Low Resistance Load Switch with Current Limit Control and Over-Voltage Reverse Blocking Protection

Brief Description

The KTS1688 Evaluation (EVAL) Kit is used to demonstrate and evaluate the KTS1688 Low On-Resistance current-source protection load switch with reverse blocking functionality, performance, and PCB layout. The kit includes a fully assembled and tested PCB with the KTS1688 IC installed, two pairs of high-current XT30-to-Banana power cables, and a printed copy of the Quick Start Guide (also contained within this document).

Ordering Information

Part Number	Description	IC Package
KTS1688EUH-MMEV01	KTS1688 EVAL Kit	WLCSP-9

3D CAD Image

EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTS1688 EVAL fully assembled PCB	1
2	XT30-to-Banana power cables, red/black pair	2 pairs
3	Anti-static bag	1
4	Quick Start Guide, printed 1 page (A4 or US Letter)	1
5	EVAL Kit box	1

QR Links for Documents

IC Datasheet	EVAL Kit Landing Page
https://www.kinet-ic.com/kts1688/	https://www.kinet-ic.com/kts1688euh-mmev01/

User-Supplied Equipment

Required Equipment

1. Bench Power Supply for VIN – 5.0V (or 5.1V) from 1A up to 3A capable, as needed for the intended application.
2. Digital Multimeters – one or more, used to measure input/output voltages and currents.

Optional Equipment

1. Oscilloscope – for dynamic testing of input and output load voltages as well as OC fault flag state (and input or load currents with a current probe, if available).
2. Load – Electronic Load, power resistors, or an actual system load.

Recommended Operating Conditions

Symbol	Description	Value	Units
VIN	Input Withstand Voltage	-0.3 to 6.0	V
	Input Operating Voltage	2.5 to 5.5	V
VOUT	Output Withstand Voltage	-0.3 to 29	V
I_{OUT}	Output Load Current	0 to 2.5	A

Jumper Description

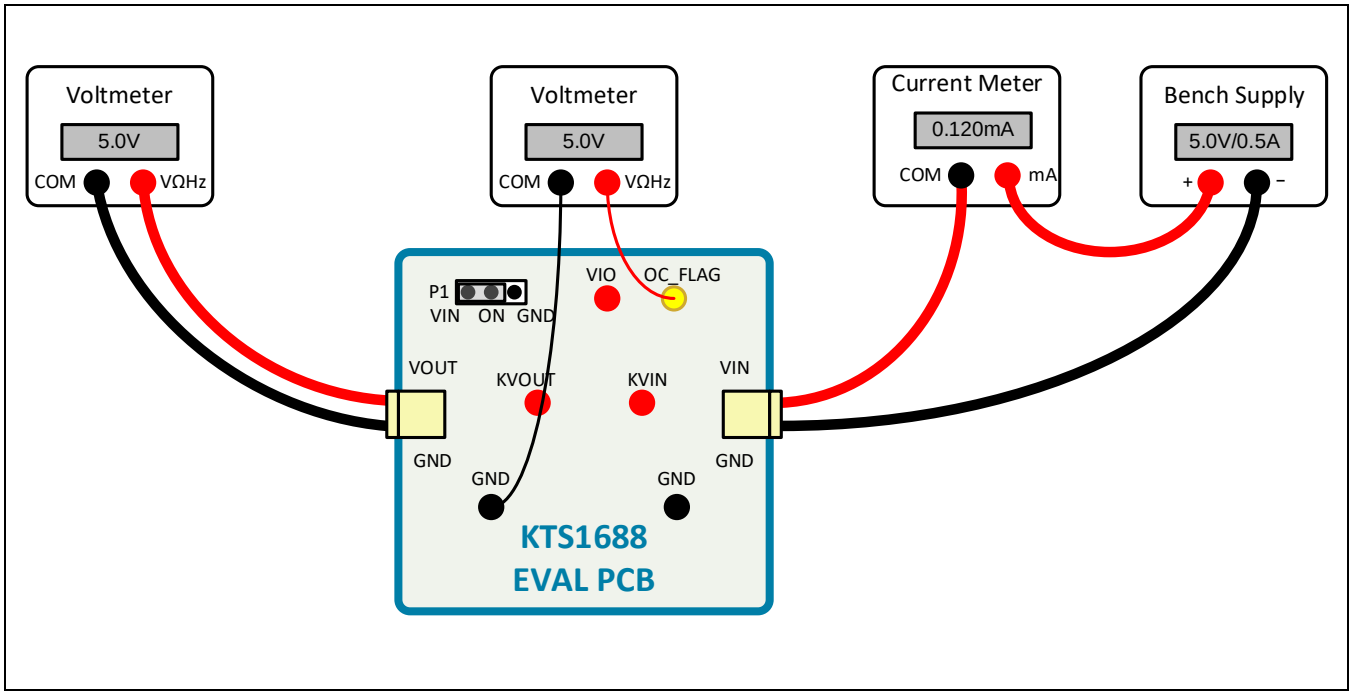
Designator	Name	Description	Default
P1	CTRL	Active-High Turn-On Logic Input VIN (H): IC enabled / ON GND (L): IN disabled / OFF	L

Quick Start Procedures

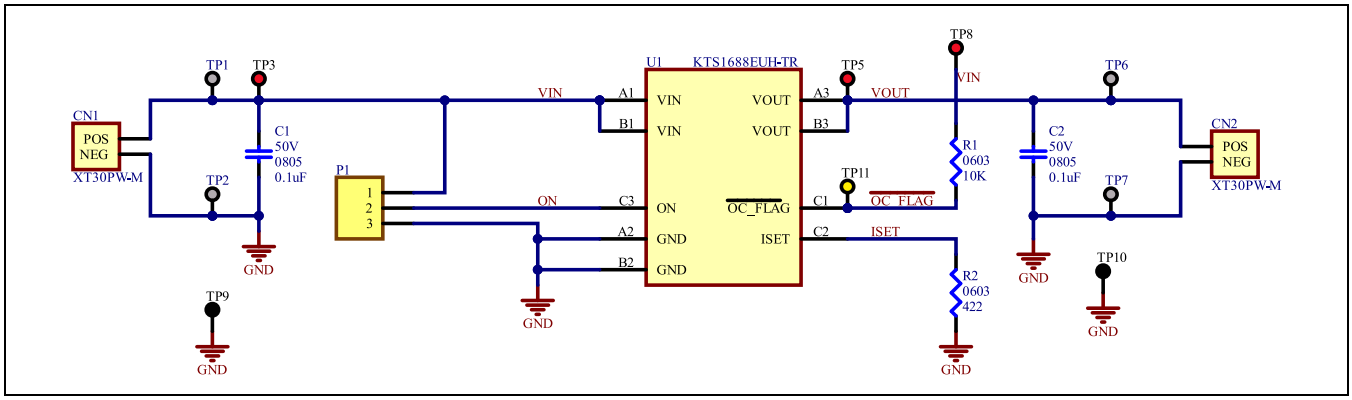
1. Set Jumper to default: CTRL (P1) On/Off = ON to VIN to enable the device. ON to GND disables the device.
2. Connect one pair of XT30-to-Banana power cables to the XT30 connector at VIN and GND (right edge of EVAL Kit).
3. Before connecting the EVAL Kit to the VIN bench supply, turn on the supply and adjust the voltage as close to 0V as possible. Then turn off or disable the supply output. While off, connect the banana ends of the XT30-to-Banana power cables to the VIN bench supply.
4. Turn on the VIN bench supply and very slowly ramp the output voltage to an appropriate level, such as 5.0V or 5.1V. While ramping VIN slowly, use the bench supply's output current indication (or a digital multimeter) to monitor the VIN current. If the current becomes high, reduce the VIN voltage quickly to prevent damage. Then inspect the setup for any wiring errors.
5. With valid VIN voltage, use a digital multimeter to check the output voltage between the KVOUT and GND terminals on the EVAL Kit. It should be nearly the same as the input voltage. The active low OC_FLAG output should be equal to VIN or a logic high level.
6. Use a digital multimeter to check the no-load supply current to VIN. Consult the KTS1688 datasheet for the expected current range at the VIN voltage condition in use. For conditions of VIN = 5.0V, CTRL (P1) = H, and no-load, the input supply current should be close to 120μA.

Typical Test Setup Diagram

As an example, use the following test setup to measure item 6 in the Quick Start Procedures.



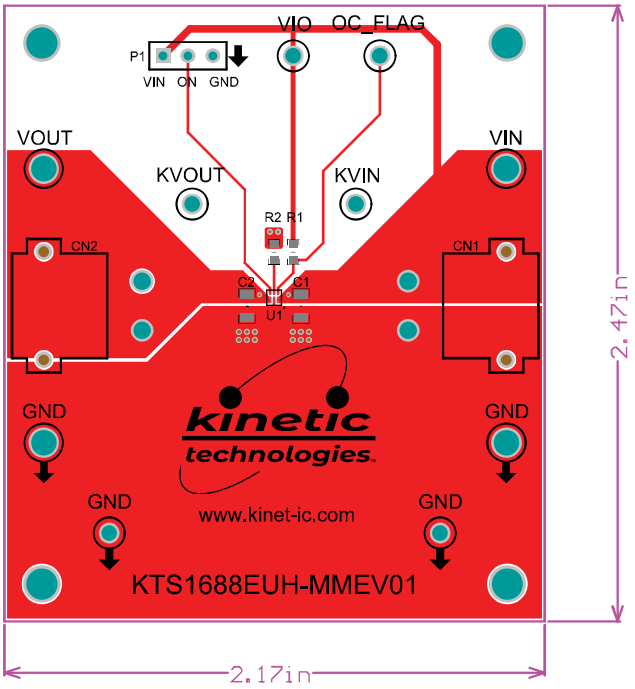
Electrical Schematic

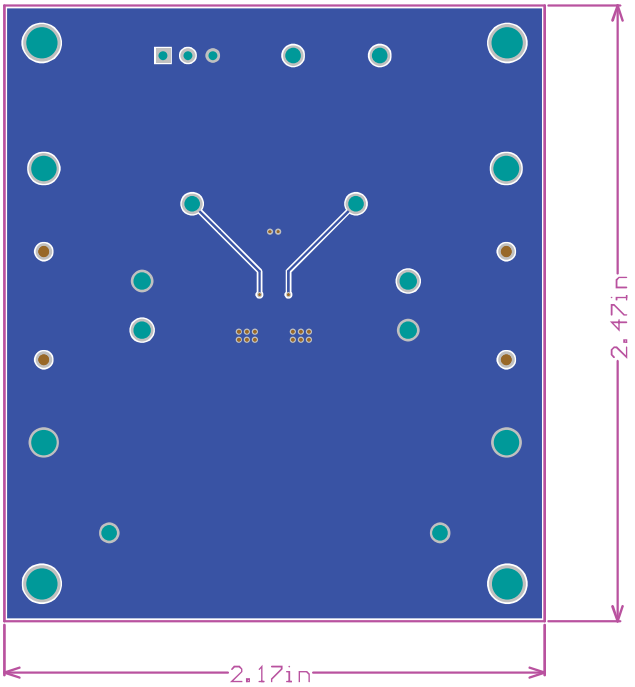


Bill of Materials (BOM)

Item #	Quantity	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
1	2	C1, C2	CAP 0.1UF 50V X7R 0805	0.1uF	0805	Yageo	CC0805KRX7R9BB104	311-1140-1-ND	603-CC805KRX7R9BB104
2	2	CN1, CN2	30A Right Angle Through Hole Power Connectors			AMASS	XT30PW-M		
3	4	H1, H2, H3, H4	BRD SPT SNAP LOCK REST MNT 4MM			Essentra Components	PSD-4M-19	PSD-4M-19-ND	144-PSD-4M-19
4	1	P1	CONN HEADER VERT 3POS 2.54MM		TH	Sullins Connector Solutions	PREC003SAAN-RC	S1012EC-03-ND	
5	1	R1	RES 10K OHM 1% 1/10W 0603	10K	0603	Yageo	RC0603FR-0710KL	311-10.0KHRCT-ND	603-RC0603FR-0710KL
6	1	R2	RES 422 OHM 1% 1/8W 0805	422	0603	Yageo	RC0805FR-07422RL	311-422CRCT-ND	603-RC0805FR-07422RL
7	4	TP1, TP2, TP6, TP7	TERM TURRET SINGLE L=5.56MM TIN		TH	Keystone	1502-2	36-1502-2-ND	534-1502-2
8	3	TP3, TP5, TP8	PC TEST POINT MULTIPURPOSE RED		TH	Keystone	5010	36-5010-ND	534-5010
9	2	TP9, TP10	PC TEST POINT MULTIPURPOSE BLACK		TH	Keystone	5011	36-5011-ND	534-5011
10	1	TP11	PC TEST POINT MULTIPURPOSE YELLOW		TH	Keystone	5014	36-5014-ND	534-5014
11	1	U1	Low Resistance Load Switch with Current Limit Control and		WLCSP-9	Kinetic Technologies	KTS1688EUH-TR		389-KTS1688EUHTR

Printed Circuit Board (PCB)





Additional Test Procedures

1. Logic Pin Testing:
    a. Checking the on state or shutdown supply current at VIN is accomplished by turning the device on or off via the P1 jumper. To enable the device, place a jumper between ON and VIN.
    b. The VIO logic voltage level is set by the R1 pull up resistor to VIN. The default value for R1 is 10kΩ, this sets the active low OC_FLAG fault functionality. Connect a voltmeter or oscilloscope probe to the OC_FLAG terminal to observe the state of the over-current protection flag.
2. Testing with Load:
    a. Use the second XT30-to-Banana power cable pair to apply loads from VOUT to GND.
    b. Use multimeters and an oscilloscope to make DC and transient measurements as desired.

Setting the Output Current Limit

The KTS1688 EVAL Kit is supplied with a pre-installed current limit set resistor R2. The default value is 422Ω to set the current limit protection threshold to 2.5A. To adjust the current limit protection to a different level as may be required for a given application, change the value of R2. Consult the KTS1688 datasheet and use resistor values found in the *Electrical Characteristics* table or in the Figure 2 curve found in the *Current Limiting* section of the *Functional Description*.

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