

MAX15096/A/D Evaluation Kits

Evaluate: MAX15096/MAX15096A/MAX15096D

General Description

The MAX15096/A/D evaluation kit (EV kit) provides a proven design to evaluate the MAX15096 hot-swap controller with an integrated 6A MOSFET. The EV kit is configured to pass 6A in a 2.7V to 18V hot-swap application, thus providing a fully integrated solution. The EV kit uses the MAX15096GWE+ in a 2mm x 2mm, 16-bump, 0.5mm pitch wafer-level package (WLP) with a proven four-layer PCB design. As configured, the EV kit is optimized to operate at 12V.

The EV kit can be used to evaluate all MAX15096A and MAX15096D variants

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	1 μ F \pm 10%, 25V X7R ceramic capacitors (0603) Murata GRM188R71E105K TDK C1608X5R1E105M
C3	1	5600pF \pm 10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H562K TDK C1608C0G1H562J
C4	0	Not installed, ceramic capacitor (1206)
C5	0	Not installed, ceramic capacitor (0805)
C6–C11	6	10 μ F \pm 10%, 25V X7R ceramic capacitors (1206) Murata GRM31CR71E106K TDK C3216X5R1E106M
C12	0	Not installed, electrolytic capacitor (D = 11mm)
D1	1	18V, 600W transient voltage suppressor (SMB) Fairchild SMBJ18A
D2	0	Not installed, Schottky diode (SMA)

Features

- 2.7V to 18V Operating Voltage Range
- Up to 6A Configurable Load Current Capability
- Banana Jacks for Input and Output Voltage
- Programmable Slew-Rate Control
- Selectable/Configurable Circuit-Breaker Threshold
- Configurable Overvoltage/Undervoltage Lockout
- Programmable Fast Comparator Response
- PG Output
- Defined Safe Operation Area
- Proven PCB Layout
- Fully Assembled and Tested

DESIGNATION	QTY	DESCRIPTION
D3	0	Not installed, Schottky diode (SOD523)
GATE, GDRV, REG, TIMER, UV/OV, VCC	6	Red test points
GND (x2), IN, OUT	4	Banana jacks
JU1	1	3-pin header
JU2–JU5	4	2-pin headers
Q1	1	30V, 65A n-channel MOSFET (DPAK) IRF IRLR8721PbF
R1	1	178k Ω \pm 1% resistor (0603)
R2	1	15k Ω \pm 1% resistor (0603)
R3	1	10 Ω \pm 5% resistor (0603)
R4	1	10 Ω \pm 5% resistor (0603)
R5	1	41.2k Ω \pm 5% resistor (0603)
R6	1	500k Ω potentiometer
R7–R9	3	100k Ω \pm 5% resistors (0603)
R10	1	49.9 Ω \pm 1% resistor (0603)
R11	1	50k Ω potentiometer
R12	1	0 Ω resistor (0603)

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U1	1	6A hot-swap solution (16 WLP) Maxim MAX15096GWE+ or Maxim MAX15096AGWE+ or Maxim MAX15096DGWE+

DESIGNATION	QTY	DESCRIPTION
—	5	Shunts
—	1	PCB: MAX15096 EVALUATION KIT

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
STMicroelectronics	408-452-8585	www.us.st.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: Indicate that you are using the MAX15096 when contacting these component suppliers.

Quick Start

Required Equipment

- MAX15096 EV kit
- 12V, 6A DC power supply
- Voltmeter

Procedure

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

- 1) Verify that a shunt is installed across pins 1-2 on jumper JU1. Also ensure that jumpers JU2 and JU4 are opened and jumpers JU3 and JU5 are closed.
- 2) Turn on the power supply and set the supply to 12V, then disable the power supply.
- 3) Connect the positive terminal of the power supply to the IN banana jack on the EV kit. Connect the negative terminal of the power supply to the GND banana jack.
- 4) Enable the power supply.
- 5) Verify that the voltage between the OUT and GND banana jacks is 12V.
- 6) Verify that the internal regulator voltage (REG) is 3.3V.
- 7) The EV kit is now ready for additional evaluation.

Detailed Description of Hardware

The MAX15096 EV kit provides a proven design to evaluate the MAX15096. The EV kit can be conveniently connected between the system power and the load using

the banana jacks provided for the input and output. PCB pads are provided to monitor and control the device signals. The EV kit operates between 2.7V and 18V up to 6A load current capability.

Evaluating the MAX15096

The EV kit can be used to evaluate the MAX15096, with the MAX15096GWE+ installed. The MAX15096A/MAX15096D are pin-to-pin compatible with the MAX15096. Refer to the device data sheet for details on the MAX15096A and MAX15096D.

Circuit Breaker (CB)

Jumper JU1 sets the current limit for the internal circuit breaker (CB) of the device. The CB pin can be connected to a fixed resistor (R5) or a potentiometer (R11) to set the current limit. See [Table 1](#) for shunt positions.

The circuit-breaker threshold can be set according to the following formula:

$$ICB = [(RCB/6510) - 0.34]$$

where I_{CB} is in A and R_{CB} (the resistor between CB and ground) is in Ω .

Table 1. JU1 Jumper Selection (CB)

SHUNT POSITION	CB PIN CONNECTED TO	CURRENT LIMIT
1-2*	R5	12A
2-3	R11	Adjustable

*Default position.

Setting the Output Slew Rate

An external capacitor (C3) is connected from GATE to GND on the IC to reduce the output slew rate during startup. During startup, a 5.9µA (typ) current is sourced to enhance the internal MOSFET with 10V/ms (typ). C3 can be calculated according to the following formula:

$$C3 = (I_{GATE} \times \Delta t) / \Delta V_{GATE}$$

where I_{GATE} is 5.9µA (typ), Δt is the desired slew rate, and ΔV_{GATE} is the voltage at the gate of the internal MOSFET at turn-on.

Enable/Present-Detect Inputs

The EV kit features jumpers JU2 and JU3 to enable/disable the output. JU3 allows simulation of PC Express card being plugged in. OUT is enabled when \overline{PRSNT} is pulled low and EN is pulled high. If \overline{PRSNT} is high, OUT is not enabled, regardless of EN logic state. See [Table 2](#) for jumper positions.

Undervoltage/Overvoltage Lockout

The EV kit provides an option to configure the undervoltage/overvoltage-lockout threshold using a resistive divider, R1 and R2 from IN to ground with the center tap

connected to UVOV. The EV kit's undervoltage-lockout threshold is set to 7.1V (typ) and the overvoltage-lockout threshold is set to 15.8V (typ). Refer to the device data sheet for more details.

TIMER

Jumper JU5 connects TIMER to REG, which sets the total response time of the fast-trip comparator to less than 200ns (typ). For adjustable response time, open JU5 and close JU4. JU4 connects TIMER to a 500kΩ potentiometer (R6). See [Table 3](#) for shunt positions.

Use the following formula to set the fast-trip comparator's response time:

$$t_{FCD} = 0.2 + R6 \times 22.9 \times 10^{-3}$$

where t_{FCD} is the fast-trip comparator response time in µs and R6 is the total resistance from TIMER to ground in kΩ set by the 500kΩ potentiometer. Refer to the device data sheet for more details.

Table 2. JU2 and JU3 Jumpers Selection

SHUNT POSITION	EN/ \overline{PRSNT} CONNECTIONS	EV KIT OPERATION
Not installed (JU2)	EN pulled to REG with a 100kΩ pullup	OUT enabled with \overline{PRSNT} low
Installed (JU3)	\overline{PRSNT} forced to GND	OUT enabled with EN high

*Default position.

Table 3. JU4 and JU5 Jumpers Selection

SHUNT POSITION	TIMER CONNECTED TO	t_{FCD}
Not installed (JU4)	R6	Adjustable
Installed (JU5)	REG	200ns

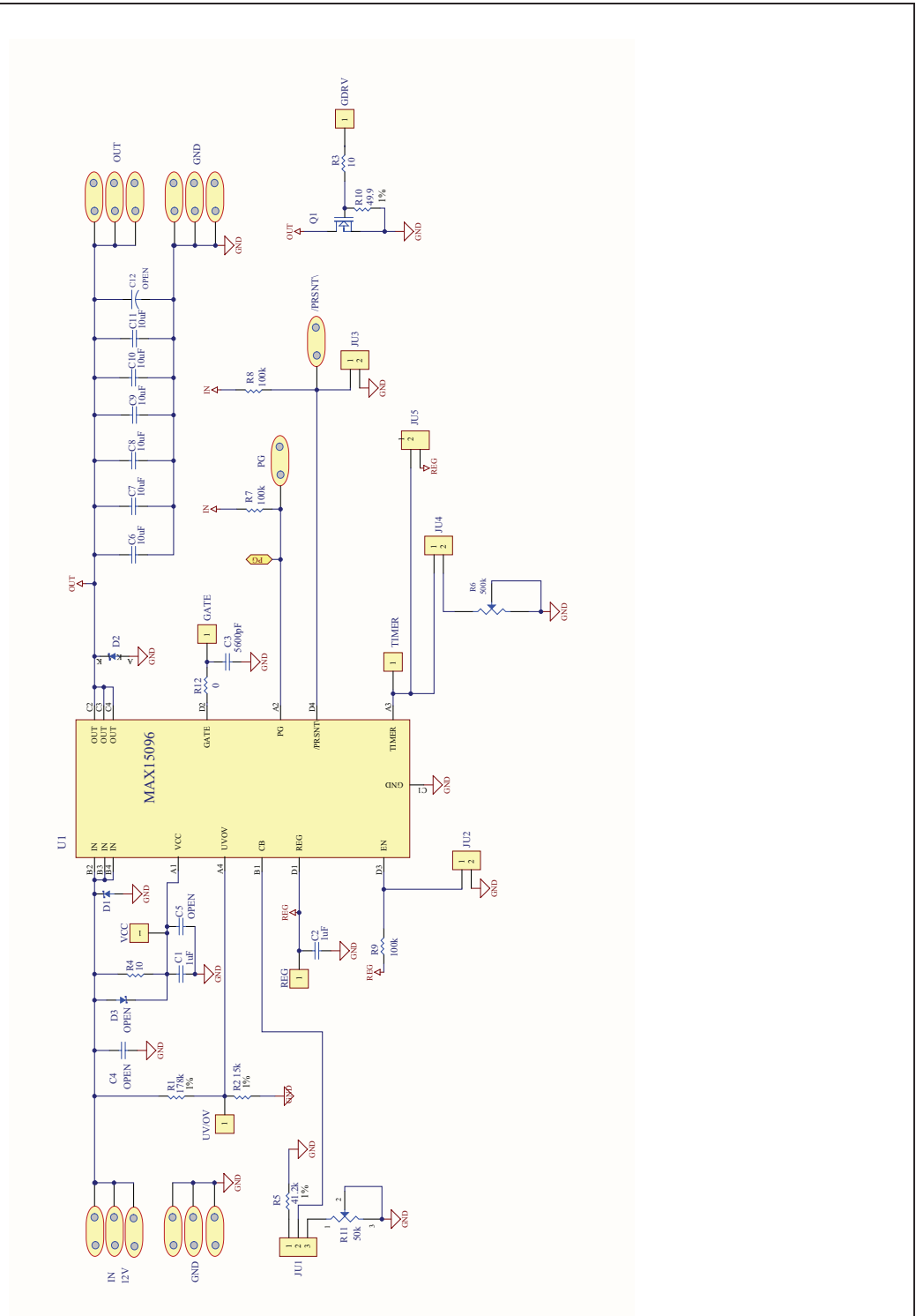


Figure 1. MAX15096 EV Kit Schematic

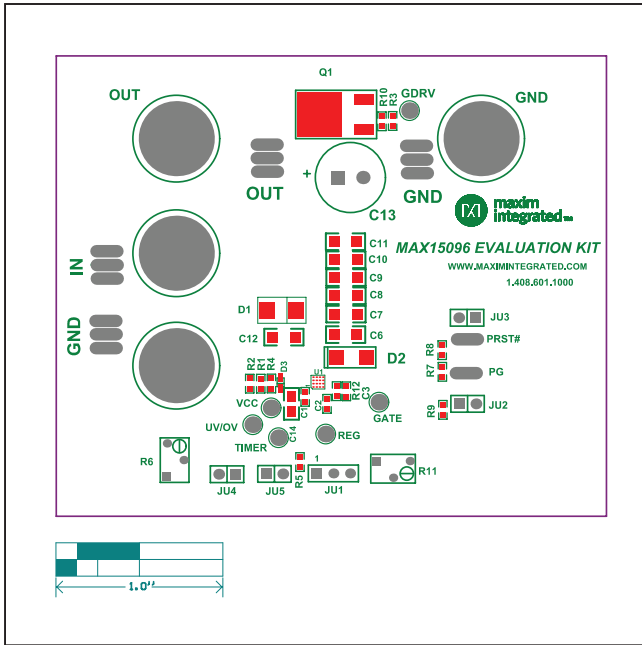


Figure 2. MAX15096 EV Kit Component Placement Guide—Component Side

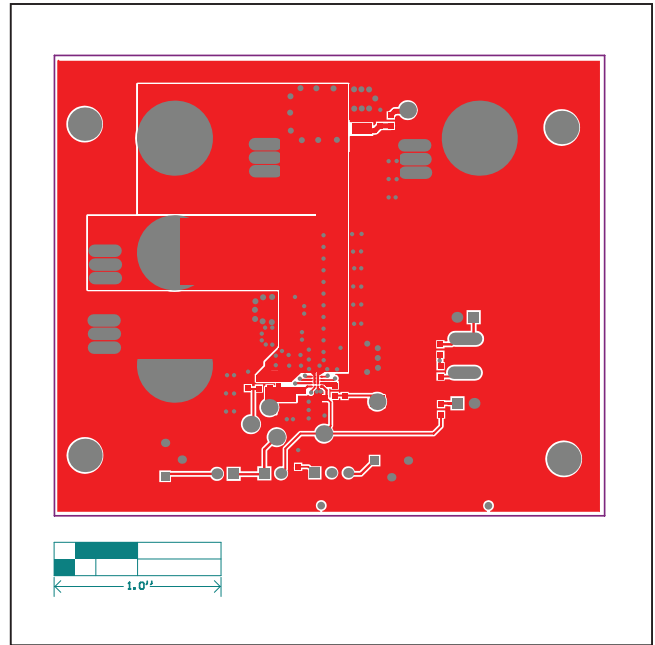


Figure 3. MAX15096 EV Kit PCB Layout—Component Side

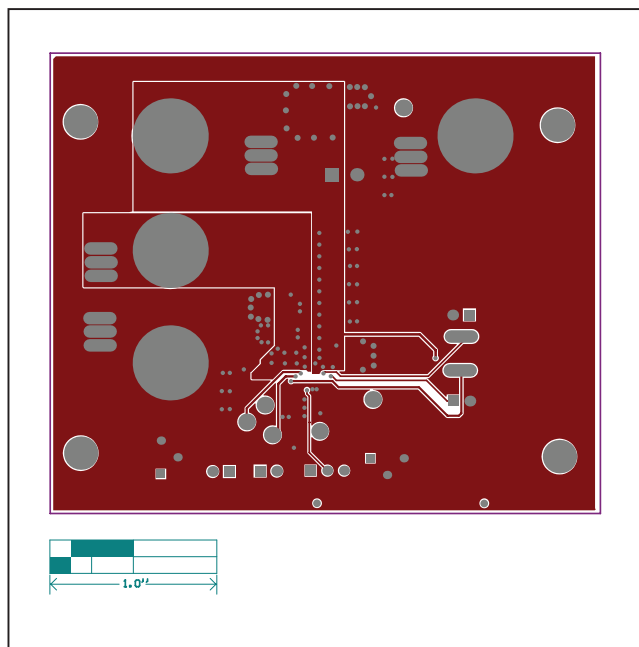


Figure 4. MAX15096 EV Kit PCB Layout—Layer 2 (PWR/GND)

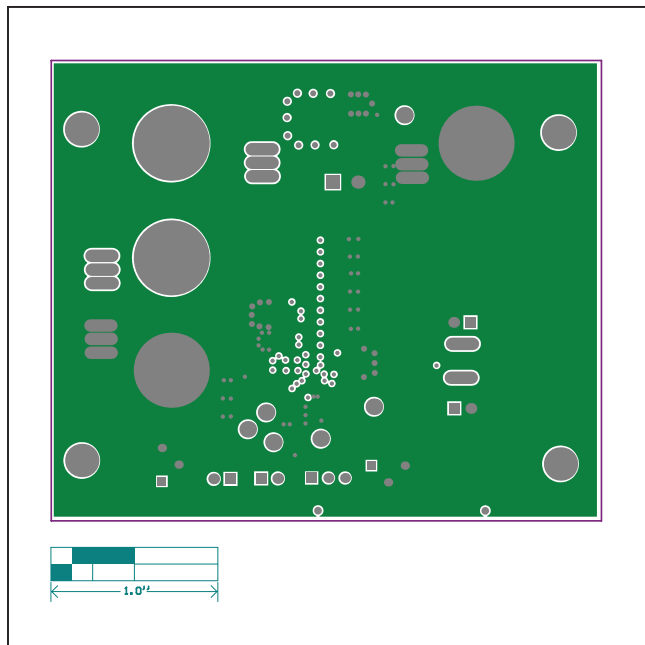


Figure 5. MAX15096 EV Kit PCB Layout—Layer 3 (GND)

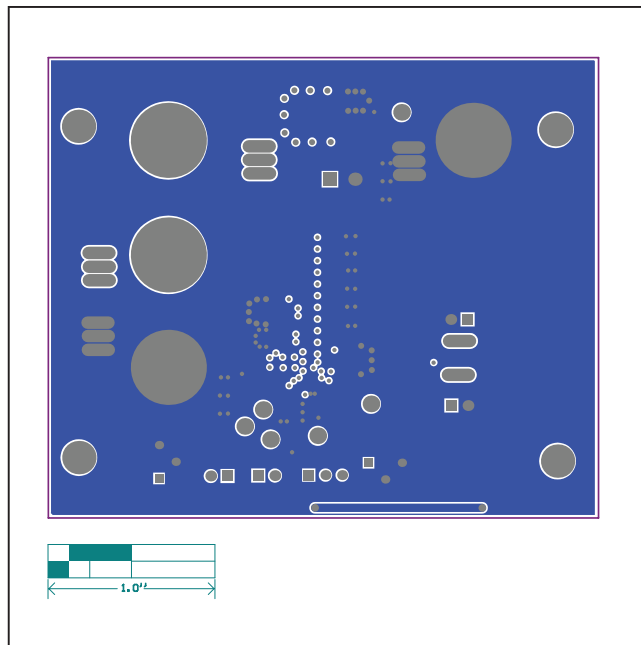


Figure 6. MAX15096 EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX15096EVKIT#	EV Kit
MAX15096AEVKIT#	EV Kit
MAX15096DEVKIT#*	EV Kit

#Denotes RoHS compliant.

*Future product—contact factory for availability.