MAX15112 Evaluation Kit
Evaluates: MAX15112

General Description

The MAX15112 evaluation kit (EV kit) provides a proven design to evaluate the MAX15112 high-efficiency, 12A, step-down regulator with integrated switches in a 24-bump wafer-level package (WLP). The EV kit is preset for 1.5V output at load currents up to 12A from a 2.7V to 5.5V input supply. The device features a 1MHz fixed switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast transient responses.

Features

- **Operates from a 2.7V to 5.5V Input Supply**
- **All-Ceramic Capacitor Design**
- **1MHz Switching Frequency**
- **Output Voltage Range**
  - **0.6V Up to 0.94 x V_{IN} (Forced PWM)**
  - **0.6V Up to 0.85 x V_{IN} (Skip Mode)**
- **Enable Input/Power-Good Output**
- **Selectable Skip-Mode Functionality**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information appears at end of data sheet.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C3	3	22µF ±20%, 6.3V X5R ceramic capacitors (1206) TDK C3216X5R0J226M
C5	0	Not installed, ceramic capacitor (0603)
C7, C8	2	100µF ±10%, 6.3V X5R ceramic capacitors (1206) Murata GRM31CR60J107M
C9, C10	0	Not installed, ceramic capacitors (1206)
C11	1	1µF ±10%, 10V X7R ceramic capacitor (0603) Murata GRM188R71A105K
C13	1	0.47µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C474K
C14	1	22pF ±5%, 50V ceramic capacitor (0603) Murata GRM1885C1H220J
C15	1	3300pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H332K

DESIGNATION	QTY	DESCRIPTION
C16	1	0.1µF ±10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H104K Murata GRM188R71H104K
C18	1	1500pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H152K
C19, C20	2	10µF ±10%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106K
C21, C22	2	1000µF ±20%, 10V aluminum electrolytic capacitors (10.3mm x 10.3mm) Panasonic EEEFP1A102AP
C23	1	2.2µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R61C225K TDK C1608X5R1C225K
IN, OUT, PGND (x2)	4	Binding posts
JU1	1	2-pin header
JU2	1	3-pin header
L1	1	0.22µH, 21A inductor Vishay IHLP2525BD01R22M01

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R1	1	3.32kΩ ±1% resistor (0603)
R2	1	2.21kΩ ±1% resistor (0603)
R3	1	5.23kΩ ±1% resistor (0603)
R4, R5	2	100kΩ ±5% resistors (0603)
R6	1	100Ω ±5% resistor (0603)
R7	1	4.7Ω ±5% resistor (0603)
R8	1	1Ω ±1% resistor (0805)
R12	1	10Ω ±1% resistor (0603)

DESIGNATION	QTY	DESCRIPTION
R13	1	0Ω ±5% resistor (0603)
R14	1	470Ω ±5% resistor (0402)
U1	1	12A current-mode buck converter (24 WLP) Maxim MAX15112EWG+
—	2	Shunts
—	1	PCB: MAX15112 EVALUATION KIT

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
TDK Corp.	847-803-6100	www.component.tdk.com
Vishay	402-563-6866	www.vishay.com

Note: *Indicate that you are using the MAX15112 when contacting these component suppliers.*

Quick Start

Recommended Equipment

- MAX15112 EV kit
- 5V, 7A DC power supply
- Load capable of sinking 12A
- Digital voltmeter

Procedure

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

1) Connect the positive terminal of the 5V supply to the IN PCB pad and the negative terminal to the nearest PGND PCB pad.
2) Connect the positive terminal of the 12A load to the OUT PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the digital voltmeter across the OUT PCB pad and the nearest PGND PCB pad.
4) Verify that a shunt is installed on jumper JU1.
5) Verify that a shunt is installed on 2-3 on jumper JU2.
6) Turn on the DC power supply.
7) Enable the load.
8) Verify that the voltmeter displays 1.5V.

Detailed Description of Hardware

The MAX15112 EV kit provides a proven design to evaluate the MAX15112 high-efficiency, 12A, step-down regulator with integrated switches. The applications include distributed power systems, portable devices, and preregulators. The EV kit is preset for 1.5V output at load currents up to 12A from a 2.7V to 5.5V input supply. The device features a 1MHz fixed switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast transient responses. Input aluminum electrolytic capacitors (C21, C22) are provided to damp the input if long wires are used; they are not required in a tight system design.

Soft-Start and Reference Input (SS/REFIN)

The device utilizes an adjustable soft-start function to limit inrush current during startup. The soft-start time is adjusted by the value of C16, the external capacitor from SS/REFIN to GND. By default, C16 is currently 0.1µF, which gives a soft-start time of approximately 6ms. To adjust the soft-start time, determine C16 using the following formula:

$$C16 = (10\mu A \times t_{SS})/0.6V$$

where t_{SS} is the required soft-start time in seconds and C16 is in farads. C16 should be a minimum of 1nF capacitor between SS/REFIN and GND. The resistor in series with the soft-start capacitor (R14) improves load regulation.

When no external reference is applied at SS/REFIN, the device uses the internal 0.6V reference. An external tracking reference with steady-state value between 0 and V_{IN} - 2.5V can be applied to SS/REFIN. Refer to the *Setting the Soft-Start Time* section of the MAX15112 IC data sheet for a more detailed description. During 1ms hiccup timeout, the SS/REFIN pin is pulled to GND internally to discharge the soft-start capacitor. R6 limits the currents from an externally supplied reference during the 1ms hiccup timeout event.

Setting the Output Voltage

The EV kit can be adjusted from 0.6V up to 0.94 x V_{IN} (forced PWM) by changing the values of resistors R1 and R2. To determine the value of the resistor-divider, first select R2 between 1kΩ and 20kΩ. Then use the following equation to calculate R1:

$$R1 = R2 [(V_{OUT}/V_{FB}) - 1]$$

where V_{FB} is equal to the reference voltage at SS/REFIN and V_{OUT} is the desired output. If no external reference is applied at SS/REFIN the internal reference is automatically selected and V_{FB} becomes 0.6V. When regulating for an output of 0.6V in skip mode, set R1 to 0Ω and keep R2 connected from FB to GND.

When R1 is changed, compensation components C14, R1, and C15 must be changed to ensure loop stability (refer to the *Compensation Design Guidelines* section in the MAX15112 IC data sheet).

Regulator Enable (EN)

The device features a regulator enable input. For normal operation, a shunt should be installed on jumper JU1. To disable the output, remove the shunt on JU1 and the EN pin will be pulled to PGND through resistor R4. See Table 1 for JU1 settings.

Skip-Mode Input (SKIP)

The device offers selectable skip-mode functionality to reduce current consumption and achieve a higher efficiency at light loads. To operate in skip mode, install a shunt on pins 1-2 on jumper JU2. See Table 2 for JU2 settings. **Caution: Do not change the setting of the skip jumper while the device is operating.**

Table 1. Regulator Enable (EN) Jumper JU1 Description

SHUNT POSITION	EN PIN	DEVICE OUTPUT
Installed*	Connected to IN	Enabled
Not installed	Pulled to PGND through R4	Disabled

**Default position.*

Table 2. Skip-Mode Input (SKIP) Jumper JU2 Description

SHUNT POSITION	SKIP PIN	MODE
1-2	Connected to EN	Skip-mode operation
2-3*	Connected to PGND	Forced-PWM operation

**Default position.*

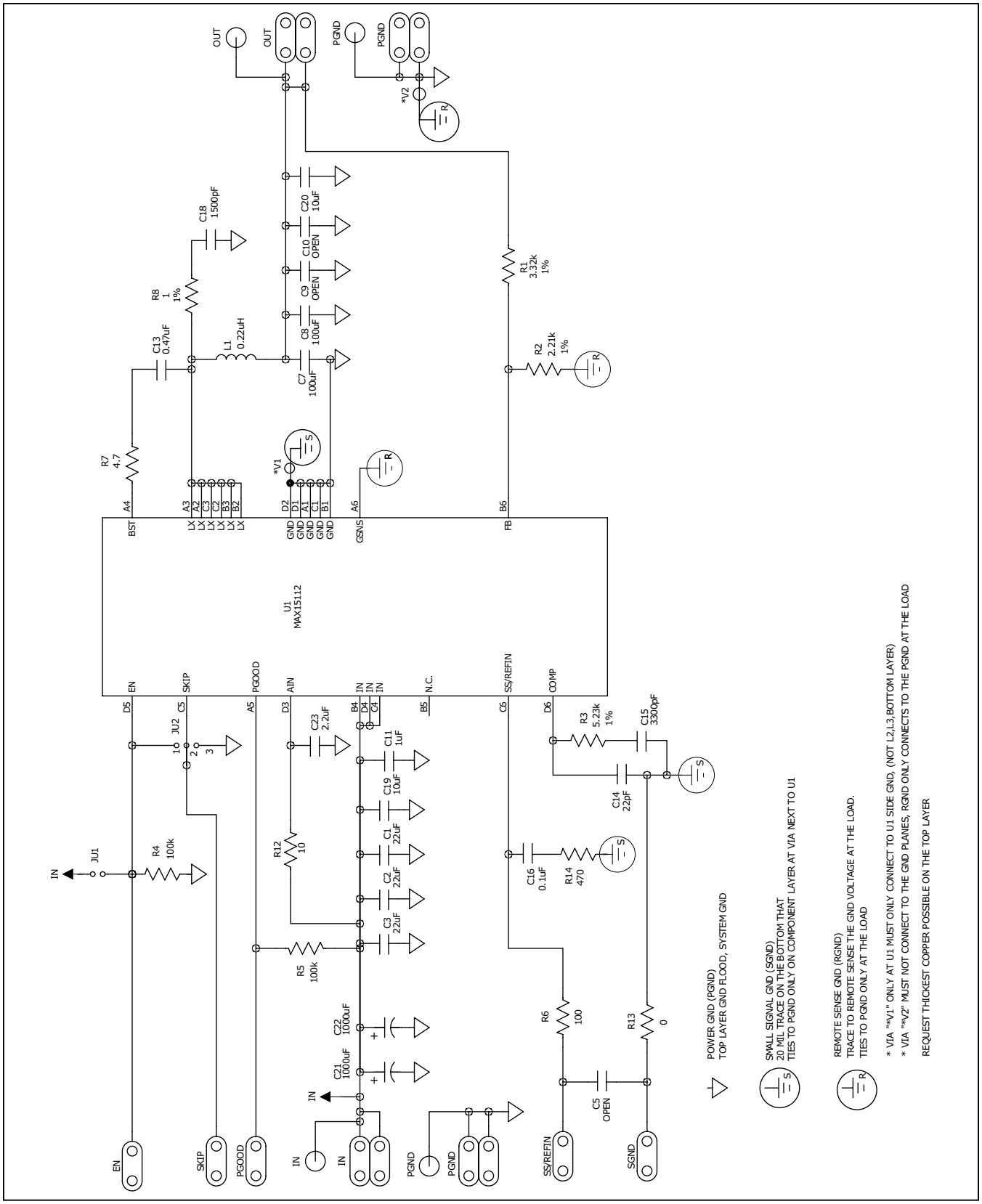

Figure 1. MAX15112 EV Kit Schematic

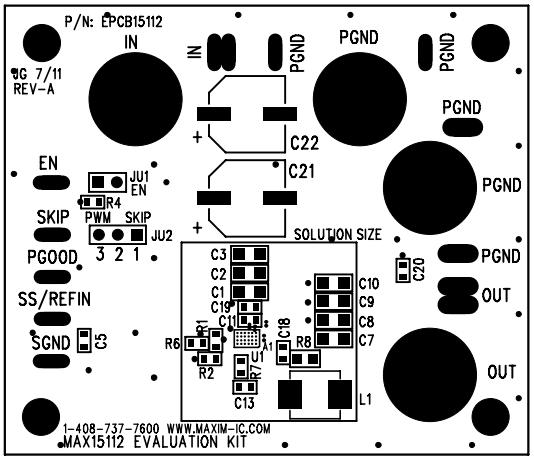

Figure 2. MAX15112 EV Kit Component Placement Guide—Component Side

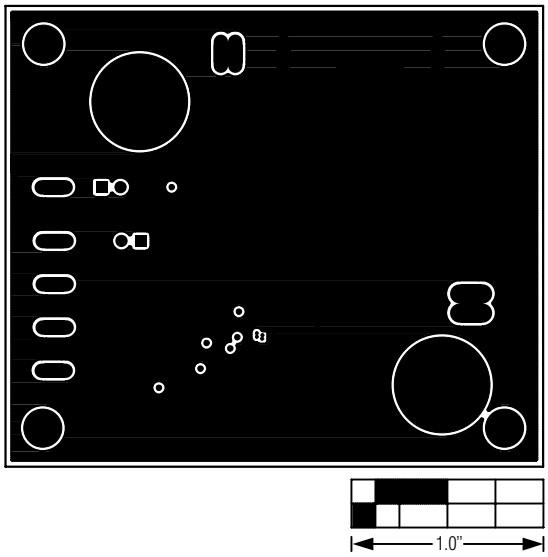

Figure 4. MAX15112 EV Kit PCB Layout—Inner Layer 2

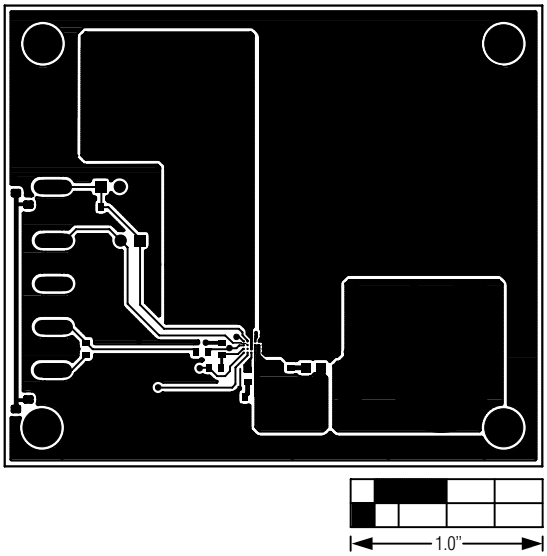

Figure 3. MAX15112 EV Kit PCB Layout—Component Side

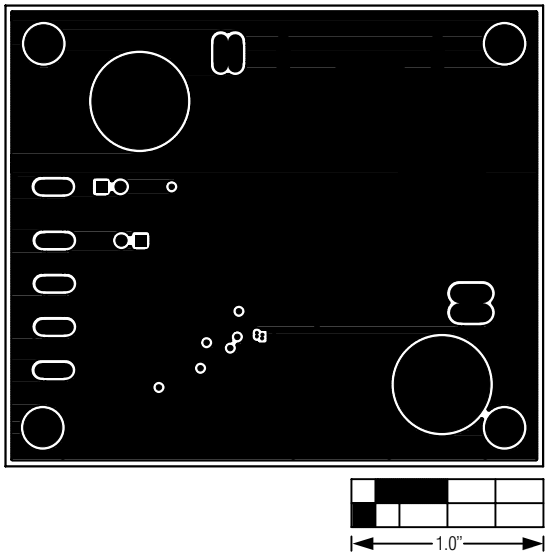

Figure 5. MAX15112 EV Kit PCB Layout—Inner Layer 3

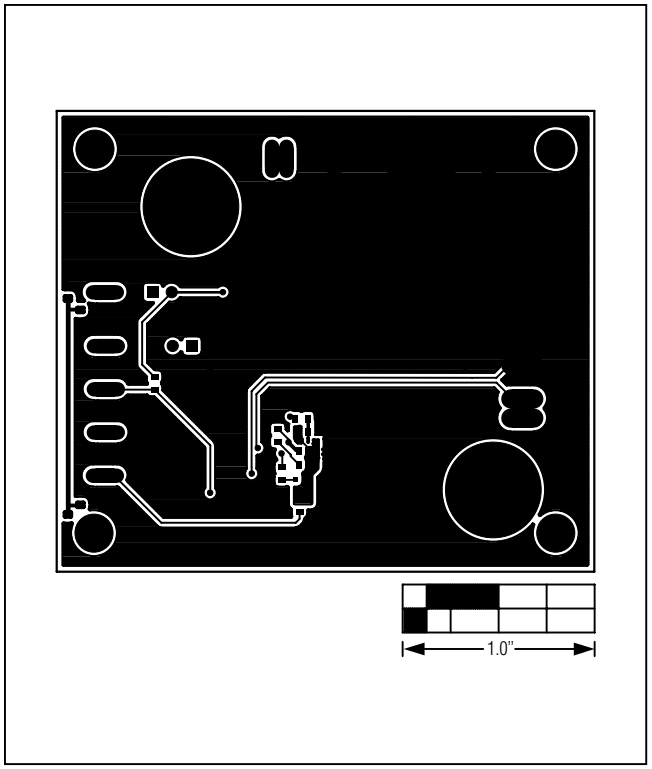

Figure 6. MAX15112 EV Kit PCB Layout—Solder Side

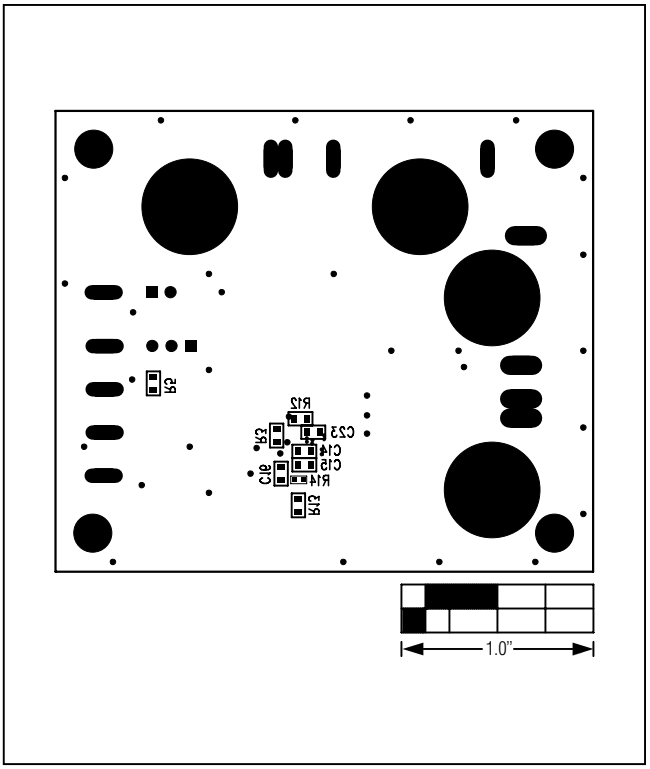

Figure 7. MAX15112 EV Kit Component Placement Guide—Solder Side

Ordering Information

PART	TYPE
MAX15112EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/11	Initial release	—
1	9/12	Updated *Component List* and Figure 1	1, 4