

MAX17609 Evaluation Kit

**Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit**

General Description

The MAX17609 evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the MAX17609 4.5V to 60V, 1A, OV, UV protector with forward current-limit in a 12-pin TDFN-EP package. The EV kit can be configured to demonstrate adjustable overvoltage, under-voltage, different current-limit types, and different current-limit thresholds.

Features

- 4.5V to 60V Operating-Voltage Range
- Features a TVS Diode across the Input and Schottky Diode across the Output Terminals
- Evaluates UVLO, OVLO, Three Current-Limit Types, and Current-Limit Threshold
- UVLO programmed to 4.5V
- OVLO programmed to 36V
- Jumper-Configurable Current-Limit (Selected as 0.1A by default)
- Current-Limit Mode Set To Autoretry by default
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

Quick Start

Recommended Equipment

- MAX17609 EV kit
- 60V DC power supply
- Multimeters
- Adjustable load (0A-1.5A)
- USB-A male to USB-B male cable or 5V DC power supply

Equipment Setup and Test 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 all jumpers are in their default positions.
- 2) Connect the USB cable to J1 from a computer or connect a 5V-DC power supply to TP3.
- 3) Verify that LED1 is on.
- 4) Set the 60V DC power supply to 5V and connect to IN (J2/TP6). Verify that OUT (J3/TP8) is 5V.
- 5) Gradually increase the DC power-supply voltage and verify that OUT voltage goes down and $\overline{\text{UVOV}}$ goes low when input reaches approximately 36V.
- 6) Gradually decrease the DC power-supply voltage and verify that OUT comes back and $\overline{\text{UVOV}}$ goes high when the input reaches approximately 34.8V.
- 7) Set the DC power-supply voltage to 24V and connect the adjustable load between OUT and GND terminals and a multimeter in series to measure the current. Gradually increase the load current and verify that the OUT goes down and $\overline{\text{FLAG}}$ goes low when the load current increases above 0.1A.
- 8) The jumper JU1 can be configured to change the current limit as given in Table 2. Verify various current limit operations by repeating step 7.

CAUTION: When applying a negative input to V_{IN} , the negative input test should be performed when the output capacitors are fully discharged and V_{BUS} is not supplied.

MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

Detailed Description

The EV kit circuit can be configured to evaluate user-defined UVLO and OVLO thresholds using resistor-dividers. The overcurrent threshold is determined by external resistors connected to the SET1 pin and is jumper-configurable through jumper JU1. Using jumper JU4, the EV kit circuit can be configured to evaluate different current limit types (Autoretry, Continuous, and Latch-off). LED1 on the EV kit indicates availability of logic power for annunciation signals ($\overline{\text{UVOV}}$ and $\overline{\text{FLAG}}$) and EN.

The EV kit provides on-board output capacitors to enable a demonstration of the MAX17609 protection features.

Input-Power Supply

The EV kit is powered by a user-supplied 4.5V to 60V power supply connected between J2/TP6 (INPUT POWER) and GND.

Enable

To enable the device, connect a USB-A male connector from the computer to the USB-B female connector, J1, or an external 5V supply to TP3 and GND. This provides 5V to V_{BUS} and to the EN pin (JU5 connects V_{BUS} to EN by default). Choose the JU5 setting to enable or disable operation of the MAX17609 (see [Table 1](#)).

UVLO/OVLO Threshold

Ensure jumper JU2 is installed to use the UVLO/OVLO resistive dividers.

Table 1. Enable (JU5)

JUMPER	SHUNT POSITION	DESCRIPTION	MAX17609 STATUS
JU5	1-2*	EN pin connected to V_{BUS}	ON
	2-3	EN pin connected to GND	OFF
	Open	EN pin floating	ON

*Default position.

Table 2. Current-Limit Threshold (JU1)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Current limit 0.1A
	3-4	Current limit 0.5A
	5-6	Current limit 1.0A
	7-8	Current limit adjustable

*Default position.

The UVLO threshold for input voltage is set through the R9, R10 resistive divider. Use the following equation to calculate the value of R10 for a required undervoltage threshold level:

$$R10 = \frac{R9}{\left(\frac{V_{\text{UVLO}}}{V_{\text{REF}}} - 1\right)}$$

where R9 can be chosen as 2.2M Ω , V_{REF} is 1.5V, and V_{UVLO} is the required undervoltage protection threshold.

The OVLO threshold for input voltage is set through the R11, R12 resistive divider. Use the following equation to calculate the value of R12 for a required overvoltage threshold level:

$$R12 = \frac{R11}{\left(\frac{V_{\text{OVLO}}}{V_{\text{REF}}} - 1\right)}$$

where R11 can be chosen as 2.2M Ω , V_{REF} is 1.5V, and V_{OVLO} is the required overvoltage protection threshold.

Current-Limit Threshold

The EV kit features a jumper (JU1) to select the current-limit threshold. Install a jumper as shown in [Table 2](#) to change the current-limit threshold.

MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

Current-Limit Type Select

The EV kit features jumper JU4 to select different current-limit responses. See [Table 3](#) for jumper settings.

Output-Load Capacitor

Use JU6 to connect the OUT pins to the OUT test point (TP8). Use jumper JU7 to connect output to 330μF capacitors. See [Table 4](#) for jumper settings

Table 3. Current-Limit Type Select (JU4)

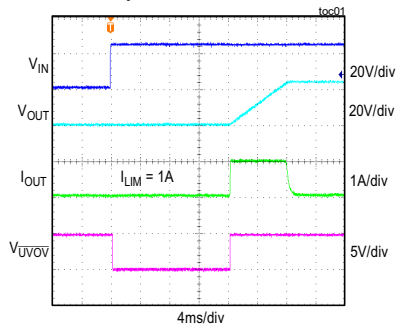
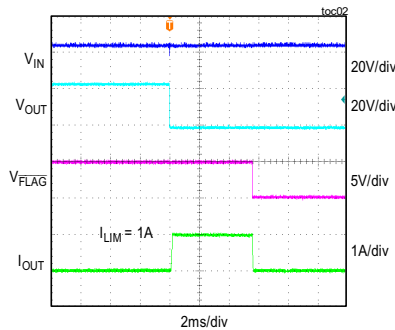
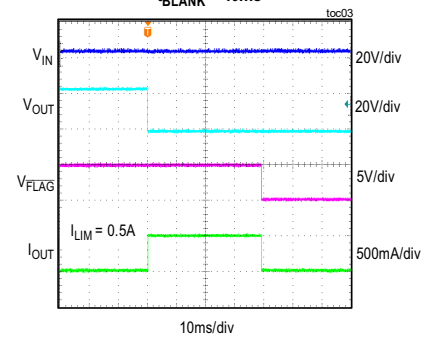
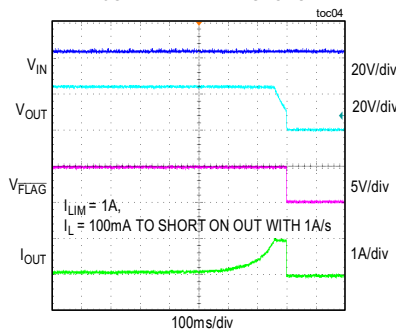
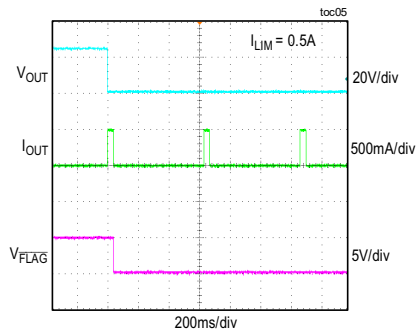
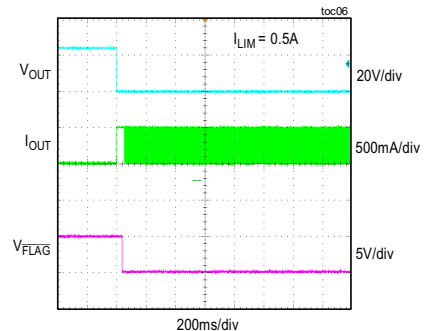
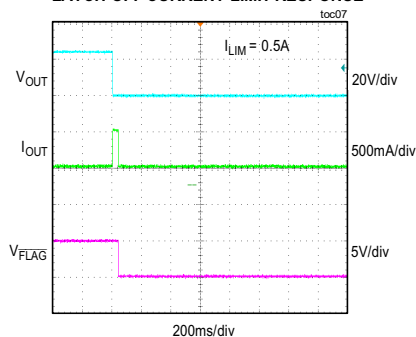
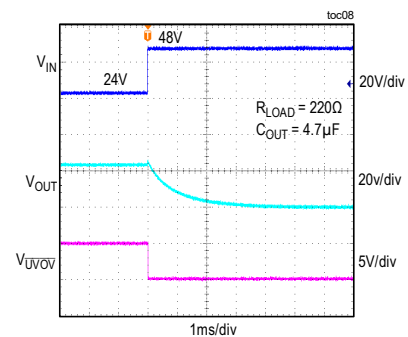
JUMPER	SHUNT POSITION	DESCRIPTION
JU4	1-2	Latch-off
	2-3	Continuous
	Open*	Autoretry

*Default position.

Table 4. Output Load Capacitor (JU7)

JUMPER	SHUNT POSITION	DESCRIPTION
JU7	Installed	OUT connected to C4 and C5.
	Not installed*	OUT not connected to C4 and C5.

*Default position.

MAX17609 EV Kit Performance Report(V_{IN} = 24V, unless otherwise noted.)**POWER-UP RESPONSE
WITH 330 μ F CAPACITOR AT NO LOAD****THERMAL SHUTDOWN DUE TO
OUTPUT SHORT-CIRCUIT****OUTPUT SHORT-CIRCUIT RESPONSE
t_{BLANK} = 40ms****CURRENT-LIMIT RESPONSE****AUTORETRY CURRENT-LIMIT RESPONSE****CONTINUOUS CURRENT-LIMIT RESPONSE****LATCH-OFF CURRENT-LIMIT RESPONSE****OVERVOLTAGE-FAULT RESPONSE**

MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

Component Suppliers

SUPPLIER	WEBSITE
Bourns, Inc.	www.bourns.com
Fairchild Semiconductor	www.fairchildsemi.com
FCI Electronics Interconnection Solutions	www.fciconnect.com
Lite-On, Inc.	www.us.liteon.com
Lumex Inc.	www.lumex.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
Phoenix Contact, Inc.	www.phoenixcontact.com
STMicroelectronics	www.us.st.com
TDK Corp.	www.component.tdk.com

Note: Indicate that you are using the MAX17609 when contacting these component suppliers.

Ordering Information

PART	TYPE
MAX17609EVKIT#	EV Kit

MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

MAX17609 EV Kit Bill of Materials

PART REFERENCE	QTY	DESCRIPTION	MANUFACTURER PART NUMBER
C1	1	1 μ F 10%, 25V X7R ceramic capacitors (0603)	Murata GRM188R61E105KA12
C2	1	0.47 μ F 10%, 100V X7R ceramic capacitors (0805)	Murata GRM21BR72A474KA73L
C3	1	4.7 μ F 10%, 100V X7R ceramic capacitors (1210)	Kemet C1210C475K1R2C, Murata GRM32ER72A475KE14
C4	1	330 μ F 20%, 50V aluminium (10mm)	Panasonic EEU-EB1H331
D1	1	TVS Diode, 600W (SMB)	Bourns SMBJ40CA
D2	1	Power Schottky Diode, 60V, 5A (SMC)	Diodes Incorporated B560CQ-13-F
D3	1	Power Schottky Diode, 60V, 1A (SMA)	Diodes Incorporated B160-13-F
J1	1	USB B connector	FCI Connect 61729-0010BLF
J2, J3	2	2-Pin Green PC Terminal Block	Degson Electronics DG128-5.0-02P-14
JU1	1	2x4 Dual-Row Header, 0.1in centers, cut to fit	Sullins Connector PBC04DAAN
JU2, JU3, JU6, JU7	4	2-Pin Single-Row Header, 0.1in centers, cut to fit	Molex Connector 22-28-4023
JU4, JU5	2	3-Pin Single-Row Header, 0.1in centers, cut to fit	Sullins Connector PEC03SAAN
LED1	1	Green LED (1206)	Kingbright APT3216SGC
R1	1	1k Ω 1% resistors (0603)	—
R2, R3	2	10k Ω 1% resistors (0402)	—
R4	1	150k Ω 5% resistor (0402)	—
R5, R13	2	5k Ω 0.1% resistors (0402)	—
R6	1	15k Ω 1% resistors (0402)	—
R7	1	3k Ω 1% resistors (0402)	—
R8	1	1.5k Ω 1% resistors (0402)	—
R9, R11	2	2.2M Ω 5% resistors (0402)	—
R10	1	1.1M Ω 1% resistors (0402)	—
R12	1	95.3k Ω 1% resistors (0402)	—
R14	1	20k Ω 1% resistors (0402)	—
R15	1	1k Ω 1% resistors (0402)	—
R16	1	20k Ω Trimmer Potentiometers	Bourns 3296W-1-203LF
TP1, TP9, TP11-TP13	5	White Test Point	Keystone Electronics Corp 5002
TP2, TP4, TP5, TP7	4	Black Test Point	Keystone Electronics Corp 5001
TP3, TP6, TP8	3	Red Test Point	Keystone Electronics Corp 5000
TP10	1	Green Test Point	Keystone Electronics Corp 5116
U1	1	4.5V to 60V, 1A, OV, UV Protector with Forward Current Limit (12-pin TDFN-EP, 3mm x 3mm)	MAX17609ATC+
C5	0	Not Installed; 330 μ F 20%, 50V aluminium (10mm)	Panasonic EEU-EB1H331
D4	0	Not Installed; TVS Diode, 600W (SMB)	Bourns SMBJ40CA
PCB	1	PCB: MAX17609 Evaluation Kit	—

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

The schematic diagram illustrates a 12-bit digital-to-analog converter (DAC) system. The central component is the DAC128C08, which is configured with various resistors (R1-R16), capacitors (C1-C5), and comparators (D1-D4). The circuit includes input and output buffers (J1-J7), a 5V reference source (J1), and a 12-bit digital input (J2). The output is a 12-bit digital signal (J7) and a 12-bit analog output (J6). The schematic is labeled with component values and pin numbers, and includes a legend for the output signals.

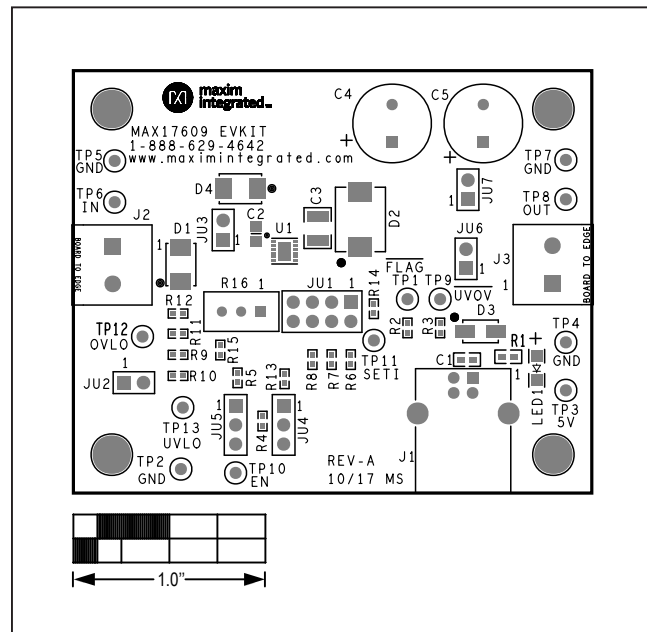
Legend:

- 12-bit DIGITAL INPUT (J2)
- 12-bit DIGITAL OUTPUT (J7)
- 12-bit ANALOG OUTPUT (J6)

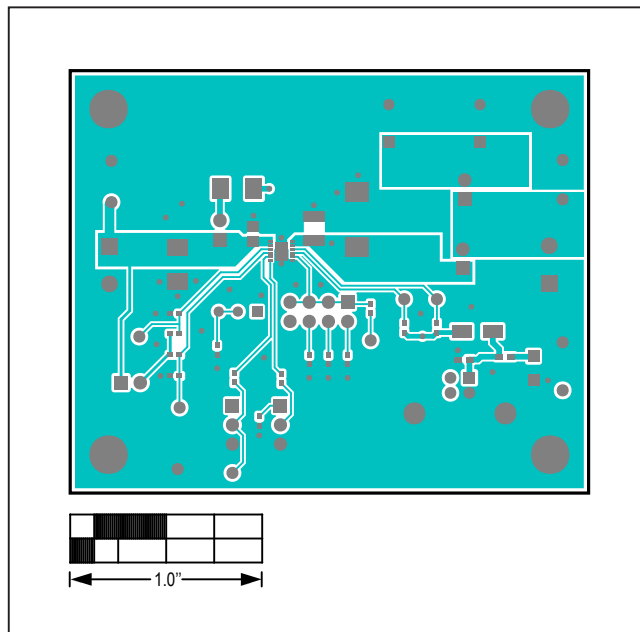
MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

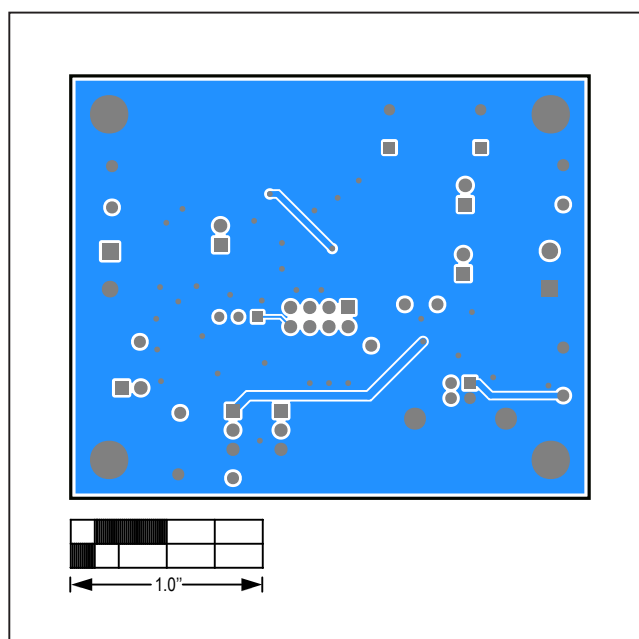
MAX17609 EV Kit PCB Layout



MAX17609 EV Kit PCB Layout—Top Silkscreen



MAX17609 EV Kit PCB Layout—Top Layer



MAX17609 EV Kit PCB Layout—Bottom Layer

MAX17609 Evaluation Kit

Evaluates: MAX17609 – 4.5V to 60V,
1A, OV, UV Protector with
Forward Current Limit

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/18	Initial release	—

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.

Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.