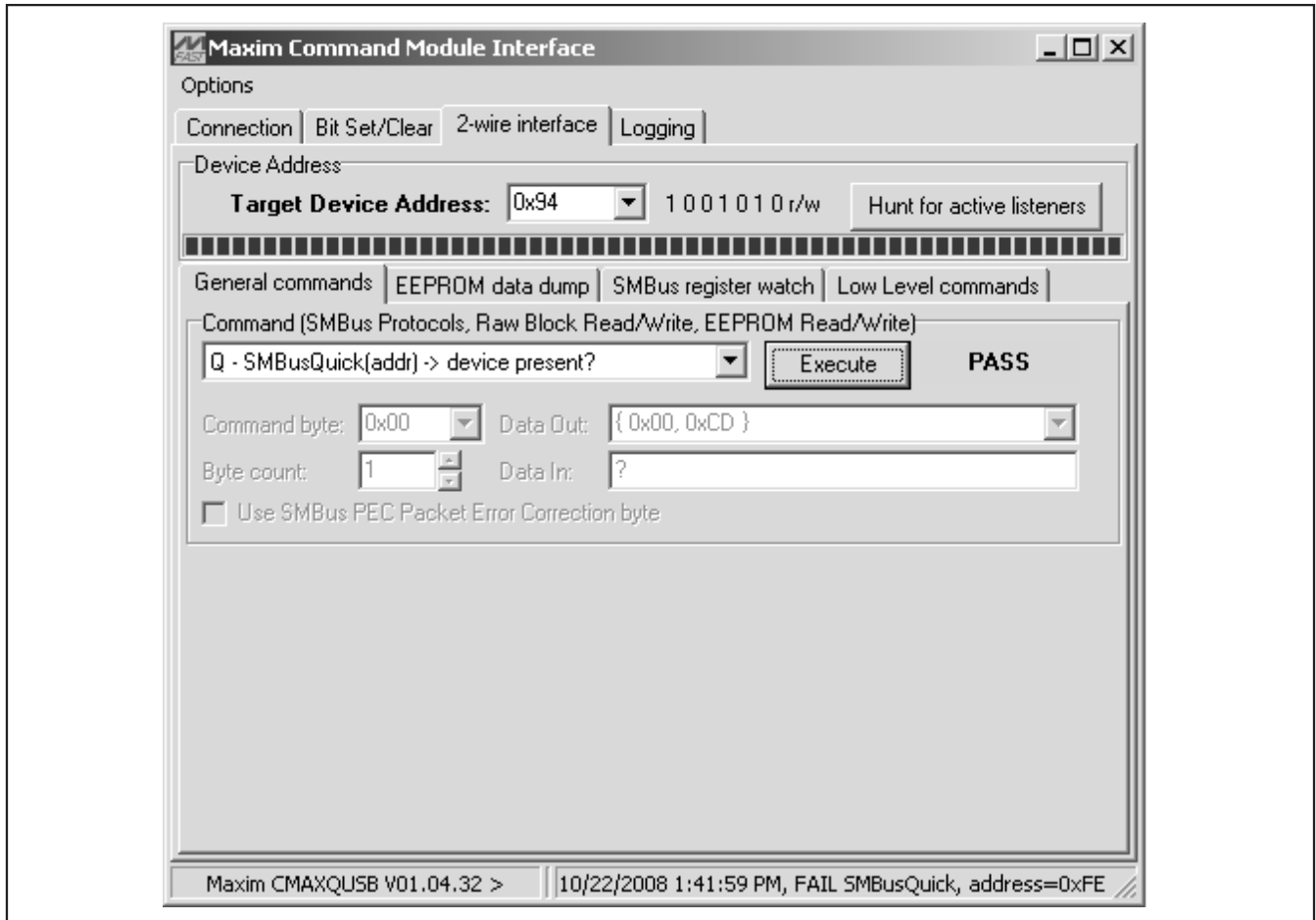


Figure 6. Maxim Command Module Interface Window

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Evaluates: MAX8834Y/MAX8834Z

Detailed Description of Hardware

The MAX8834Y EV kit's default jumper settings are shown in Table 1.

MAXQ2000 Command Module

The MAX8834Y EV kit includes the MAX8834Y IC main circuitry (Figure 7a) and the MAXQ2000 command module (Figures 7b and 7c). The command module provides the I²C/SMBus-compatible interface for software control of the MAX8834Y configuration: individual output on/off, the step-up output voltage setting, the movie/flash current, and the flash timer duration settings.

To use the MAX8834Y EV kit with a user-supplied I²C interface, see the *Using VDD, SDA, SCL, LED_EN, and GSMB I/O Pads Independently* section for more details.

VDD Power Supply

VDD is the logic supply driving SCL, SDA, LED_EN, and GSMB. On the MAX8834Y EV kit, with the JU10 shunt installed, VDD is powered by the MAX8512 LDO and has five voltage levels (1.6V, 1.8V, 2.8V, 3V, and 3.6V) selected through jumper JU5. The MAX8512 (U7) can be powered by USB or the MAX8834Y input supply using jumper JU6.

Connect the JU10 pin labeled by VDD to an external power supply with the JU10 shunt removed.

Driving a Single High-Current LED

The MAX8834Y EV kit can be configured to drive a single high-current LED (D1) by shorting FLED1, FLED2, and INDLED through the proper jumper settings. FLED1 and FLED2 can be shorted together by installing a shunt on JU3 and by placing a shunt across jumper JU4 pins 2-3. INDLED can be shorted to FLED1 and FLED2 by installing a shunt on JU3 and by placing shunts across jumpers JU4 and JU9 pins 2-3. The total high current flowing across D1 is the sum of the programmed FLED1, FLED2, and/or INDLED current by software.

For high-current LED (D1), the MAX8834Y EV kit comes with a 1.5A OSRAM OSLUX white LED LW_F65G. The D1 footprint also accommodates Philips Lumileds' LED, LXCL-PWF4.

Using VDD, SDA, SCL, LED_EN, and GSMB I/O Pads Independently

To use the MAX8834Y EV kit with external VDD, SDA, SCL, LED_EN, and GSMB signals, remove the shunts on jumpers JU1, JU2, and JU10. Connect the external power supply to the JU10 pin labeled by VDD. Connect the external SDA, SCL, LED_EN, and GSMB signals to the corresponding pads.

Evaluating the MAX8834Z

To evaluate the MAX8834Z, carefully remove the MAX8834Y and install the MAX8834Z. Inductor L1 also needs to be replaced by extra inductor L2 on the EV kit. All other components remain the same.

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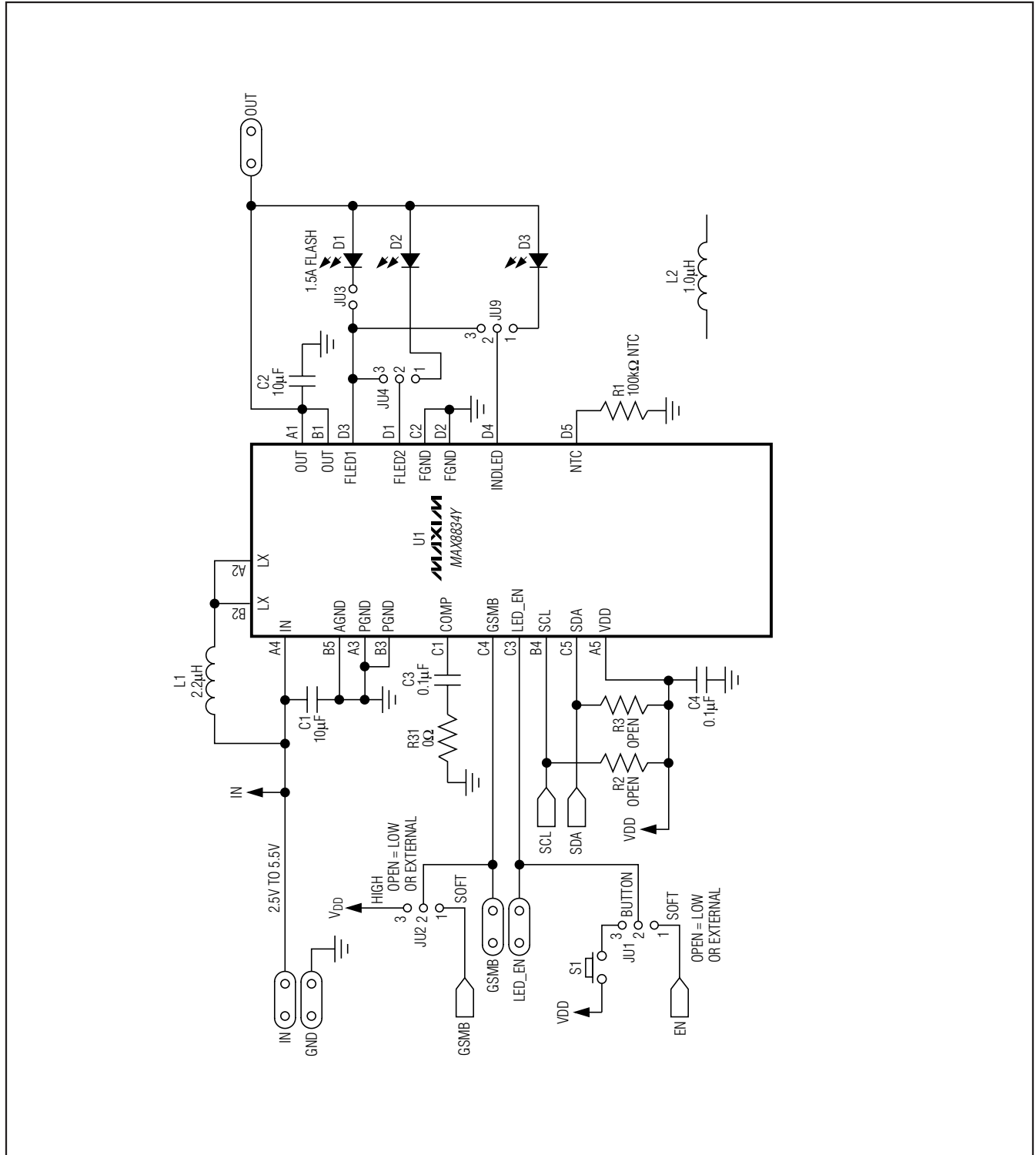


Figure 7a. MAX8834Y EV Kit Schematic (Sheet 1 of 3)

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Evaluates: MAX8834Y/MAX8834Z

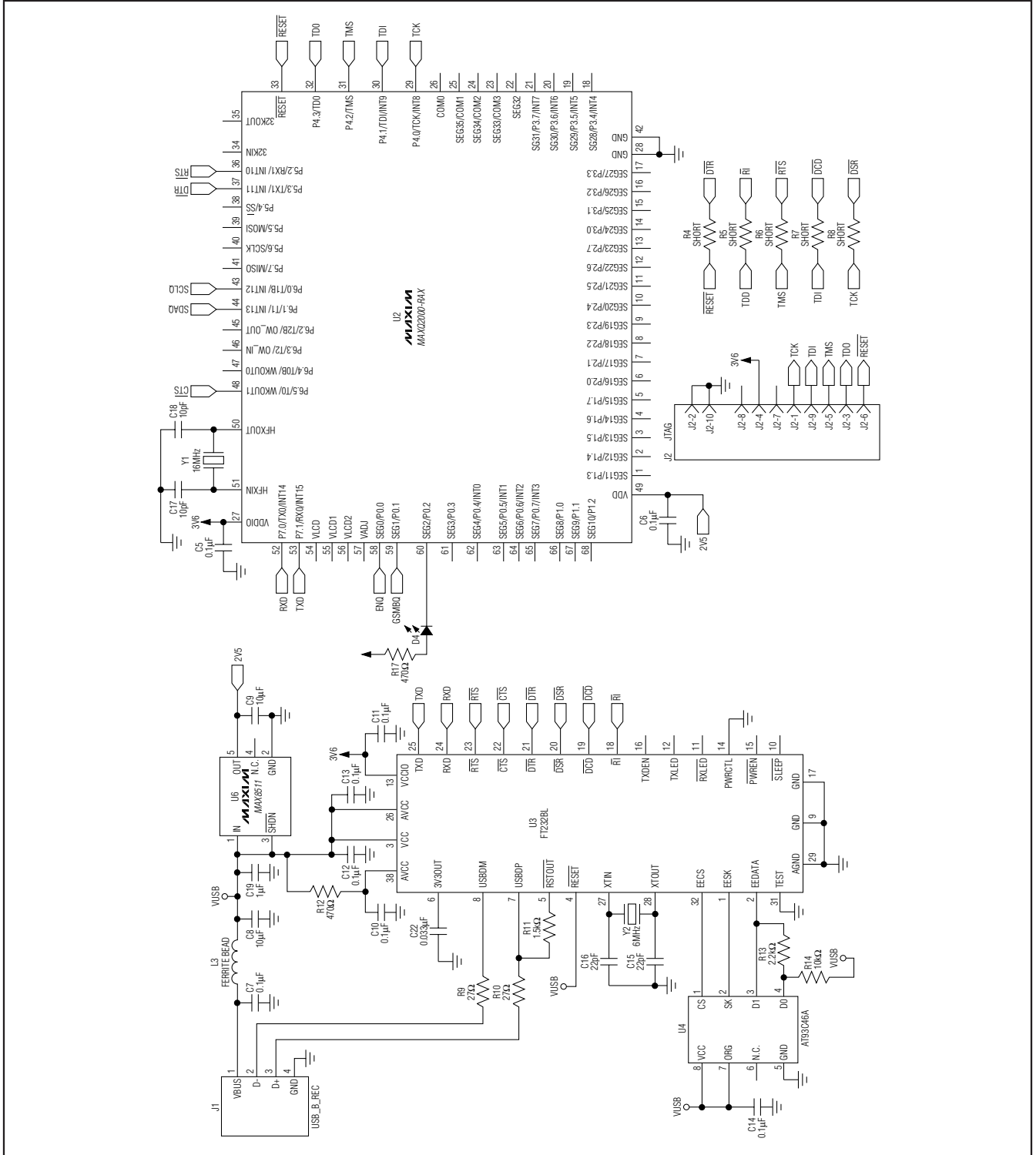


Figure 7b. MAX8834Y EV Kit Schematic (Sheet 2 of 3)

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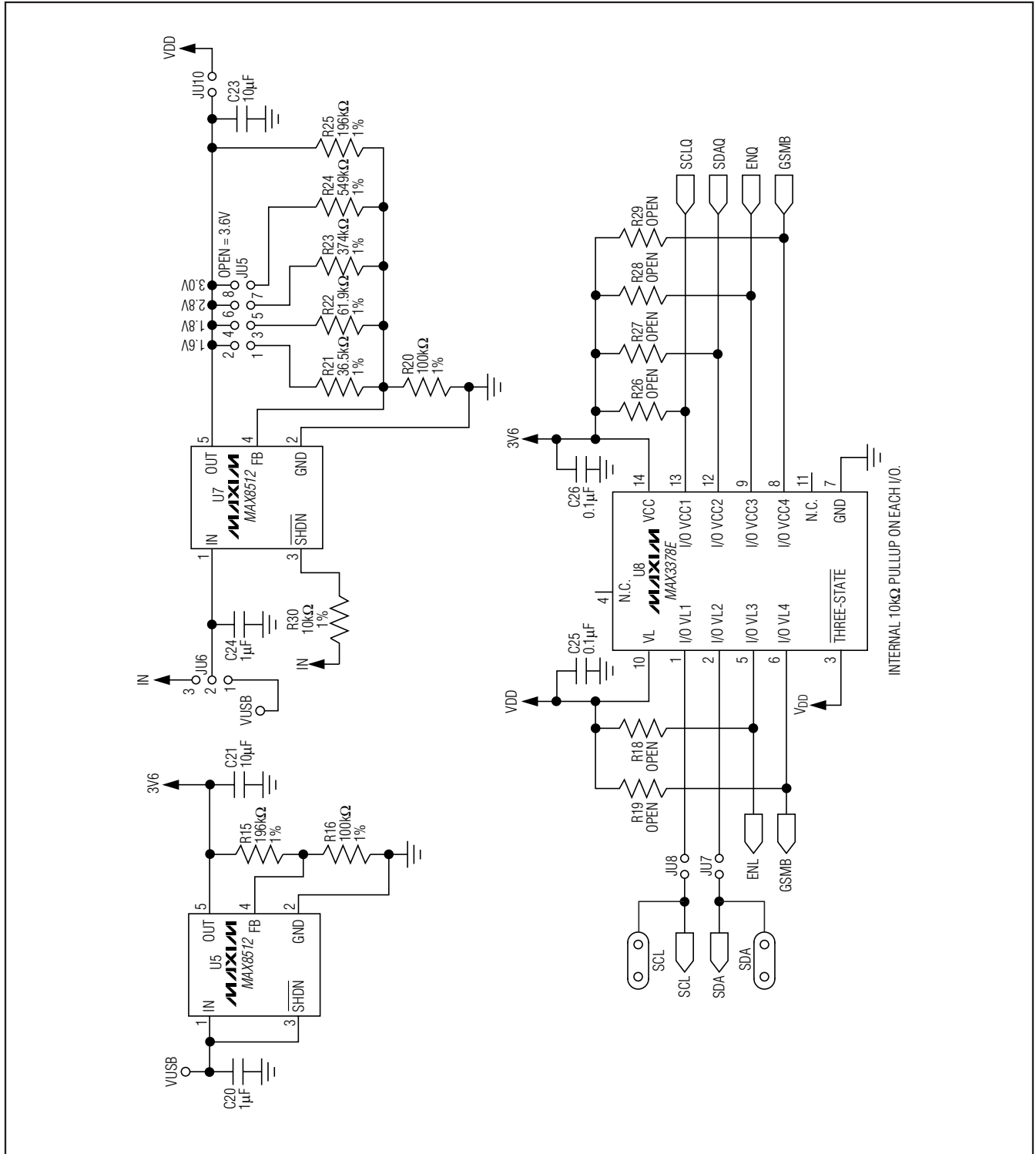


Figure 7c. MAX8834Y EV Kit Schematic (Sheet 3 of 3)

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Evaluates: MAX8834Y/MAX8834Z

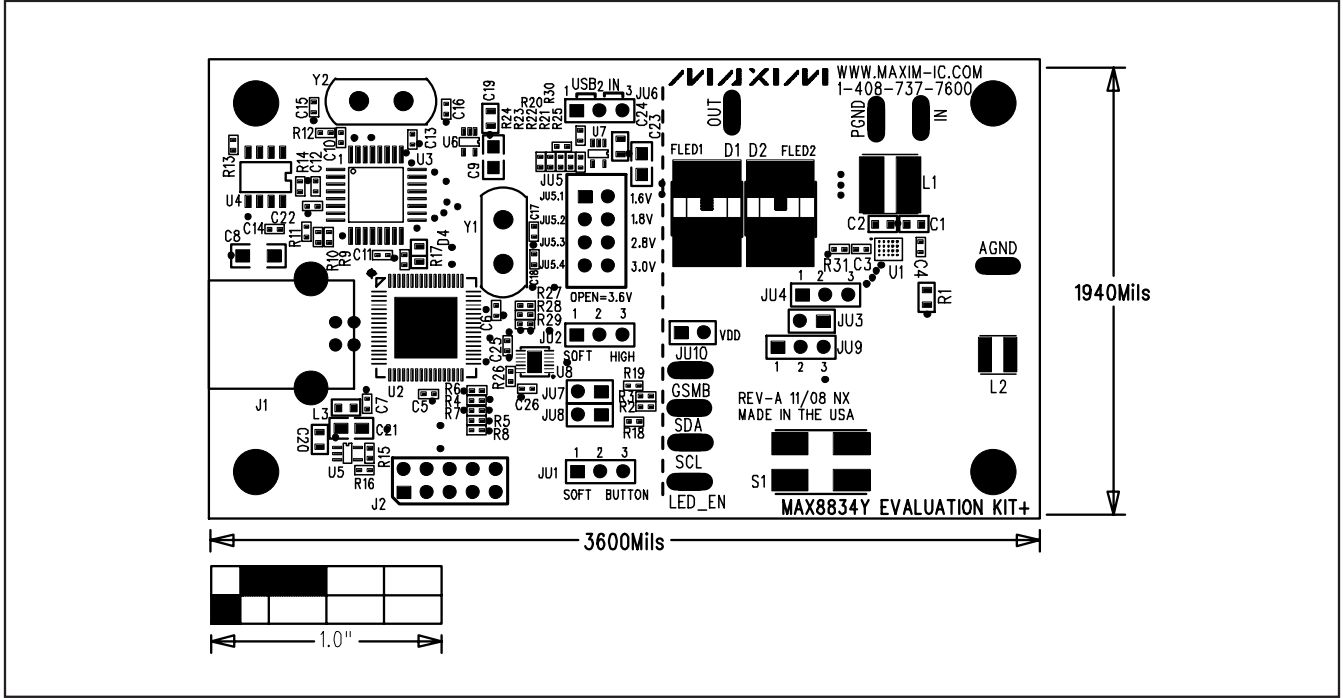


Figure 8. MAX8834Y EV Kit Component Placement—Top Layer

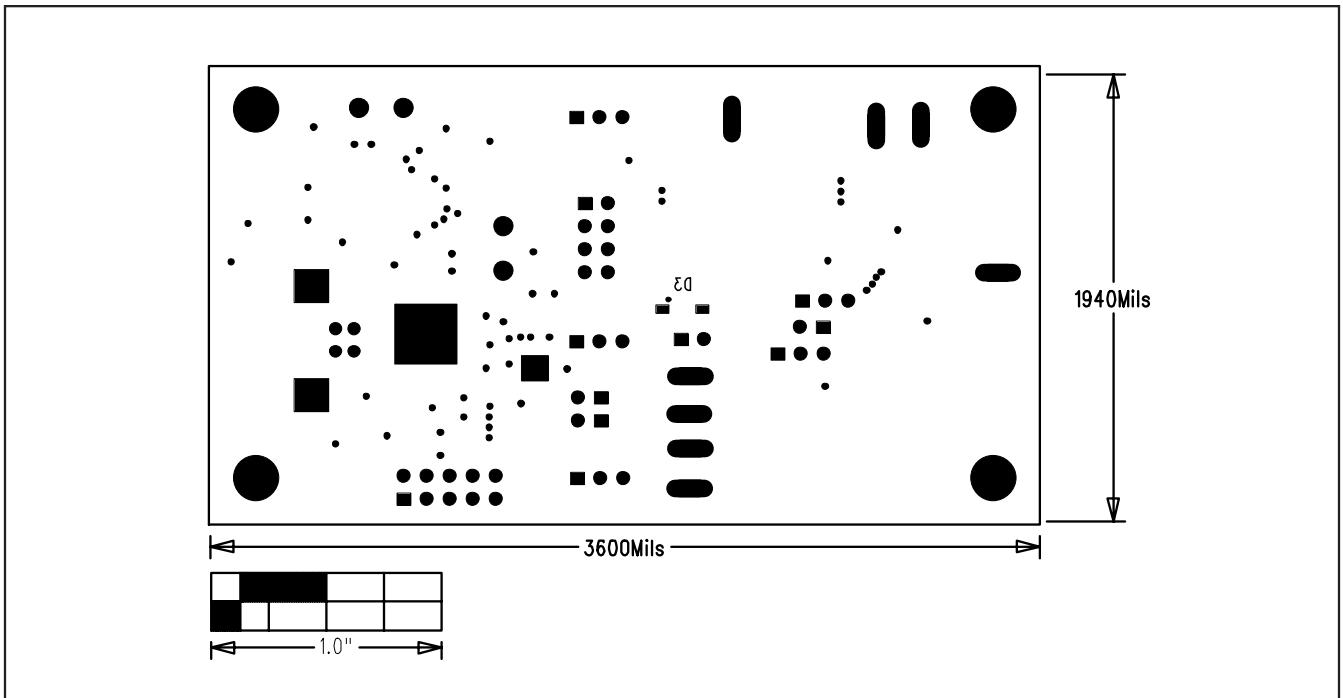


Figure 9. MAX8834Y EV Kit Component Placement—Bottom Layer

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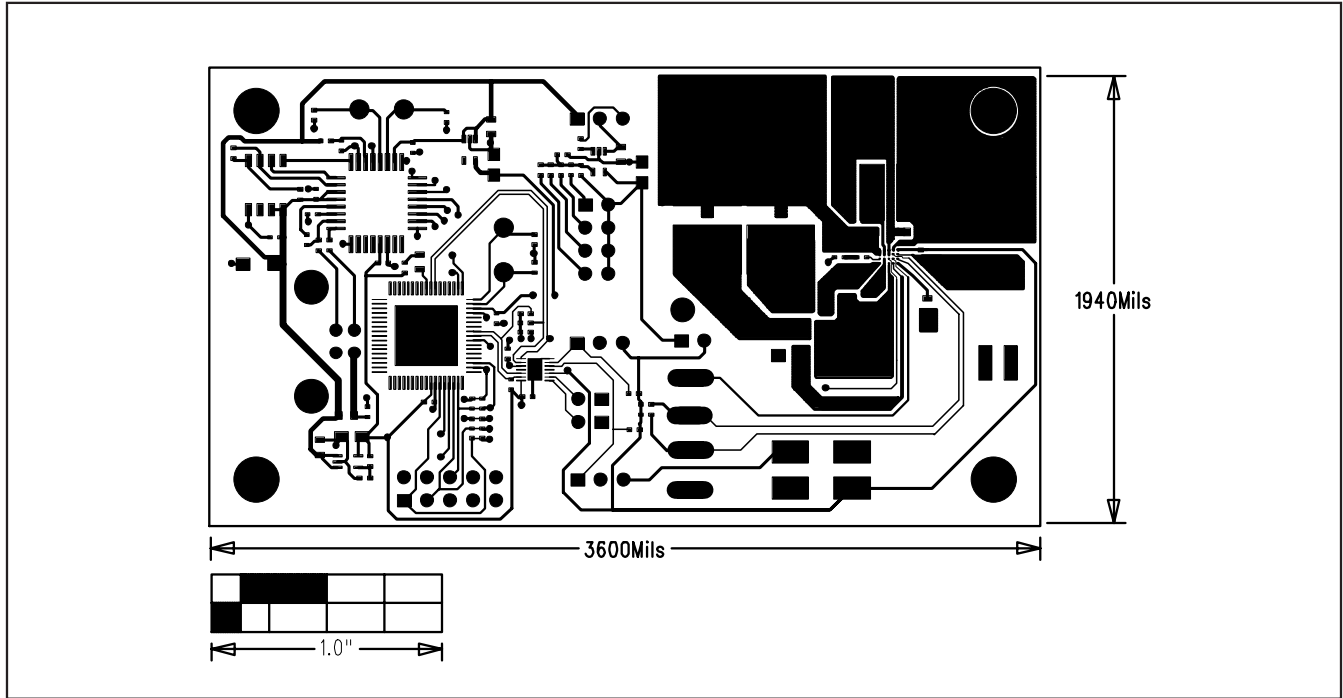


Figure 10. MAX8834Y EV Kit PCB Layout—Top Layer

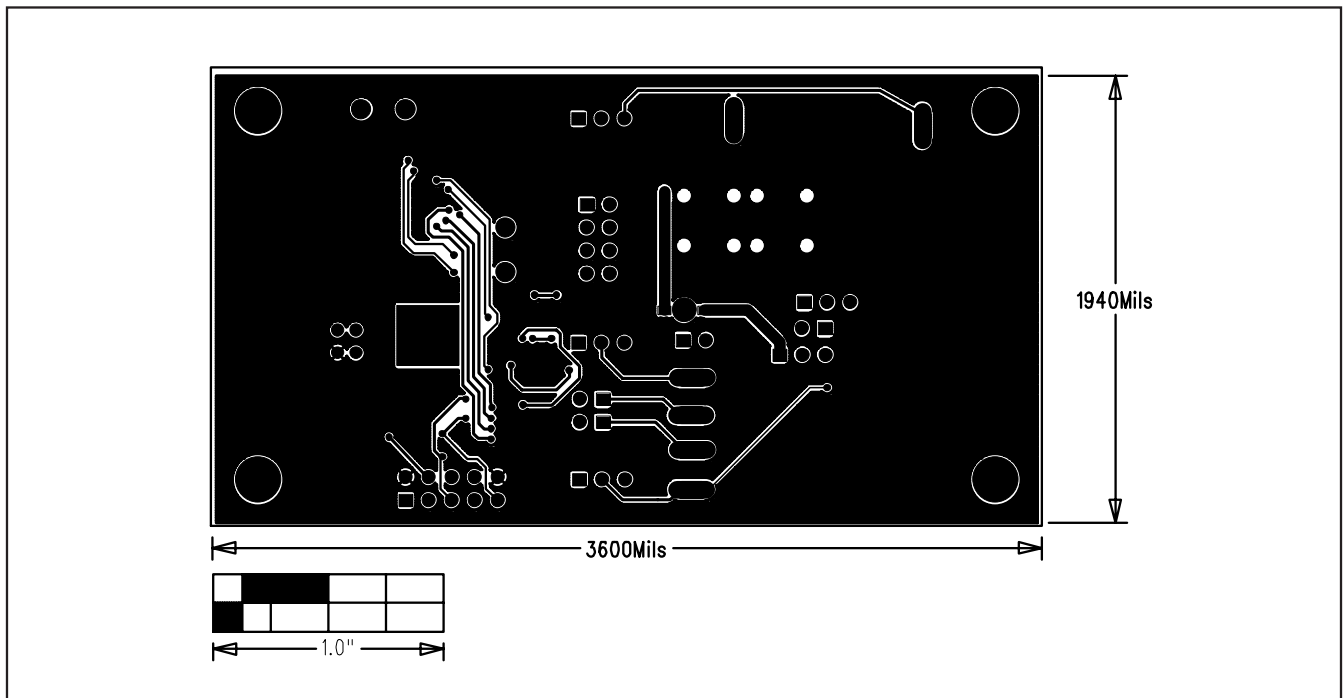


Figure 11. MAX8834Y EV Kit PCB Layout—Bottom Layer

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