

## MAX77503 Evaluation Kit

Evaluates: MAX77503

### General Description

The MAX77503 evaluation kit (EV kit) is a fully assembled and tested PCB that demonstrates the MAX77503 synchronous step-down (buck) converter. The EV kit is a step-down voltage regulator circuit using MAX77503 that is capable of 3V to 14V input, 1.5A continuous load, and output voltage adjustable between 0.8V and 5V (internal feedback options) or 1.55V and 99% of the input voltage (external feedback option).

The EV kit features a dual-range electronic load that allows easy evaluation of loading use cases for the buck converter circuit. Steady-state, transient, or random load profiles can be programmed.

A USB-to-I2C translator circuit allows a Windows®-based PC to run a graphical user interface (GUI) for easy control of the MAX77503 registers as well as the on-board electronic load.

### Benefits and Features

- Proven PCB Reference Design and Layout
- Easy to Use
  - Simple Hardware Control: Jumpers and Test Points for EN, BIASEN, and POK
  - GUI Drives I2C Interface for Optional Software Control
  - Fully Assembled and Tested
- USB to I2C Converter Allows for Easy Communication
  - Windows-Based Software GUI Controls Registers
  - Level Translator (MAX3395) Allows for Adjusting I2C Bus Voltage from 1.8V to 3.3V
- On-Board Electronic Load Emulates System Loading
  - Steady-State, Transient, and Random Modes

Ordering Information appears at end of data sheet.

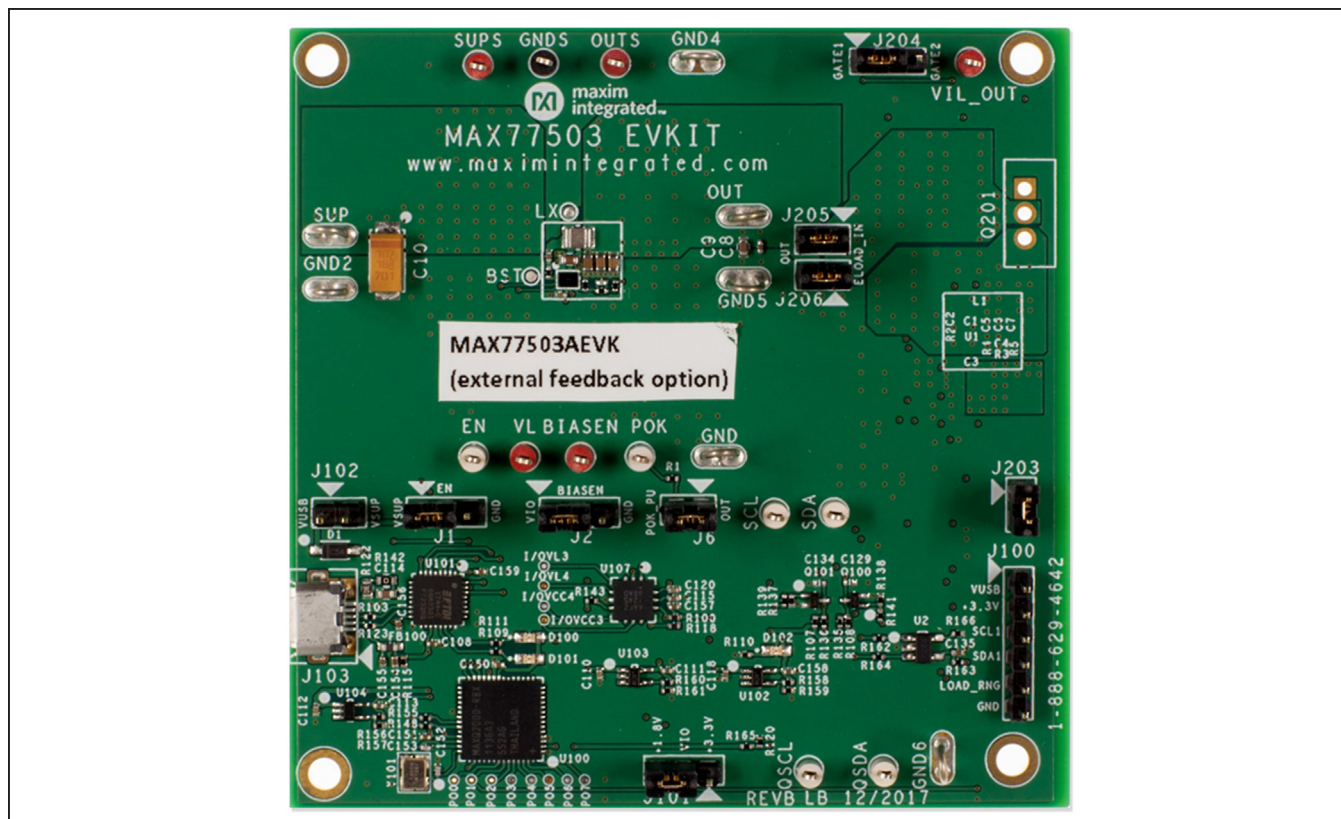


Figure 1. MAX77503 EV Kit Photo

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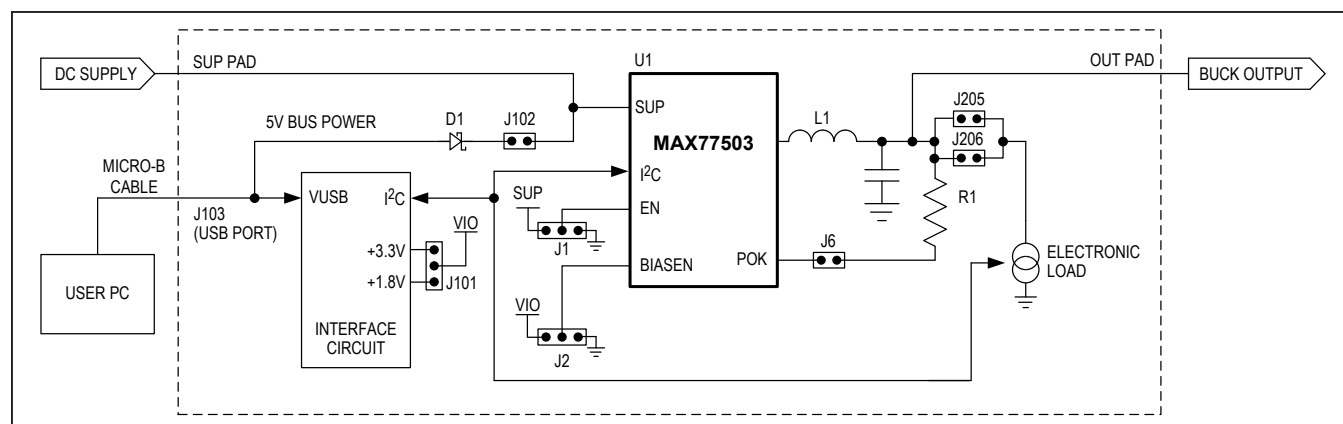


Figure 2. Simplified Block Diagram

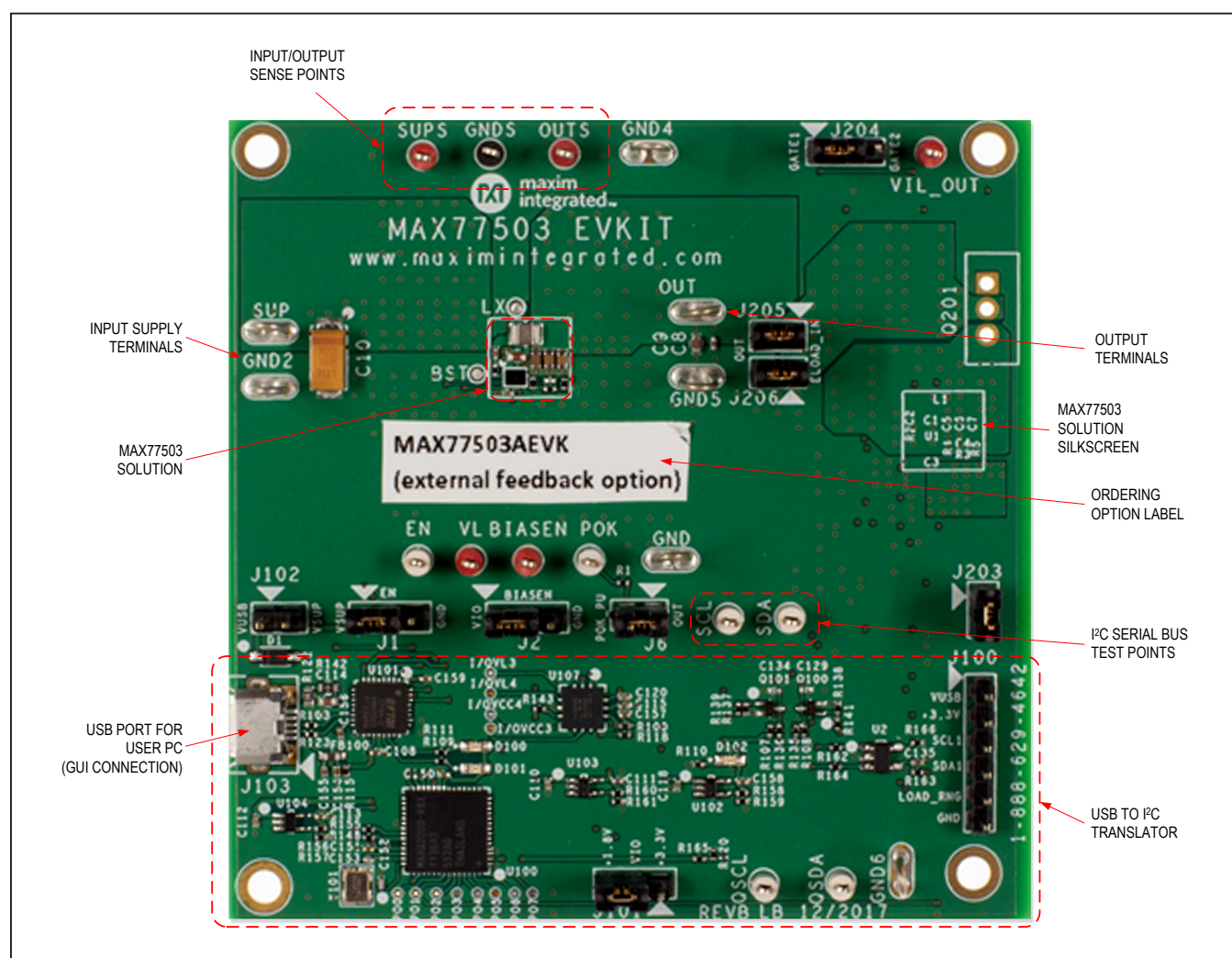


Figure 3. MAX77503 EV Kit Top View

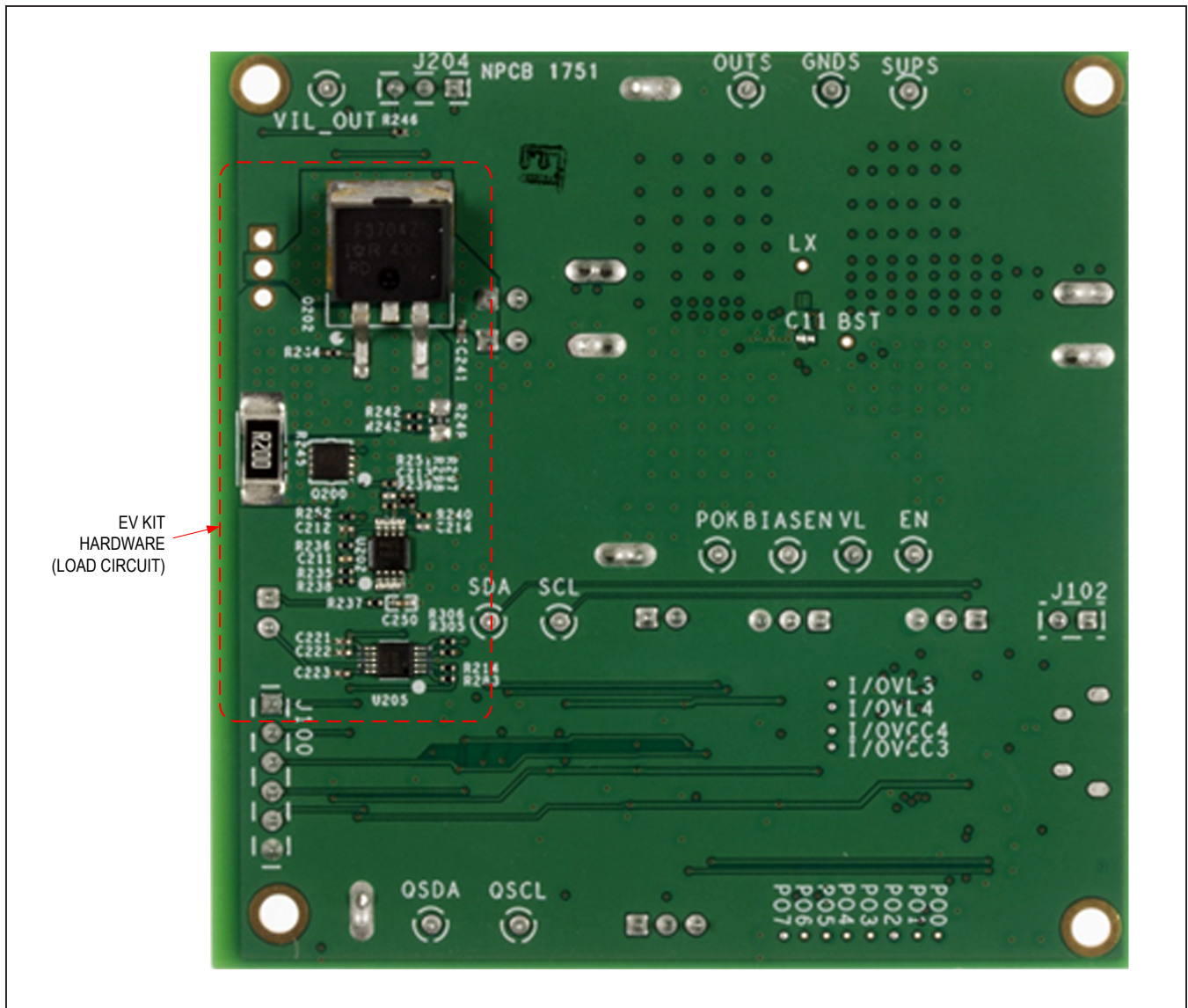


Figure 4. MAX77503 EV Kit Bottom View



## EV Kit Default Configuration

- $V_{IN}$  (SUP) = 3V to 14V
- $V_{OUT}$  = 1.2V, 1.8V, or 3.3V depending on ordering option. Output is further adjustable:
  - 0.8V to 5V for internal feedback. See the [Setting the Output Voltage \(Internal Feedback Version\)](#) section.
  - 1.55V to 99% $V_{SUP}$  for external feedback. See the [Setting the Output Voltage \(External Feedback Version\)](#) section.
- $I_{OUT}$  = 1.5A maximum
- SKIP mode enabled (MODE = 0)
- 1ms soft-start time ( $t_{SS}$ )
- 2A peak inductor current limit ( $I_{LX-PEAK}$ )
- Active discharge enabled (ADEN = 1, internal feedback versions only)
  - Active discharge function not available for external feedback version.

## Quick-Start

### Required Equipment

- MAX77503 EV kit
- Power supply with 15V and 2A capability
- Two digital voltmeters (DVM)
- Ammeter
- Windows-based PC
- Micro-USB cable
- GUI

**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

- 1) Install EV kit shunts per [Table 1](#).
- 2) Connect a DVM to the SUPS and GNDS terminals to measure input voltage.

**Table 1. Default Shunt Positions and Jumper Descriptions**

| REFERENCE DESIGNATOR | DEFAULT POSITION | FUNCTION                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| J1                   | 1-2              | <b>1-2:</b> Connects EN to VSUP<br><b>2-3:</b> Connects EN to GND                                                                                                                                                                                                                                                                                                                         |
| J2                   | 1-2              | <b>1-2:</b> Connects BIASEN to VIO<br><b>2-3:</b> Connects BIASEN to GND                                                                                                                                                                                                                                                                                                                  |
| J6                   | 1-2              | <b>1-2:</b> Connects POK to OUT through a 100k $\Omega$ resistor.                                                                                                                                                                                                                                                                                                                         |
| J100                 | N/A              | J100 is an evaluation header. Do not connect shunts to J100.                                                                                                                                                                                                                                                                                                                              |
| J101                 | 2-3              | <b>1-2:</b> Sets the I <sup>2</sup> C bus voltage to the 3.3V EV kit logic rail.<br><b>2-3:</b> Sets the I <sup>2</sup> C bus voltage to the 1.8V EV kit logic rail.                                                                                                                                                                                                                      |
| J102                 | Open             | <b>1-2:</b> Connects VUSB to VSUP through Schottky diode, D1. Install this jumper to power the MAX77503 VSUP from VUSB. This jumper allows for communication with the MAX77503 through the on-board USB-to-I <sup>2</sup> C translator without the need for an external power supply.<br><b>Note:</b> Remove this jumper any time an external power supply is applied as an input source. |
| J203                 | 1-2              | <b>1-2:</b> Connects the output of the MAX5805 DAC to drive the on board electronic load.                                                                                                                                                                                                                                                                                                 |
| J204                 | 1-2              | <b>1-2:</b> Connects the U202 amplifier to the gate of the Q202 load MOSFET.<br><b>2-3:</b> Connects the U202 amplifier to the gate of the Q201 depopulated TO-220 electronic load MOSFET.                                                                                                                                                                                                |
| J205<br>J206         | 1-2              | <b>1-2:</b> Connects OUT to the onboard electronic load (each jumper supports up to 1A).                                                                                                                                                                                                                                                                                                  |

- 3) Connect a DVM to the OUTS and GNDS terminals to measure output voltage.
  - 4) Apply a power supply set to 0V (100mA current limit) through an ammeter (10mA range) across the SUP and GND2 terminals of the EV kit. Turn the supply on and increase the voltage to 12V.
  - 5) Confirm that the DVM connected to OUTS and GNDS reads the default output voltage of the EV kit. See [Table 2](#) for expected no-load output voltage at 12V supply.
- The next steps of the procedure use the software GUI and the MAX77503 I<sup>2</sup>C serial interface. If evaluation of the I<sup>2</sup>C bus is not required, then skip the following steps and connect SCL and SDA to GND using test leads. Unconnected (floating) SDA/SCL pins may chatter causing extra supply current draw.
- 6) Install GUI software. Visit the product webpage at [www.maximintegrated.com/MAX77503evkit](http://www.maximintegrated.com/MAX77503evkit) and navigate to *Design Resources* to download the latest version of the EV kit software. Save the EV kit software to a temporary folder and decompress the ZIP file. Run the .EXE file and follow the on-screen instructions to complete installation.
  - 7) Connect a Micro-B USB cable between the EV kit's J103 and your PC's USB port.
  - 8) Open the GUI and click the **Device** button in the menu bar. Click the **Connect** button in the **Device** button's drop-down list. Wait for the device to respond, and in the **Synchronize** window, press the **Read and Close** button.
  - 9) Increase the power supply's current limit from 100mA to 500mA or greater.
  - 10) Short out the series input ammeter or change its range from 10mA to 1A or greater.
  - 11) If the EV kit evaluates the internal feedback version of MAX77503, then drag the slider bar in **Config B** to change the output voltage and click **Write**. **Config B** is a *don't care* for the external feedback version of the MAX77503.
  - 12) Confirm with a DVM that the software instruction to change output voltage was successful.
- This concludes the Quick Start procedure. Users are now encouraged to explore the device and its register settings with the GUI. During general device evaluation, set the ammeter range to greater than or equal to 1A to minimize the impact of its series resistance.
- For more information on the GUI, see the [Software](#) section.

**Table 2. EV Kit Measurements**

| EV KIT PART NUMBER | NO-LOAD SUPPLY CURRENT*<br>AT 12V SUPPLY (μA) | OUTPUT VOLTAGE AT NO LOAD<br>(SKIP MODE) (V) |
|--------------------|-----------------------------------------------|----------------------------------------------|
| MAX77503AEVKIT#    | 115                                           | 3.34                                         |
| MAX77503B33EVKIT#  | 14                                            | 3.38                                         |
| MAX77503B18EVKIT#  | 9                                             | 1.84                                         |
| MAX77503B12EVKIT#  | 31                                            | 1.23                                         |

\*Supply current measured value with jumper J101 (VIO select) installed and VUSB powered from J103 micro-B USB connector. The MAX77503 SDA/SCL pins must be pulled-up to a valid VIO supply or strapped to GND to achieve similar measurements. Unconnected (floating) SDA/SCL pins may chatter causing extra supply current draw.

Evaluating Different MAX77503 Versions

The EV kit is orderable with different versions of MAX77503 preinstalled (see Table 3). A label in the center of the PCB denotes the ordered part number and differentiates the EV kit options.

Any EV kit option can be reconfigured to evaluate any other version of the MAX77503.

- To evaluate the external feedback version, ensure that feedback resistors R3 and R4 are populated and adjusted according to the [Setting the Output Voltage \(External Feedback Version\)](#) section (MAX77503AEWC).
- To evaluate the internal feedback version, ensure that R3's value is 0Ω and R4 is open.

The values of R3 and R4 are initially set by Maxim per Table 3.

Hardware

Electronic Load

To easily evaluate the MAX77503, the EV kit comes with an on-board, dual-range electronic load (10mA or 2.56A full-scale). See Figure 5. Use 10mA range for

evaluation of small load currents to gain an understanding of MAX77503's SKIP mode and DCM performance. Use 2.56A range to evaluate the full load capability of MAX77503 (1.5A max) as well as the buck's response to overloads and soft-short circuits.

The electronic load is controllable with the GUI. The GUI controls an on-board DAC and op-amp configuration to set the load current. Parallel jumpers J205 and J206 connect the load to the output of the MAX77503. See the [Software](#) section for how to set the load current from the GUI.

To simulate load transient response, connect a signal generator to pin 2 of J204. Drive the MOSFET gate with an analog signal between 1V (off) and 3V (fully on) to apply transients to the output of the buck.

For manually measuring current, measure the voltage across the sense resistor using test point VIL\_OUT. The value of the sense resistor changes depending on electronic load range.

- In 10mA range, the sense resistor is 49.9Ω.
- In 2.56A range, the sense resistor is 0.2Ω.

Use the GUI to set the range. See Figure 11.

Table 3. EV Kit Component Default Values

| EV KIT PART NUMBER | U1 IC           | L1*   | R3**<br>(TOP FEEDBACK) | R4**<br>(BOTTOM FEEDBACK) |
|--------------------|-----------------|-------|------------------------|---------------------------|
| MAX77503AEVKIT#    | MAX77503AEWC+   | 4.7μH | 10kΩ                   | 3.24kΩ                    |
| MAX77503B33EVKIT#  | MAX77503BEWC33+ | 4.7μH | 0Ω                     | OPEN                      |
| MAX77503B18EVKIT#  | MAX77503BEWC18+ | 2.2μH | 0Ω                     | OPEN                      |
| MAX77503B12EVKIT#  | MAX77503BEWC12+ | 2.2μH | 0Ω                     | OPEN                      |

\*Default inductor case size is 2520 (metric).  
\*\*Default feedback resistor case size is 0402 (imperial).

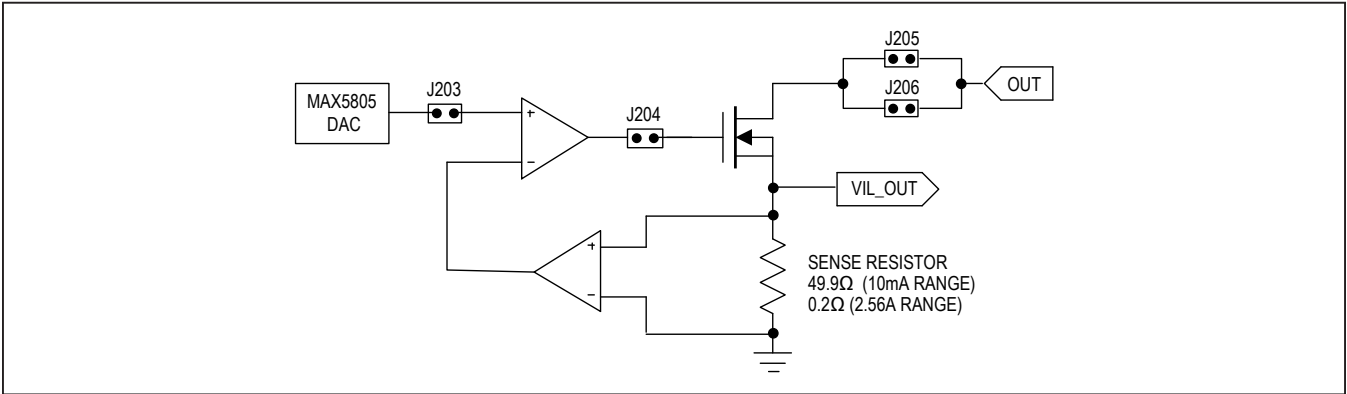


Figure 5. Electronic Load Block Diagram

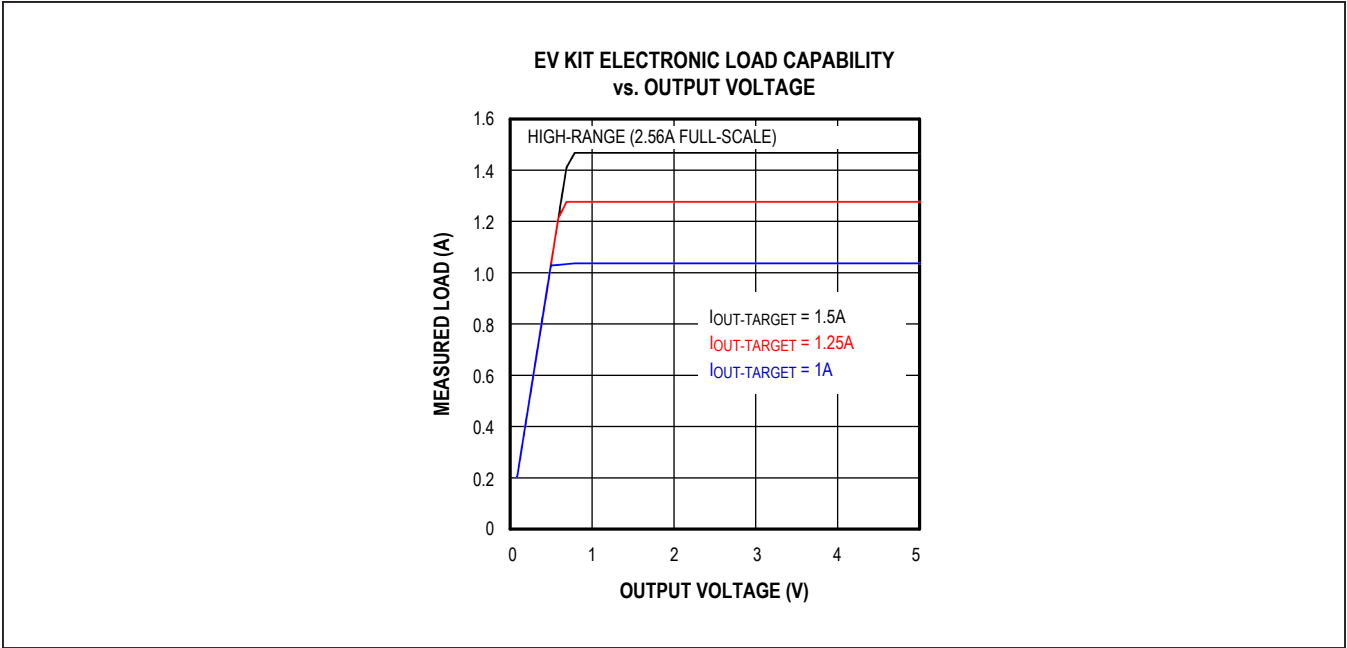


Figure 6. Electronic Load Capability vs. Voltage

Setting the Output Voltage  
(External Feedback Version)

The external feedback version of the device (MAX77503AEWC) uses resistors to set the output voltage between 1.55V and 99% of the input voltage. Use R3 and R4 to set the output voltage.

Choose R3 to be 10kΩ. Calculate the value of R4 for a desired output voltage with the following equation:

$$R4 = \frac{R3}{\left(\frac{V_{OUT}}{V_{FB}} - 1\right)}$$

where V<sub>FB</sub> is 0.8V and V<sub>OUT</sub> is the desired output voltage. Common values of R3 and R4 are listed in Table 4. For the internal feedback version of the MAX77503, use the software GUI to change the output voltage. See the [Setting the Output Voltage \(Internal Feedback Version\)](#) section for more information.

Table 4. Common Feedback Resistor Values

| OUTPUT VOLTAGE<br>TARGET (V) | R3 (kΩ) | R4 (kΩ) |
|------------------------------|---------|---------|
| 1.55                         | 10      | 10.7    |
| 1.85                         | 10      | 7.68    |
| 2.05                         | 10      | 6.34    |
| 2.5                          | 10      | 4.75    |
| 3.0                          | 10      | 3.65    |
| 3.3                          | 10      | 3.24    |
| 3.5                          | 10      | 2.94    |
| 5                            | 10      | 1.91    |
| 5.6                          | 10      | 1.65    |

Software

The graphical user interface (GUI) software allows for quick, easy, and thorough evaluation of the MAX77503. The GUI drives I<sup>2</sup>C-communication with the EV kit. Every control in the GUI (excluding the Load Control) corresponds directly to a register within the MAX77503. Refer to the *Register Map* section in the MAX77503 device data sheet for a complete description of the registers.

See [Figure 7](#) for a screenshot of the GUI upon first opening.

Installation

Visit the product webpage at [www.maximintegrated.com/MAX77503evkit](http://www.maximintegrated.com/MAX77503evkit) and navigate to Design Resources to download the latest version of the EV kit software. Save the EV kit software to a temporary folder and decompress the ZIP file. Run the .EXE file and follow the on-screen instructions to complete installation.

Windows Drivers

After connecting a Micro-USB cable between your PC and the EV kit for the first time, wait a few minutes for Windows to automatically install the necessary drivers.

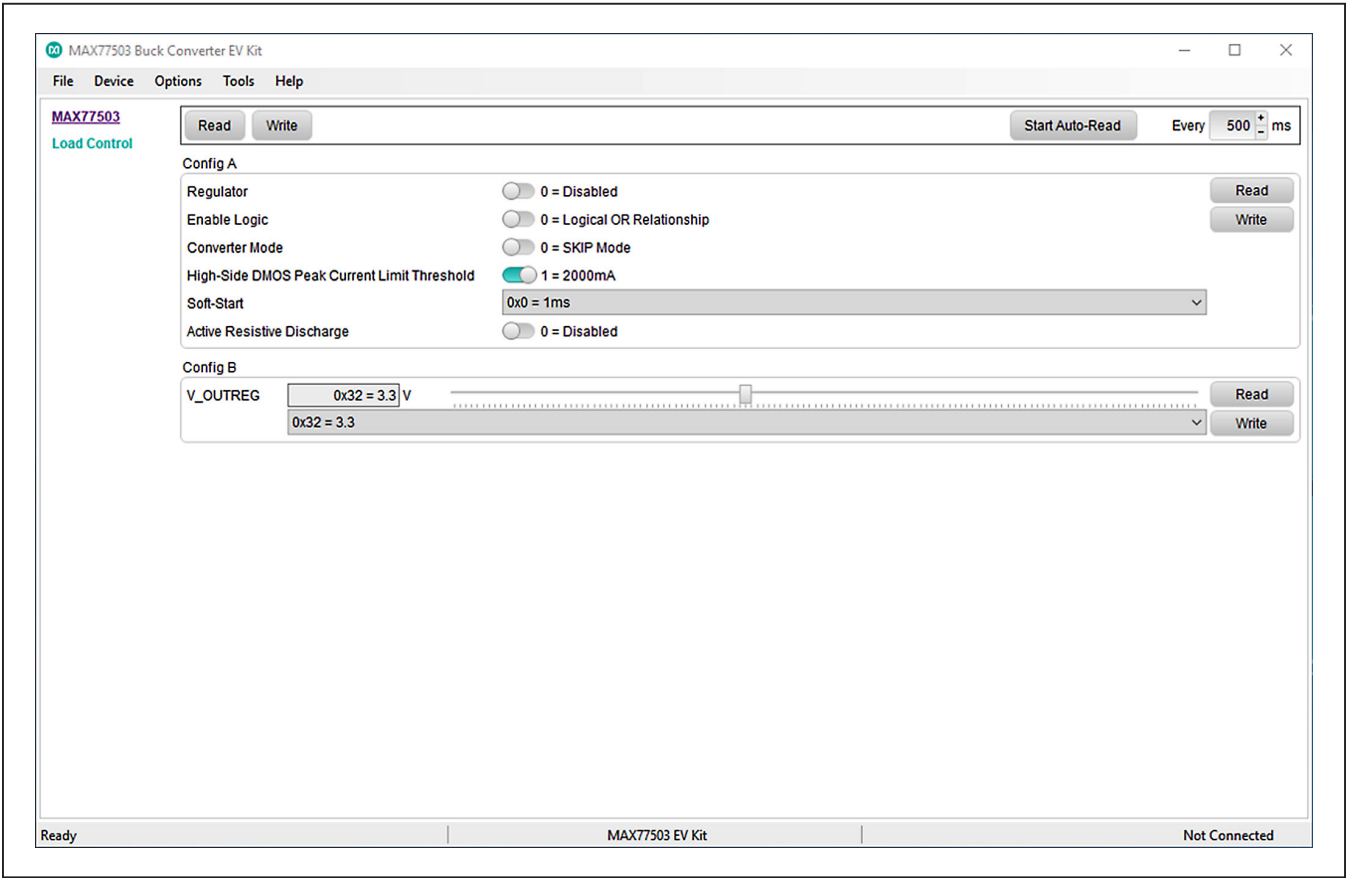


Figure 7. MAX77503 Evaluation Kit GUI Interface



Connecting the GUI

In the GUI, click **Device** in the upper left corner of the GUI window. Click the **Connect** option in the drop-down menu.

The **Synchronize** menu opens (Figure 8) once the MAX77503 responds (it must be powered and enabled through either EN or BIASEN to respond). Click **Read and Close**. The text at the bottom right of the GUI window changes from *Not Connected* to *Connected*.

The **Synchronize** menu shows the buck’s I2C 8-bit device write address. Address shown changes depending on ordering option. Refer to the [EV Kit Schematic](#) section of this document or the *MAX77503 device data sheet* for more information.

Configuring the Buck Converter

The MAX77503 features several different programmable options to customize the behavior of the regulator during startup, operation, and shutdown. Figure 9 shows the portion of the main GUI window that allows for configuration of the device.

Enabling and Disabling the Buck Converter

Turn on the device by clicking the toggle switch to the right of **Regulator** to change the value of the enable bit (EN\_BIT). Alternatively, activate the regulator by bringing the EN pin logic-high by connecting the shunt on jumper J1 between terminals 1-2.

The default relationship between the GUI enable control (EN\_BIT) and jumper J1’s enable control (EN pin) is a logic OR. To change this relationship to a logical *AND*, click the toggle switch to the right of **Enable Logic** in the GUI.

Consult the *Buck Enable Control (EN)* section of the MAX77503 device data sheet for more information.

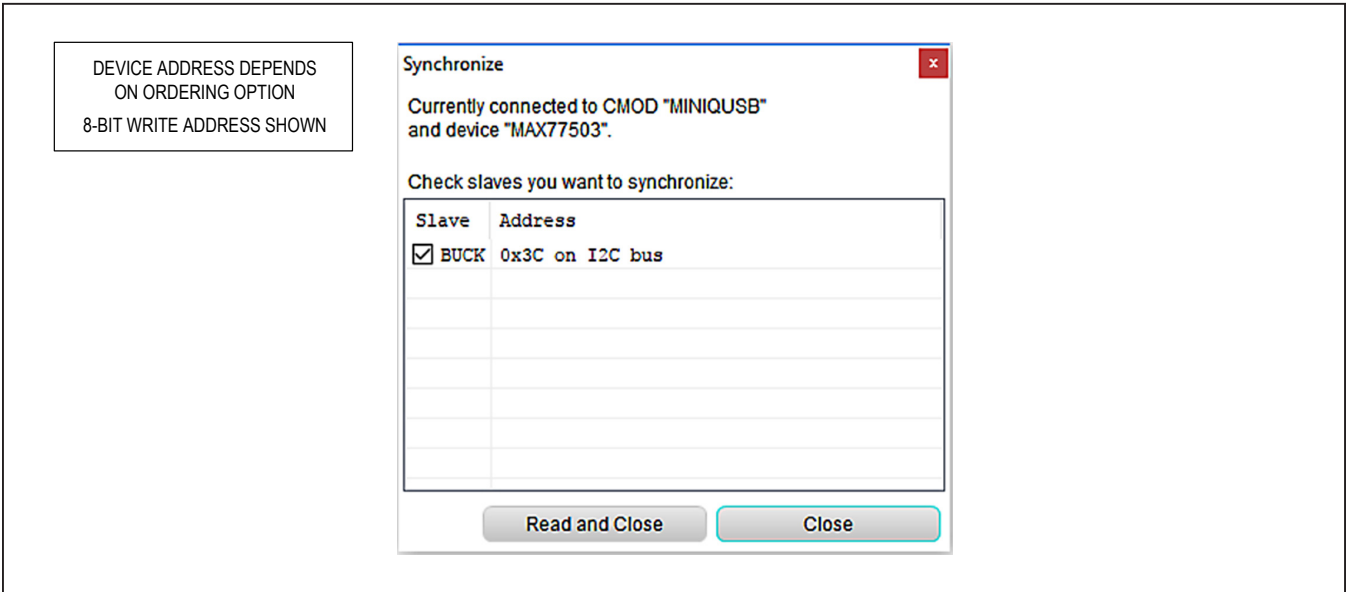


Figure 8. MAX77503 Evaluation Kit GUI Window after “Connecting”

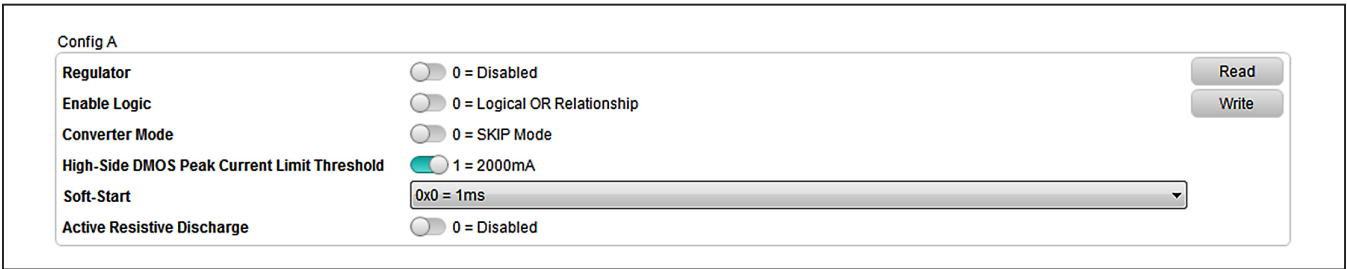


Figure 9. Config A Control Portion of Main GUI Window

Setting the Output Voltage  
(Internal Feedback Version)

The MAX77503 internal feedback version features a programmable output voltage from 0.8V to 5V in 50mV steps. External feedback resistors are not required.

When the EV kit is first powered on and connected to the GUI, the default output voltage appears in the **V\_OUTREG** section of the GUI under **Config B** (Figure 10). Drag the slider or enter the desired output voltage and click **Write** to change the output voltage. Clicking **Read** returns the programmed output voltage to the GUI.

Avoid changing the output voltage target while the converter is both enabled and supplying load.

**Config B** is a *don't care* for the external feedback version of the MAX77503. See the [Setting the Output Voltage \(External Feedback Version\)](#) section for more information on how to set  $V_{OUT}$ .

Electronic Load Control Tab

The load control tab contains controls for setting load on the output. The GUI is capable of setting Steady State, Transient, and Random load currents. To set a load current, use the slider bar or text field to input a value (mA) and press the **Enable** button. Shuffle through the modes to exercise different load conditions.

Electronic load range is set with the toggle switch shown in Figure 11.

- 10mA range uses a 49.9Ω sense resistor (R249) for precise load control with 2.5μA of resolution.
- 2.56A range uses a 0.2Ω sense resistor (R245) for heavy loads with 0.625mA of resolution.

The offset and gain values are set by Maxim and do not need to be altered.

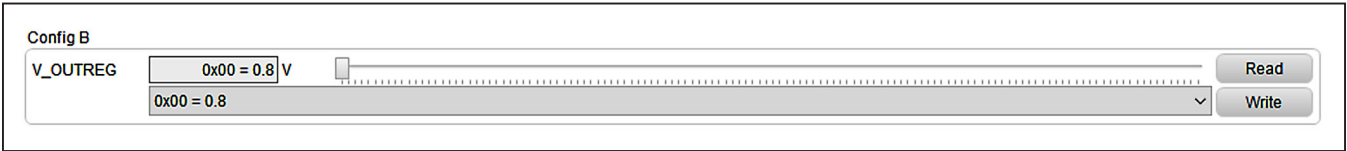


Figure 10. Config B Output Voltage Control Slider (MAX77503 Internal Feedback Version)

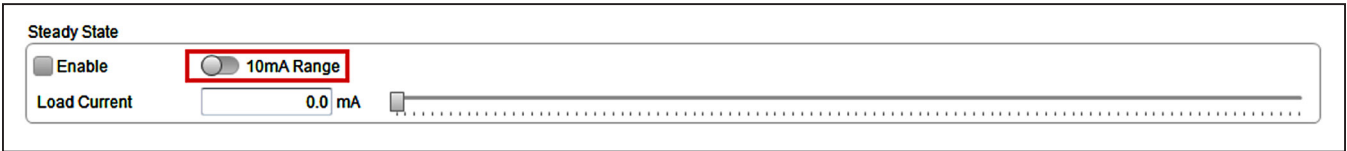


Figure 11. Electronic Load Range Control Switch

Ordering Information

| PART NUMBER        | U1 IC           | VOLTAGE FEEDBACK | DEFAULT OUTPUT VOLTAGE     |
|--------------------|-----------------|------------------|----------------------------|
| MAX77503AEVKIT#    | MAX77503AEWC+   | External         | 3.3V<br>(set by R3 and R4) |
| MAX77503B33EVKIT#  | MAX77503BEWC33+ | Internal         | 3.3V                       |
| MAX77503B18EVKIT#* | MAX77503BEWC18+ | Internal         | 1.8V                       |
| MAX77503B12EVKIT#* | MAX77503BEWC12+ | Internal         | 1.2V                       |

+Denotes a lead(Pb)-free/RoHS-compliant package.  
\*Future product—contact factory for availability.  
EV kit differences detailed in [Table 3](#).

## MAX77503 EV Kit Bill of Materials

| REF_DES                                                                                                      | QTY | MFG PART #                                 | MANUFACTURER | VALUE                                            | DESCRIPTION                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------|--------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| U1                                                                                                           | 1   | MAX77503<br>(see <a href="#">Table 3</a> ) | MAXIM        | VARIES<br>(see <a href="#">Table 3</a> )         | EVKIT PART-IC; MAX77503; 14V; 1.5A;<br>HIGH-EFFICIENCY BUCK CONVERTER; PKG.<br>DWG. NO.: 21-100250                                  |
| L1                                                                                                           | 1   | DFE252012F-xxxx                            | MURATA       | 4.7UH OR 2.2UH<br>(see <a href="#">Table 3</a> ) | INDUCTOR; SMT (2520); METAL ALLOY CHIP;<br>TOL = $\pm 20\%$ ; $> 2A$ SAT                                                            |
| R2, R5                                                                                                       | 3   | ANY                                        | ANY          | 0                                                | RESISTOR; 0402; 0 $\Omega$ ; 0%; JUMPER; 0.10W; THICK<br>FILM; FORMFACTOR                                                           |
| R3                                                                                                           | 1   | ANY                                        | ANY          | 10K OR 0<br>(see <a href="#">Table 3</a> )       | RESISTOR, 0402, 1%, 100PPM, 0.0625W,<br>THICK FILM; FORMFACTOR                                                                      |
| R4                                                                                                           | 1   | ANY                                        | ANY          | 3.24K OR OPEN<br>(see <a href="#">Table 3</a> )  | RESISTOR, 0402, 1%, 100PPM, 0.0625W, THICK<br>FILM; FORMFACTOR                                                                      |
| C1                                                                                                           | 1   | ANY                                        | ANY          | 4.7UF                                            | CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7UF;<br>25V; TOL = 10%; MODEL = ;<br>TG = -55°C TO +85°C; TC = X5R ; FORMFACTOR              |
| C2                                                                                                           | 1   | ANY                                        | ANY          | 0.22UF                                           | CAPACITOR; SMT (0402); CERAMIC; 0.22UF; 16V;<br>TOL = 10%; MODEL = GRM SERIES;<br>TG = -55°C TO +125°C; TC = X7R; FORMFACTOR        |
| C3                                                                                                           | 1   | ANY                                        | ANY          | 2.2UF                                            | CAPACITOR; SMT (0402); CERAMIC; 2.2UF; 6.3V;<br>TOL = [10%]; MODEL = C SERIES;<br>TG = -55°C TO +85°C; TC = X5R                     |
| C4                                                                                                           | 1   | C0402C569C5GAC                             | KEMET        | 100PF                                            | CAPACITOR; SMT (0402); CERAMIC CHIP; 5.6PF;<br>50V; TOL = $\pm 0.25$ PF; MODEL = ;<br>TG = -55°C TO +125°C; TC = COG                |
| C5-C7, C9                                                                                                    | 3   | ANY                                        | ANY          | 22UF                                             | CAPACITOR; SMT (0603); CERAMIC CHIP; 22UF;<br>10V; TOL = 20%; MODEL = CL SERIES;<br>TG = -55°C TO +85°C; TC = X5R; FORMFACTOR       |
| C8                                                                                                           | 1   | ANY                                        | ANY          | 0.1UF                                            | CAPACITOR; SMT; 0402; CERAMIC; 0.1uF; 10V;<br>10%; X5R; -55°C to + 125°C; 0 $\pm 30$ PPM/°C;<br>FORMFACTOR                          |
| Components below this line are outside of the immediate MAX77503 evaluation circuit and solution silkscreen. |     |                                            |              |                                                  |                                                                                                                                     |
| C10                                                                                                          | 1   | TPSC107K016R0200                           | AVX          | 100UF                                            | CAPACITOR;SMT(6032);TANTALUMCHIP;100UF;<br>16V; TOL = 10%; MODEL = ;<br>TG = -55°C TO +125°C                                        |
| C108, C135,<br>C150, C151,<br>C155-C157,<br>C159                                                             | 8   | ANY                                        | ANY          | 0.1UF                                            | CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF;<br>50V; TOL = 10%; MODEL = CGA SERIES;<br>TG = -55°C TO +125°C; TC = X7R;<br>FORMFACTOR |
| C110-C113,<br>C115, C118,<br>C120, C158                                                                      | 8   | ANY                                        | ANY          | 1UF                                              | CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF;<br>6.3V; TOL = 10%; MODEL = ;<br>TG = -55°C TO +85°C; TC = X5R;                           |

## MAX77503 EV Kit Bill of Materials (continued)

| REF_DES                               | QTY | MFG PART #                               | MANUFACTURER                      | VALUE        | DESCRIPTION                                                                                                              |
|---------------------------------------|-----|------------------------------------------|-----------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| C114                                  | 1   | ANY                                      | ANY                               | 0.47UF       | CAPACITOR; SMT; 0603; CERAMIC; 0.47uF; 10V; 10%; X5R; -55°C to +125°C; ; FORMFACTOR                                      |
| C152, C153                            | 2   | C0402C0G500-150JNP;<br>GRM1555C1H150JA01 | VENKEL LTD./<br>MURATA            | 15PF         | CAPACITOR; SMT (0402); CERAMIC CHIP; 15PF; 50V; TOL = 5%; TG = -55°C TO +125°C; TC = C0G                                 |
| C154                                  | 1   | ANY                                      | ANY                               | 4.7UF        | CAPACITOR; SMT (0402); CERAMIC CHIP; 4.7UF; 10V; TOL = 20%; MODEL = C SERIES; TG = -55°C TO +85°C; TC = X5R; FORMFACTOR  |
| C211                                  | 1   | ANY                                      | ANY                               | 1000PF       | CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL = 10%; MODEL = C0G; TG = -55°C TO +125°C; TC = +; FORMFACTOR       |
| C212,<br>C221-C223                    | 4   | ANY                                      | ANY                               | 0.1UF        | CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 25V; TOL = 10%; MODEL = C SERIES; TG = -55°C TO +125°C; TC = X7R; FORMFACTOR |
| C213, C214                            | 2   | C0402C101K5GAC;<br>C1005C0G1H101K050BA   | KEMET/TDK                         | 100PF        | CAPACITOR; SMT; 0402; CERAMIC; 100pF; 50V; 10%; C0G; -55°C to +125°C; 0 ±30PPM/°C                                        |
| C241                                  | 1   | C1005X5R1C105K                           | TDK                               | 1UF          | CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 16V; TOL = 10%; MODEL = C SERIES; TG = -55°C TO +85°C; TC = X5R                |
| C250                                  | 1   | C1005X5R1H472K050                        | TDK                               | 4700PF       | CAPACITOR; SMT (0402); CERAMIC CHIP; 4700PF; 50V; TOL = 10%; TG = -55°C TO +85°C; TC = X5R                               |
| D1                                    | 1   | CMHSH5-4                                 | CENTRAL<br>SEMICONDUCTOR<br>CORP. | CMHSH5-4     | DIODE; SCH; SMT (SOD-123); PIV = 40V; IF = 0.5A; -65°C TO +125°C                                                         |
| D100, D101                            | 2   | LTST-C190YKT                             | LITE-ON<br>ELECTRONICS;<br>INC.   | LTST-C190YKT | DIODE; LED; STANDARD; YELLOW; SMT (0603); PIV = 5.0V; IF = 0.02A; -55°C TO +85°C                                         |
| D102                                  | 1   | LTST-C190GKT                             | LITE-ON<br>ELECTRONICS;<br>INC.   | LTST-C190GKT | DIODE; LED; WATER CLEAR GREEN; SMT (0603); VF = 2.1V; IF = 0.03A; -55°C TO +85°C                                         |
| EN, POK, SCL,<br>SDA, QSCL,<br>QSDA   | 6   | 5002                                     | KEYSTONE                          | N/A          | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;              |
| FB100                                 | 1   | BLM18PG221SN1                            | MURATA                            | 220          | INDUCTOR; SMT (0603); FERRITE-BEAD; 220; TOL = ±25%; 1.4A; -55°C TO +125°C                                               |
| GND, OUT, SUP,<br>GND2, GND4-<br>GND6 | 7   | 9020 BUSS                                | WEICO WIRE                        | MAXIMPAD     | EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG                                 |
| GND1, GND3,<br>OUT1, SUP1             | 4   | 111-2223-001                             | EMERSON<br>NETWORK<br>POWER       | 111-2223-001 | MACHINE SCREW; THUMBSCREW; BANANA; 1/4-32IN; 11/32IN; NICKEL PLATED BRASS                                                |

## MAX77503 EV Kit Bill of Materials (continued)

| REF_DES                                      | QTY | MFG PART #      | MANUFACTURER              | VALUE           | DESCRIPTION                                                                                                              |
|----------------------------------------------|-----|-----------------|---------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| GNDS                                         | 1   | 5001            | KEYSTONE                  | N/A             | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; |
| J1, J2, J101                                 | 3   | TSW-103-07-T-S  | SAMTEC                    | TSW-103-07-T-S  | CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 3PINS                                                         |
| J6, J203, J205, J206                         | 4   | TSW-102-07-T-S  | SAMTEC                    | TSW-102-07-T-S  | CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 2PINS; -55°C TO +105°C                                        |
| J100                                         | 1   | PBC06SAAN       | SULLINS ELECTRONICS CORP. | PBC06SAAN       | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 6PINS; -65°C TO +125°C                                               |
| J102                                         | 1   | PBC02SAAN       | SULLINS ELECTRONICS CORP. | PBC02SAAN       | EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS; -65°C TO +125°C;                                   |
| J103                                         | 1   | 10103592-0001LF | FCI CONNECT               | 10103592-0001LF | CONNECTOR; FEMALE; SMT; MICRO USB B-TYPE REVERSE; RIGHT ANGLE; 5PINS                                                     |
| J204                                         | 1   | PEC03SAAN       | SULLINS ELECTRONICS CORP. | PEC03SAAN       | EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65°C TO +125°C;                                   |
| Q100, Q101                                   | 2   | FDY300NZ        | FAIRCHILD SEMICONDUCTOR   | FDY300NZ        | TRAN; SINGLE N-CHANNEL 2.5V SPECIFIED POWER TRENCH MOSFET; NCH; SC89; PD-(0.625W); I-(0.6A); V-(20V)                     |
| Q200                                         | 1   | IRFHM8337TRPBF  | INTERNATIONAL RECTIFIER   | IRFHM8337TRPBF  | TRAN; HEXFET POWER MOSFET; NCH; PQFN8; PD-(2.8W); I-(18A); V-(30V)                                                       |
| Q202                                         | 1   | IRF3704ZSPBF    | N/A                       | IRF3704ZSPBF    | TRAN; HEXFET POWER MOSFET; NCH; D2PAK; PD-(57W); I-(67A); V-(20V)                                                        |
| VL, OUTS, SUPS, BIASEN, VIL_OUT              | 5   | 5000            | KEYSTONE                  | N/A             | TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;     |
| R100, R118                                   | 2   | ANY             | ANY                       | 4.7K            | RESISTOR, 0402, 4.7KΩ, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR                                                       |
| R103, R123                                   | 2   | ANY             | ANY                       | 22              | RESISTOR, 0402, 22Ω, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR                                                         |
| R107, R108                                   | 2   | ANY             | ANY                       | 2.2K            | RESISTOR, 0402, 2.2KΩ, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR                                                       |
| R110                                         | 1   | CRCW0402470RFB  | VISHAY DALE               | 470             | RESISTOR, 0402, 470Ω, 1%, 100PPM, 0.0625W, THICK FILM                                                                    |
| R1, R120, R115, R157, R159, R161, R214, R283 | 8   | ANY             | ANY                       | 100K            | RESISTOR; 0402; 100K; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR                                                        |



## MAX77503 EV Kit Bill of Materials (continued)

| REF_DES                                                               | QTY | MFG PART #                                              | MANUFACTURER                              | VALUE | DESCRIPTION                                                        |
|-----------------------------------------------------------------------|-----|---------------------------------------------------------|-------------------------------------------|-------|--------------------------------------------------------------------|
| R122                                                                  | 1   | ANY                                                     | ANY                                       | 1M    | RESISTOR; 0603; 1M; 1%; 100PPM; 0.10W; THICK FILM; FORMFACTOR      |
| R135, R136, R139, R141, R143, R148, R155, R162-R166, R238, R305, R306 | 15  | ANY                                                     | ANY                                       | 0     | RESISTOR; 0402; 0Ω; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR    |
| R137, R138                                                            | 2   | ANY                                                     | ANY                                       | 49.9  | RESISTOR; 0402; 49.9Ω; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR |
| R142                                                                  | 1   | ANY                                                     | ANY                                       | 0     | RESISTOR; 0603; 0Ω; 0%; JUMPER; 0.10W; THICK FILM; FORMFACTOR      |
| R156                                                                  | 1   | CRCW0402105KFK                                          | VISHAY DALE                               | 105K  | RESISTOR; 0402; 105KΩ; 1%; 100PPM; 0.063W ; THICK FILM             |
| R158                                                                  | 1   | CRCW0402169KFK                                          | VISHAY DALE                               | 169K  | RESISTOR; 0402; 169KΩ; 1%; 100PPM; 0.063W; THICK FILM              |
| R160                                                                  | 1   | CRCW04024752FK;<br>9C04021A4752FLHF3;<br>CRCW040247K5FK | VISHAY DALE                               | 47.5K | RESISTOR; 0402; 47.5K; 1%; 100PPM; 0.0625W; THICK FILM             |
| R109, R111, R235                                                      | 3   | CRCW0402100RFX;<br>9C04021A1000FL;<br>RC0402FR-07100RL  | VISHAYDALE;<br>PANASONIC;<br>YAGEOPHYCOMP | 100   | RESISTOR; 0402; 100Ω; 1%; 100PPM; 0.063W; THICKFILM                |
| R236                                                                  | 1   | CRCW0402680RFX;<br>RC0402FR-07680RL                     | VISHAY DALE/<br>YAGEO PHICOMP             | 680   | RESISTOR, 0402, 680Ω, 1%, 100PPM, 0.0625W, THICK FILM              |
| R237                                                                  | 1   | CRCW040220K0FK                                          | VISHAY DALE                               | 20K   | RESISTOR; 0402; 20KΩ; 1%; 100PPM; 0.063W; THICK FILM               |
| R239, R240                                                            | 2   | CRCW04024K02FK;<br>ERJ-2RKF4021X                        | VISHAY DALE/<br>PANASONIC                 | 4.02K | RESISTOR; 0402; 4.02K; 1%; 100PPM; 0.0625W; THICK FILM             |
| R242, R243                                                            | 2   | ANY                                                     | ANY                                       | 1K    | RESISTOR; 0402; 1K; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR    |
| R244, R246, R251                                                      | 3   | CRCW04021M00FK                                          | VISHAY DALE                               | 1M    | RESISTOR; 0402; 1M; 1%; 100PPM; 0.0625W; THICK FILM                |
| R245                                                                  | 1   | WSL2512R2000F                                           | VISHAY DALE                               | 0.2   | RESISTOR; 2512; 0.2Ω; 1%; 75PPM; 1.0W; THICK FILM                  |
| R249                                                                  | 1   | CRCW080549R9FK;<br>ERJ-6ENF49R9                         | VISHAY DALE;<br>PANASONIC                 | 49.9  | RESISTOR; 0805; 49.9Ω; 1%; 100PPM; 0.125W; THICK FILM              |
| R252                                                                  | 1   | CRCW040210K0FK;<br>RC0402FR-0710K                       | VISHAY DALE;<br>YAGEO PHICOMP             | 10K   | RESISTOR; 0402; 10K; 1%; 100PPM; 0.0625W; THICK FILM               |
| R297                                                                  | 1   | ERJ-2RKF4703X                                           | PANASONIC                                 | 470K  | RESISTOR, 0402, 470KΩ, 1%, 100PPM, 0.0625W, THICK FILM             |

## MAX77503 EV Kit Bill of Materials (continued)

| REF_DES         | QTY | MFG PART #            | MANUFACTURER                        | VALUE         | DESCRIPTION                                                                                                        |
|-----------------|-----|-----------------------|-------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------|
| R298            | 1   | CRCW0402649KFK        | VISHAY DALE                         | 649K          | RESISTOR; 0402; 649KΩ; 1%; 100PPM; 0.063W; THICK FILM                                                              |
| U2              | 1   | 24AA02T-I/OT          | MICROCHIP                           | 24AA02T-I/OT  | IC; EPROM; 2K I2C SERIAL EEPROM; SOT23-5                                                                           |
| U100            | 1   | MAXQ2000-RBX+         | MAXIM                               | MAXQ2000-RBX+ | IC; CTRL; LOW-POWER LCD MICROCONTROLLER; TQFN56-EP 8X8                                                             |
| U101            | 1   | FT232RQ               | FUTURE TECHNOLOGY DEVICES INTL LTD. | FT232RQ       | IC; INFC; UART INTERFACE IC USB TO SERIAL; QFN32-EP 5X5                                                            |
| U102-U104       | 3   | MAX8512EXK            | MAXIM                               | MAX8512EXK    | IC, VREG, Ultra-Low-Noise, High PSRR, Adjustable Vout, SC70-5                                                      |
| U107            | 1   | MAX3395EETC           | MAXIM                               | MAX3395EETC   | IC; TRANS; 15KV ESD-PROTECTED HIGH-DRIVE CURRENT QUAD-LEVEL TRANSLATOR WITH SPEED-UP CIRCUITRY; TQFN12 4X4         |
| U202            | 1   | MAX44251AUA+          | MAXIM                               | MAX44251AUA+  | IC; OPAMP; ULTRA-PRECISION; LOW-NOISE OP AMP; UMAX8                                                                |
| U205            | 1   | MAX5805AAUB+          | MAXIM                               | MAX5805AAUB+  | IC; DAC; ULTRA-SMALL, SINGLE-CHANNEL, 12-BIT BUFFERED OUTPUT DAC WITH INTERNAL REFERENCE AND I2C INTERFACE; UMAX10 |
| Y101            | 1   | CX3225SB16000 D0FLJZZ | KYOCERA-KINSEKI                     | 16MHZ         | CRYSTAL; SMT (3225) 3.2X2.5; 8PF; 16MHZ; ±10PPM; ±15PPM                                                            |
| PCB             | 1   | MAX77503 SOLDERDOWN   | MAXIM                               | PCB           | PCB:MAX77503SOLDERDOWN                                                                                             |
| Q201            | 0   | PSMN022-30PL          | NXP                                 | PSMN022-30PL  | TRAN; N-CHANNEL 30V 22MOHM LOGIC LEVEL MOSFET; NCH; TO-220AB; PD-(41W); I-(30A); V-(30V)                           |
| C11, C129, C134 | 0   | N/A                   | N/A                                 | OPEN          | CAPACITOR; SMT (0402); OPEN; FORMFACTOR                                                                            |

## MAX77503 EV Kit Schematic

| Part Number        | Configuration                                                            | 7-bit                     | 8-bit Write                                    | 8-bit Read          |
|--------------------|--------------------------------------------------------------------------|---------------------------|------------------------------------------------|---------------------|
| MAX77503AEWC+      | External Feedback version<br>(default U1 installed on MAX77503AEVKIT#)   | 0x1E<br>0b001 1110        | 0X3C<br>0b0011 1100                            | 0x3D<br>0b0011 1101 |
| MAX77503BEWC33+    | Internal Feedback version<br>(default U1 installed on MAX77503B33EVKIT#) | 0x1E<br>0b001 1110        | 0X3C<br>0b0011 1100                            | 0x3D<br>0b0011 1101 |
| MAX77503BEWC18+    | Internal Feedback version<br>(default U1 installed on MAX77503B18EVKIT#) | 0x24<br>0b010 0100        | 0X48<br>0b0100 1000                            | 0x49<br>0b0100 1001 |
| MAX77503BEWC12+    | Internal Feedback version<br>(default U1 installed on MAX77503B12EVKIT#) | 0x37<br>0b011 0111        | 0x6E<br>0b0110 1110                            | 0x6F<br>0b0110 1111 |
| MAX5805<br>(DAC)   | ADDR=GND                                                                 | 0x18<br>0b001 1000        | 0x30<br>0b0011 0000<br>0x32 ***<br>0b0011 0010 | 0x31<br>0b0011 0001 |
| 24AA02<br>(EEPROM) | N/A                                                                      | 0x50 to 0x57<br>0b1010xxx | 0b1010xxx0                                     | 0b1010xxx1          |

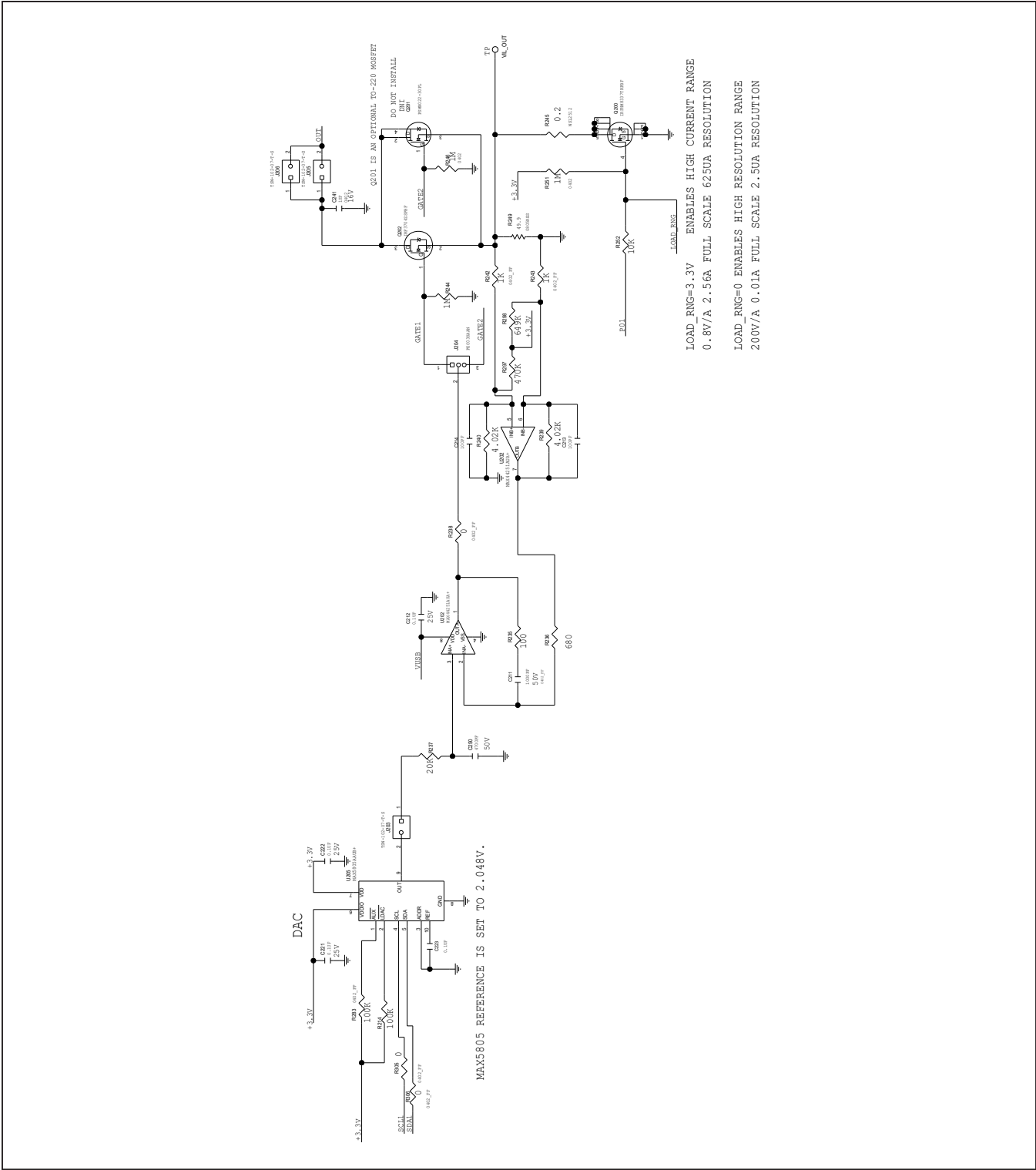
\*\*\* MAX5805 also responds to an I2C Broadcast Address 0b0011 0010 (8-bit)

| EV KIT PART NUMBER | U1 IC           | L1    | R3  | R4    |
|--------------------|-----------------|-------|-----|-------|
| MAX77503AEVKIT#    | MAX77503AEWC+   | 4.7uH | 10K | 3.24K |
| MAX77503B33EVKIT#  | MAX77503BEWC33+ | 4.7uH | 0   | OPEN  |
| MAX77503B18EVKIT#  | MAX77503BEWC18+ | 2.2uH | 0   | OPEN  |
| MAX77503B12EVKIT#  | MAX77503BEWC12+ | 2.2uH | 0   | OPEN  |

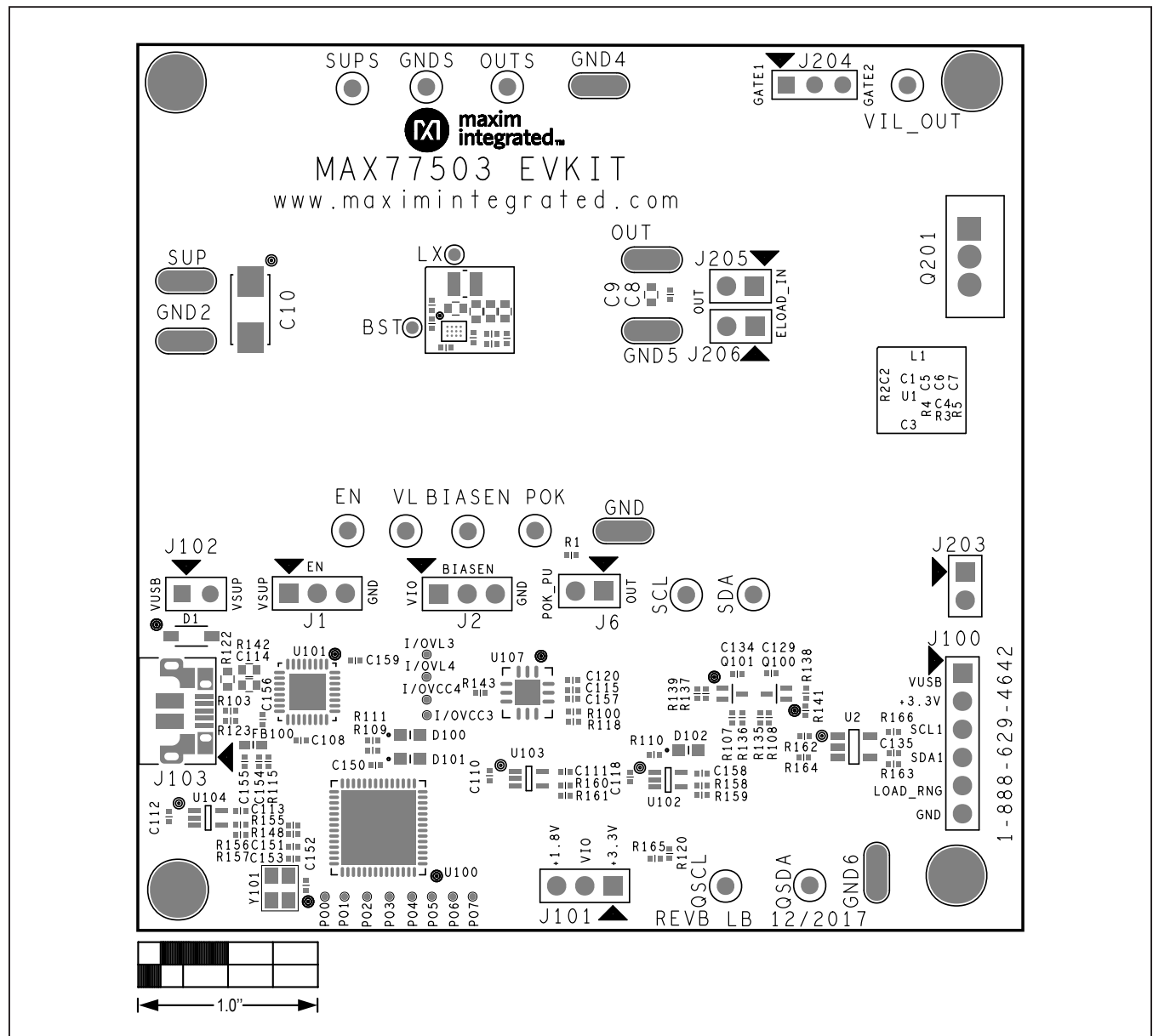




MAX77503 EV Kit Schematic (continued)

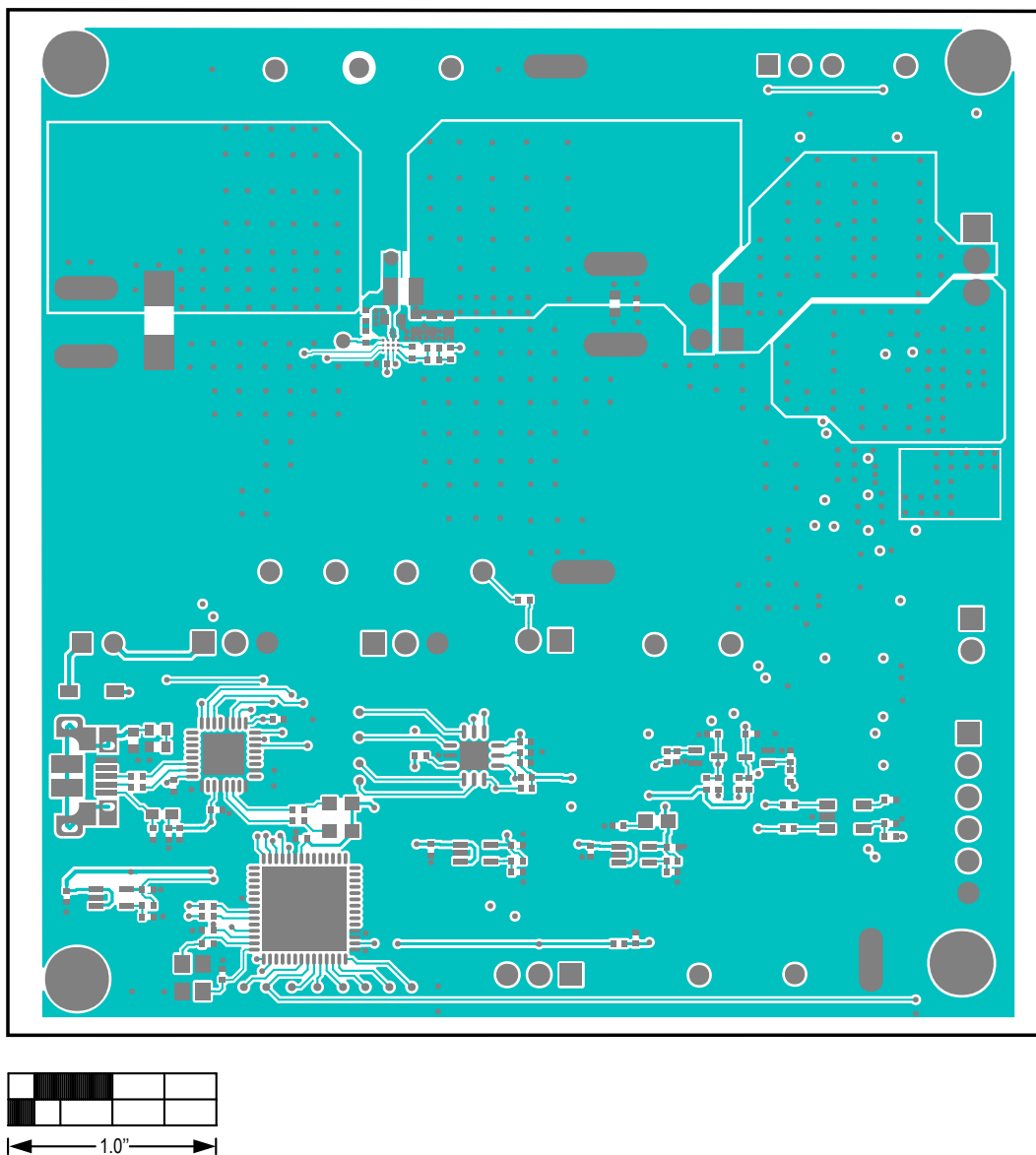


## MAX77503 EV Kit PCB Layouts



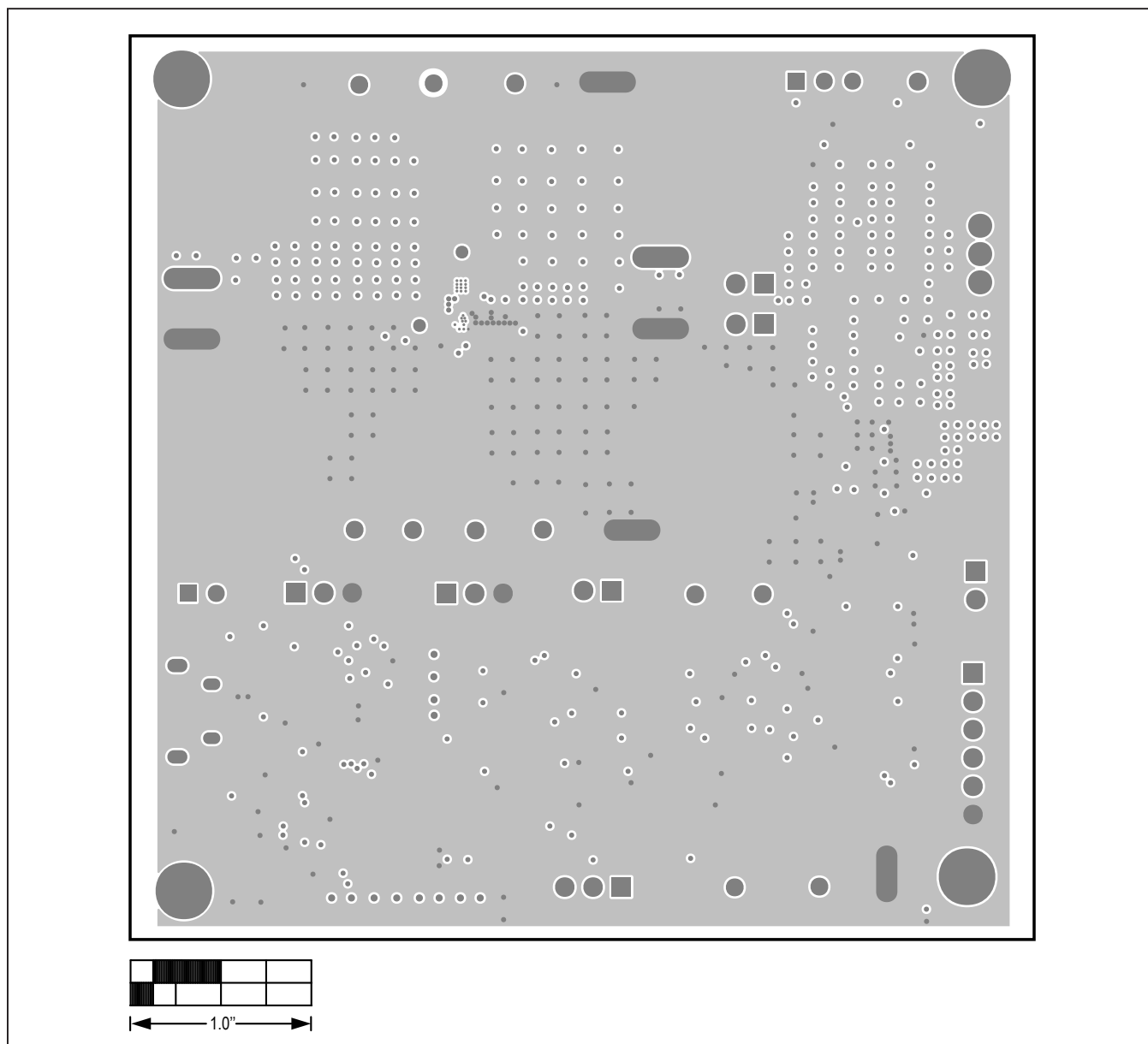
MAX77503 EV Kit Component Placement Guide—Top Silkscreen

## MAX77503 EV Kit PCB Layouts (continued)



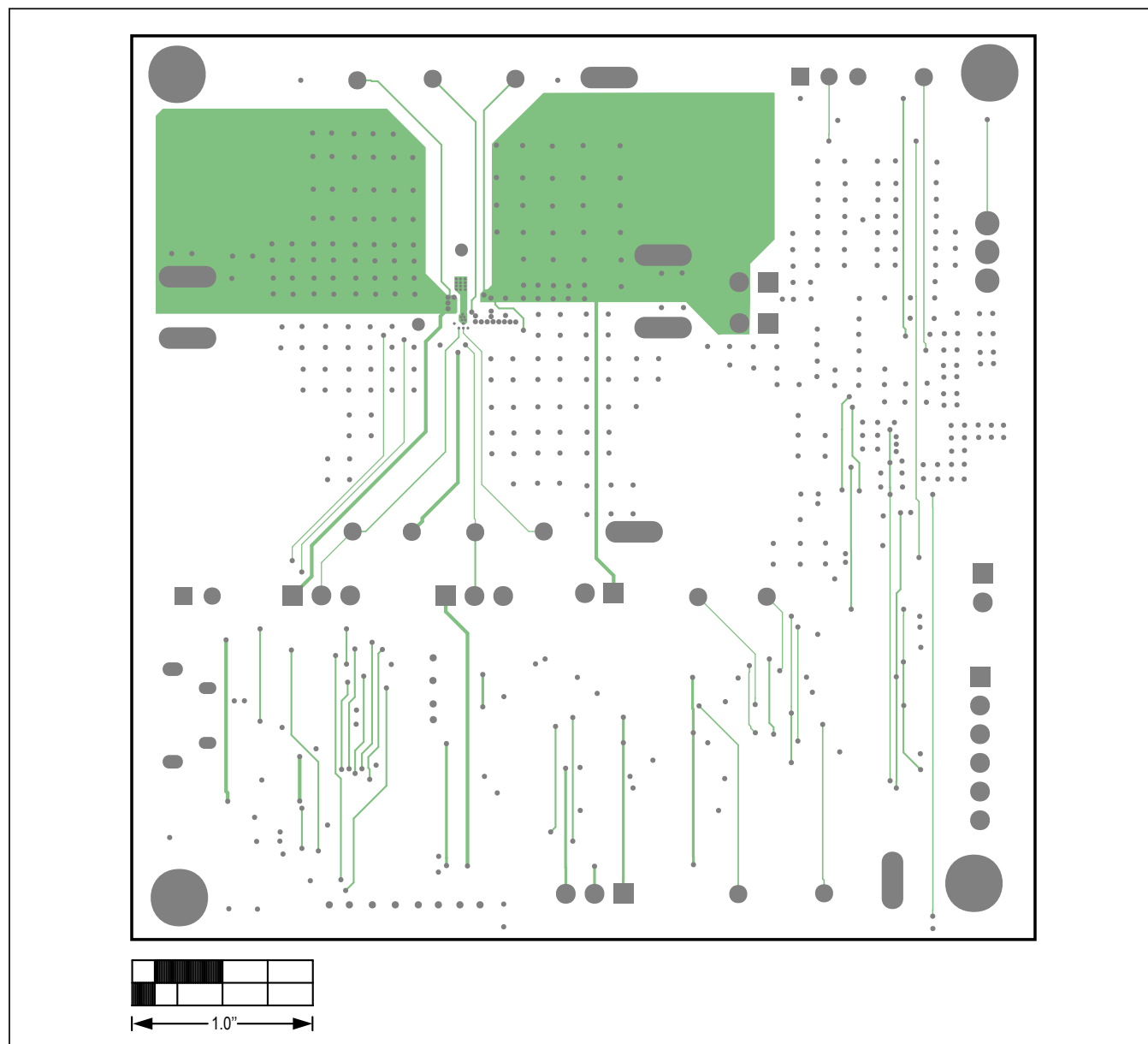
MAX77503 EV Kit PCB Layout—Top Layer

## MAX77503 EV Kit PCB Layouts (continued)



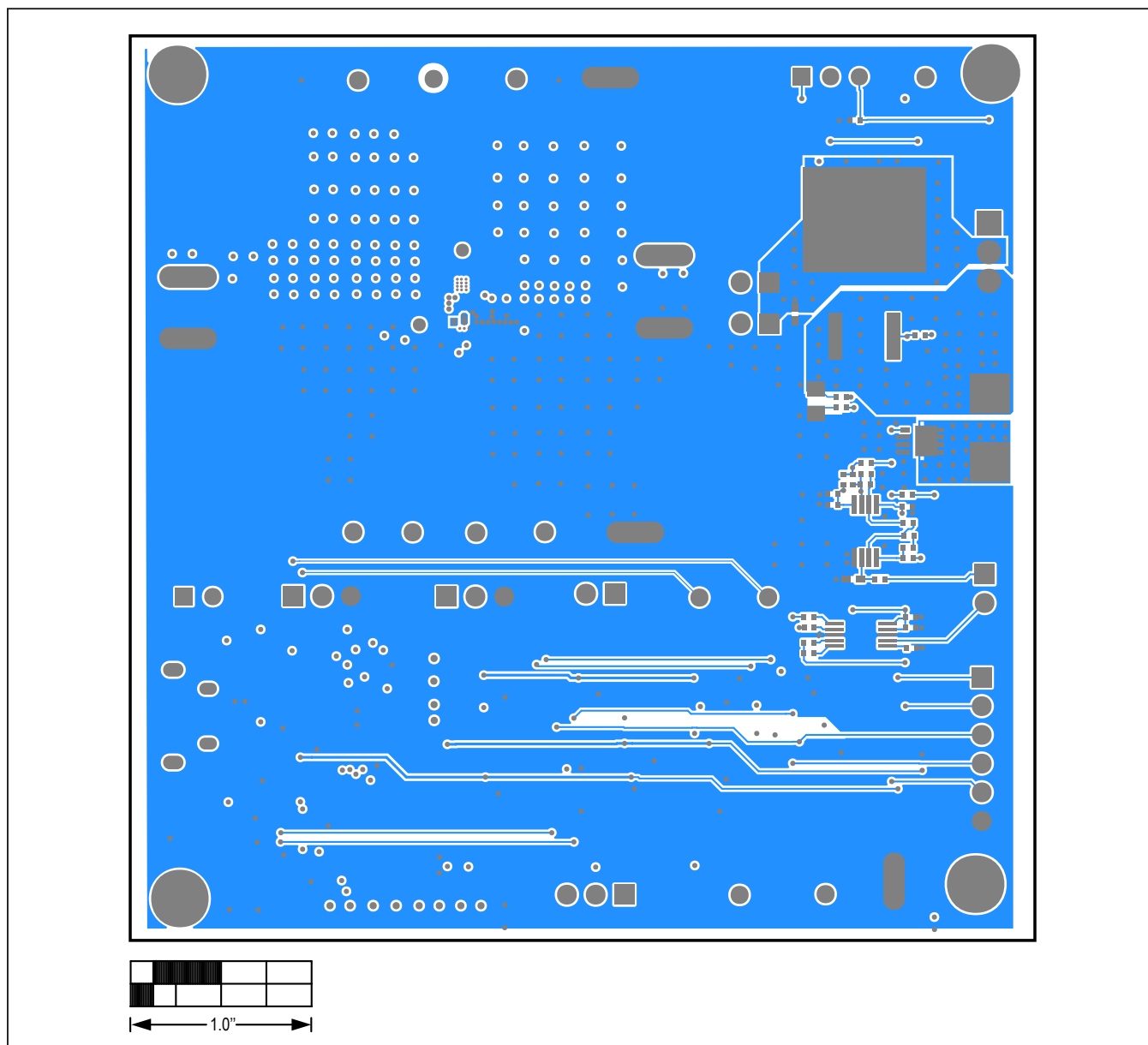
MAX77503 EV Kit PCB Layout—Internal Layer 2

## MAX77503 EV Kit PCB Layouts (continued)



MAX77503 EV Kit PCB Layout—Internal Layer 3

## MAX77503 EV Kit PCB Layouts (continued)



MAX77503 EV Kit PCB Layout—Bottom Layer

MAX77503 EV Kit Component Placement Guide—Bottom Silkscreen



## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION                                                                                                                 | PAGES<br>CHANGED |
|--------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------|
| 0                  | 9/18             | Initial release                                                                                                             | —                |
| 1                  | 2/19             | Added notes about I <sup>2</sup> C device address, updated Figure 8 and <i>Ordering Information</i> table, added hyperlinks | 9–11             |

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