



# MAX1518 Evaluation Kit

**Evaluates: MAX1518**

## General Description

The MAX1518 evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board that contains a step-up switching regulator, a positive charge pump postregulated by a high-voltage linear regulator, a negative charge pump postregulated by a high-voltage negative linear regulator, and five high-current operational amplifiers. The step-up switching circuit is configured for a +13V output (VMAIN) and provides up to 650mA from a +4.5V to +5.5V DC supply voltage.

The positive linear regulator is configured for a +25V output (VPOS) using two charge-pump stages providing up to 10mA. The negative linear regulator is configured for a -8V output (VNEG) using a single charge-pump stage providing up to 15mA. The DC input source or the step-up switching regulator output provides power for the positive charge-pump input. The DC input source or the power ground provides power for the negative charge-pump input.

The MAX1518 EV kit demonstrates low-quiescent current and high efficiency for maximum battery life. Operation at 1.2MHz allows the use of tiny surface-mount components.

## Features

- ◆ +4.5V to +5.5V Input Range
- ◆ Output Voltages
- ◆ +13V Output at 650mA (VMAIN)
- ◆ +25V Output at 10mA (VPOS)
- ◆ -8V Output at 15mA (VNEG)
- ◆ Adjustable Output Voltages (External Resistors)
- ◆ 1.2MHz Switching Frequency
- ◆ Five High-Performance Operational Amplifiers
- ◆ Low-Profile Surface-Mount Components
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1518EVKIT	0°C to +70°C	32 TQFN 5mm x 5mm

## Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	100 $\mu$ F $\pm$ 20%, 16V aluminum electrolytic capacitor Sanyo 16MV100UAX
C2, C3	2	10 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (1206) TDK C3216X5R0J106M-0.85
C4, C5, C6	3	4.7 $\mu$ F $\pm$ 20%, 16V X5R ceramic capacitors (1210) TDK C3225X5R1C475M-1.15
C7, C8, C9, C14, C16, C17, C24-C29	12	0.1 $\mu$ F $\pm$ 10%, 50V X7R ceramic capacitors (0603) TDK C1608X7R1H104K
C10	1	0.47 $\mu$ F $\pm$ 10%, 25V X5R ceramic capacitor (1206) TDK C3216X5R1E474KT-0.90
C11, C31, C32	3	0.22 $\mu$ F, 50V X7R ceramic capacitors (0805) Taiyo Yuden UMK212BJ224MG TDK C2012X7R1H224M

DESIGNATION	QTY	DESCRIPTION
C12	1	220pF $\pm$ 10%, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H221K
C13, C19, C20, C21, C30	0	Not installed (0603)
C15	1	0.22 $\mu$ F $\pm$ 10%, 10V X7R ceramic capacitor (0603) Taiyo Yuden LMK107BJ224KA
C18	1	0.47 $\mu$ F $\pm$ 10%, 16V X7R ceramic capacitor (0805) TDK C2012X7R1C474K-0.60
C22	0	Not installed (1210)
C23	1	0.033 $\mu$ F $\pm$ 10%, 25V X7R ceramic capacitor (0603) Murata GRM188R71E333K TDK C1608X7R1E333K
C33	1	10pF $\pm$ 5%, 50V COG ceramic capacitor (0603) Murata GRM1885C1H100J TDK C1608COG1H100J

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## Component List

DESIGNATION	QTY	DESCRIPTION
D1	1	3A 30V Schottky diode (M-flat) Toshiba CMS02 2.2A, 30V Schottky diode Nihon EC20QS03L
D2, D3, D4	3	200mA, 100V, dual, ultra-fast diodes (SOT23) Central Semiconductor CMPD6001S (top mark ULS)
D5	0	Not installed (SOT23) 200mA, 100V, dual, ultra-fast diode (SOT23) Central Semiconductor CMPD6001S (top mark ULS)
JU4	1	2-pin header
L1	1	3.3 $\mu$ H, 3A inductor Sumida CDRH6D28-3R3
Q1	1	200mA, 40V pnp bipolar transistor (SOT23) Central Semiconductor CMPT3906 (top mark C2A) Fairchild MMBT3906 (top mark 2A)

DESIGNATION	QTY	DESCRIPTION
Q2	1	200mA, 40V npn bipolar transistor (SOT23) Central Semiconductor CMPT3904 (top mark C1A) Fairchild MMBT3904 (top mark 1A)
R1	1	95.3k $\Omega$ $\pm$ 1% resistor (0603)
R2, R4	2	10.2k $\Omega$ $\pm$ 1% resistors (0603)
R3	1	191k $\Omega$ $\pm$ 1% resistor (0603)
R5, R6	2	6.8k $\Omega$ $\pm$ 5% resistors (0603)
R7	1	332k $\Omega$ $\pm$ 1% resistor (0603)
R8	1	40.2k $\Omega$ $\pm$ 1% resistor (0603)
R9	1	180k $\Omega$ $\pm$ 5% resistor (0603)
R10–R20	11	100k $\Omega$ $\pm$ 5% resistors (0603)
R21	1	10 $\Omega$ $\pm$ 5% resistor (0603)
R22–R26	5	Not installed (short PC trace) (0603)
U1	1	MAX1518ETJ (32-pin TQFN 5mm x 5mm)

## Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Central Semiconductor	516-435-1110	516-435-1824	www.centrasemi.com
Fairchild	408-822-2000	408-822-2102	www.fairchildsemi.com
Murata	770-436-1300	770-436-3030	www.murata.com
Nihon	661-867-2555	661-867-2698	www.niec.co.jp
Sanyo	619-661-6322	619-661-1055	www.sanyovideo.com
Sumida	708-956-0666	708-956-0702	www.sumida.com
Taiyo Yuden	800-348-2496	847-925-0899	www.t-yuden.com
TDK	847-390-4373	847-390-4428	www.component.tdk.com
Toshiba	949-455-2000	949-859-3963	www.toshiba.com/taec

**Note:** Indicate that you are using the MAX1518 when contacting these component suppliers.

### Quick Start

The MAX1518 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.**

### Recommended Equipment

- 4.5V to 5.5V, 2A DC power supply
- Digital multimeters (DMMs)

- 1) Turn on the power supply and verify that the step-up regulator output (VMAIN) is +13V.
- 2) Verify that the positive linear-regulator output (VPOS) is +25V.
- 3) Verify that the negative linear-regulator output (VNEG) is -8V.

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**Table 1. Jumper JU1 Functions**

SHUNT LOCATION	POSITIVE CHARGE-PUMP INPUT VOLTAGE
1-2	1st stage of a two-stage charge pump powered by VMAIN
2-3 (default)	1st stage of a 2-stage charge pump powered by VIN

## **Detailed Description**

The MAX1518 EV kit contains a step-up switching regulator and two linear regulators. It operates from a +4.5V to +5.5V DC power supply. The switching frequency is 1.2MHz. As configured, the step-up switching regulator generates a +13V output and can provide up to 650mA. VPOS uses two charge-pump stages to generate approximately +25V and can provide up to 10mA. VNEG uses one charge-pump stage to generate approximately -8V and can provide up to 15mA. The EV kit includes five high-current operational amplifiers.

## **Jumper Selection**

### **Positive Charge Pump (JU1)**

The positive charge pump can be powered by VIN or VMAIN. Jumper JU1 selects the voltage source for the positive charge pump. Table 1 lists the jumper options. The default configuration for the positive charge pump of the MAX1518 EV kit is a two-stage charge pump powered by VIN as indicated in Tables 1 and 2.

### **Negative Charge Pump (JU2)**

The negative charge pump can be connected to VIN or PGND. Jumper JU2 selects the voltage source for the negative charge pump. Table 2 lists the jumper options. The default configuration for the negative charge pump of the MAX1518 EV kit is a one-stage charge pump connected to PGND.

**Table 2. Jumper JU2 Functions**

SHUNT LOCATION	NEGATIVE CHARGE-PUMP INPUT VOLTAGE
1-2 (default)	Charge pump connected to PGND
1-3	Charge pump connected to another charge pump
1-4	Charge pump connected to VIN

## **Output Voltage Selection**

### **Step-Up Switching-Regulator Output Voltage (VMAIN)**

The MAX1518 EV kit's step-up switching-regulator output is set to +13V by feedback resistors R1 and R2. To generate output voltages other than +13V (+4.7V to +VMAIN), select different external voltage-divider resistors (R1 and R2). The output capacitors (C4, C5, and C6) are rated at +16V. To set the output voltage greater than +15V, use higher-voltage rated capacitors. Refer to the *Output Voltage Selection* section in the MAX1518 data sheet for instructions on selecting the feedback resistors.

### **Positive Linear-Regulator Output Voltage (VPOS)**

The MAX1518 EV kit's positive linear-regulator output is set to +25V by feedback resistors R3 and R4. To generate output voltages other than +25V (+1.25V to +28V), select different external voltage-divider resistors (R3 and R4). Refer to the *Output Voltage Selection* section in the MAX1518 data sheet for instructions on selecting the resistors.

### **Negative Linear-Regulator Output Voltage (VNEG)**

The MAX1518 EV kit's negative linear-regulator output is set to -8V by feedback resistors R7 and R8. To generate output voltages other than -8V (0 to -22V), select different external voltage-divider resistors (R7 and R8). Refer to the *Output Voltage Selection* section in the MAX1518 data sheet for instructions on selecting the resistors.

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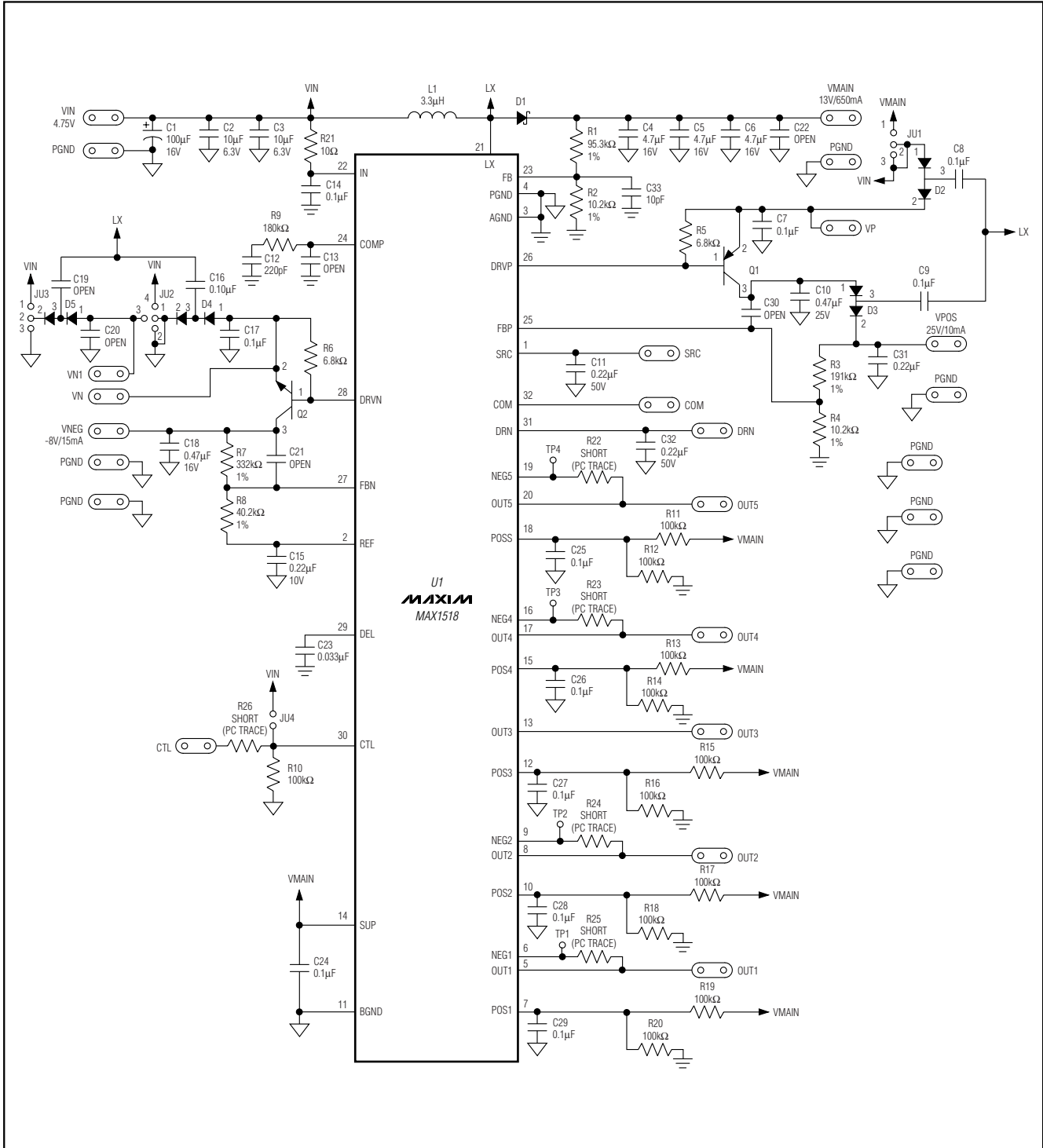


Figure 1. MAX1518 EV Kit Schematic

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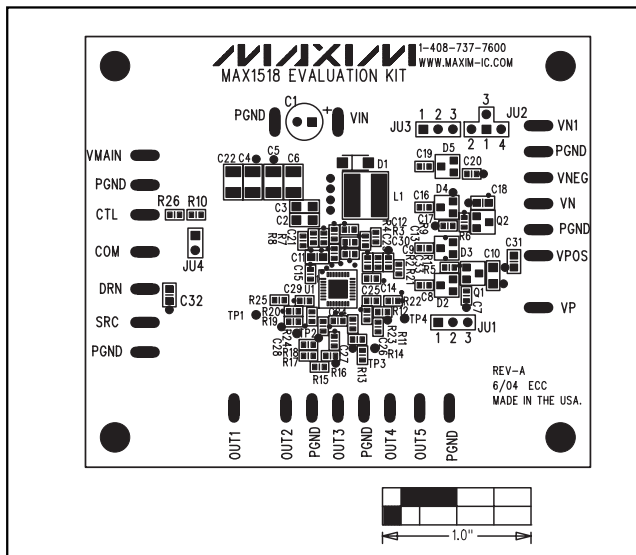


Figure 2. MAX1518 EV Kit Component Placement Guide—Component Side

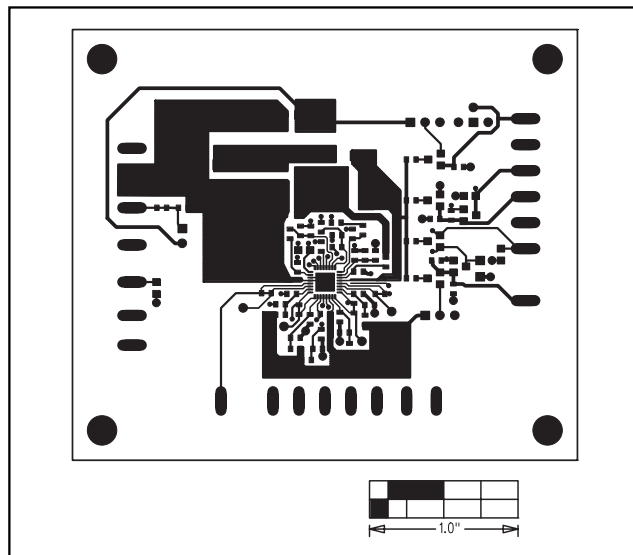


Figure 3. MAX1518 EV Kit PC Board Layout—Component Side

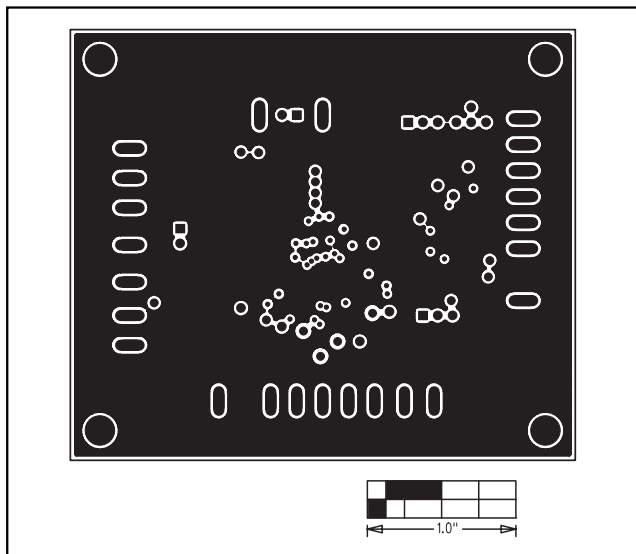


Figure 4. MAX1518 EV Kit PC Board Layout—Internal Layer 2—GND Plane

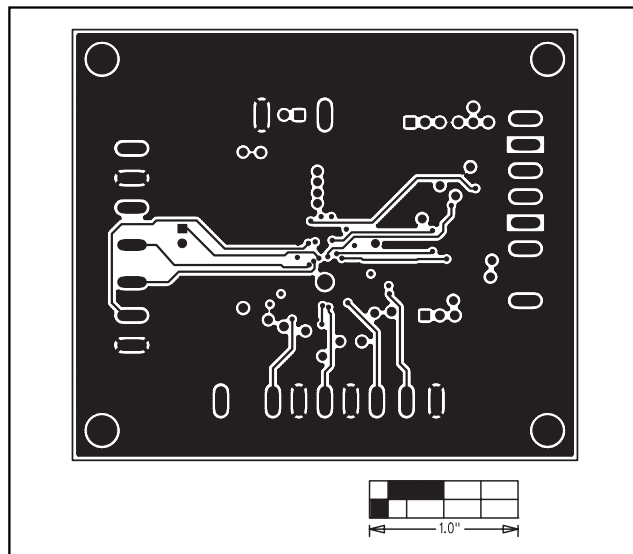


Figure 5. MAX1518 EV Kit PC Board Layout—Internal Layer 3—Signal/GND Plane

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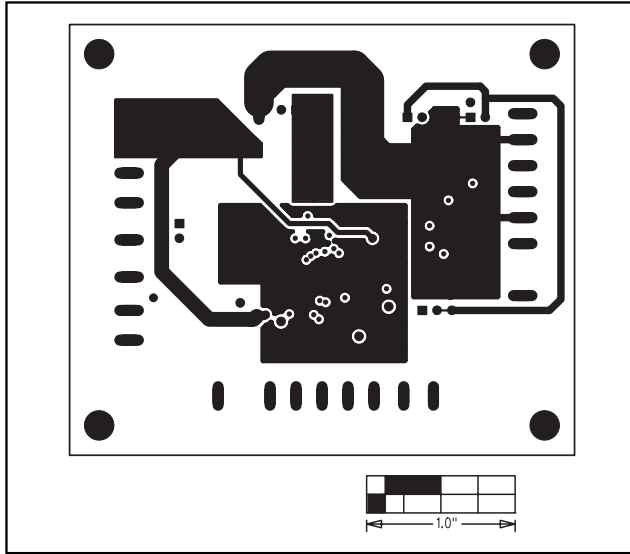


Figure 6. MAX1518 EV Kit PC Board Layout—Solder Side

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.