

# MAXIM

## MAX1522 Evaluation Kit

### General Description

The MAX1522 evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board that contains two separate step-up switching controller circuits. The first circuit (left side) utilizes the MAX1524, is configured for +5V output, and can deliver up to 1A of current. The MAX1524 supply pin is bootstrapped to the output. The second circuit (right side) utilizes the MAX1522, is configured for +12V output, and can deliver up to 200mA of current with the input voltage as low as +2.7V.

The MAX1522 and MAX1524 feature soft-start and fault-detect. The EV kit allows the user to set the on-time of the N-channel MOSFETs to either 0.5μs or 3μs.

### Component Suppliers

SUPPLIER	PHONE	FAX
Fairchild	408-822-2000	408-822-2102
Murata	814-237-1431	814-238-0490
Nihon USA	661-867-2555	661-867-2698
Sanyo	619-661-6835	619-661-1055
Sumida	847-956-0666	847-956-0702
Taiyo Yuden	408-573-4150	408-573-4159
TDK	847-803-6100	847-803-6296
Toshiba	949-455-2000	949-859-3963

**Note:** Please indicate that you are using the MAX1522, MAX1523, or MAX1524 when contacting these component suppliers.

### Features

- ◆ **Input Voltage**
  - +1.5V to +5.5V (Left Side, BOOTSTRAPPED)
  - +2.5V to +5.5V (Right Side, NON-BOOTSTRAPPED)
- ◆ **Output Voltage**
  - +5V Output Up to 1A (Left Side)
  - +12V Output Up to 200mA (Right Side)
- ◆ **No Current-Sense Resistor**
- ◆ **Fault-Detection**
- ◆ **Soft-Start Limits Inrush Current**
- ◆ **Selectable Maximum Duty Cycle (45% or 80%)**
- ◆ **Adjustable Output Voltages**
- ◆ **1μA (max) Shutdown Current**
- ◆ **Switching Frequency Up to 1MHz**
- ◆ **Fully Assembled and Tested**

### Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX1522EVKIT	0°C to +70°C	6 SOT23

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	100pF, 50V COG ceramic capacitors (0603) TDK C1608COG1H101JT or Murata GRM39COG101J050AD
C3	1	47pF, 50V COG ceramic capacitor (0603) TDK C1608COG1H470JT
C4	1	330pF, 50V COG ceramic capacitor (0603) TDK C1608X7R1H331KT or Murata GRM39COG331J050AD
C5	1	1μF, 16V X7R ceramic capacitor (1206) Taiyo Yuden EMK316BJ105KF or TDK C3216X7R1C105KT

DESIGNATION	QTY	DESCRIPTION
C6, C7	2	10μF, 6.3V X5R ceramic capacitors (1206) TDK C3216X5R0J106KT or Taiyo Yuden JMK316BJ106KL
C8	1	47μF ±20%, 20V aluminum electrolytic capacitor Sanyo 25CV47AX
C9	1	33μF, 10V Poscap capacitor (C) Sanyo 10TPA33M
R1	1	301kΩ ±1% resistor (0805)
R2, R4	2	100kΩ ±1% resistors (0805)
R3	1	866kΩ ±1% resistor (0805)
R5	1	10Ω ±5% resistor (0805)
N1, N2	2	30V, 5.2A N-channel MOSFET Fairchild FDC633N (6-pin SuperSOT)

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## Component List (continued)

DESIGNATION	QTY	DESCRIPTION
D1	1	2.2A, 30V Schottky diode (SMD) Nihon EC31QS03L
D2	1	1A, 30V Schottky diode (SOT123) Toshiba CRS02 or Nihon EP10QY03
L1	1	3.3μH, 1.44A inductor Sumida CR43-3R3
L2	1	33μH, 0.88A Inductor Sumida CDR74B-330
U1	1	MAX1524EUT (6-pin SOT23) (Top mark – AAOZ)
U2	1	MAX1522EUT (6-pin SOT23) (Top mark – AAOX)
JU1–JU4	4	3-pin headers
None	4	Shunts (JU1–JU4)
None	1	MAX1522 PC board
None	1	MAX1522 data sheet
None	1	MAX1522 EV kit data sheet

## Quick Start

The MAX1522 EV kit is fully assembled and tested. Follow these steps to verify board operation. **Do not turn on the power supply until all connections are completed.**

### +5.0V Output Circuit (BOOTSTRAPPED)

- 1) Verify that shunts are across pins 2 and 3 of jumper JU1 (SET, 0.5μs) and pins 1 and 2 of jumper JU2 (SHDN).
- 2) Connect a +2.5V to +5.5V DC power supply to the VIN1 pad. Connect the supply ground to the GND1 pad.
- 3) Turn on the power supply.
- 4) With a voltmeter, verify that the output voltage VOUT1 is +5.0V.

For instructions on selecting the feedback resistors for other output voltages, refer to *Evaluating Other Output Voltages* in this document.

### +12.0V Output Circuit (NONBOOTSTRAPPED)

- 1) Verify that shunts are across pins 1 and 2 of jumpers JU3 (SET, 3μs) and JU4 (SHDN).
- 2) Connect a +2.5V to +5.5V DC power supply to the VIN2 pad. Connect the supply ground to the GND2 pad.
- 3) Turn on the power supply.
- 4) With a voltmeter, verify that the output voltage VOUT2 is +12V.

For instructions on selecting the feedback resistors for other output voltages, refer to *Evaluating Other Output Voltages* in this document.

## Detailed Description

The MAX1522 EV kit is a fully assembled and tested surface-mount circuit board that contains two separate step-up switching controller circuits.

The first circuit (left side), labeled BOOTSTRAPPED, utilizes the MAX1524, is configured for +5.0V output, and can deliver up to 1A of current with 3.3V input voltage. The circuit requires a +1.5V to +5.5V input DC source. The MAX1524 V<sub>CC</sub> supply is bootstrapped to the output to provide +5V gate drive with low input voltages. The device features a fault-detect that reinitiates soft-start whenever the output drops to half of its nominal voltage regulation level.

The second circuit (right side), labeled NON-BOOTSTRAPPED, utilizes the MAX1522, is configured for +12V output, and can deliver up to 200mA of current with 2.7V input voltage. The circuit requires a +2.5V to +5.5V input DC source. The MAX1522 is not bootstrapped to the output because during regulation the +12.0V exceeds the maximum supply voltage rating of the controller. The MAX1522 features a latched fault-detect that can be reset by toggling the SHDN pin with the jumper provided on the EV kit.

Each circuit requires an input DC source that can supply 2A of current. Both ICs implement soft-start to prevent excessive input currents during startup. The MAX1522 EV kit also provides jumpers to set the fixed on-time of the N-channel MOSFETs. See *Setting the On-Time* section.

## Jumper Selection

### Shutdown Mode

The MAX1522 EV kit features 3-pin jumpers (JU2 and JU4) to shut down or power up the BOOTSTRAPPED or NON-BOOTSTRAPPED circuits. Table 1 lists the selectable jumper options for jumpers JU2 and JU4.

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**Table 1. Jumper JU2 and JU4 Functions**

SHUNT LOCATION	JUMPER	SHDN PIN	FUNCTION
1 and 2	JU2	Connected to VIN	MAX1524 Enable
	JU4		MAX1522* Enable
2 and 3	JU2	Connected to GND	MAX1524 Disable
	JU4		MAX1522* Disable

\*To reset a latched fault-detect condition, the respective IC must be disabled first and then enabled.

## Setting the On-Time

The MAX1522 EV kit features 3-pin jumpers (JU1 and JU3) to set the fixed on-time of the N-channel power MOSFET in each circuit. Table 2 lists the selectable jumper options for jumpers JU1 and JU3. Setting the on-time to 3μs ensures an 80% maximum duty factor and a maximum switching frequency of 285kHz. Setting the on-time to 0.5μs ensures a 45% maximum duty factor and a maximum switching frequency of 1MHz.

On the left circuit (BOOTSTRAPPED) of the MAX1522EVKIT, the inductor has been selected for 0.5μs on-time. Before switching the shunt on jumper JU1 from pins 2 and 3 (0.5μs on-time) to pins 1 and 2 (3.0μs on-time), it is necessary to change inductor L1 to a higher value and a higher saturation current rating to prevent inductor saturation. Refer to the *Design Procedure* section of the MAX1522 data sheet for details.

On the right circuit (NON-BOOTSTRAPPED) of the MAX1522EVKIT, the inductor and the output voltage setting have been selected for 3.0μs on-time. Switching the shunt on jumper JU3 from pins 1 and 2 (3.0μs on-time) to pins 2 and 3 (0.5μs on-time) will prevent the output voltage from reaching 12V under load. Refer to the *Design Procedure* section of the MAX1522 data sheet for details.

**Table 2. Jumper JU1 and JU3 Functions**

SHUNT LOCATION	SET PIN	FUNCTION
1 and 2	Connected to VCC	3.0μs On-Time
2 and 3	Connected to GND	0.5μs On-Time

## Evaluating Other Output Voltages

### Left Circuit (+5V)

The EV kit contains a MAX1524 step-up controller on the left side of the board (BOOTSTRAPPED) that is set for +5V (VOUT1) output by two feedback resistors. To

generate output voltages other than +5V (+2.5V to +5.5V), replace resistors R1 and R2. Refer to the *Component List* to verify that the circuit's components will function properly if the output voltage is reconfigured. The output voltages are determined by the following equation:

$$VOUT1 = V_{FB}((R1 / R2) + 1)$$

where  $V_{FB} = 1.25V$ .

### Right Circuit (+12V)

The MAX1522 EV kit contains a MAX1522 step-up controller on the right side of the board (NONBOOTSTRAPPED) that is set for +12V (VOUT2) output by two feedback resistors. To generate output voltages other than +12.0V, replace resistors R3 and R4. Refer to the *Component List* to verify that the circuit's components will function properly if the output voltage is reconfigured. The output voltages are determined by the following equation:

$$VOUT2 = V_{FB}((R3 / R4) + 1)$$

where  $V_{FB} = 1.25V$ .

## Evaluating the MAX1523

The MAX1522 EV kit can also evaluate the MAX1523 step-up controller. The MAX1523 is different from the MAX1522 in that it doesn't latch a fault-detect. To evaluate the MAX1523, replace the MAX1522, located on the right circuit (NON-BOOTSTRAPPED), with the MAX1523. To request MAX1523 samples, call the phone number listed at the bottom of page 1 of this data sheet and ask for MAX1523EUT samples.

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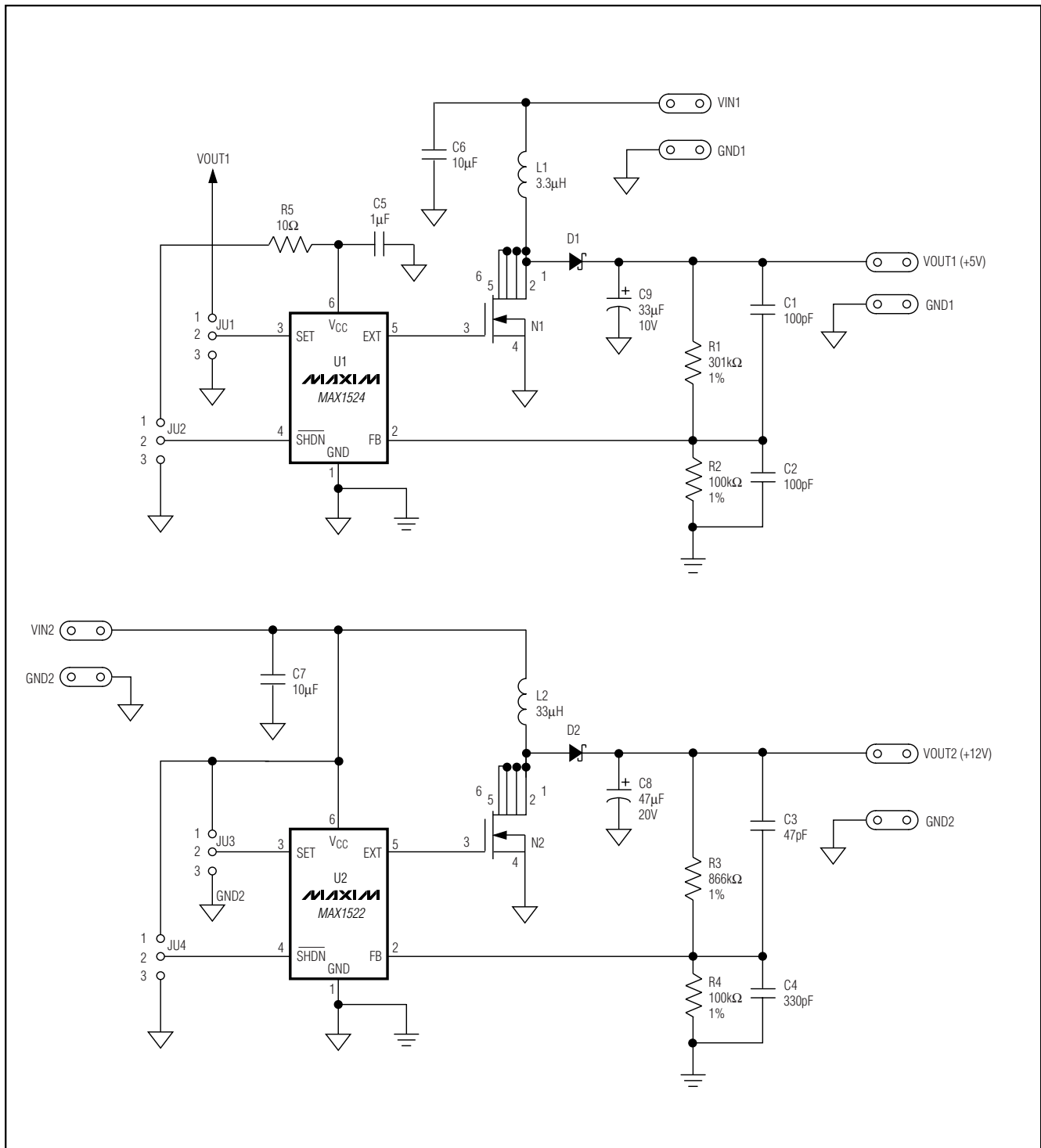


Figure 1. MAX1522 EV Kit Schematic

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Evaluates: MAX1522/MAX1523/MAX1524

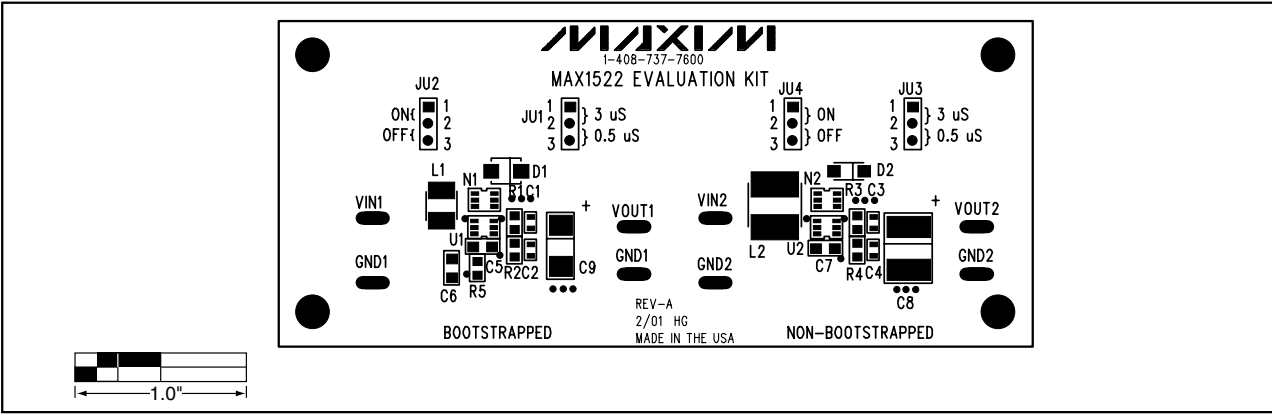


Figure 2. MAX1522 EV Kit Component Placement Guide—Component Side

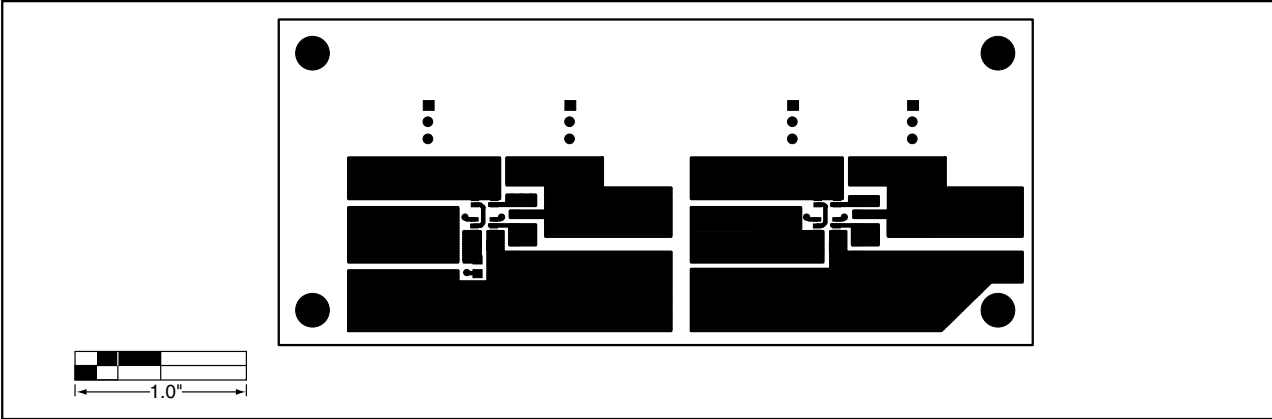


Figure 3. MAX1522 EV Kit PC Board Layout—Component Side

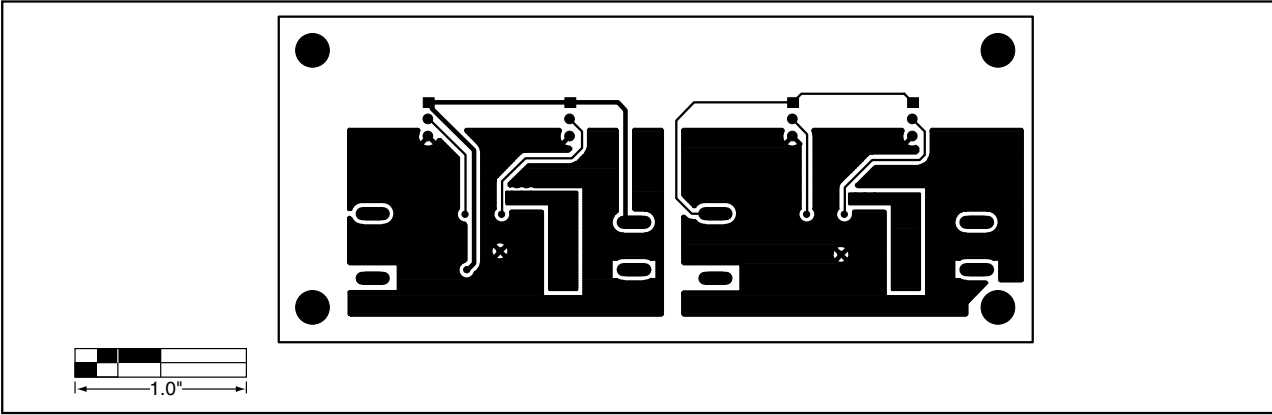


Figure 4. MAX1522 EV Kit PC Board Layout—Solder Side

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