

## MAX77511/MAX77711 Evaluation Kit

## Evaluates: MAX77511/MAX77711

### General Description

The MAX77511/MAX77711 evaluation kit (EV kit) is a fully assembled and tested printed circuit board (PCB) that demonstrates either the MAX77511 or MAX77711 power-management integrated circuit (IC).

The EV kit is a step-down voltage regulator circuit using the IC that allows for easy evaluation of each feature. The circuit is capable of 2.3V to 10V input, 3A/phase continuous load, and output voltage adjustable between 0.25V and 5.2V. The EV kit evaluates either MAX77511 or MAX77711. Both ICs are the same except MAX77711 includes a 300mA LDO.

The EV kit supports evaluation of each converter phase ( $\Phi$ ) configuration:

- 4 $\Phi$  (single 12A output)
- 3 $\Phi$  + 1 $\Phi$  (9A output + 3A output)
- 2 $\Phi$  + 2 $\Phi$  (6A output + 6A output)
- 2 $\Phi$  + 1 $\Phi$  + 1 $\Phi$  (6A output + 3A output + 3A output)
- 1 $\Phi$  + 1 $\Phi$  + 1 $\Phi$  + 1 $\Phi$  (four 3A outputs)

Three on-board transient loads allow users to exercise the full capability of the buck regulator or LDO. Windows-based software provides a friendly graphical user interface (GUI) as well as a detailed register-based interface to exercise all the features of the IC.

### Benefits and Features

- Proven PCB Reference Design and Layout
- Fully Assembled and Tested
- Easy Evaluation of All Phase Configurations
  - 0 $\Omega$  Resistors Quickly Create Multiphase Configurations
  - Jumpers and Test Points for ENSEQ, GPIOs, nRSTIO, and PHCFG
  - GUI Drives I<sup>2</sup>C Interface for Optional Software Control
- Inputs Separatable with 0 $\Omega$  Resistors for Prototyping
- USB to I<sup>2</sup>C Converter Allows Easy Communication with Windows PC
  - Windows Software GUI Controls Registers
  - Level Translator (MAX3395) Allows for Adjusting I<sup>2</sup>C Bus Voltage from 1.8V to 3.3V
- On-Board Transient Load Emulates System Loading
  - Covers Full 12A Load Range (with 4 $\phi$  Configuration)
  - Control Using an External Function Generator

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

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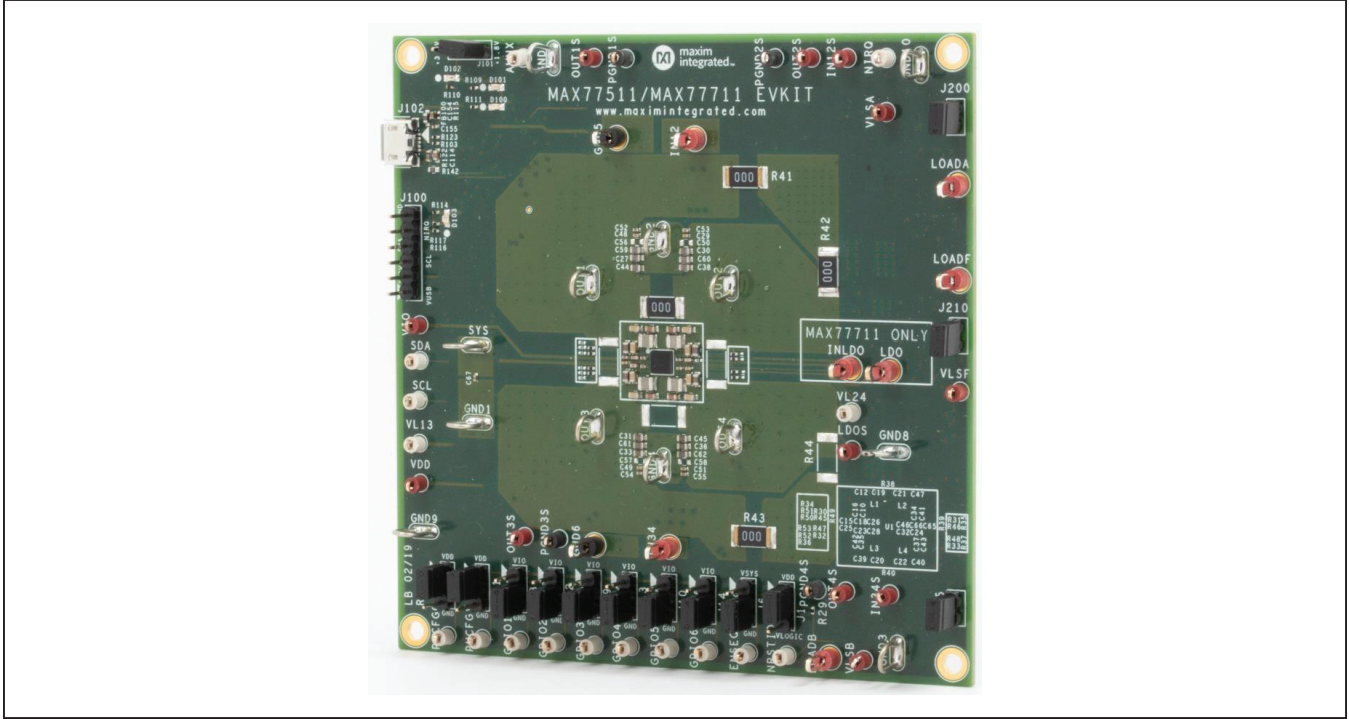


Figure 1. MAX77511/MAX77711 EV Kit Photo

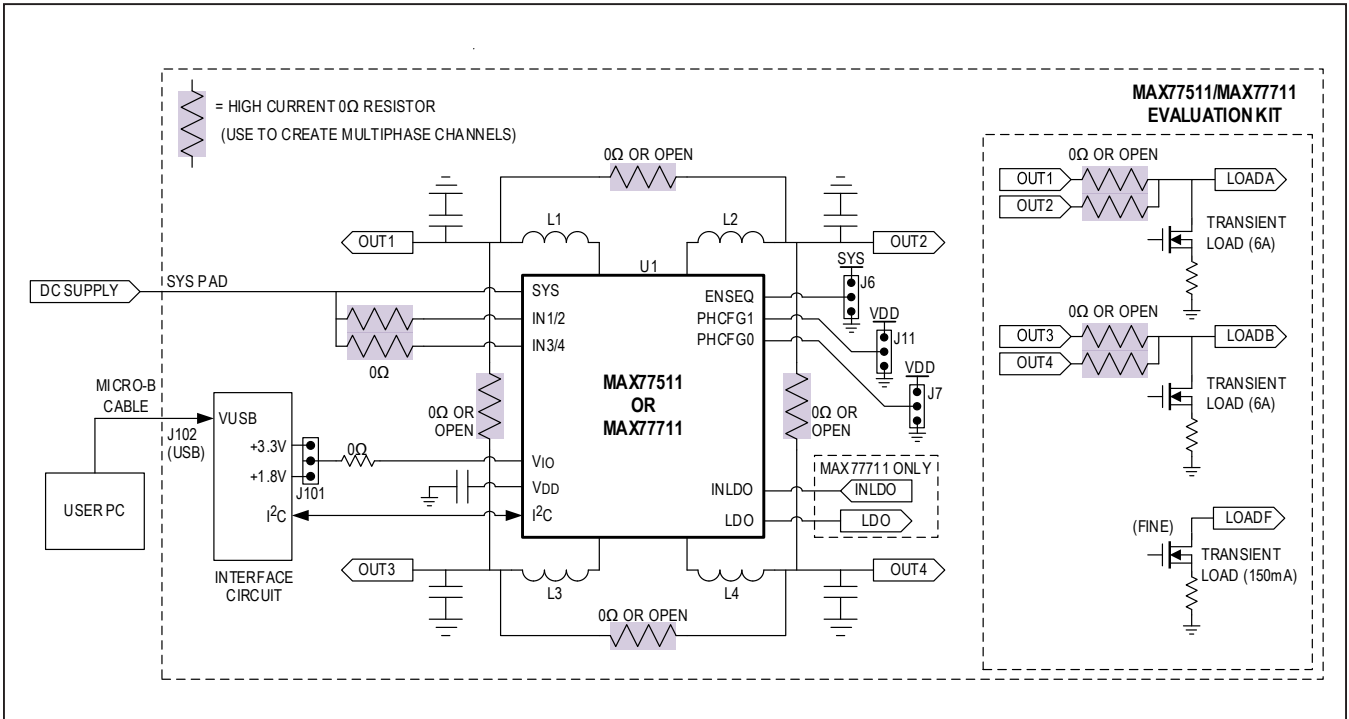


Figure 2. Simplified EV Kit Block Diagram

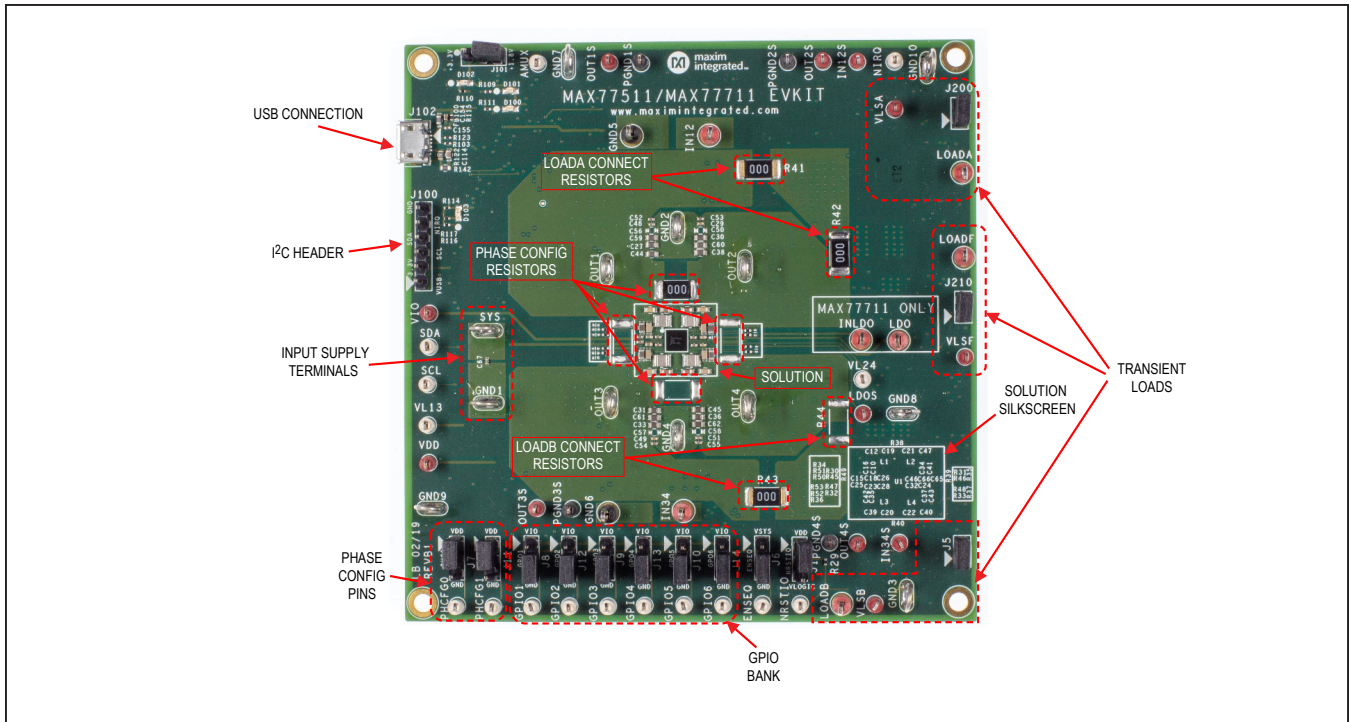


Figure 3. MAX77511/MAX77711 EV Kit Top View

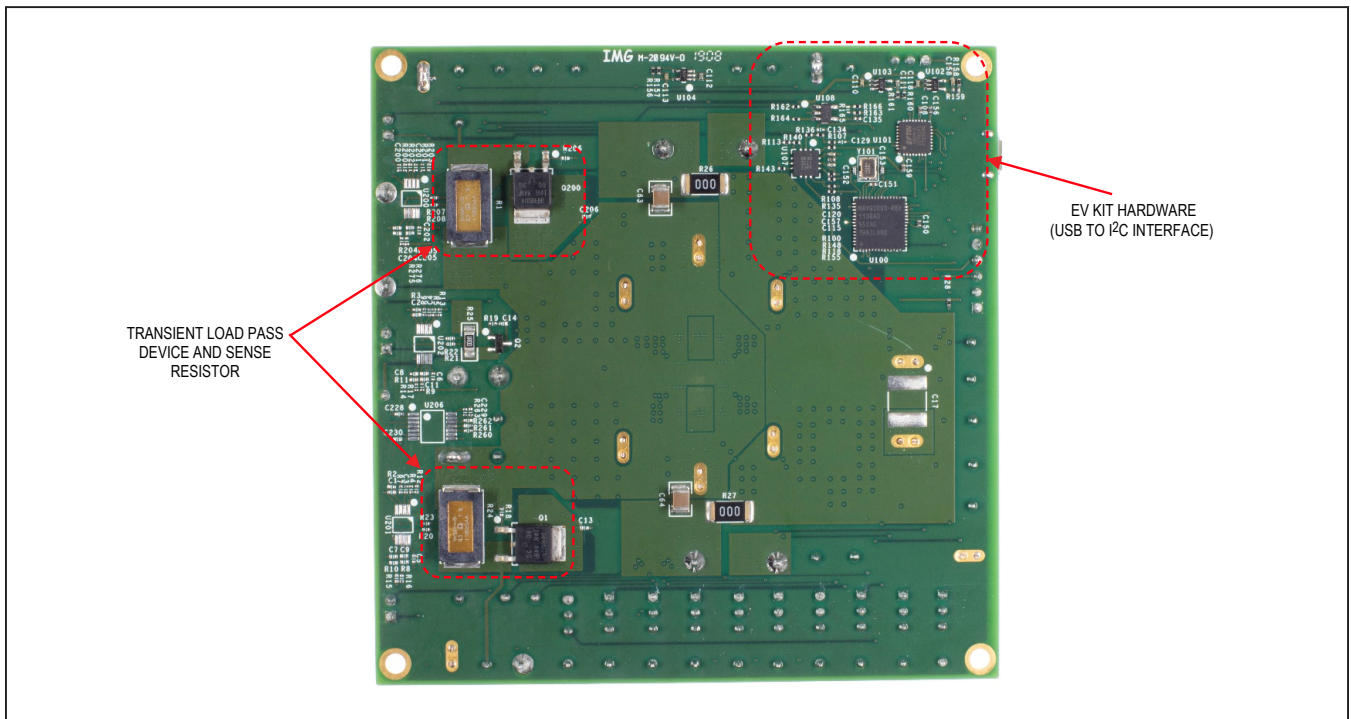


Figure 4. MAX77511/MAX77711 EV Kit Bottom View

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

REFERENCE DESIGNATOR	DEFAULT POSITION	FUNCTION
J101	2-3	<b>1-2:</b> Connects VLOGIC to the 3.3V EV kit logic rail <b>2-3:</b> Connects VLOGIC to the 1.8V EV kit logic rail (V <sub>LOGIC</sub> connects to V <sub>IO</sub> through a 0Ω resistor)
J200	1-2	Use pin 2 to access the gate of the Q200 transient load MOSFET (LOADA).
J210	1-2	Use pin 2 to access the gate of the Q2 transient load MOSFET (LOADB).
J5	1-2	Use pin 2 to access the gate of the Q1 transient load MOSFET (LOADF).
J100	Open	Evaluation header. Do not connect shunts to J100.
J7 (critical)	1-2	<b>1-2:</b> Connects PHCFG0 to V <sub>DD</sub> (logic-high). <b>2-3:</b> Connects PHCFG0 to GND (logic-low). <b>OPEN:</b> PHCFG0 = OPEN (high-Z). Sets phase/channel configuration and I <sup>2</sup> C device address along with PHCFG1. Phase-connecting 0Ω resistors must populate to match selected configuration. See <a href="#">Table 2</a> .
J11 (critical)	1-2	<b>1-2:</b> Connects PHCFG1 to V <sub>DD</sub> (logic-high). <b>2-3:</b> Connects PHCFG1 to GND (logic-low). <b>OPEN:</b> PHCFG1 = OPEN (high-Z). Sets phase/channel configuration and I <sup>2</sup> C device address along with PHCFG0. Phase-connecting 0Ω resistors must populate to match selected configuration. See <a href="#">Table 2</a> .
J8	2-3	<b>1-2:</b> Connects GPIO1 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO1 to GND
J12	2-3	<b>1-2:</b> Connects GPIO2 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO2 to GND
J9	2-3	<b>1-2:</b> Connects GPIO3 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO3 to GND
J13	2-3	<b>1-2:</b> Connects GPIO4 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO4 to GND
J10	2-3	<b>1-2:</b> Connects GPIO5 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO5 to GND
J14	2-3	<b>1-2:</b> Connects GPIO6 to V <sub>IO</sub> <b>2-3:</b> Connects GPIO6 to GND
J6	2-3	<b>1-2:</b> Connects ENSEQ to SYS <b>2-3:</b> Connects ENSEQ to GND
J1 (critical)	1-2	<b>1-2:</b> Pulls nRSTIO up to V <sub>DD</sub> through R29. <b>2-3:</b> Pulls nRSTIO up to V <sub>LOGIC</sub> through R29. Do not leave open. R29 is a 100kΩ pullup. V <sub>LOGIC</sub> connects to V <sub>IO</sub> through a 0Ω resistor.



## EV Kit Default Configuration

Note that default  $V_{OUT}$  targets, LDO availability, and GPIO special function mapping depends on U1 ordering option. The following summary is true for U1 = MAX77711AEWB. Carefully check the bill of materials (BOM) and ordering slip to verify the defaults associated with each device under test (DUT). Contact the factory for help.

- $V_{IN}$  (SYS) = 2.3V to 10V
- 2 $\Phi$  + 1 $\Phi$  + 1 $\Phi$  phase/channel configuration. Buck 1 is dual-phase (6A), utilizing both L1 and L2. Buck 3 and buck 4 are single-phase (3A each).
- $V_{OUT1}$  = 0.7V,  $V_{OUT3}$  = 1.8V, and  $V_{OUT4}$  = 3.3V.  $V_{OUT2}$  is 1.2V, but buck 2 is not configured as a stand-alone channel by default. (Buck 1 is dual-phase, using both L1 and L2.)
- The 300mA LDO is available for evaluation (U1 is MAX77711).
- Each buck is in Turbo SKIP mode.
- Flexible power sequencer off (ENSEQ = 0).
- Device wake source is  $V_{IO}$  valid (from USB).
- GPIO1/2/3/4 map to buck 1/2/3/4 enable special functions, respectively. GPIO2 (buck 2 enable) is a *don't care* by default because buck 2 is not configured as a stand-alone channel by default.
- GPIO5 maps to LDO enable by default.
- GPIO6 maps to flexible power sequencer slot 12 (last slot) digital output. Use GPIO6 to signal sequence completion.

## Quick-Start

Follow this procedure to familiarize yourself with the EV kit.

### Required Equipment

- MAX77511/MAX77711 EV kit
- Windows-based PC
- Power supply (10V, 8A capability recommended but not required)
- Two digital voltmeter (DVM)
- Ammeter
- 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

This procedure is true for U1 = MAX77711AEWB. Carefully check the BOM and ordering slip to verify the default  $V_{OUTs}$  associated with the part number you are evaluating. Contact Maxim for help with this procedure.

- 1) Install GUI software. Visit the product webpage at [www.maximintegrated.com/MAX77711](http://www.maximintegrated.com/MAX77711) and navigate to *Design Resources* to download the latest version of the EV kit software. Save the EV kit software in a temporary folder and decompress the ZIP file. Run the .EXE file. Use the same software to evaluate either MAX77511 or MAX77711.
- 2) Install the EV kit shunts per [Table 1](#).
- 3) Ensure R38 0 $\Omega$  phase connecting resistor is installed. This resistor connects OUT1 to OUT2 for buck 1's dual-phase configuration.
- 4) Connect a DVM to the SYS and GND1 terminals to measure input voltage.
- 5) Connect a DVM to the OUT1 and GND2 terminals to measure buck 1's output voltage.
- 6) Connect a Micro-B USB cable between the EV kit's USB port (J102) and your Windows-based PC.
- 7) Apply a power supply set to 0V (100mA current limit) through an ammeter (10mA range) across the SYS and GND1 terminals of the EV kit. Turn the supply on and increase the voltage to 7.4V
- 8) Confirm that the ammeter connected in series with the power supply reads the expected standby supply current of the IC and EV kit (between 20 $\mu$ A and 60 $\mu$ A). At this point, no bucks should be on but the I<sup>2</sup>C serial interface is ready (standby state).
- 9) On your PC, 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.
- 10) Navigate to the **Status** control tab under **Global Resources**. Find the **Phase Configuration Status** and verify that it reads back **0x5 = (1,1) 2 $\Phi$  + 1 $\Phi$  + 1 $\Phi$** . If this field reads back anything else, then disable the power supply and go back and check steps 2 and 3 of this procedure.
- 11) Increase the power supply's current limit from 100mA to 1A or greater.

- 12) Change the series input ammeter’s range to 1A or greater.
- 13) Navigate to the **Buck 1** control tab under **Buck Configuration**. In **Buck1 Configuration A**, find the **Buck 1 Enable Control** field (controlling bitfield BEN1[3:0]). In the drop-down list, change this field to **0x1 = Forced Enabled** and click **Write**.
- 14) Confirm that the voltmeter connected to OUT1 reads 0.7V. At this point, only buck 1 (2Φ) should be on.
- 15) Confirm the input ammeter is reading the correct Turbo SKIP no-load supply current (approximately 350μA).
- 16) Locate jumper J6 (ENSEQ) and change its shunt position to pin 1-2. This activates the flexible power sequencer (FPS) and any resource assigned to it. Buck 3, buck 4, and LDO are assigned to the FPS by default when U1 = MAX77711AEWB.
- 17) Use either DVM to confirm OUT3 measures 1.8V. Confirm OUT4 measures 3.3V. Note that LDO requires a separate power input (between 1.25V and 5.5V) to INLDO to operate. (The LDO can not power from a 7.4V SYS.) Connect OUT4 (3.3V) to INLDO to quickly verify the LDOs output is 1.8V.

This concludes the Quick Start procedure. Users are now encouraged to explore the device and its register settings with the GUI. Reconfigure the EV kit’s phase configuration by consulting the [Phase Configuration Programming](#) section. See the [Software](#) section for more information about the GUI.

## Hardware

### Phase Configuration Programming

Carefully take the following three steps to configure the phase configuration of the EV kit:

- 1) While the EV kit is unpowered, configure the PHCFG1/0 pins (jumpers J7 and J11) in the desired positions to program the IC for a given phase configuration. See [Table 2](#).
- 2) Configure the 0Ω resistors on the EV kit (R38 through R44, and R49) for the phase configuration programmed in step 1. See [Table 2](#) and [Figure 5](#).
- 3) If multiphase configurations are formed, ensure that all inductors of the multiphase buck are the same value (0.47μH for RNGx = 0, 1.5μH for RNGx = 1).

Make sure the programmed configuration (PHCFG1 and PHCFG0) matches the 0Ω resistor configuration. Mismatch impairs EV kit function. Be aware that the load connecting 0Ω resistors (R41 through R44) can also short outputs together.

The IC evaluates PHCFG1/0 pin status when SYS is valid and the IC exits shutdown (V<sub>DD</sub> turns on). The decoded phase configuration latches until next shutdown/wake cycle. The device wakes from shutdown whenever V<sub>IO</sub> is valid or ENSEQ is logic high. See the MAX77511/MAX77711 data sheet (*Top-Level* section) for more information.

**Table 2. EV Kit Buck Phase Configuration**

PHCFG1 (J7)	PHCFG0 (J11)	PHASE (Φ) CONFIGURATION	R38	R39	R40	R49	R41 <sup>1</sup>	R42 <sup>1</sup>	R43 <sup>2</sup>	R44 <sup>2</sup>
0	0	4Φ (1 output)	0Ω	0Ω	0Ω	0Ω	0Ω	0Ω	0Ω	0Ω
0	1	3Φ + 1Φ (2 outputs)	0Ω	OPEN	OPEN	0Ω	0Ω	0Ω	0Ω in either, not both <sup>2</sup>	
0	OPEN	2Φ + 2Φ (2 outputs)	0Ω	OPEN	0Ω	OPEN	0Ω	0Ω	0Ω	0Ω
1	0	2Φ + 1Φ + 1Φ (3 outputs)	0Ω	OPEN	OPEN	OPEN	0Ω	0Ω	0Ω in either, not both <sup>2</sup>	
1	1									
1	OPEN	1Φ + 1Φ + 1Φ + 1Φ (4 outputs)	OPEN	OPEN	OPEN	OPEN	0Ω in either, not both <sup>1</sup>		0Ω in either, not both <sup>2</sup>	
OPEN	0									
OPEN	1									
OPEN	OPEN									

**Note 1:** Populating both R41 and R42 connects OUT1 to OUT2. Do not install both when buck 1 is single-phase.

**Note 2:** Populating both R43 and R44 connects OUT3 to OUT4. Do not install both when buck 4 is single-phase.

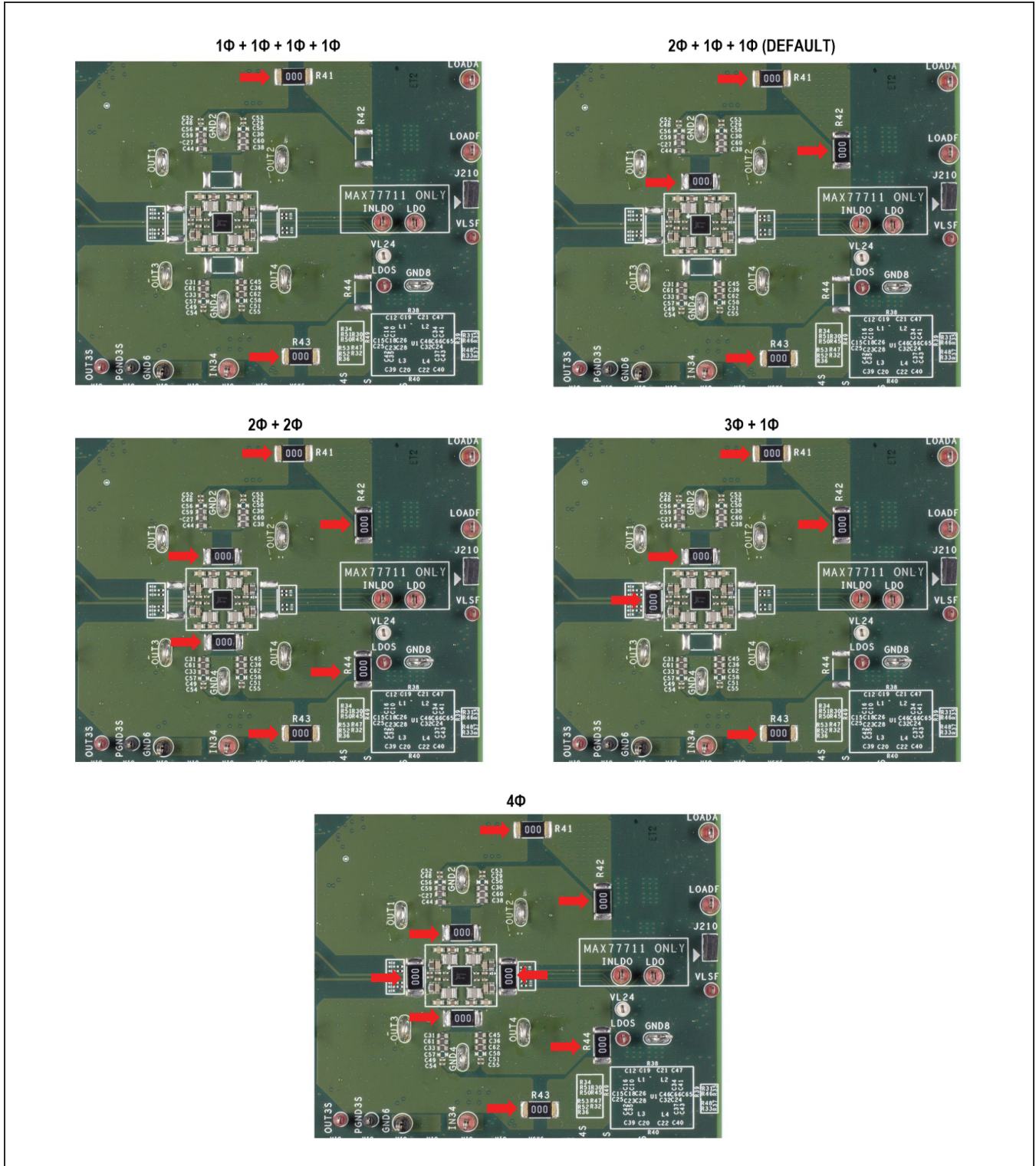


Figure 5. EV Kit 0Ω Installation for Different Phase Configurations

The buck feedback configuration is specific to the phase configuration. For example, a quad-phase (4Φ) buck regulates a single output voltage using every inductor (L1-L4) but only the SNS1+/SNS1- pins for feedback. (See [Table 3](#) for buck naming conventions.) Unused feedback pins should connect to ground in the final application schematic but may connect to the output voltage during EV kit evaluation with no consequence. See the [Buck Feedback Sense Location](#) section for more information.

Only the master buck I2C registers control the regulator in multiphase configurations. See [Table 3](#). For example, a 2Φ + 2Φ configuration utilizes L1 and L2 to create buck 1 (master 1) and L3 and L4 to create buck 3 (master 3). In this example, buck 2 and buck 4 are not configured as stand-alone channels. Register control fields for buck 2 and buck 4 are *don't care*.

Each inductor under a single buck's control must be the same value (0.47μH for RNGx = 0 and 1.5μH for RNGx = 1).

**Buck Feedback Configuration**

Buck feedback configuration is specific to the selected phase configuration. Each of the four bucks in the MAX77511/MAX77711 have differential feedback inputs (SNSx+ and SNSx-). Only the *master* buck feedback pins

need to connect to the output voltage to ensure regulation (see [Table 3](#)). Unused or slave phase feedback pins can connect to the output voltage during evaluation at no consequence.

For example, a 2Φ + 2Φ configuration creates buck 1 (using L1 and L2) and buck 3 (using L3 and L4). Buck 1's feedback is SNS1+ and SNS1-. Buck 3's feedback is SNS3+ and SNS3-. In this example, buck 2 and buck 4 are not configured as stand-alone channels. Therefore, SNS2+/SNS2- and SNS4+/SNS4- are *don't care* but can connect to their corresponding multiphase outputs with no consequence. Connect unused or slave phase feedback pins to ground in the final application schematic. Use EV kit 0Ω resistors R34 through R37 to strap positive sense inputs to ground for evaluation.

**Buck Feedback Sense Location**

The EV kit uses additional 0Ω resistors to modify the feedback routing between the IC and the output voltage sense location. In general, single-phase configurations should take feedback close to the corresponding output capacitor as close to the IC as possible (this is the default EV kit configuration). Optimize multiphase buck performance by changing the feedback routing using [Table 4](#).

**Table 3. Buck Output Naming Convention and Feedback**

PHASE (Φ) CONFIGURATION	NAMING CONVENTION AND PHASES USED	FEEDBACK INPUTS
4Φ	Buck 1 (4Φ) uses ALL (L1, L2, L3, L4)	SNS1±
3Φ + 1Φ	Buck 1 (3Φ) uses L1, L2, L3	SNS1±
	Buck 4 (1Φ) uses L4	SNS4±
2Φ + 2Φ	Buck 1 (2Φ) uses L1, L2	SNS1±
	Buck 3 (2Φ) uses L3, L4	SNS3±
2Φ + 1Φ + 1Φ	Buck 1 (2Φ) uses L1, L2	SNS1±
	Buck 3 (1Φ) uses L3	SNS3±
	Buck 4 (1Φ) uses L4	SNS4±
1Φ + 1Φ + 1Φ + 1Φ	Buck 1 (1Φ) uses L1	SNS1±
	Buck 2 (1Φ) uses L2	SNS2±
	Buck 3 (1Φ) uses L3	SNS3±
	Buck 4 (1Φ) uses L4	SNS4±



Buck 2 and buck 4 can only be configured as single-phase bucks (see Table 3 for convention). Therefore, the only useful feedback routing option for buck 2 and 4 is to the corresponding buck's nearest output capacitor. Buck 2 uses resistors R31 and R46 to route feedback. Buck 4 uses R33 and R48.

**On-Board Transient Loads**

The EV kit includes three on-board transient loads (Figure 6). Two high current loads (LOADA and LOADB) support 6A each. One fine current load (LOADF) supports 150mA for evaluating the LDO.

The 0Ω resistors R41 and R42 connect OUT1 and OUT2 to LOADA, respectively. The 0Ω resistors R43 and R44 connect OUT3 and OUT4 to LOADB, respectively. Be aware that R41 through R44 may connect the various buck outputs together.

Use LOADF by connecting a test lead between the LOADF test point and the desired regulator output.

The on-board transient loads can be used to generate fast load transients. Remove the jumper of the desired MOSFET gate (J200, J5, or J210) and connect a function generator output between pin 2 and GND (pin 1 is unused). To start, drive the gate of the MOSFET with a manually triggered 250µs pulse from 0V to 2.2V. Adjust the voltage levels of the pulse to change the load transient current levels. Adjust the slew rate of the function generator to change the rising and falling edges of the pulse. Manual pulsing is recommended to reduce heat accumulating in the load circuit and prevent damage. If a pulse train is required, ensure that the frequency, duty cycle, and transient levels keep the average current at or below 1A. Use the VLSA or VLSB test points on the EV kit to convert the load transient current into a voltage across the 0.1Ω sense resistor.

**Table 4. Multiphase Buck Feedback Recommended Routing**

MULTIPHASE BUCK	PHASE CONFIGURATION	INSTALL FEEDBACK ROUTING RESISTORS
Buck 1	4Φ	R30, R45
	3Φ	R30, R45
	2Φ	R51, R50
	1Φ	R30, R45
Buck 3	2Φ	R52, R53
	1Φ	R32, R47

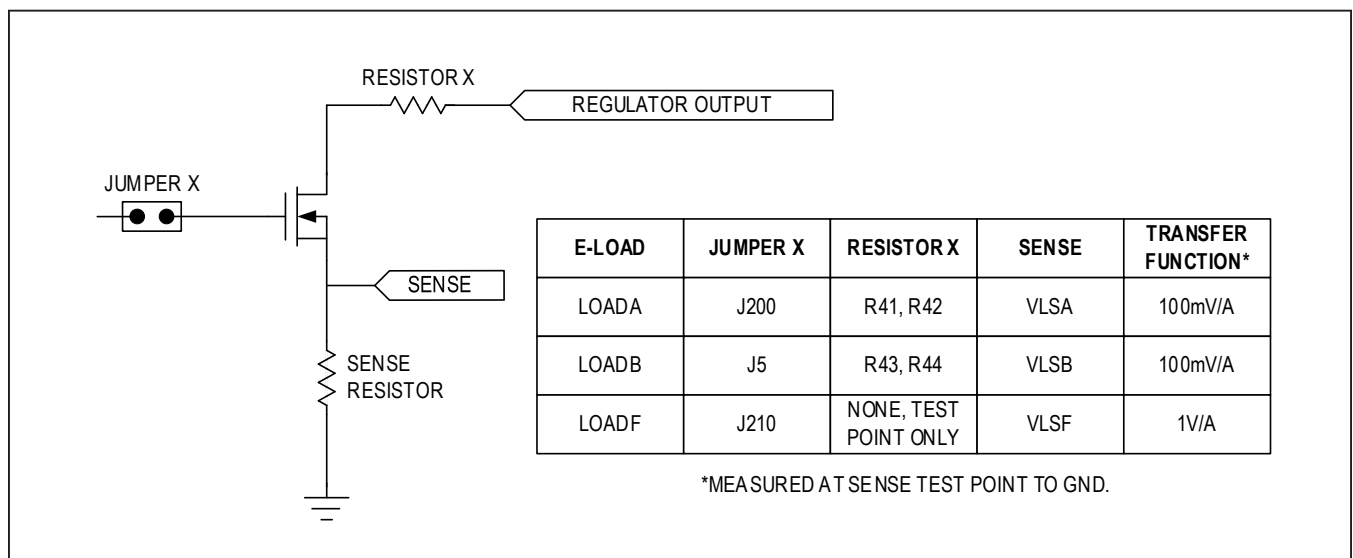


Figure 6. Transient Load Simplified Diagram



### Software

The graphical user interface (GUI) software allows for quick, easy, and thorough evaluation of the MAX77511/MAX77711. The GUI drives I<sup>2</sup>C communication with the EV kit. Every control in the GUI corresponds directly to a register within the MAX77511/MAX77711. Refer to the *Register Map* section of the MAX77511/MAX77711 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/MAX77711evkit](http://www.maximintegrated.com/MAX77711evkit) and navigate to *Design Resources* to download the latest version of the EV kit software.

Use the same software to evaluate either MAX77511 or MAX77711. 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.

### 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.

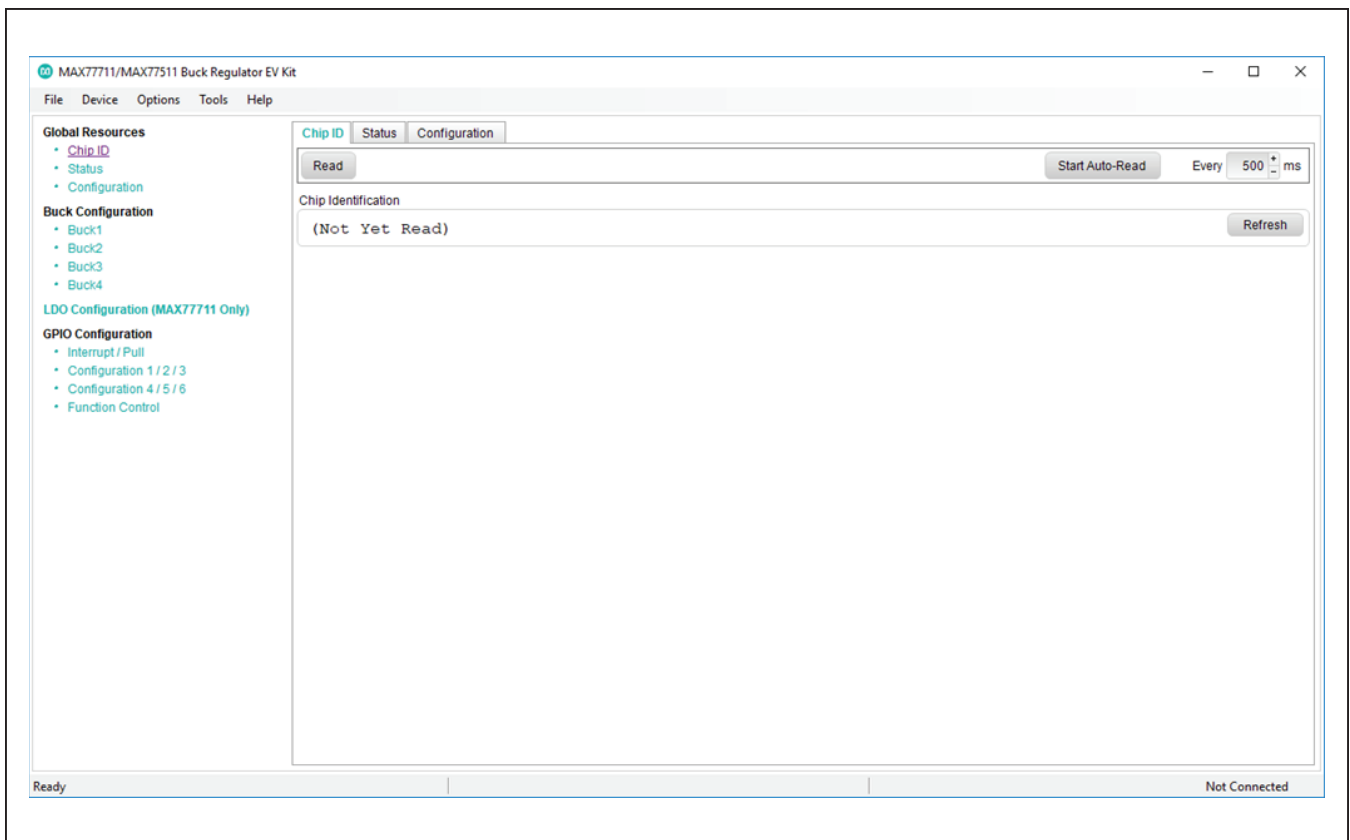


Figure 7. MAX77511/MAX77711 EV Kit GUI Interface

The **Synchronize** menu opens (Figure 8) once the IC responds (SYS and V<sub>IO</sub> must be valid 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 ICs I<sup>2</sup>C 8-bit device write address. Address shown changes depending on device phase configuration (status of PHCFG1/0 pins). See Table 5.

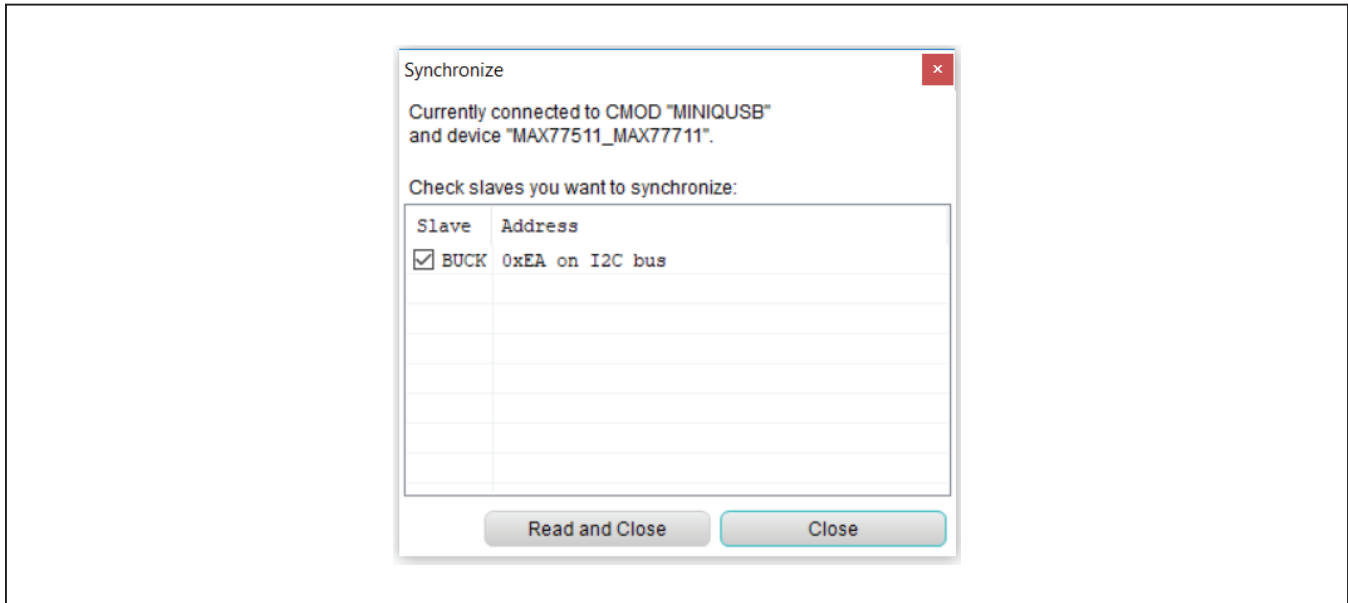


Figure 8. EV Kit GUI Window after “Connecting”

Table 5. I<sup>2</sup>C Address Selection

[PHCFG1, PHCFG0]	PHASE (Φ) CONFIGURATION	7-BIT SLAVE ADDRESS	8-BIT WRITE ADDRESS	8-BIT READ ADDRESS
[0, 0]	4Φ	0x71 0b 111 0001	0xE2 0b 1110 0010	0xE3 0b 1110 0011
[0, 1]	3Φ + 1Φ	0x72 0b 111 0010	0xE4 0b 1110 0100	0xE5 0b 1110 0101
[0, OPEN]	2Φ + 2Φ	0x73 0b 111 0011	0xE6 0b 1110 0110	0xE7 0b 1110 0111
[1, 0]	2Φ + 1Φ + 1Φ	0x74 0b 111 0100	0xE8 0b 1110 1000	0xE9 0b 1110 1001
[1, 1]	2Φ + 1Φ + 1Φ	0x75 0b 111 0101	0xEA 0b 1110 1010	0xEB 0b 1110 1011
[1, OPEN]	1Φ + 1Φ + 1Φ + 1Φ	0x76 0b 111 0110	0xEC 0b 1110 1100	0xED 0b 1110 1101
[OPEN, 0]	1Φ + 1Φ + 1Φ + 1Φ	0x77 0b 111 0111	0xEE 0b 1110 1110	0xEF 0b 1110 1111
[OPEN, 1]	1Φ + 1Φ + 1Φ + 1Φ	0x4E 0b 100 1110	0x9C 0b 1001 1100	0x9D 0b 1001 1101
[OPEN, OPEN]	1Φ + 1Φ + 1Φ + 1Φ	0x4F 0b 100 1111	0x9E 0b 1001 1110	0x9F 0b 1001 1111

### Global Status

The **Status** tab displays high-level information about the IC. Check the **Phase Configuration Status** field on this tab after applying power to the EV kit and synchronizing registers to verify that the buck converter is configured in the intended phase configuration for evaluation. Mismatch between the ICs programmed phase

configuration (PHCFG1/0 pins) and the PCBs 0Ω resistor configuration impairs EV kit function. See the [Phase Configuration Programming](#) section for more information.

Periodically check the **Status** tab during evaluation to monitor interrupts, fault status, GPIO status, and buck POK. (See [Figure 9.](#))

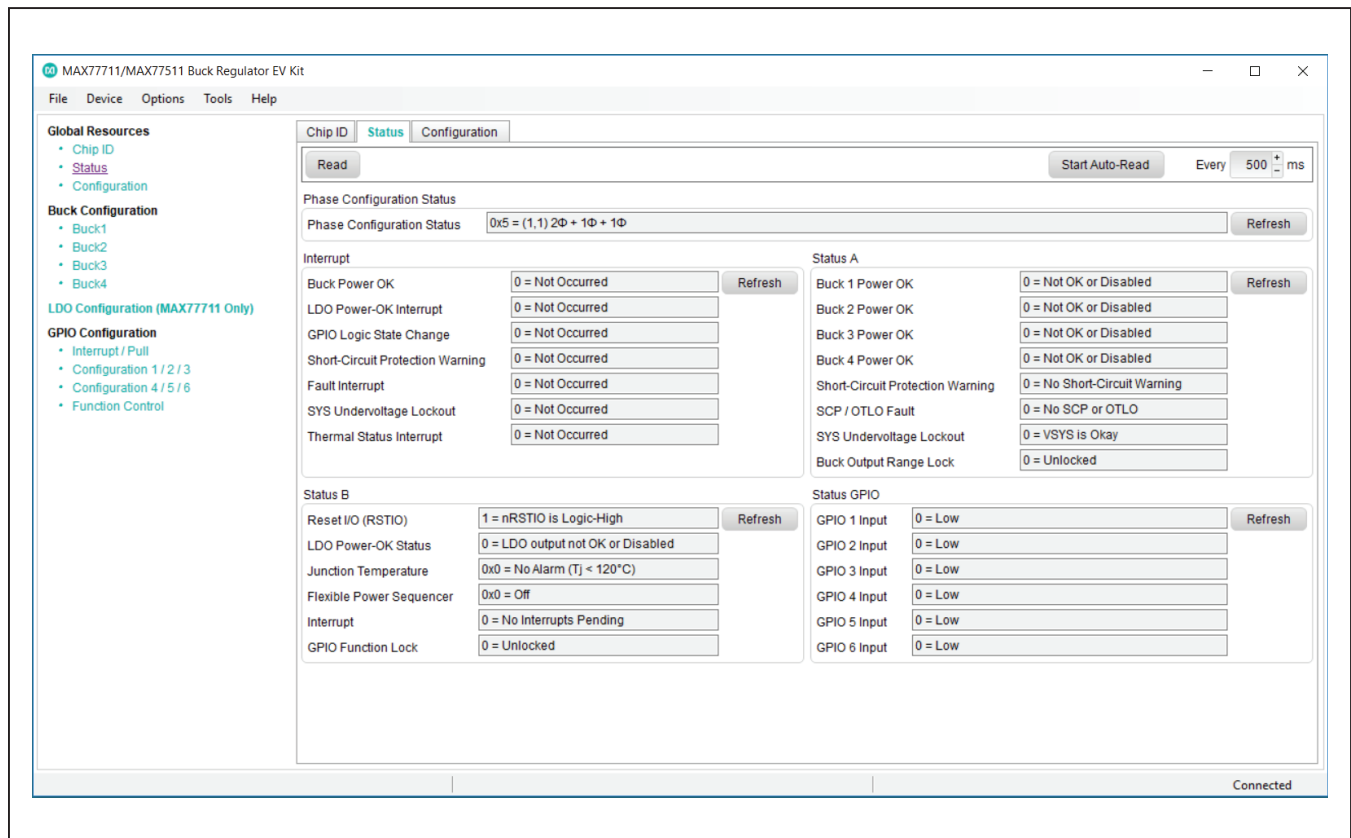


Figure 9. EV Kit GUI Status Tab

### Configuring the Buck Converter

The **Buck Configuration** section shows control tabs for each buck regulator. Use these tabs to control buck mode, enable, output voltage, peak current limit, soft-start, soft-stop, DVS, active-discharge, and spread-spectrum. Refer to the MAX77511/MAX77711 device data sheet and see [Figure 10](#) for more information.

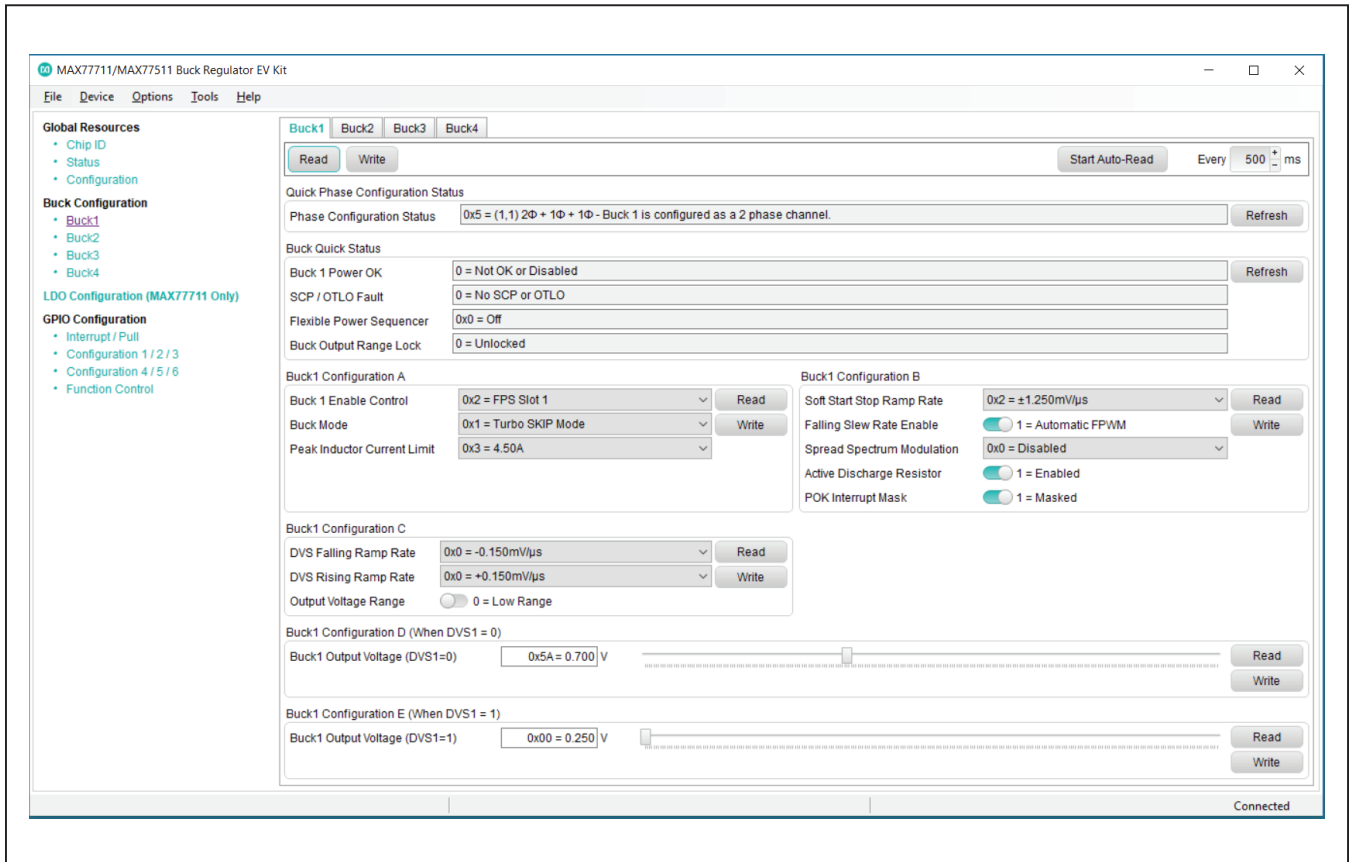


Figure 10. EV Kit GUI Buck Control Tab

The availability of buck controls depends on the ICs phase configuration. If a buck is not configured as a stand-alone channel, then its register controls are *don't care*. The GUI indicates this with a status message and greying out unused control fields. See [Figure 11](#).

See [Table 3](#) to familiarize yourself with the ICs buck naming convention.

### Enabling and Disabling the Buck Converter

Enable the buck converter by navigating to the **Buck x Configuration A** section in any **Buck Configuration** tab.

Find the **Buck x Enable Control** and use the drop-down to accomplish one of the following actions:

- 1) Disable the buck converter (**0x0 = Disabled**). The buck can still enable through a GPIO mapped as a buck enable (BENx) special function.
- 2) Enable the buck converter (**0x1 = Enabled**).
- 3) Assign the buck to the flexible power sequencer (i.e., **0x2 = FPS Slot 1**). Use the ENSEQ pin (jumper J6) to activate/deactivate the sequencer.

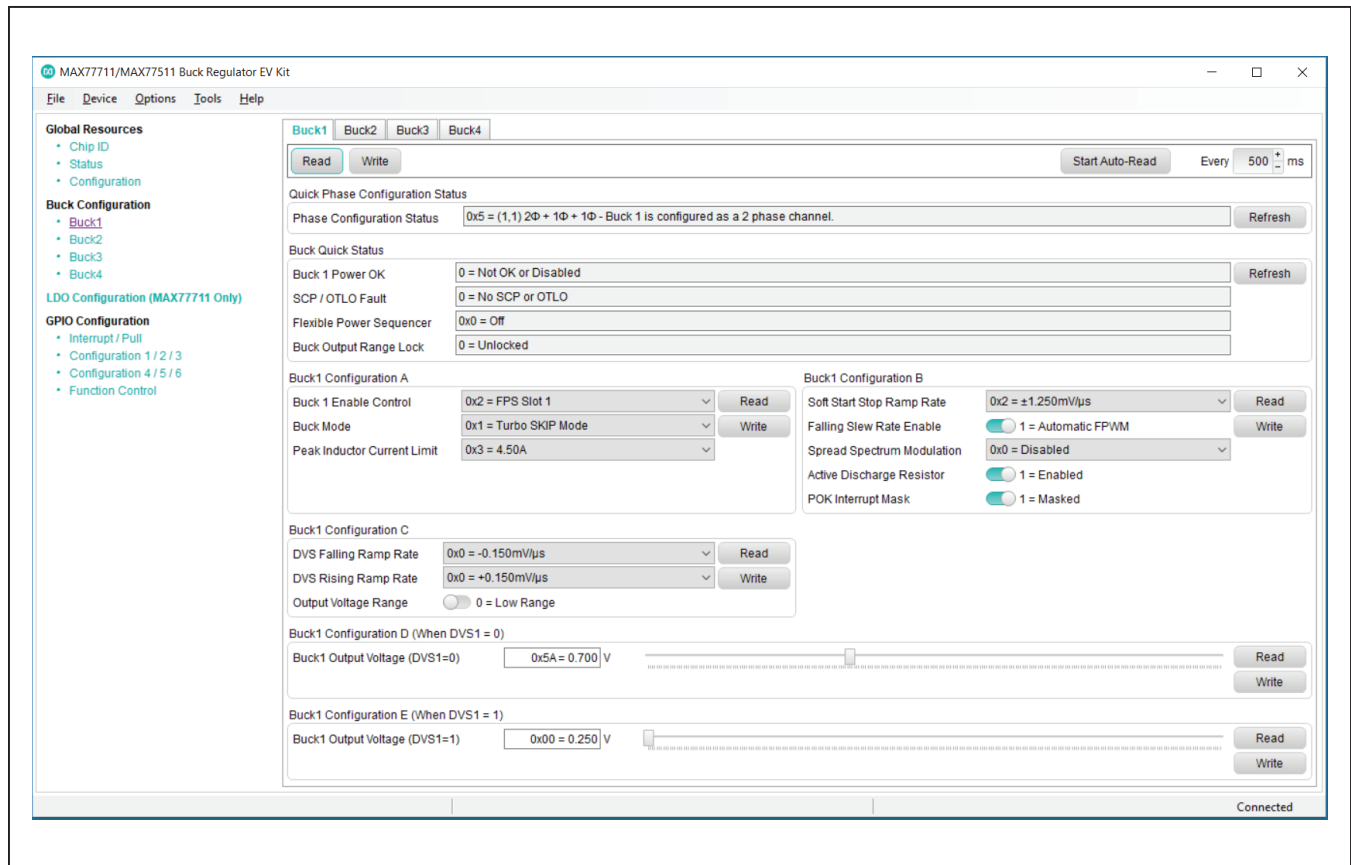


Figure 11. GUI Indicating Buck Registers are Don't Care



### Setting the Buck Output Voltage

Set the buck output voltage by navigating to the **Buck x Configuration D** section in any **Buck Configuration** tab. Find the **Buck x Output Voltage** field and use the slide control to pick the output voltage and hit the 'Write' button to send the command.

Note that the **Buck x Configuration E** field looks very similar. This field controls the output voltage when a GPIO is configured as a DVS input and is logic high (1). When no GPIO is mapped to a DVS input, then DVS = 0 always and **Buck x Configuration D** controls the  $V_{OUT}$  target.

### LDO Control (MAX77711 Only)

The **LDO Configuration (MAX77711 Only)** tab is available when evaluating the MAX77711. Do not modify these registers when using the MAX77511.

In the **LDO Config A** tab, find the **LDO Enable/Mode Control** and use the drop-down to accomplish one of the following actions:

- 1) Disable the LDO (**0x0 = Disabled**). The LDO can still enable through a GPIO mapped as an LDO enable (LDOEN) special function.
- 2) Enable the LDO (**0x1 = Enabled**).
- 3) Assign the LDO to the flexible power sequencer (**i.e., 0x5 = FPS Slot 4**). Use the ENSEQ pin (jumper J6) to activate/deactivate the sequencer.

Set the LDO output voltage with the **LDO Configuration B** section. Use the **LDO Target Regulation Voltage** slide control to pick the output voltage and hit the 'Write' button to send the command.

### GPIO Control

Refer to the device data sheet for full descriptions of the GPIO and their control registers. The GUI has four tabs: **Interrupt/Pull**, **Configuration 1/2/3**, **Configuration 4/5/6**, and **Function Control**.

- Use the **Interrupt/Pull** tab to configure the pullup/pulldown resistors for the GPIO or read interrupts.
- Use the **Configuration 1/2/3** and **Configuration 4/5/6** tabs to configure:
  - Drive Type (open-drain or push-pull)
  - Direction (input or output)
  - Debounce Timer
  - Interrupt (rising edge, falling edge, or both edges)
  - Data Value (when configured as a general purpose output)
- Use the **Function Control** tab to configure the functionality of each GPIO. Each GPIO is mappable to special buck or LDO control functions. Refer to the device data sheet for the default GPIO function map associated with each part number. The default function map for MAX77711AEWB is given in [Table 6](#).

**Table 6. MAX77711AEWB Default GPIO Function Map**

GPIO1	Buck 1 Enable Input with Pulldown, No Debounce, No Interrupt
GPIO2	Buck 2 Enable Input with Pulldown, No Debounce, No Interrupt
GPIO3	Buck 3 Enable Input with Pulldown, No Debounce, No Interrupt
GPIO4	Buck 4 Enable Input with Pulldown, No Debounce, No Interrupt
GPIO5	LDO Enable Input with Pulldown, No Debounce, No Interrupt
GPIO6	Flexible Power Sequencer Open-Drain Digital Output (Slot 12)

**Note:** GPIO function map can be reprogrammed through I<sup>2</sup>C (if GPIOLOCK = 0).

### Ordering Information

PART NUMBER	U1 IC	DEFAULT PHASE CONFIGURATION
MAX77711AEVKIT#	MAX77711AEWB+	2Φ+1Φ+1Φ

+Denotes a lead(Pb)-free/RoHS-compliant package.

## MAX77511/MAX77711 EV Kit Bill of Materials

REF_DES	QTY*	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
U1	1	MAX77511/MAX77711 <i>(see Ordering Information)</i>	MAXIM	VARIES	EVKIT PART-IC; 10V INPUT QUAD PHASE CONFIGURABLE 3A PHASE HIGH EFFICIENCY BUCK REGULATOR; PACKAGE OUTLINE 21-100211; PACKAGE CODE W643D3+1
L1, L2	2	DFE252012F-R47M	MURATA	0.47UH	INDUCTOR; SMT (1008); METAL; 0.47UH; 20%; 6.7A
L3, L4	2	DFE252012F-1R5M	MURATA	1.5UH	INDUCTOR; SMT (1008); SHIELDED; 1.5UH; 20%; 3.8A
C10, C12, C34, C35, C37, C39, C40, C47	8	GRM188R60J476ME15	MURATA	47UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 47UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
R26, R27, R38, R41-R43	6	CRCW25120000ZS	VISHAY DALE	0	RESISTOR; 2512; 0 OHM; 1%; JUMPER; 1.0W; METAL FILM
R39, R40, R44, R49	0	N/A	N/A	OPEN	RES; SMT (2512); OPEN (USE ADDITIONAL CRCW25120000ZS TO EVALUATE MULTIPHASE CONFIGURATIONS)
C13, C14, C206	3	ANY	ANY	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 6.3V; TOL=20%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R ; FORMFACTOR
C15	1	ANY	ANY	0.1UF	CAPACITOR; SMT; 0402; CERAMIC; 0.1uF; 10V; 10%; X5R; -55degC to +125degC; 0 +/-30PPM/degC; FORMFACTOR ;
C16, C27, C30, C31, C33, C36, C38, C41-C45, C59-C62	16	ANY	ANY	22UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 22UF; 10V; TOL=20%; MODEL=CL SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
C18, C24	2	ANY	ANY	2.2UF	CAPACITOR; SMT (0402); CERAMIC; 2.2UF; 6.3V; TOL=[10%]; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R
C19-C22	4	ANY	ANY	10UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 10UF; 16V; TOL=20%; MODEL=GRM SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
C23	1	GRM155R61A106ME44	MURATA	10UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 10V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R;
C25	1	ANY	ANY	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 16V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
C26, C28, C32, C46, C52-C55, C67	9	ANY	ANY	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R-
C29, C48, C49, C51	4	ANY	ANY	0.01UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 16V; TOL=10%; MODEL=CHIP MONOLITHIC CERAMIC CAPACITOR; TG=-55 DEGC TO +85 DEGC; TC=X7R; FORMFACTOR
C63, C64	2	EMK325ABJ107MM	TAIYO YUDEN	100UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 100UF; 16V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R

## MAX77511/MAX77711 EV Kit Bill of Materials (continued)

REF_DES	QTY*	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
C65	1	GRM155R60J475ME87; GRM153R60J475ME15	MURATA; MURATA	4.7UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 4.7UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C66	1	GRM155R60J106ME44; GRM155R60J106ME47; C1005X5R0J106M050BC; CL05A106MQ5NUN; C0402C106M9PAC	MURATA; MURATA; TDK; SAMSUNG ELECTRONICS; KEMET	10UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C108, C135, C150, C151, C155-C157, C159	8	ANY	ANY	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; MODEL=CGA SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R; FORMFACTOR
C110-C113, C115, C118, C120, C158	8	ANY	ANY	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 6.3V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R;
C114	1	ANY	ANY	0.47UF	CAPACITOR; SMT; 0603; CERAMIC; 0.47uF; 10V; 10%; X5R; -55degC to + 125degC, ; FORMFACTOR
C152, C153	2	C0402COG500-150JNP; GRM1555C1H150JA01; GCM1555C1H150JA16	VENKEL LTD.; MURATA; MURATA	15PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 15PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=COG
C154	1	ANY	ANY	4.7UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 4.7UF; 10V; TOL=20%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
D100, D101	2	LTST-C190YKT	LITE-ON ELECTRONICS INC.	LTST-C190YKT	DIODE; LED; STANDARD; YELLOW; SMT (0603); PIV=5.0V; IF=0.02A; -55 DEGC TO +85 DEGC
D102, D103	2	LTST-C190CKT	LITE-ON ELECTRONICS INC.	LTST-C190CKT	DIODE; LED; STANDARD; RED; SMT (0603); PIV=5.0V; IF=0.04A; -55 DEGC TO +85 DEGC
FB100	1	BLM18PG221SN1	MURATA	220	INDUCTOR; SMT (0603); FERRITE-BEAD; 220; TOL=+/-25%; 1.4A; -55 DEGC TO +125 DEGC
GND5, GND6	2	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
GND7, GND8	2	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
IN12, IN34, INLDO, LDO, LOADA, LOADB, LOADF	7	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
IN12S, IN34S, LDOS, OUT1S- OUT4S, VDD, VIO, VLSA, VLSB, VLSF	12	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;
J1, J6-J14	10	PEC03SAAN	SULLINS ELECTRONICS CORP.	PEC03SAAN	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC;

## MAX77511/MAX77711 EV Kit Bill of Materials (continued)

REF_DES	QTY*	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
J5, J200, J210	3	TSW-102-07-T-S	SAMTEC	TSW-102-07-T-S	CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 2PINS; -55 DEGC TO +105 DEGC
J100	1	PBC06SAAN	SULLINS ELECTRONICS CORP.	PBC06SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 6PINS; -65 DEGC TO +125 DEGC
J101	1	PBC03SABN	SULLINS	PBC03SABN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
J102	1	10118193-0001LF	FCI CONNECT	10118193-0001LF	CONNECTOR; FEMALE; SMT; MICRO USB B TYPE RECEPTACLE; RIGHT ANGLE; 5PINS
PGND1S-PGND4S	4	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;
Q1, Q200	2	IRFR8314TRPBF	INTERNATIONAL RECTIFIER	IRFR8314TRPBF	TRAN; HEXFET POWER MOSFET; NCH; DPAK; PD-(125W); I-(179A); V-(30V)
Q2	1	DMG3420U	DIODES INCORPORATED	DMG3420U	TRAN; N-CHANNEL ENHANCEMENT MODE MOSFET; NCH; SOT-23; PD-(0.74W); I-(5.47A); V-(20V)
R1, R24	2	WSR5R1000F	VISHAY DALE	0.1	RES; SMT (4527); 0.1; 1%; +/-75PPM/DEGC; 5W
R18, R19, R206	3	CRCW04021M00FK	VISHAY DALE	1M	RESISTOR; 0402; 1M; 1%; 100PPM; 0.0625W; THICK FILM
R25	1	CSR1206FT1R00	STACKPOLE ELECTRONICS INC.	1	RESISTOR; 1206; 1 OHM; 1%; 100PPM; 0.5W; THICK FILM
R100, R118	2	ANY	ANY	4.7K	RESISTOR, 0402, 4.7K OHM, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR
R103, R123	2	ANY	ANY	22	RESISTOR, 0402, 22 OHM, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR
R107, R108	2	ANY	ANY	2.2K	RESISTOR, 0402, 2.2K OHM, 1%, 100PPM, 0.0625W, THICK FILM; FORMFACTOR
R109, R111	2	ANY	ANY	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR
R110, R117	2	CRCW0402470RFK	VISHAY DALE	470	RESISTOR, 0402, 470 OHM, 1%, 100PPM, 0.0625W, THICK FILM
R29, R115, R157, R159, R161, R113	6	CRCW0402100KFK; RC0402FR-07100KL	VISHAY; YAGEO	100K	RESISTOR;0402;100K;1%;100PPM;0.0625W;THICKFILM
R114	1	CRCW040210K0FK; RC0402FR-0710KL	VISHAY DALE; YAGEO PHICOMP	10K	RESISTOR; 0402; 10K; 1%; 100PPM; 0.0625W; THICK FILM
R28, R30-R33, R45-R48, R116, R135, R136, R140, R143, R148, R155, R162-R164, R166	20	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM
R122	1	ANY	ANY	1M	RESISTOR; 0603; 1M; 1%; 100PPM; 0.10W; THICK FILM; FORMFACTOR
R142	1	CRCW06030000Z0	VISHAY DALE	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM

## MAX77511/MAX77711 EV Kit Bill of Materials (continued)

REF_DES	QTY*	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
R156	1	CRCW0402105KFK	VISHAY DALE	105K	RESISTOR; 0402; 105K OHM; 1%; 100PPM; 0.063W ; THICK FILM
R158	1	CRCW0402169KFK	VISHAY DALE	169K	RESISTOR; 0402; 169K OHM; 1%; 100PPM; 0.063W; THICK FILM
R160	1	CRCW04024752FK; 9C04021A4752FLHF3; CRCW040247K5FK	VISHAY DALE; YAGEO; VISHAY DALE	47.5K	RESISTOR; 0402; 47.5K; 1%; 100PPM; 0.0625W; THICK FILM
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	MAX8512E XK	IC, VREG, Ultra-Low-Noise, High PSRR, Adjustable Vout, SC70-5
U107	1	MAX3395EETC+	MAXIM	MAX3395E ETC	IC; TRANS; 15KV ESD-PROTECTED HIGH-DRIVE CURRENT QUAD-LEVEL TRANSLATOR WITH SPEED-UP CIRCUITRY; TQFN12 4X4
U108	1	24AA02T-I/OT	MICROCHIP	24AA02T-I/OT	IC; EPROM; 2K I2C SERIAL EEPROM; SOT23-5
Y101	1	CX3225SB16000D0FLJZZ	KYOCERA-KINSEKI	16MHZ	CRYSTAL; SMT (3225) 3.2X2.5; 8PF; 16MHZ; +/-10PPM; +/-15PPM
C1, C2, C200	0	GRM155R71E472KA01	MURATA	4700PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 4700PF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
C3, C4, C201	0	N/A	N/A	1000PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL=10%; MODEL=COG; TG=-55 DEGC TO +125 DEGC; TC=+; FORMFACTOR
C5, C6, C202, C228-C230	0	N/A	N/A	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 25V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R; FORMFACTOR
C7-C9, C11, C204, C205	0	ECJ-0EB1H101K; CC0402KRX7R9BB101	PANASONIC; YAGEO PHYCOMP	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=10%; MODEL=ECJ SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R
C17	0	594D337X0016R2	VISHAY SPRAGUE	330UF	CAPACITOR; SMT (CASE_R); TANTALUM CHIP; 330UF; 16V; TOL=20%; TG=-55 DEGC TO +125 DEGC; LOW ESR
R2, R3, R200	0	CRCW040220K0FK	VISHAY DALE	20K	RESISTOR; 0402; 20K OHM; 1%; 100PPM; 0.063W; THICK FILM
R4, R5, R201	0	CRCW0402100RFK; 9C04021A1000FL; RC0402FR-07100RL	VISHAY DALE;PANASONIC; YAGEO PHYCOMP	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.063W; THICK FILM
R6, R7, R202	0	CRCW0402680RFK; RC0402FR-07680RL	VISHAY DALE;YAGEO PHICOMP	680	RESISTOR, 0402, 680 OHM, 1%, 100PPM, 0.0625W, THICK FILM
R8, R10, R204, R205	0	CRCW04024K02FK; ERJ-2RKF4021	VISHAY DALE;PANASONIC	4.02K	RESISTOR; 0402; 4.02K; 1%; 100PPM; 0.0625W; THICK FILM
R9, R11	0	CRCW040276K8FK	VISHAY DALE	76.8K	RESISTOR; 0402; 76.8K OHM; 1%; 100PPM; 0.063W; THICK FILM
R12, R13, R203, R260, R261	0	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM

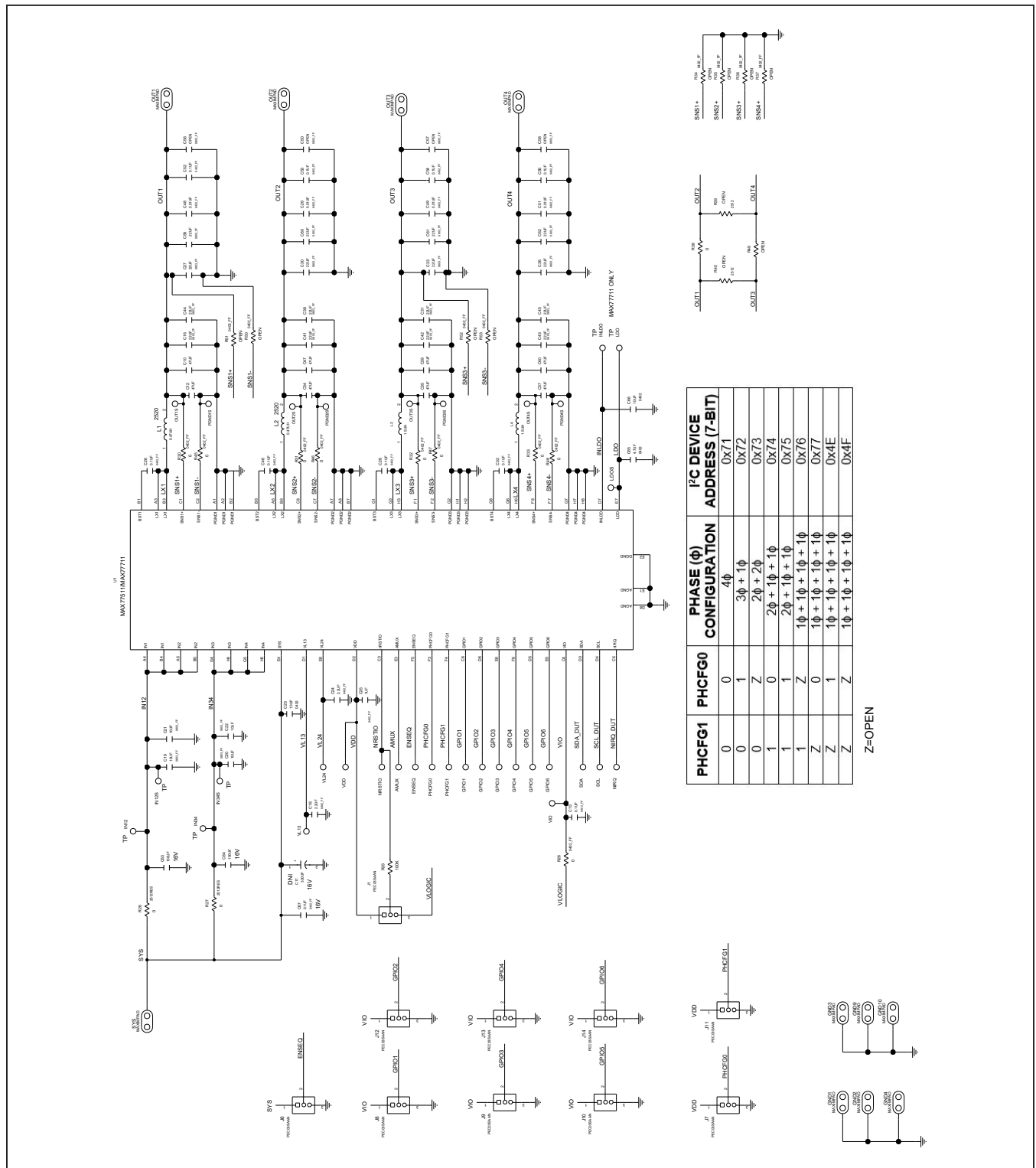


## MAX77511/MAX77711 EV Kit Bill of Materials (continued)

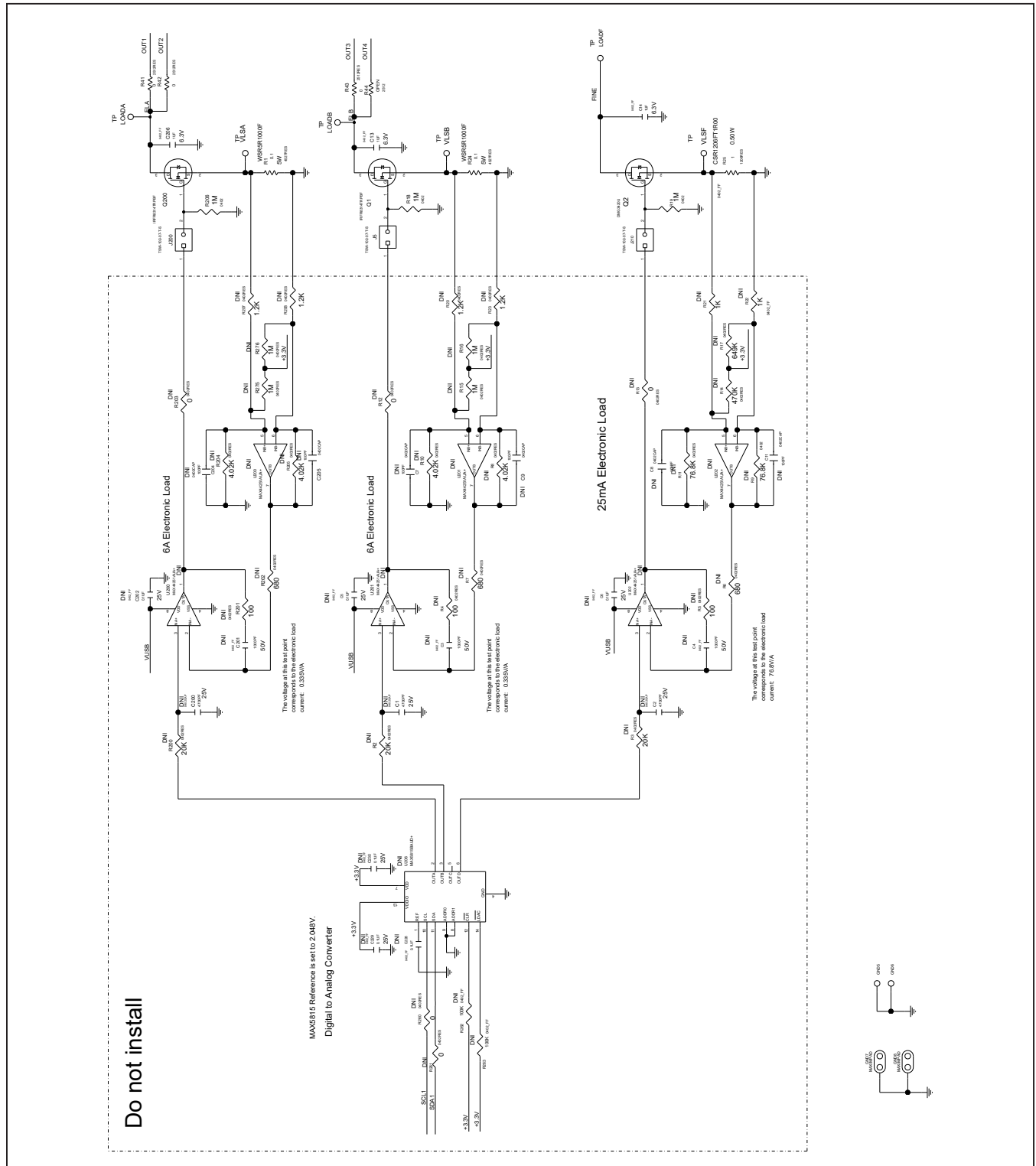
REF_DES	QTY*	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
R14	0	ERJ-2RKF4703	PANASONIC	470K	RESISTOR, 0402, 470K OHM, 1%, 100PPM, 0.0625W, THICK FILM
R15, R16, R275, R276	0	ERJ-2RKF1004	PANASONIC	1M	RESISTOR; 0402; 1M OHM;1%; 100PPM; 0.10W; THICK FILM
R17	0	CRCW0402649KFK	VISHAY DALE	649K	RESISTOR; 0402; 649K OHM; 1%; 100PPM; 0.063W; THICK FILM
R20, R23, R207, R208	0	CRCW04021K20FK; 9C04021A1201LF; MCR01MZPF1201	VISHAY DALE; VISHAY DALE; ROHM SEMICONDUCTOR	1.2K	RESISTOR; 0402; 1.2K; 1%; 100PPM; 0.0625W; THICK FILM
R21, R22	0	N/A	N/A	1K	RESISTOR; 0402; 1K; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR
R262, R263	0	N/A	N/A	100K	RESISTOR; 0402; 100K; 1%; 100PPM; 0.0625W; THICK FILM; FORMFACTOR
U200-U202	0	MAX44251AUA+	MAXIM	MAX44251A UA+	IC; OPAMP; ULTRA-PRECISION; LOW-NOISE OP AMP; UMAX8
U206	0	MAX5815BAUD+	MAXIM	MAX5815B AUD+	IC; DAC; ULTRA-SMALL; QUAD-CHANNEL; 12-BIT BUFFERED OUTPUT DACS WITH INTERNAL REFERENCE AND I2C INTERFACE; TSSOP14
C50, C56-C58	0	N/A	N/A	OPEN	CAPACITOR; SMT (0603); OPEN; FORMFACTOR
C129, C134	0	N/A	N/A	OPEN	CAPACITOR; SMT (0402); OPEN; FORMFACTOR
R34-R37, R50-R53, R165	0	N/A	N/A	OPEN	RESISTOR; 0402; OPEN; FORMFACTOR

\*If QTY = 0, then DNI (do not install).

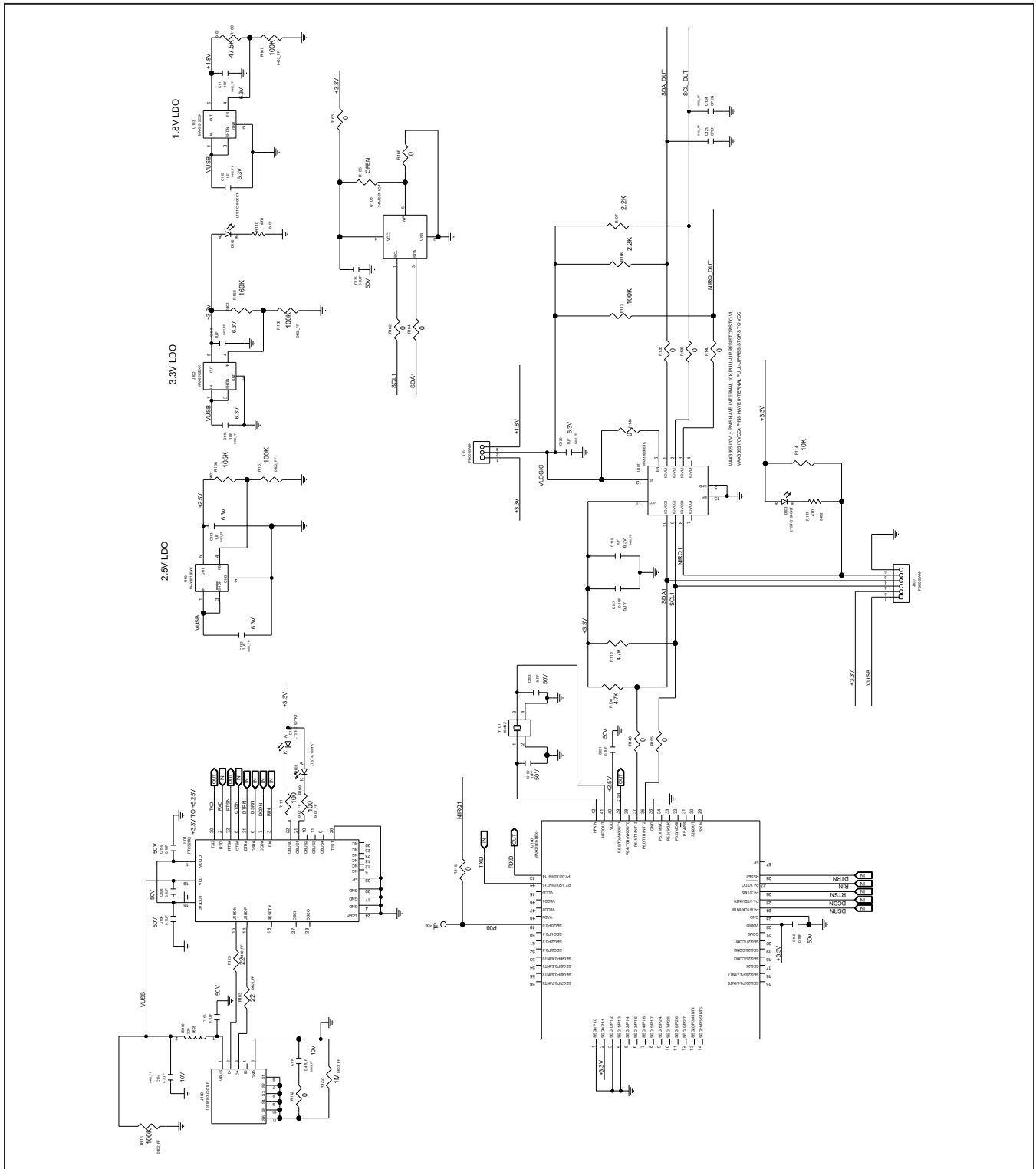
MAX77511/MAX77711 EV Kit Schematic



MAX77511/MAX77711 EV Kit Schematic (continued)



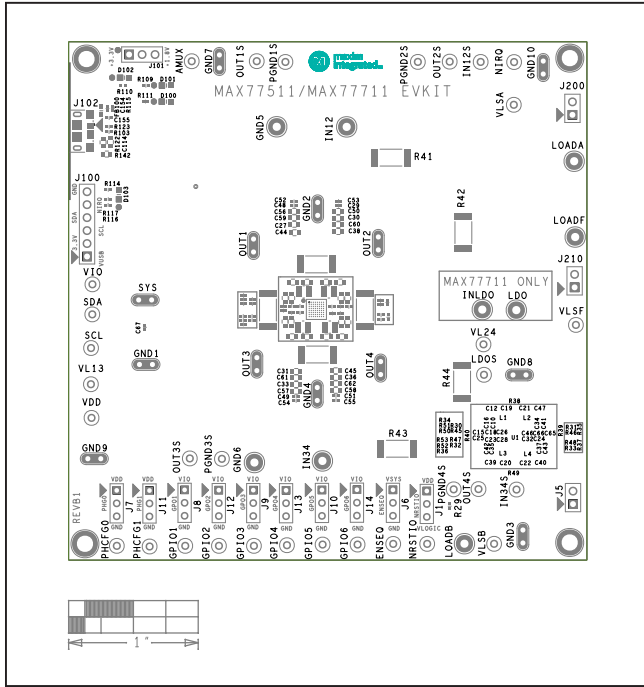
MAX77511/MAX77711 EV Kit Schematic (continued)



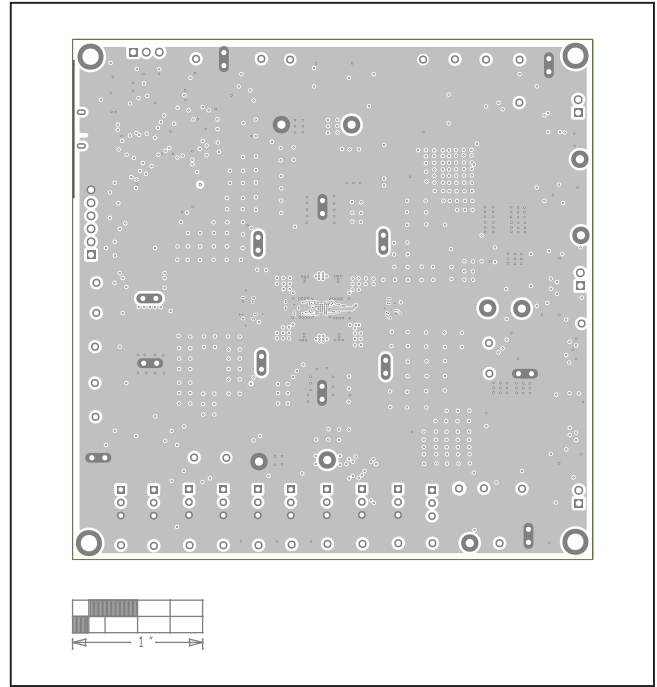
# MAX77511/MAX77711 Evaluation Kit

Evaluates: MAX77511/MAX77711

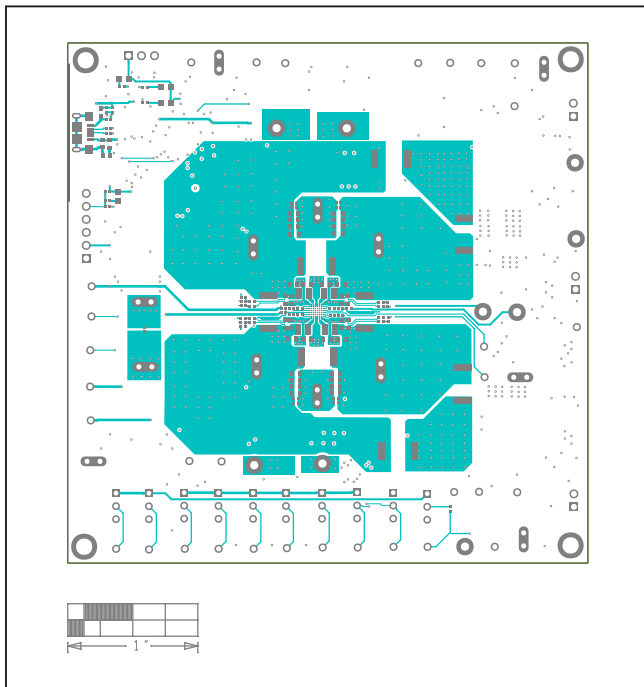
## MAX77511/MAX77711 EV Kit PCB Layout



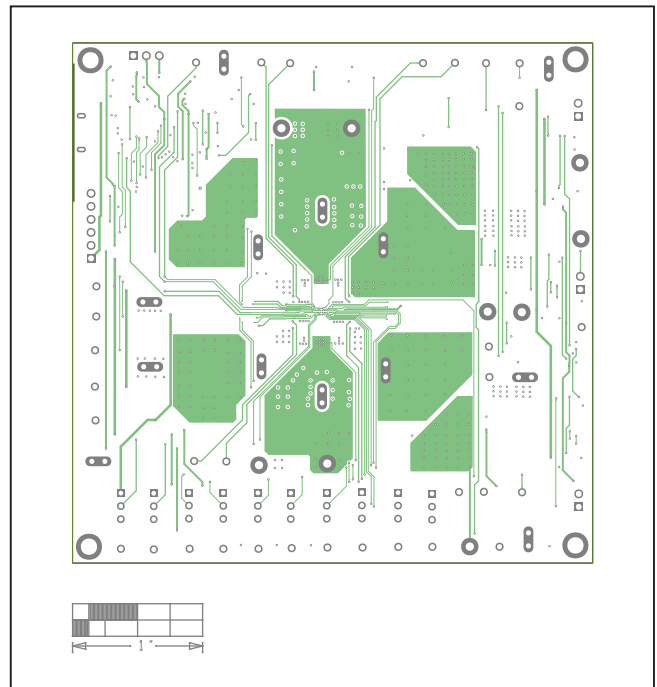
MAX77511/MAX77711 EV Kit Component Placement Guide—Top Silkscreen



MAX77511/MAX77711 EV Kit PCB Layout—Internal Layer 2



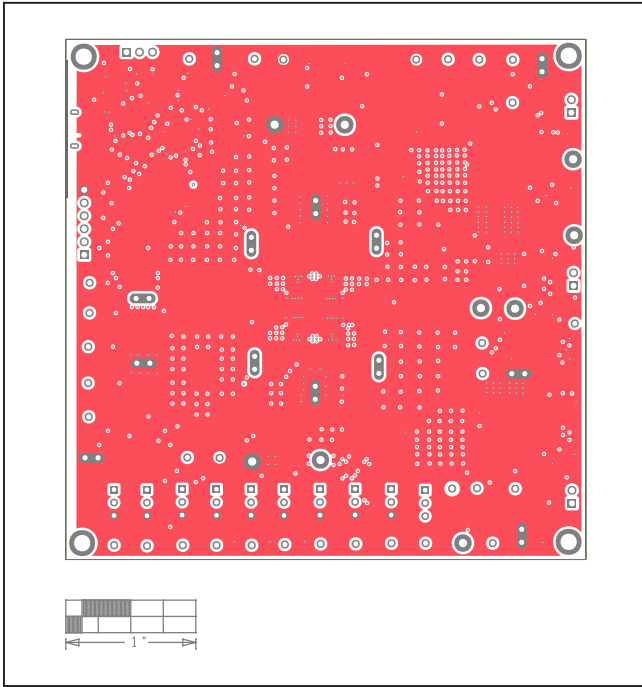
MAX77511/MAX77711 EV Kit PCB Layout—Top Layer



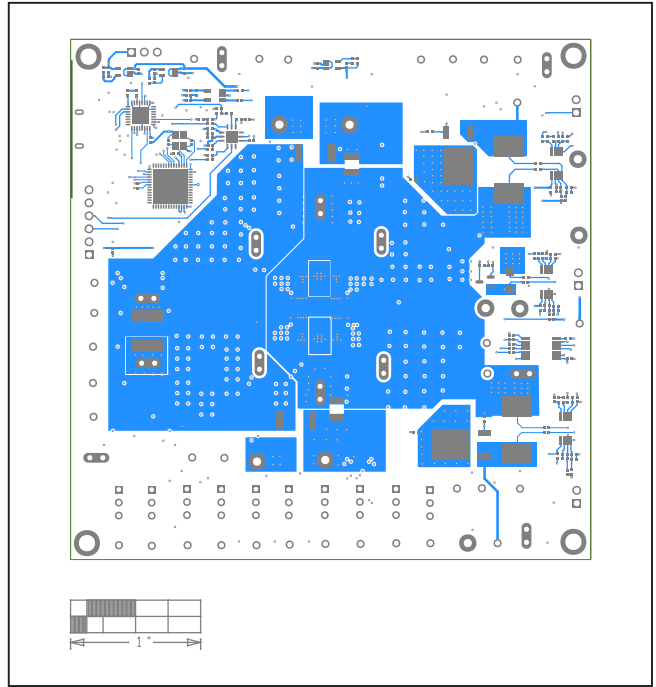
MAX77511/MAX77711 EV Kit PCB Layout—Internal Layer 3



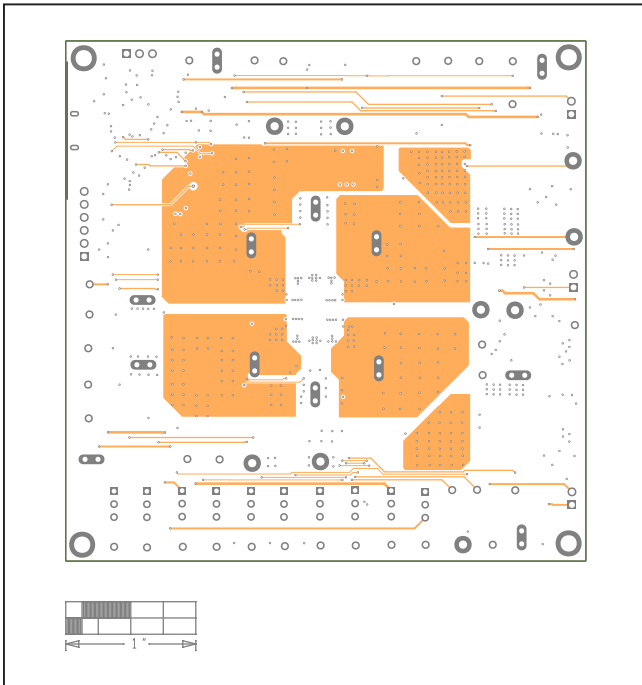
MAX77511/MAX77711 EV Kit PCB Layout (continued)



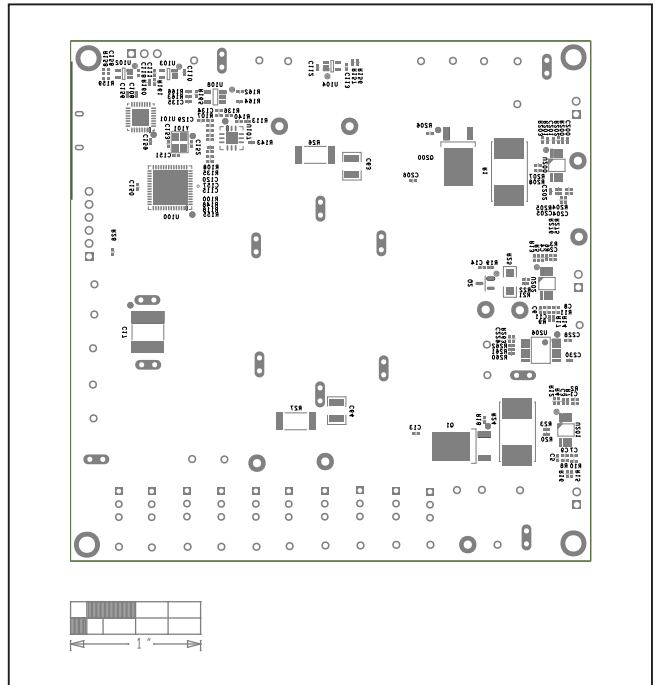
MAX77511/MAX77711 EV Kit PCB Layout—Internal Layer 4



MAX77511/MAX77711 EV Kit PCB Layout—Bottom Layer



MAX77511/MAX77711 EV Kit PCB Layout—Internal Layer 5



MAX77511/MAX77711 EV Kit Component Placement Guide—Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/19	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at <https://www.maximintegrated.com/en/storefront/storefront.html>.

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