6.5A$_{RMS}$ VBUS Load Switch for 28V EPR Systems

Brief Description

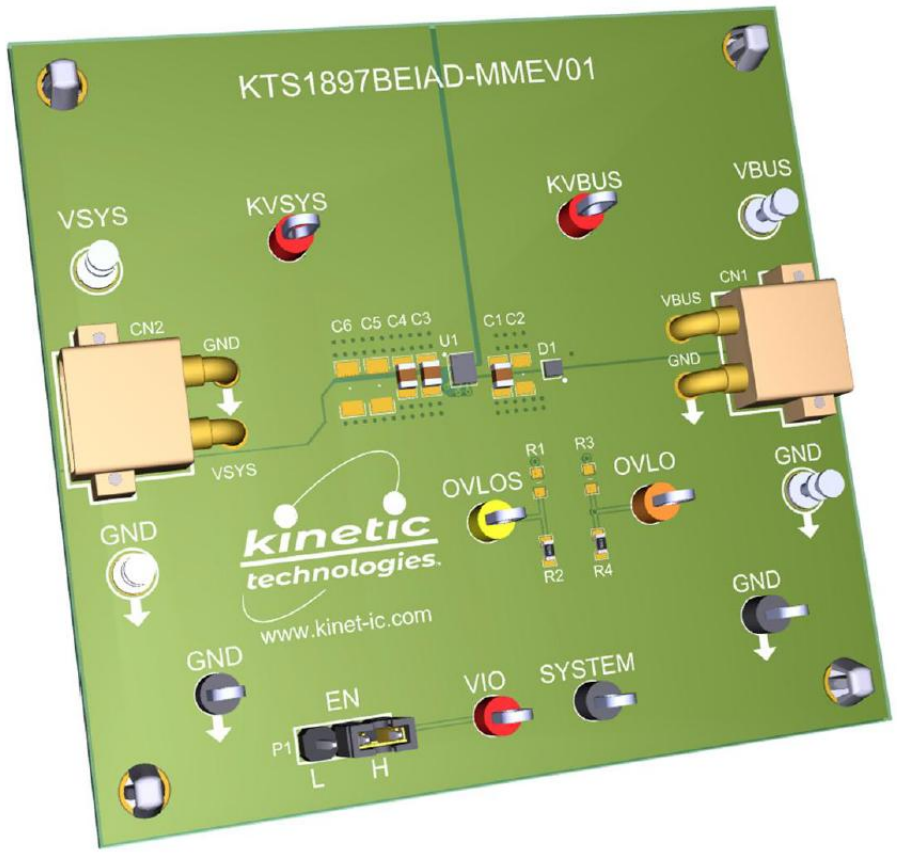
The KTS1897 Evaluation (EVAL) Kit is used to demonstrate and evaluate the KTS1897 functionality, performance, and PCB layout. The kit includes a fully assembled and tested PCB with the KTS1897 IC installed, two pairs of high-current XT30-to-Banana power cables, and a printed copy of the Quick Start Guide (also contained within this document).

This evaluation board also includes our KTS1289 flat-clamp mini TVS for High Voltage Surge & ESD Protection. This provides robust transient voltage suppression (TVS) for ESD and surge events.

Ordering Information

Part Number	Description	IC Package
KTS1897BEIAD-MMEV01	KTS1897 (+KTS1289) EVAL Kit	WLCSP54-20

3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTS1897 (+KTS1289) 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 Landing Page	EVAL Kit Landing Page
https://www.kinet-ic.com/kts1897/	https://www.kinet-ic.com/kts1897beiad-mmev01
https://www.kinet-ic.com/KTS1289/	https://www.kinet-ic.com/kts1289ecae-mmev01/

User-Supplied Equipment

Required Equipment

1. Bench Power Supply for VBUS – 5V/9V/15V/20V/28V/32V and 0.5A/1.5A/3A/5A, as needed for the intended application. For testing over-voltage protection and withstand voltage, a 35V adjustable bench power supply is preferred.
2. Digital Multimeter – one or more, used to measure input/output voltages and currents.

Optional Equipment

1. Bench Power Supply for VIO – 1.5V to 5V, low current. Needed for shutdown mode (EN = L).
2. Oscilloscope – for dynamic testing of voltages (and currents with a current probe, if available).
3. Load – either an eLoad, power resistors, or an actual system load.
4. Additional Digital Multimeters

Recommended Operating Conditions

Symbol	Description	Value	Units
VBUS	Absolute Input Withstand Voltage	-0.3 to 35	V
	Input Operating Voltage	3 to 32	V
VIO	VIO Operating Voltage	1.5 to 5.5	V
I_{OUT}	Output Load Current	0 to 5	A

Jumper Descriptions

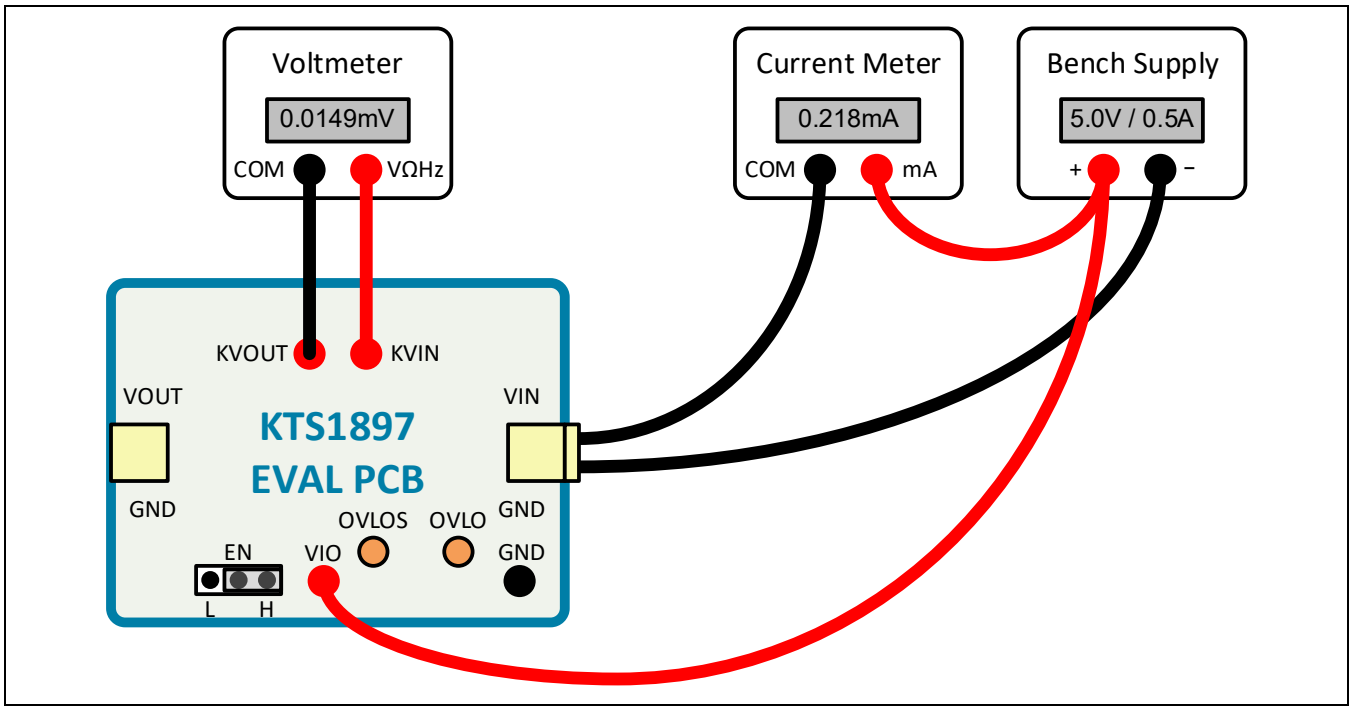
Designator	Name	Description	Default
P1	EN	Active-High Enable Input H: Enable Mode – normal switch operation (B/D-Version) L: Shutdown Mode – switch disabled (A/C-Version)	H

Quick Start Procedures

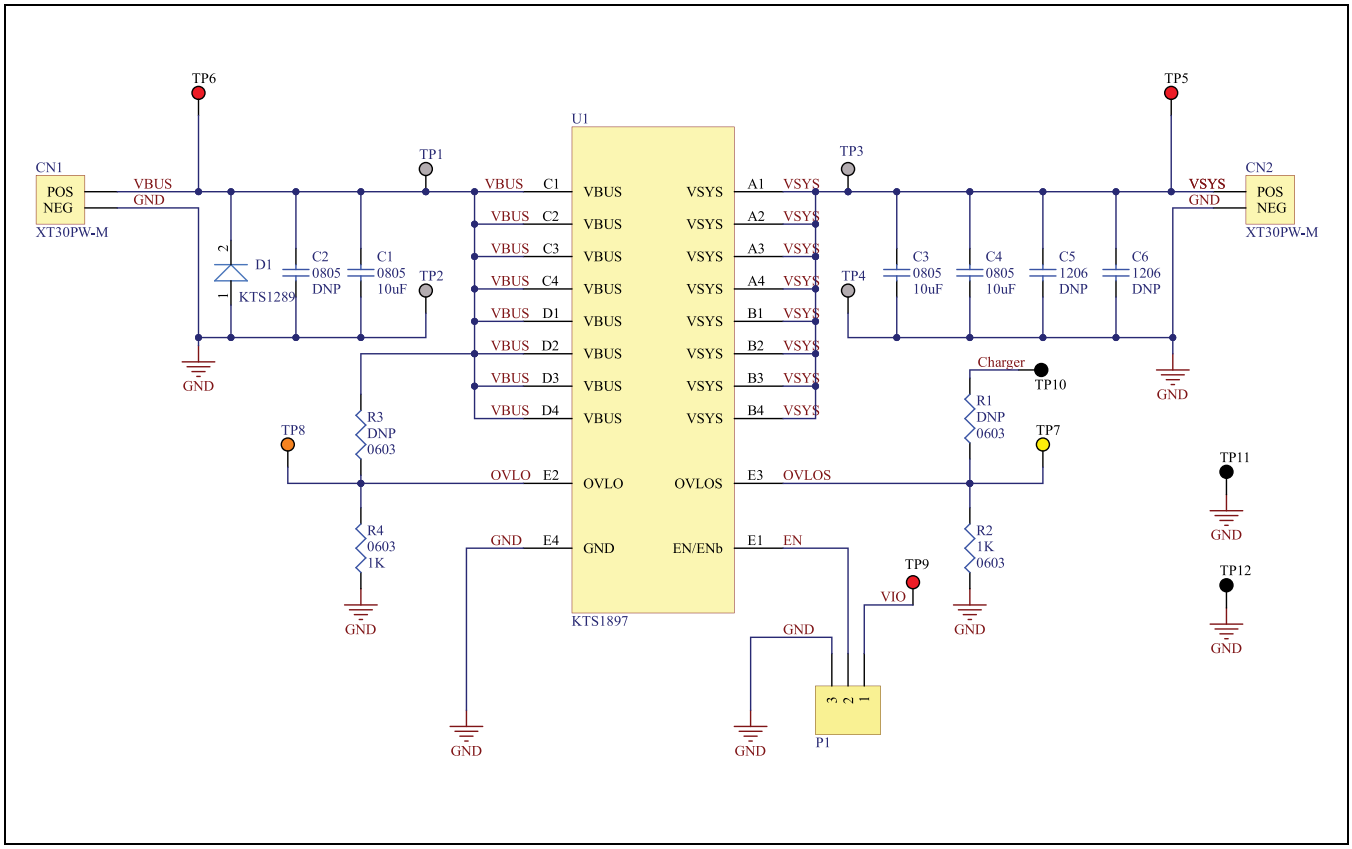
1. Set Jumpers to default: EN = H
2. Connect one pair of XT30-to-Banana power cables to the XT30 connector at VBUS and GND (right edge of EVAL Kit).
3. Before connecting the EVAL Kit to the VBUS bench supply, turn on the supply and adjust the voltage as close to 0V as possible. Then turn off the supply. While off, connect the banana ends of the XT30-to-Banana power cables to the VBUS bench supply.
4. Turn on the VBUS bench supply and very slowly ramp its voltage to an appropriate voltage, such as 5, 9, 12, 15, 20, 28 or 32V. While ramping VBUS slowly, use the bench supply's output current indication (or a digital multimeter) to monitor the VBUS current. If the current becomes high, reduce the VBUS voltage quickly to prevent damage. Then inspect the setup for any wiring errors.
5. With valid VBUS voltage, use a digital multimeter to check the output voltage between the KVSYS and GND terminals on the EVAL Kit. It should be nearly the same as the input voltage.
6. Use a digital multimeter to check the "ideal diode" droop regulation voltage between the KVBUS and KVSYS terminals on the EVAL Kit. At no-load and light-load conditions (<240mA), it should be close to 20mV.
7. Use a digital multimeter to check the no-load supply current at VBUS. Consult the KTS1897 datasheet for the expected current range at the VBUS voltage condition in use. For conditions of VBUS = 5.0V, EN = H, and no-load, it should be close to 240µA.

Typical Test Setup Diagram

As an example, use the following test setup to measure items 6 and 7 in the Quick Start Procedures.



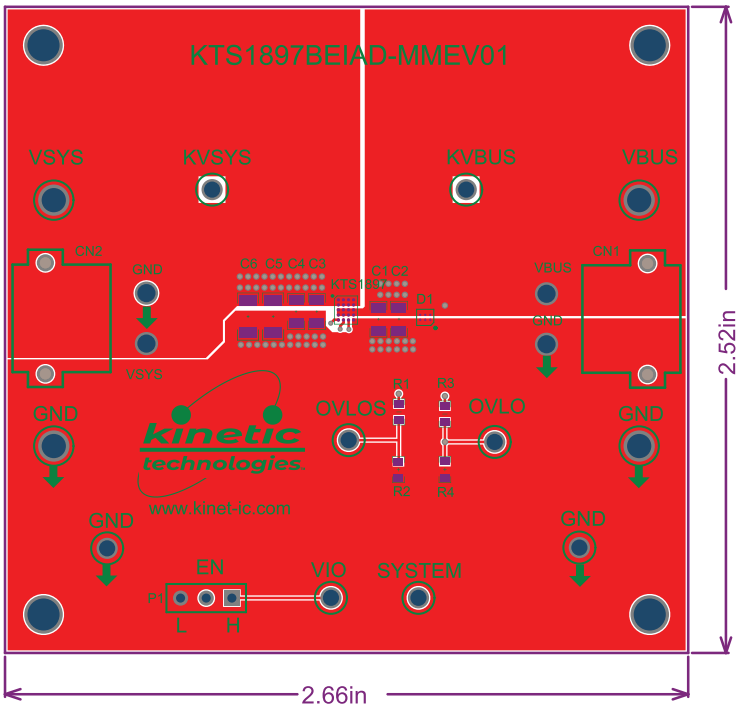
Electrical Schematic

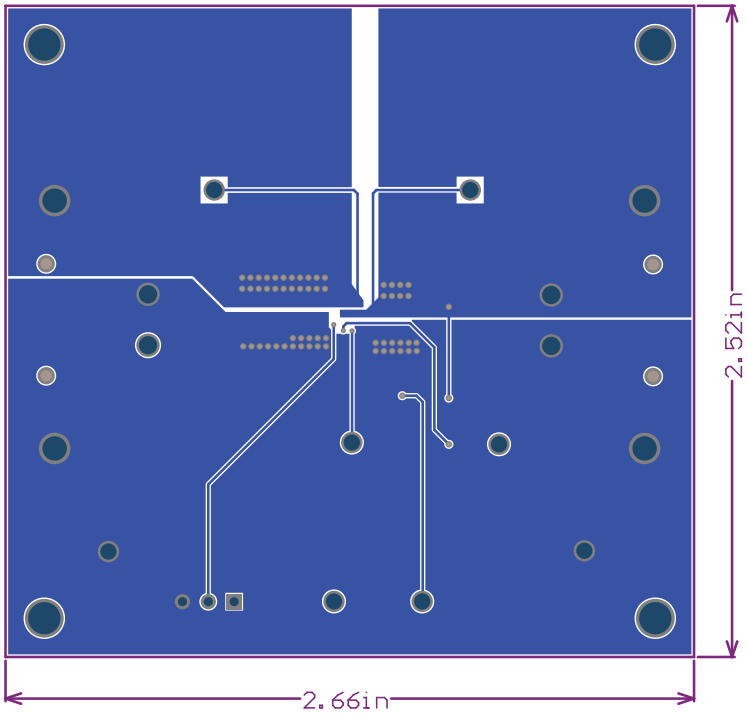


Bill of Materials (BOM)

Designator	Description	Quantity	Value	Manufacturer	Manufacturer Part Number
C1	CAP CER 10µF 50V X5R 0805	1	10µF	Samsung	CL21A106KBYQNNE
C2	CAP CER 10µF 50V X5R 0805 DNP	1	DNP		
C3, C4	CAP CER 10µF 35V X5R 0805	2	10µF	Murata	GRM21BR6YA106KE43L
C5, C6	CAP CER 10µF 35V X5R 1206	2	DNP		
CN1, CN2	30A Right Angle Through Hole Power Connectors	2		AMASS	XT30PW-M
D1	KTS1289 TVS WLCSP32-6	1		Kinetic Technologies	KTS1289ECAE-TA
H1, H2, H3, H4	BRD SPT SNAP LOCK REST MNT 4MM	4		Essentra Components	PSD-4M-19
P1	CONN HEADER VERT 3POS 2.54MM	1		Sullins Connector Solutions	PREC003SAAN-RC
R1, R3	RES SMD 0603	2	DNP		
R2, R4	RES SMD 1K 1% 1/10W 0603	2	1K	Yageo	RC0603FR-071KL
TP1, TP2, TP3, TP4	TERM TURRET SINGLE L=5.56MM TIN	4		Keystone	1502-2
TP5, TP6, TP9	PC TEST POINT MULTIPURPOSE RED	3		Keystone	5010
TP7	PC TEST POINT MULTIPURPOSE YELLOW	1		Keystone	5014
TP8	PC TEST POINT MULTI PURP ORANGE	1		Keystone Electronics	5013
TP10, TP11, TP12	PC TEST POINT MULTIPURPOSE BLACK	3		Keystone	5011
U1	6.5ARMS 28V VBUS Current-Sink Protection Load Switch	1		Kinetic Technologies	KTS1897BEIAD-TA

Printed Circuit Board (PCB)





Additional Test Procedures

1. Testing with Load:
    a. Use the second XT30-to-Banana power cable pair to apply loads from VSYS to GND.
    b. Under heavy-load conditions, use caution. The KTS1897 IC may become hot; avoid skin contact. The voltage between the KVBUS and KVSYS terminals at 3A load condition should be close to 75mV due to on-resistance of the switch.
    c. Use multimeters and an oscilloscope to make DC and transient measurements as desired.

Setting OVLO

By default, the EVAL Kit uses the internal 33V setting for the Over-Voltage Protection (OVP) threshold. The OVLO pin and associated resistive voltage divider (R3, R4) are used to externally set the over-voltage threshold in the range of 4V to 31V. As shipped, R3 is not populated and R4 is populated with a 1kΩ pull-down so that OVLO is 0V and the KTS1897 uses the internal 33V setting.

To set a different OVP threshold using the OVLO pin, populate R3. See the KTS1897 datasheet to calculate the necessary value of resistance.

Adding Additional Input Capacitance

The VBUS input capacitance of the EVAL Kit is 10µF by design. 10µF is the maximum allowed by USB standards on the VBUS pin of the USB connector. However, for non-standard applications, the C2 footprint (not populated) is available to add additional input capacitance.

External TVS - KTS1289ECAE-TA

The KTS1289 is a flat-clamp, active-control transient voltage suppressor (TVS) optimized to protect DC power ports in the 28V nominal range from surge and electrostatic discharge (ESD) events. It is rated to IEC61000-4-5 standards for surge events beyond ±200VSURGE and can discharge up to IPP=80A surge current. It is rated to IEC61000-4-2 standards for ESD events up to ±30kV contact and ±30kV air-gap ESD.

Evaluating Other ICs

This EVAL Kit may optionally be used to evaluate all KTS1897 series VBUS current-sink protection load switches. Before ordering samples of these devices, please confirm capability to reflow and exchange WLCSP devices.

Part Number	Enable Polarity	Switch Mode
KTS1897AEIAD-TA[1]	$\overline{EN}$	Uni-directional with RCP
KTS1897BEIAD-TA	EN	Uni-directional with RCP
KTS1897CEIAD-TA[1]	$\overline{EN}$	Bi-directional without RCP
KTS1897DEIAD-TA	EN	Bi-directional without RCP

Troubleshooting

Symptom	Root Cause	Solution
EN = L does not disable the switch.	EN floating or not connected to L(GND).	Set the VIO lower than EN disable voltage or make the EN pin connect to L(P1).

1. *Consult Kinetic Technologies authorized representative for availability.*

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Kinetic Technologies IC products are compliant with RoHS, formally known as Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. However, this evaluation kit does not fall within the scope of the EU directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and may not meet the requirements of these or related directives. To the best of our knowledge the information is true and correct as of the date of the original publication of the information. Kinetic Technologies bears no responsibility to update such statement.