

6A_{RMS} VBUS I_{SINK} Load Switch for 28V EPR Systems

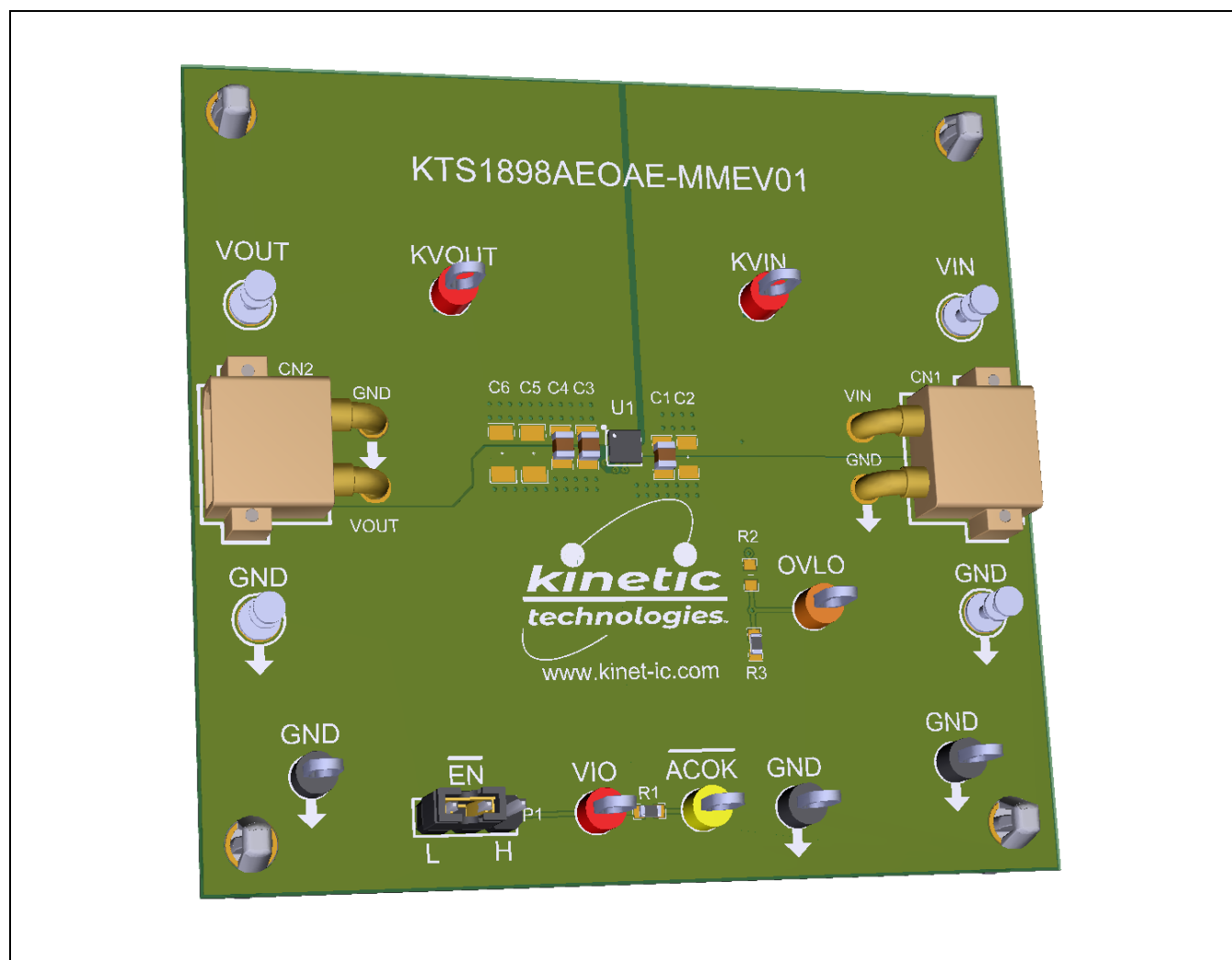
Brief Description

The KTS1898A Evaluation (EVAL) Kit is used to demonstrate and evaluate the KTS1898A functionality, performance, and PCB layout. The kit includes a fully assembled and tested PCB with the KTS1898A 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). The KTS1898A has $\overline{\text{EN}}$ active-low input logic with internal 1M Ω pull-down.

Ordering Information

Part Number	Description	IC Package
KTS1898AEOAE-MMEV01	KTS1898A EVAL Kit	WLCSP-25



3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTS1898A 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/KTS1898/	 https://www.kinet-ic.com/KTS1898aeoae-mmev01

User-Supplied Equipment

Required Equipment

1. Bench Power Supply for VIN – 5V/9V/12V/15V/20V/28V/32V and 0.5A/1.5A/3A/5A/6A, 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 ($\overline{EN} = H$) and fault monitoring (\overline{ACOK} pull-up voltage).
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
VIN	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 6	A

Jumper Descriptions

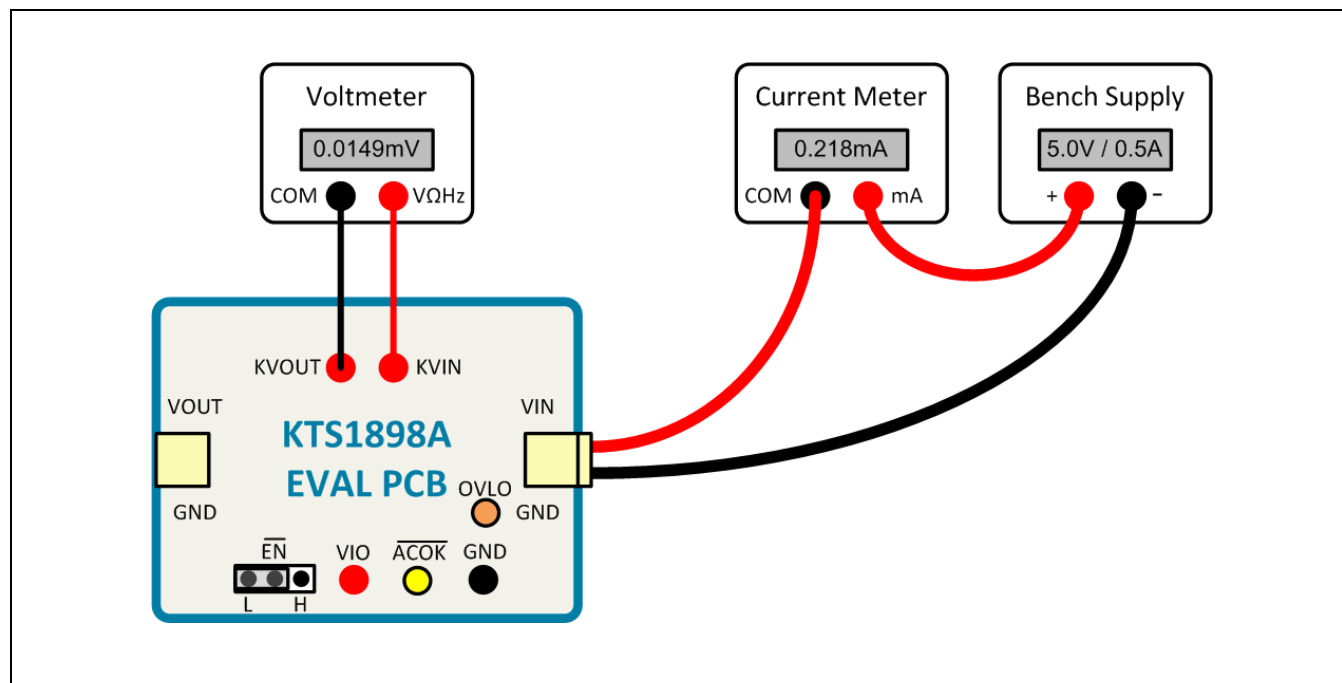
Designator	Name	Description	Default
P1	\overline{EN}	Active-Low Enable Input H: Shutdown Mode – switch disabled (A-Version) L: Enable Mode – normal switch operation (A-Version)	L

Quick Start Procedures

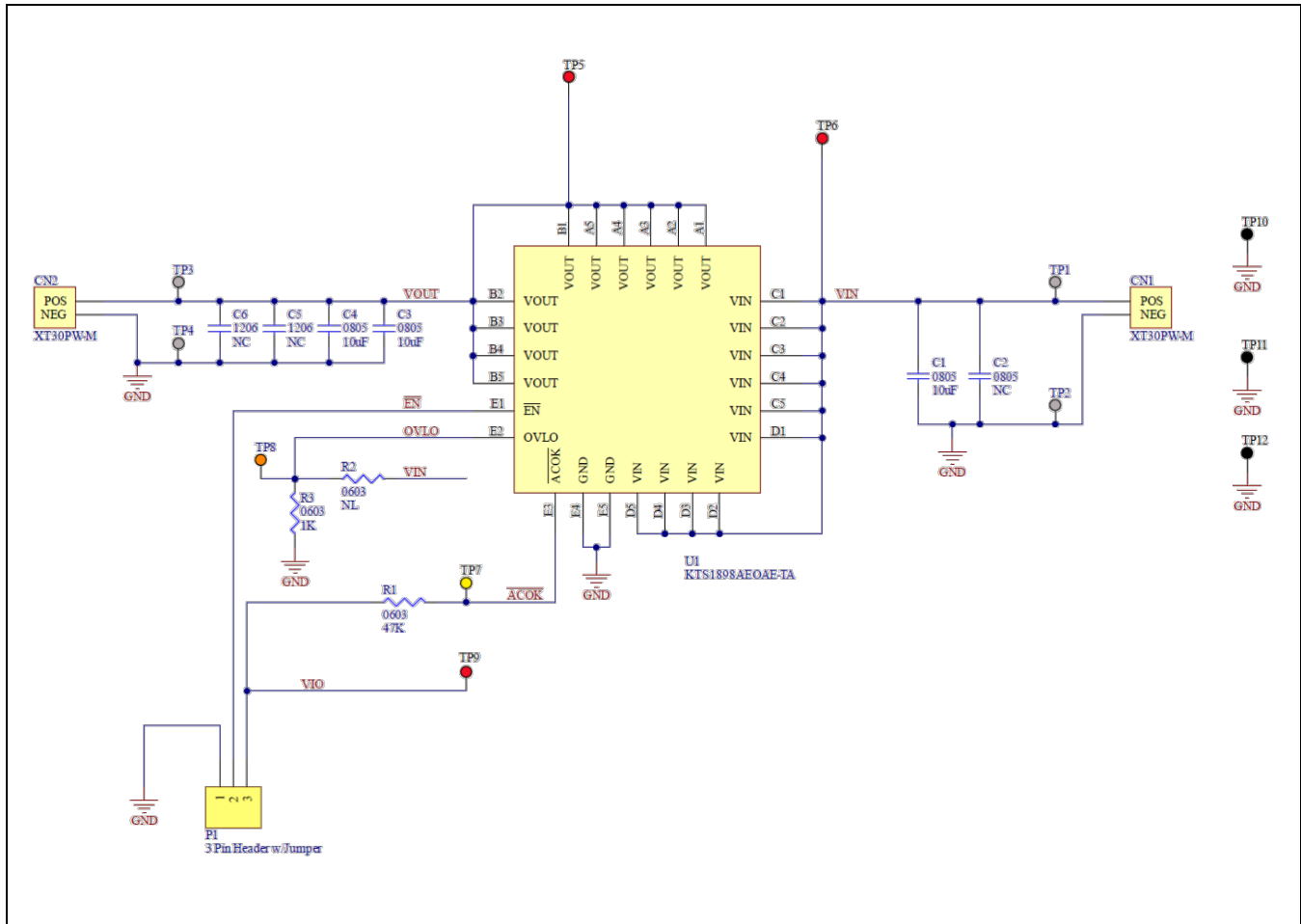
1. Set Jumpers to default: $\overline{EN} = L$
2. Connect one pair of XT30-to-Banana power cables to the XT30 connector at VIN and GND (right edge of EVAL Kit).
3. Before connecting the EVAL Kit to the VIN bench supply, turn on the supply and adjust the voltage as close to 0V as possible. Then turn off the supply. 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 its voltage to an appropriate voltage, such as 5, 9, 12, 15, 20, 28 or 32V. 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.
6. Use a digital multimeter to check the "ideal diode" droop regulation voltage between the KVIN and KVOUT terminals on the EVAL Kit. At no-load conditions, it should be close to 15mV. At light-load conditions (<1A), it should be in the range of 10mV to 30mV.
7. Use a digital multimeter to check the no-load supply current at VIN. Consult the KTS1898A datasheet for the expected current range at the VIN voltage condition in use. For conditions of VIN = 5.0V, $\overline{EN} = L$, and no-load, it should be close to 218 μ A.

Typical Test Setup Diagram

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



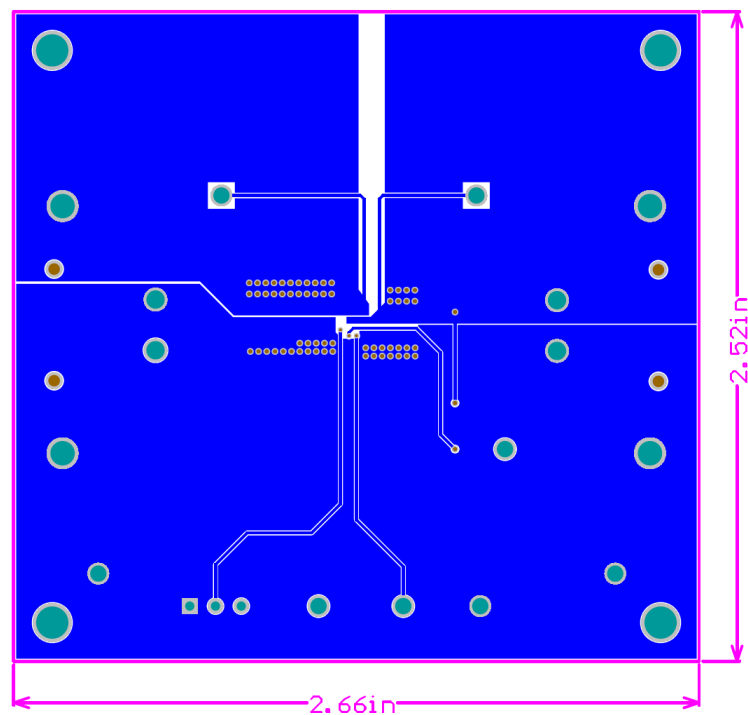
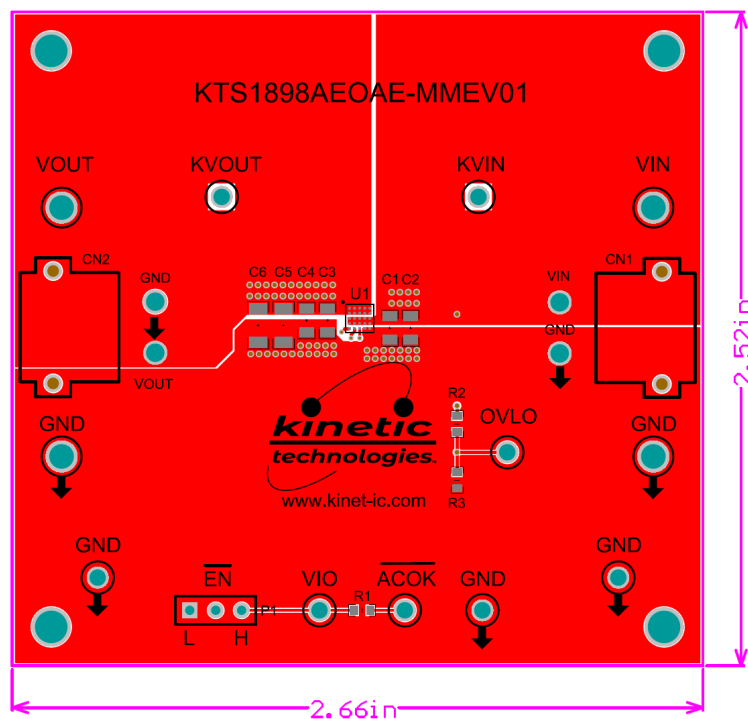
Electrical Schematic



Bill of Materials (BOM)

Item #	Quantity	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
1	1	C1	CAP CER 10uF 50V XSR 0805	10uF	0805	Samsung	CL21A106KBYQNNE	1276-CL21A106KBYQNNETR-ND	187-CL21A106KBYQNNE
2	1	C2	CAP CER 10uF 50V XSR 0805	NC	0805	Samsung	CL21A106KBYQNNE	1276-CL21A106KBYQNNETR-ND	187-CL21A106KBYQNNE
3	2	C3, C4	CAP CER 10uF 35V XSR 0805	10uF	0805	Murata	GRM21BR6YA106KE43L	490-10514-1-ND	81-GRM21BR6YA106KE3L
4	2	C5, C6	CAP CER 10uF 35V XSR 1206	NC	1206				
5	2	CN1, CN2	30A Right Angle Through Hole Power Connectors			AMASS	XT30PW-M		
6	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
7	1	P1	CONN HEADER VERT 3POS 2.54MM		TH	Sullins Connector	PREC0035AAN-RC	S1012EC-03-ND	
8	1	R1	RES SMD 47K 1% 1/10W 0603	47K	0603	Yageo	RC0603FR-0747KL	311-47.0KHRCT-ND	603-RC0603FR-0747KL
9	1	R2	RES SMD 0603	NL	0603				
10	1	R3	RES SMD 1K 1% 1/10W 0603	1K	0603	Yageo	RC0603FR-071KL	311-1.00KHRCT-ND	603-RC0603FR-071KL
11	4	TP1, TP2, TP3, TP4	TERM TURRET SINGLE L=5.56MM TIN		TH	Keystone	1502-2	36-1502-2-ND	534-1502-2
12	3	TP5, TP6, TP9	PC TEST POINT MULTIPURPOSE RED		TH	Keystone	5010	36-5010-ND	534-5010
13	1	TP7	PC TEST POINT MULTIPURPOSE YELLOW		TH	Keystone	5014	36-5014-ND	534-5014
14	1	TP8	PC TEST POINT MULTI PURP ORANGE		TH	Keystone Electronics	5013	36-5013-ND	534-5013
15	3	TP10, TP11, TP12	PC TEST POINT MULTIPURPOSE BLACK		TH	Keystone	5011	36-5011-ND	534-5011
16	1	U1	SARMS 28V VBUS Current-Sink Protection Load Switch		WLCSP-25	Kinetic Technologies	KTS1898AEOAE-TA		

Printed Circuit Board (PCB)



Additional Test Procedures

1. Logic Pins Testing:
 - a. Before connecting the EVAL Kit to the VIO 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 VIO bench supply to VIO and GND terminals on the EVAL Kit (with user-supplied banana-to-clip leads).
 - b. Turn on the VIO bench supply and very slowly ramp its voltage to an appropriate voltage, such as 1.8, 3.3, or 5V. While ramping VIO slowly, use the bench supply's output current indication (or a digital multimeter) to monitor the VIO current. If the current becomes high, reduce the VIO voltage quickly to prevent damage. Then inspect the setup for any wiring errors.
 - c. With valid VIO and VIN voltages, check the $\overline{\text{EN}}$ and $\overline{\text{ACOK}}$ functionality. Check the shutdown supply current at VIN with $\overline{\text{EN}} = \text{H}$. With $\overline{\text{EN}} = \text{L}$, check the $\overline{\text{ACOK}}$ flag pulls high to VIO when VIN < 2.5V and when VIN > 33V.
2. Testing with Load:
 - a. Use the second XT30-to-Banana power cable pair to apply loads from VOUT to GND.
 - b. Under heavy-load conditions, use caution. The KTS1898A IC may become hot; avoid skin contact. The voltage between the KVIN and KVOUT terminals at 5A load condition should be close to 150mV 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 (R2, R3) are used to externally set the over-voltage threshold in the range of 4V to 33V. As shipped, R2 is not populated and R3 is populated with a 1k Ω pull-down so that OVLO is 0V and the KTS1898A uses the internal 33V setting.

To set a different OVP threshold using the OVLO pin, populate R2. See the KTS1898A datasheet to calculate the necessary value of resistance.

Adding Additional Input Capacitance

The CIN input capacitance of the EVAL Kit is 10 μF by design. 10 μF 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.

Evaluating Other ICs

This EVAL Kit may optionally be used to evaluate the similar KTS1898B VBUS current-sink protection load switch. Before ordering samples of this device, please confirm capability to reflow and exchange WLCSP devices.



Troubleshooting

Symptom	Root Cause	Solution
\overline{ACOK} does not go high during faults.	VIO supply is off or not connected.	Connect and enable a VIO pull-up supply. \overline{ACOK} has an Absolute Maximum Rating of 6V.
$\overline{EN} = H$ does not disable the switch.	VIO supply is off or not connected.	Connect and enable a VIO pull-up supply. Optionally, remove the jumper on P1 and connect \overline{EN} (at pin 2 of P1) to VIN with a clip-to-clip lead. \overline{EN} has an Absolute Maximum Rating of 35V.

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