3.7A$_{RMS}$ VBUS Current-Source Protection Load Switch

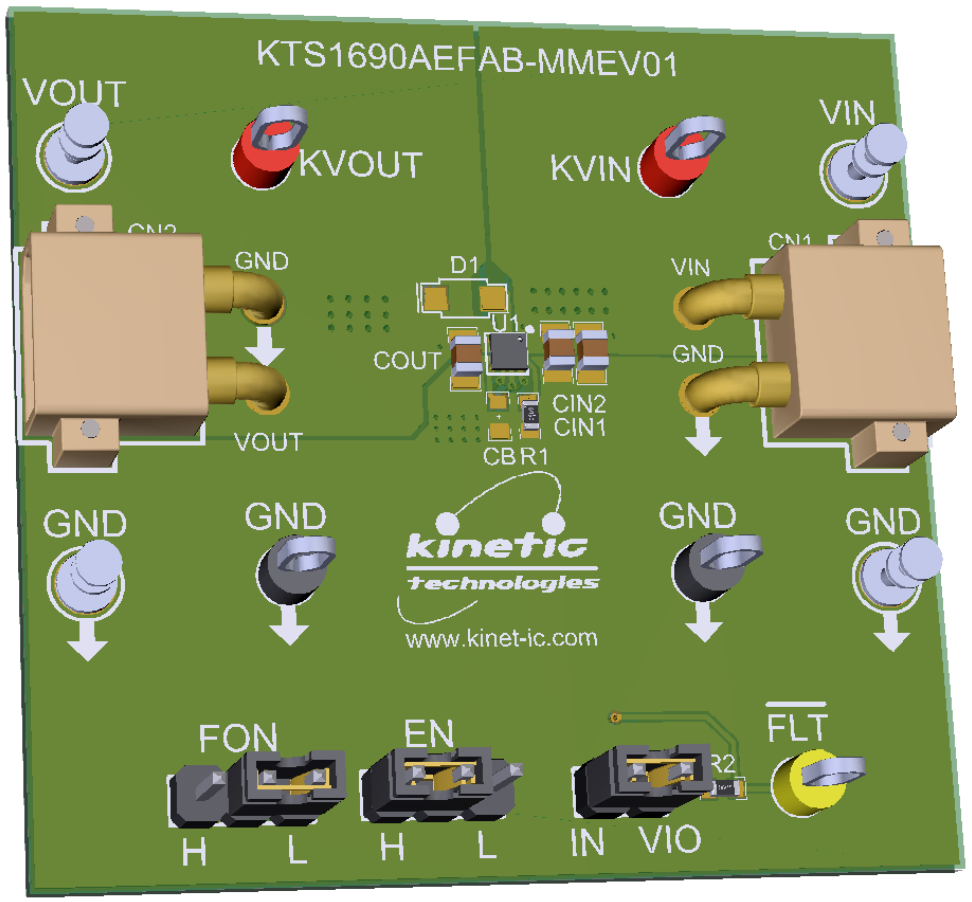
Brief Description

The KTS1690A Evaluation (EVAL) Kit is used to demonstrate and evaluate the KTS1690A functionality, performance, and PCB layout. The kit includes a fully assembled and tested PCB with the KTS1690A 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
KTS1690AEFAB-MMEV01	KTS1690A EVAL Kit	WLCSP-16

3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTS1690A 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/KTS1690A/	https://www.kinet-ic.com/kts1690aefab-mmev01/

User-Supplied Equipment

Required Equipment

1. Bench Power Supply – 5.0V (or 5.1V) from 1A up to 4A 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 voltages (and currents with a current probe, if available).
2. Load – either an eLoad, 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
VIO	VIO Operating Voltage	1.5 to 5.5	V
I_{OUT}	Output Load Current	0 to 3.7	A

Jumper Descriptions

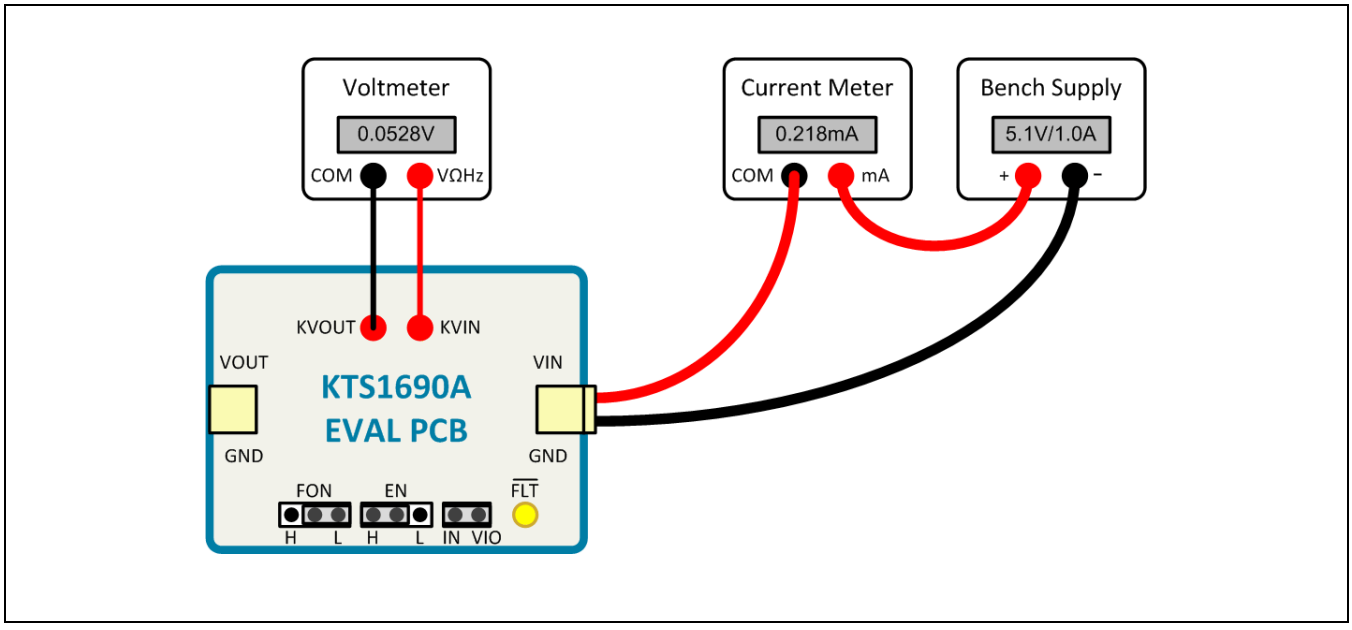
Designator	Name	Description	Default
P1	FON	Active-High Fast Turn-On Logic Input H: Fast Turn-On Mode – used only for Fast Role Swap (FRS) L: Normal Turn-On Mode – soft-start with short-circuit protection	L
P2	EN	Active-High Enable Logic Input H: Enable Mode – normal switch operation L: Shutdown Mode – switch disabled	H
P3	VIO	VIO Jumper Open: connect an external power supply from VIO to GND IN: short VIO to VIN	IN

Quick Start Procedures

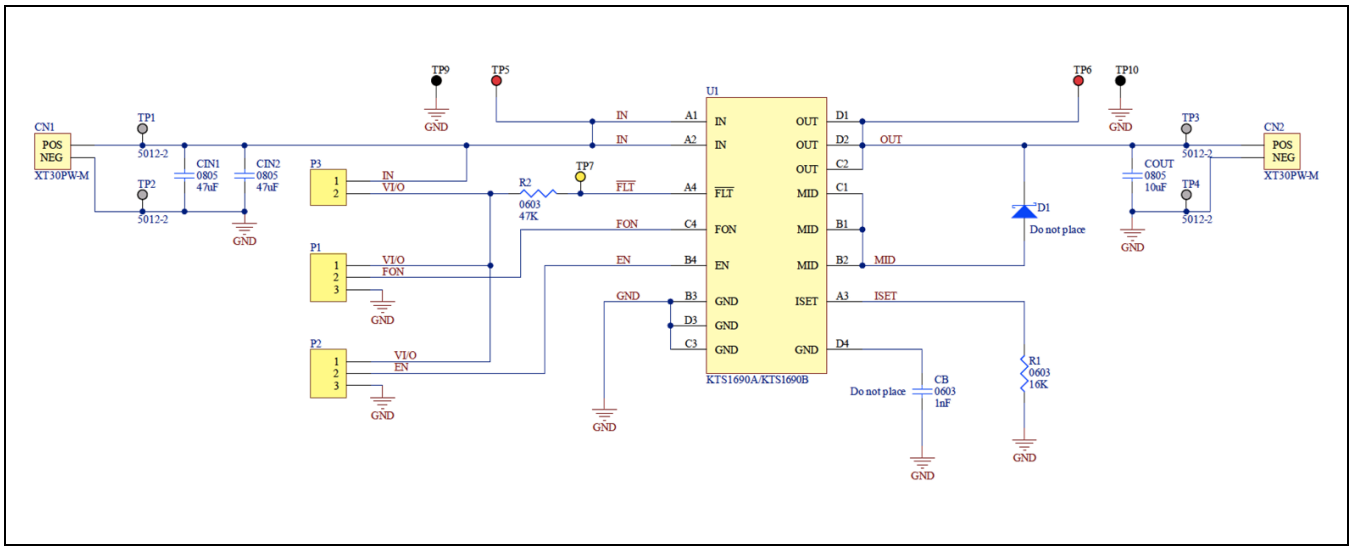
1. Set Jumpers to default: FON = L, EN = H, VIO = IN
2. Connect one pair of XT30-to-Banana power cables to the XT30 connector at VIN and GND (right edge of EVAL Kit).
3. Before connecting the EVAL Kit to the VIN bench supply, turn on the supply and adjust the voltage as close to 0V as possible. Then 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 5.0V 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.
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 and light-load conditions, it should be close to 60mV or slightly less.
7. Use a digital multimeter to check the no-load supply current at VIN. Consult the KTS1690A datasheet for the expected current range at the VIN voltage condition in use. For conditions of VIN = 5.0V, FON = L, EN = H, and no-load, it should be close to 220µA.

Typical Test Setup Diagram

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



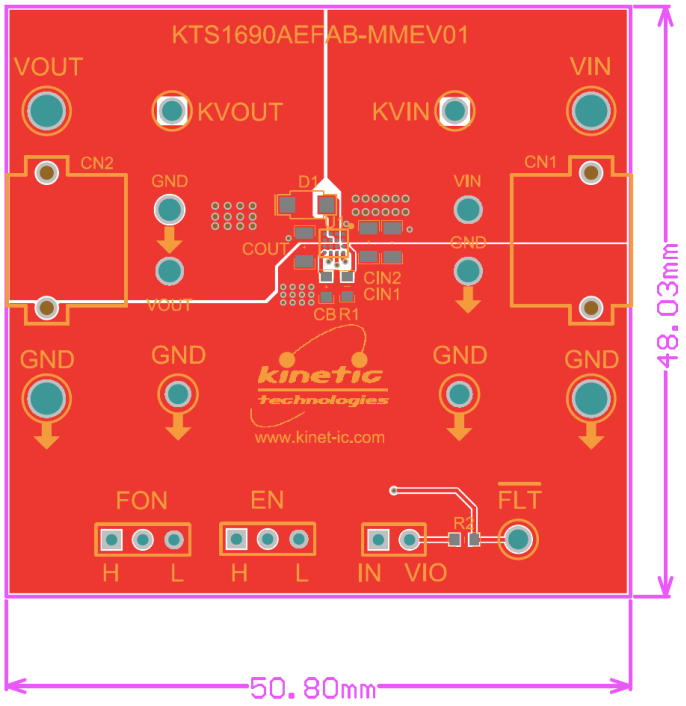
Electrical Schematic

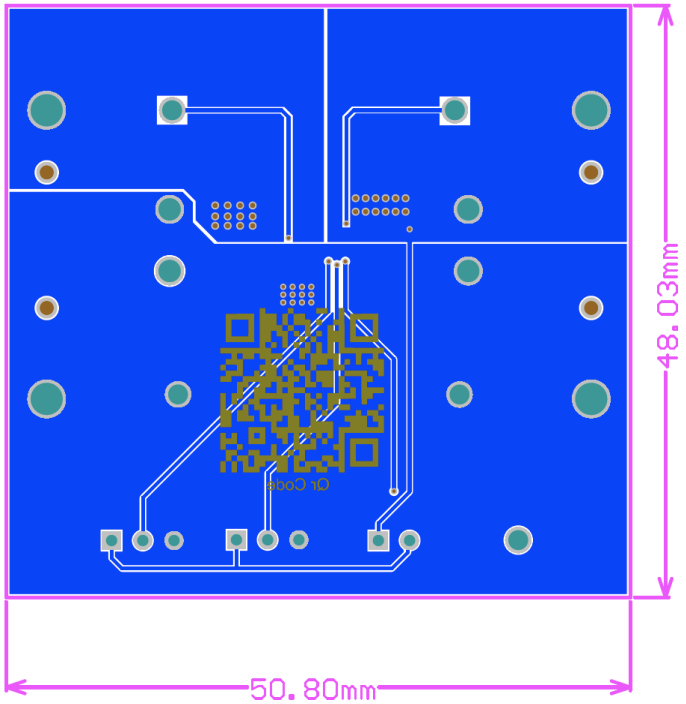


Bill of Materials (BOM)

Qty	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
1	CB	CAP CER 1nF 16V X5R 0603	1nF/16V					
2	CIN1, CIN2	CAP CER 47UF 10V X5R 0805	47uF	0805	Murata	GRM21BR61A476ME15L	490-9961-1-ND	81-GRM21BR61A476ME5L
2	CN1, CN2	30A Right Angle Through Hole Power Connectors			AMASS	XT30PW-M		
1	COUT	CAP CER 10uF 50V X5R 0805	10uF	0805	Murata	GRM21BR61H106KE43L	490-18663-1-ND	81-GRM21BR61H106KE3L
1	D1	Silicon RF Schottky Diode for Mixer Applications in the VHF/UHF Range						
2	P1, P2	CONN HEADER VERT 3POS 2.54MM			Sullins	PREC003SAAN-RC	S1012EC-03-ND	
1	P3	CONN HEADER VERT 2POS 2.54MM			Sullins	PREC002SAAN-RC	S1012EC-02-ND	
1	R1	RES 16K OHM 1% 1/10W 0603	16K	0603	Yageo	RC0603FR-0716KL	311-16.0KHRCT-ND	603-RC0603FR-0716KL
1	R2	RES 47K OHM 1% 1/10W 0603	47K	0603	Yageo	RC0603FR-0747KL	311-47.0KHRCT-ND	603-RC0603FR-0747KL
4	TP1, TP2, TP3, TP4	TERM TURRET SINGLE L=5.56MM TIN		1POS	Keystone	1502-2	36-1502-2-ND	534-1502-2
2	TP5, TP6	PC TEST POINT MULTI PURP RED			Keystone	5010	36-5010-ND	534-5010
1	TP7	PC TEST POINT MULTIPURPOSE YELLOW			Keystone	5014	36-5014-ND	534-5014
2	TP9, TP10	PC TEST POINT MULTIPURPOSE BLACK			Keystone	5011	36-5011-ND	534-5011
1	U1	USB VBUS ISOURCE Load Switch with Current Limit Control		WLCSP44-16	Kinetic	KTS1690AEGAA-TA		

Printed Circuit Board (PCB)





Additional Test Procedures

1. Logic Pins Testing:
    a. With valid VIO and VIN voltages, check the EN, FON, and $\overline{FLT}$ functionality. Check the shutdown supply current at VIN with EN = L. With EN = H, check the $\overline{FLT}$ flag pulls high to VIO when VIN < 2.1V.
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 KTS1690A IC may become hot; avoid skin contact.
    c. Use multimeters and an oscilloscope to make DC and transient measurements as desired.

Setting the Output Current Limit

The KTS1690A EVAL Kit is set for 3.3A typical output current limit protection via R1 = 16kΩ. To set a different current limit protection, change R1. Consult the KTS1690A datasheet and use values found in the *Electrical Characteristic* table or the equation in the *Current Limit Protection (CLP)* section of the *Functional Description*.

CB Capacitor

The KTS1690A EVAL Kit does not populate the CB capacitor by default. The KTS1690A does not require this capacitor. The footprint on the EVAL Kit is merely to maintain pin-to-pin compatibility with competitors that require this additional capacitor. If the CB capacitor is populated on the KTS1690A EVAL Kit, it has no effect.

D1 Schottky Diode

The KTS1690A EVAL Kit does not populate the D1 Schottky Diode by default. The optional schottky diode provides a slight performance improvement during load-transient events where the load steps rapidly from no-load (or very light loads) to heavy load conditions. It reduces the VOUT droop during such events. In most applications, the schottky diode is not needed.

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