



# MAX1515 Evaluation Kit

Evaluates: MAX1515

## General Description

The MAX1515 evaluation kit (EV kit) is designed to evaluate the MAX1515 constant off-time, pulse-width-modulated (PWM) source/sink step-down DC-DC converter that is optimized for use in low-voltage active-termination power solutions in notebook and subnotebook computers. The EV kit board defaults in DDR mode and accepts 1.3V to 3.6V at  $V_{IN}$ , 3.3V at  $V_{DD}$  as the bias, and 2.5V or 1.8V at  $V_{DDQ}$  as the reference. An output voltage is produced at  $V_{OUT}$  equal to  $V_{DDQ} / 2$  that can sink or source 2.5A.

In non-DDR mode, the voltage at  $V_{OUT}$  is pin selectable with the following options: 1.5V, 1.8V, or 2.5V. In addition, the voltage at  $V_{OUT}$  is adjustable from 0.5V to 2.7V.

The MAX1515 EV kit is conveniently designed with jumpers to activate the feedback selection (FBSEL0, FBSEL1), reference selection (REFIN), DDR mode (MODE), pulse-skipping mode (SKIP), and shutdown mode (SHDN).

## Features

- ◆ 1.3V to 3.6V  $V_{IN}$  Range
- ◆  $V_{OUT}$  Range: 0.5V to 2.7V at 2.5A
- ◆ Pin-Selectable Output Voltages: 1.5V, 1.8V, or 2.5V at 2.5A
- ◆ DDR Mode Enable ( $\overline{MODE}$ )
- ◆ Forced PWM/Pulse-Skipping Selection ( $\overline{SKIP}$ )
- ◆ Optimized Switching Frequency: 500kHz
- ◆ Shutdown Input ( $\overline{SHDN}$ )
- ◆ Power-Good Output (PGOOD)

## Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1515EVKIT	0°C to +70°C	24 TQFN (4mm x 4mm)

## Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	22 $\mu$ F, 6.3V X5R ceramic capacitor (0805) TDK C2012X5R0J226
C2	1	220 $\mu$ F, 4V, 15m $\Omega$ , 3.1A <sub>RMS</sub> POSCAP (D2E) Sanyo 4TPE220MF
C3, C4, C8	3	0.01 $\mu$ F $\pm$ 10%, 25V X7R ceramic capacitors (0402) Murata GRP155R71E103J TDK C1005X7R1E103K
C5	1	470pF $\pm$ 5%, 50V C0G ceramic capacitor (0402) Murata GRP155R71H471K TDK C1005COG1H471J
C6, C7, C9, C11	4	1 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (0402) TDK C1005X5R0J105M
C10	1	0.47 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitor (0402) TDK C1005X5R0J474M

DESIGNATION	QTY	DESCRIPTION
C12	1	0.01 $\mu$ F $\pm$ 10%, 16V X7R reverse-termination ceramic capacitor (0306) TDK C0816X7R1C103K
C13	1	100 $\mu$ F, 4V, 35m $\Omega$ , 1.4A <sub>RMS</sub> POSCAP (B2) Sanyo 4TPE100MZB
D2, D3	0	Not installed, diodes (SOD123)
L1	1	1.2 $\mu$ H inductor (7.6mm x 7.6mm x 3mm) Sumida CDR7D28MN-1R2
R1	1	110k $\Omega$ $\pm$ 1% resistor (0402)
R2, R3	2	10k $\Omega$ $\pm$ 1% resistors (0402)
R4	1	100k $\Omega$ $\pm$ 5% resistor (0402)
R5	1	10 $\Omega$ $\pm$ 5% resistor (0402)
R6	0	Shorted trace resistor (0402)
R7	0	Not installed, resistor (0402)
U1	1	MAX1515ETG (4mm x 4mm 24-pin thin QFN)
None	6	3-pin headers
None	1	MAX1515 evaluation kit PC board

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## Quick Start

### Recommended Equipment

- 2.5VDC power supply (2.5A rated): VIN/VDDQ
- 3.3VDC power supply: VDD
- 2 digital voltmeters (DVMs)

The MAX1515 EV kit is fully assembled and tested. Follow these steps to verify board operation. **Do not turn on the power supplies until all connections are completed:**

- 1) Verify the shunts are placed in the proper positions for the jumpers below:
  - JU0 (2-3): FBSEL0 = GND.
  - JU1 (2-3): FBSEL1 = GND. VOUT = VREFIN.
  - JU2 (1-2): MODE = VCC. DDR mode enabled.
  - JU3 (1-2): REFIN = VDDQ / 2.
  - JU4 (1-2):  $\overline{\text{SHDN}}$  = VCC. Shutdown mode disabled.
  - JU5 (1-2):  $\overline{\text{SKIP}}$  = VCC. Forced-PWM mode enabled.
- 2) Connect the 2.5VDC power supply rated for 2.5A across the VIN pad and the corresponding PGND pad.
- 3) Connect the 3.3VDC power supply across the VDD pad and the corresponding PGND pad.
- 4) Turn on both supplies: VDD = 3.3V and VIN = 2.5V. (Power-up sequence does not matter.)
- 5) Using a DVM, verify that the REFOUT voltage between the REFOUT and GND pads is 1.25V.
- 6) Using the other DVM, verify that the VOUT voltage between the VOUT and PGND pads is 1.25V.

## Detailed Description

The MAX1515 EV kit is designed to evaluate the MAX1515 constant off-time, PWM source/sink step-down DC-DC converter that is optimized for use in low-voltage, active-termination power solutions in notebook and subnotebook computers.

### Setting the Output Voltage in DDR Mode (VOUT = VTT)

In DDR mode, the voltage produced at VOUT is equal to REFIN (VDDQ / 2) and can sink or source 2.5A. Connect FBSEL0 and FBSEL1 to GND for DDR mode.

### Setting the Output Voltage in Non-DDR Mode (VOUT)

In non-DDR mode, the voltage at VOUT is pin selectable with the following options: 1.5V, 1.8V, or 2.5V. See Table 1 for the correct FBSEL0 and FBSEL1 settings.

In addition, the voltage at VOUT is adjustable from 1.1V to 2.7V by setting the FBSEL0/FBSEL1 to GND, shorting REFIN to REF, opening the PC board short across R6, and installing R6 and R7. Calculate R6 using the following equation:

$$R6 = ((V_{OUT} / V_{REF}) - 1) \times R7$$

where VREF = 1.1V, R7 = 100kΩ.

The voltage at VOUT is also adjustable from 0.5V to 1.1V by setting FBSEL0/FBSEL1 to GND and directly driving REFIN to a voltage equal to the desired voltage at VOUT. When adjusting VOUT from 0.5V to 1.1V, use the following equation:

$$V_{OUT} = V_{REFIN}$$

Table 1 shows the proper jumper configurations for setting the output voltage.

### Jumper Settings

See Tables 1–5 for all jumper setting descriptions on the MAX1515 EV kit.

**Table 1. Output Voltage Settings (FBSEL0/FBSEL1)**

FBSEL0 JU0	FBSEL1 JU1	DESCRIPTION
2-3*	2-3*	Adjustable V <sub>FB</sub> = V <sub>REFIN</sub>
2-3	1-2	1.5V
1-2	2-3	1.8V
1-2	1-2	2.5V

\* = Default position.

**Note:** Refer to the MAX1515 data sheet for additional information on FBSEL0/FBSEL1.

**Table 2. DDR Mode (MODE)**

JUMPER	SHUNT POSITION	DESCRIPTION
JU2	1-2*	DDR mode (REFOUT is active)
	2-3	Non-DDR mode (REFOUT is disabled)

\* = Default position.

**Note:** Refer to the MAX1515 data sheet for additional information on MODE.

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**Table 3. REFIN Selection (REFIN)**

JUMPER	SHUNT POSITION	DESCRIPTION
JU3	1-2*	REFIN = VDDQ / 2
	2-3	REFIN = REF

\* = Default position.

**Note:** Refer to the MAX1515 data sheet for additional information on REFIN.

**Table 4. Shutdown Control Input ( $\overline{\text{SHDN}}$ )**

JUMPER	SHUNT POSITION	DESCRIPTION
JU4	1-2*	The MAX1515 is in normal operation.
	2-3	The MAX1515 is in low-power shutdown. REFOUT is only in shutdown when MODE is connected to GND.

\* = Default position.

**Note:** Refer to the MAX1515 data sheet for additional information on  $\overline{\text{SHDN}}$ .

**Table 5. Pulse-Skipping Control Input ( $\overline{\text{SKIP}}$ )**

JUMPER	SHUNT POSITION	DESCRIPTION
JU5	1-2*	Low-noise forced PWM mode
	2-3	Low-power pulse-skipping mode

\* = Default position.

**Note:** Refer to the MAX1515 data sheet for additional information on  $\overline{\text{SKIP}}$ .

## Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata	770-436-1300	www.murata.com
Sanyo USA	619-661-6835	www.sanyo.com
Sumida USA	847-545-6700	www.sumida.com
TDK	847-803-6100	www.component.tdk.com

**Note:** Indicate you are using the MAX1515 when contacting these component suppliers.

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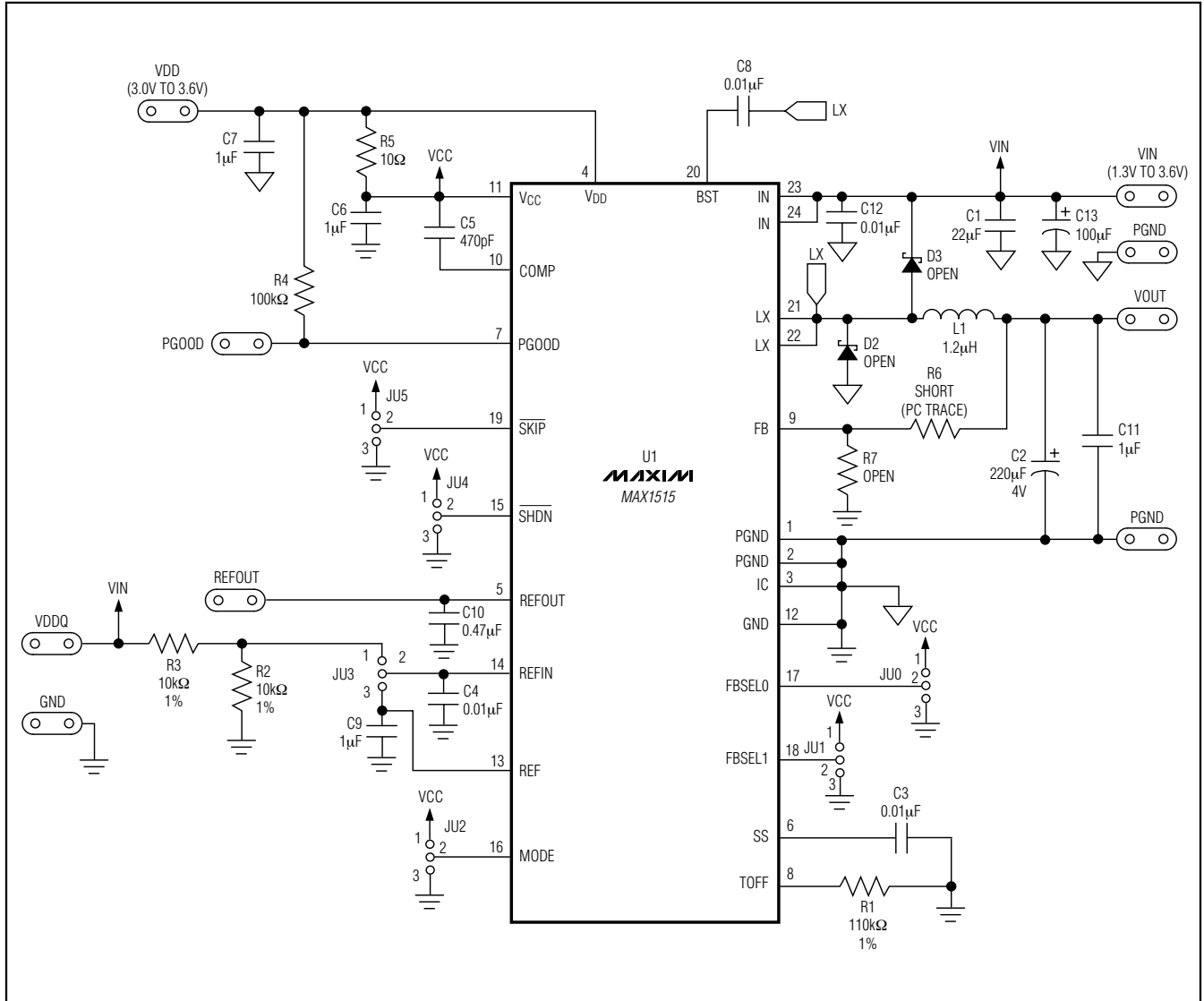


Figure 1. MAX1515 EV Kit Schematic

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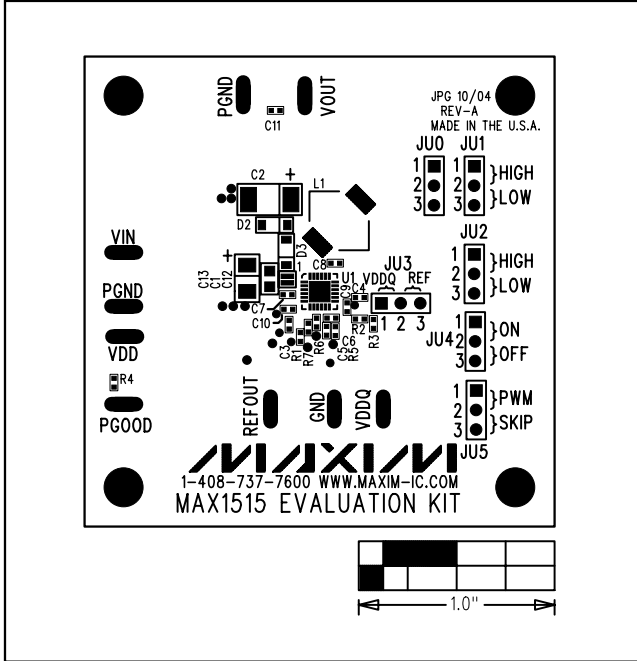


Figure 2. MAX1515 EV Kit Component Placement Guide—Component Side

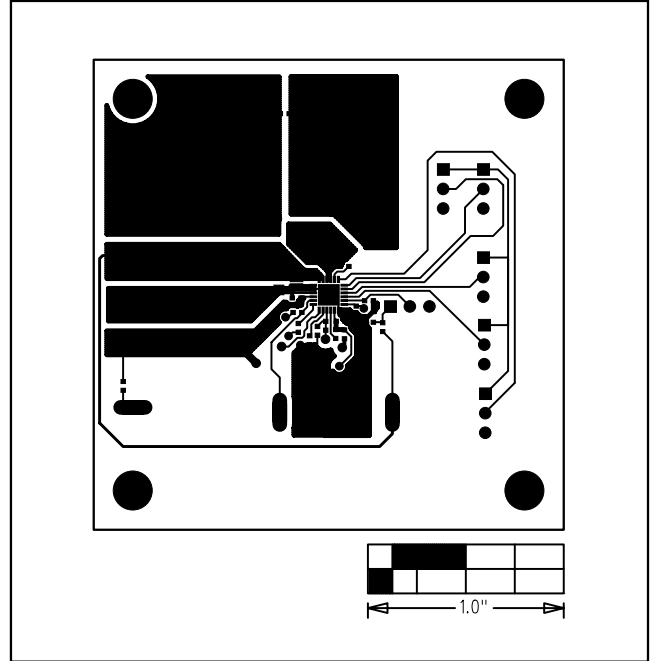


Figure 3. MAX1515 EV Kit PC Board Layout—Component Side

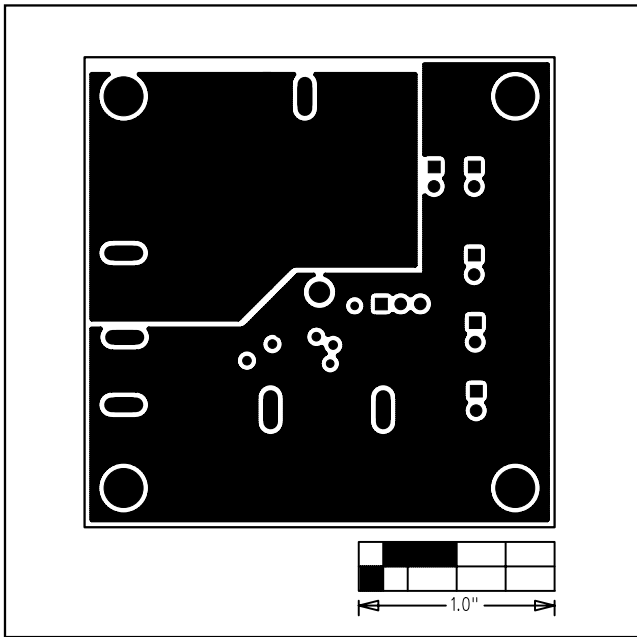


Figure 4. MAX1515 EV Kit PC Board Layout—Inner Layer 2 (GND, PGND)

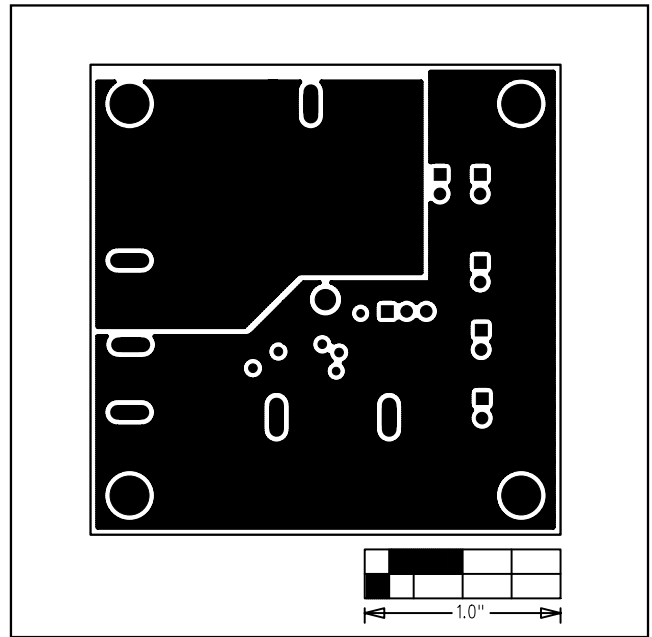


Figure 5. MAX1515 EV Kit PC Board Layout—Inner Layer 3 (GND, PGND)

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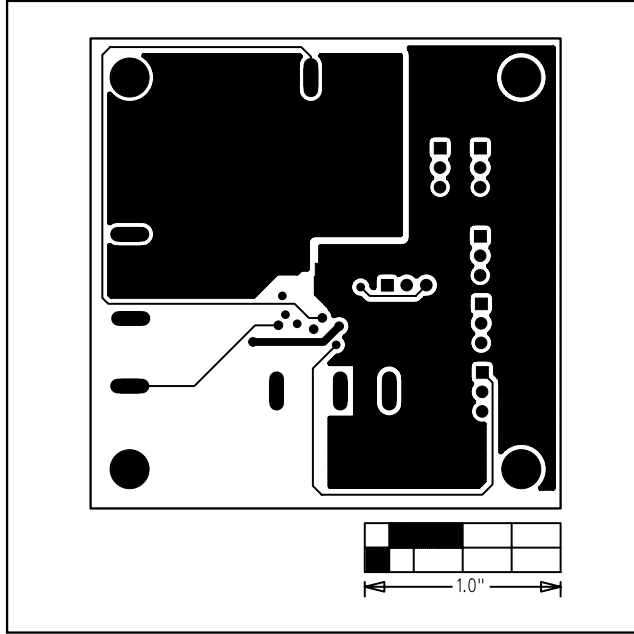


Figure 6. MAX1515 EV Kit PC Board Layout—Solder Side

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