

3.5V to 60V Input Boost/SEPIC/Flyback DC-DC Controller


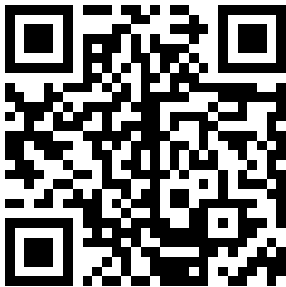
Brief Description

The User's Guide describes the design and operation of the KTC3500 evaluation board. The KTC3500 EVAL Kit contains the schematic, and the bill of materials for the KTC3500 EVB. KTC3500 is a low quiescent current DC/DC controller supporting boost, SEPIC, and flyback topologies. It employs current-mode control with internal slope compensation for fast transient response as well as superior output voltage regulation. An Analog control loop allows flexibility to set the loop gain to optimize the controllers response. The KTC3500 EVK is optimized for boost converter topologies. The EVK is targeted at 7-17 Vin, 24 Vout, Typical 48W boost converter applications. For ordering information please refer to the KTC3500 data sheet or contact your nearest sales representative.

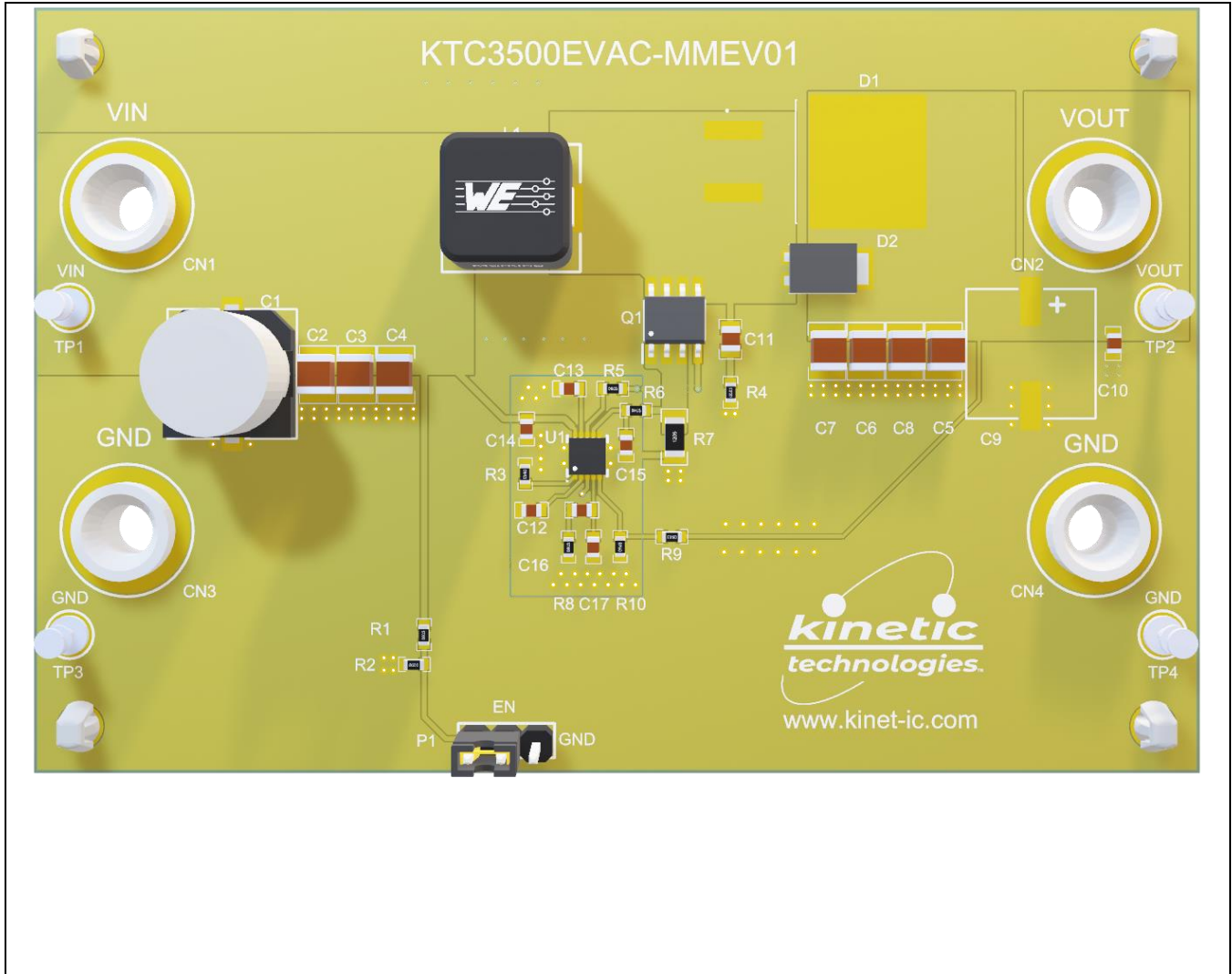
Ordering Information

Part Number	Description	IC Package
KTC3500EVAC-MMEV01	KTC3500 EVAL Kit	DFN33-10

QR Links for Documents

IC Datasheet	EVAL Kit Landing Page
 https://www.kinet-ic.com/KTC3500/	 https://www.kinet-ic.com/KTC3500 evac-mmev01/

3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTC3500 EVAL fully assembled PCB in Anti-static bag	1
2	Anti-static bag	1
3	Quick Start Guide, printed 1 page (A4 or US Letter)	1
4	EVAL Kit box	1

User-Supplied Equipment

Required Equipment

1. Bench Power Supply for VIN – 7V/17V and 5A as needed for the intended application.
2. Digital Multimeter – used to measure input/output voltages and currents.
3. Load – either power resistors, an E-Load, or an actual system load.

Optional Equipment

1. Oscilloscope and Voltage Probes – for dynamic testing, measurements, and observe input/output voltages and currents waveforms.
2. Additional Digital Multimeters

Recommended Operating Conditions

Symbol	Description	Value	Units
VIN	Input High Voltage Inputs	7 to 17	V
VO+	Output Operating Voltage	24	V
I _{OUT}	Output Load Current	0 to 5	A

Jumper Descriptions

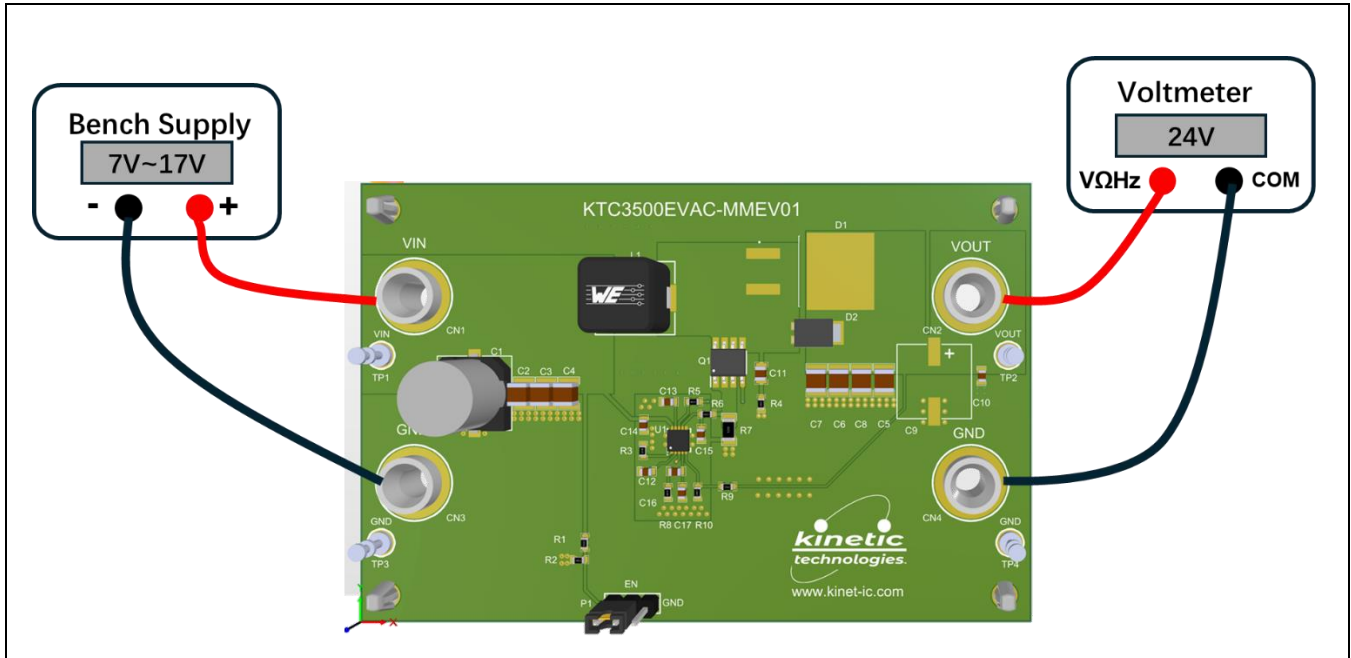
Designator	Name	Description	Default
P1	EN	Active-High Enable Input L: Shutdown Mode – switch disabled H: Enable Mode – normal switch operation	H

Quick Start Procedures

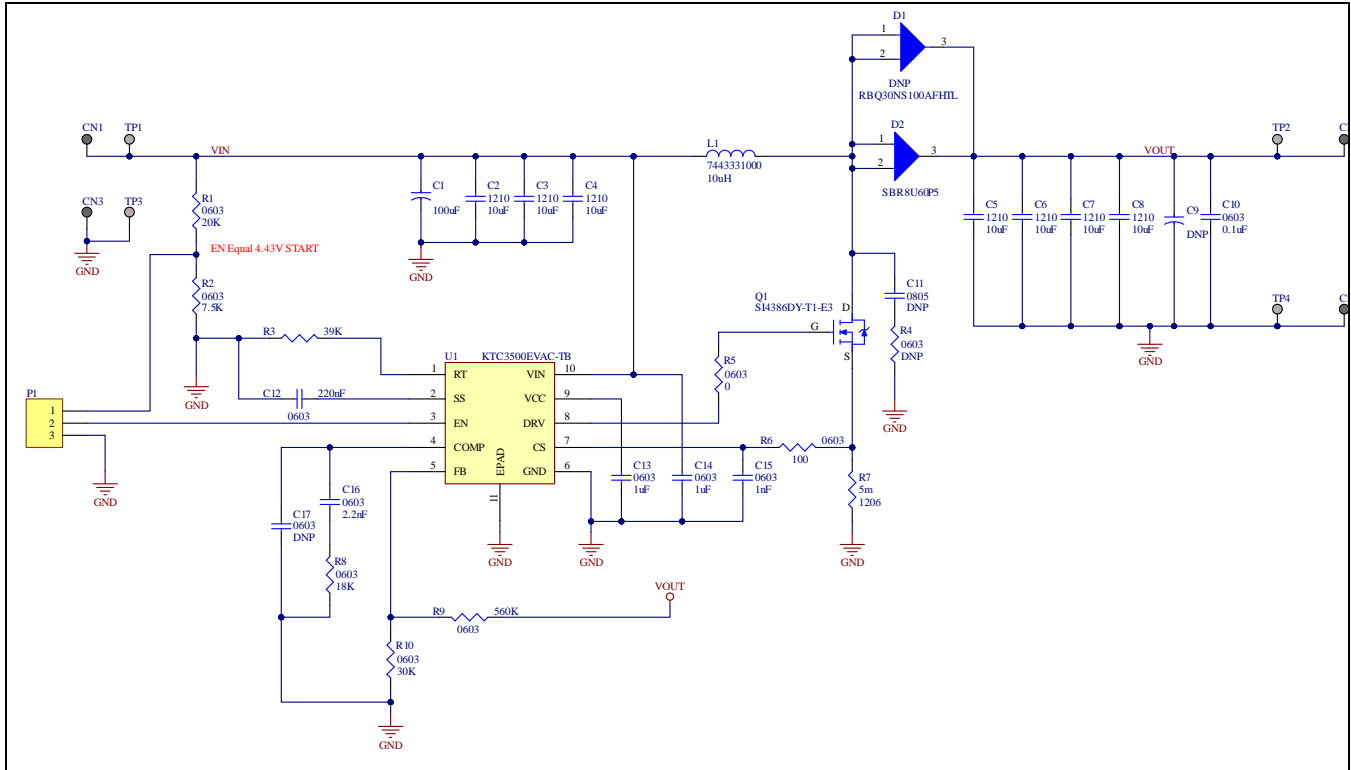
1. Before connecting the EVAL Kit to the VIN bench supply, set the supply to 0 Volts. Turn off the supply. While off, connect power cables to the VIN (CN1) and GND (CN3) on the EVAL kit and to VIN+ and VIN- on the bench supply.
2. Turn on the VIN bench supply and very slowly ramp its voltage to an appropriate voltage. While ramping VIN slowly, use the bench supply's output current indication (or a digital multimeter) to monitor the VIN current. Current will flow even though the part is not enabled. If the current becomes high, reduce the VIN voltage quickly to prevent damage. Then inspect the setup for any wiring errors.
3. With valid VIN voltage, use a digital multimeter to check the output voltage between VOUT and GND terminals on the EVAL Kit. It should be 24V.
4. EN is connected to Vin by default through R1 and R2 to enable the output. Connect EN to GND to disable.

Typical Test Setup Diagram

As an example, use the following test setup to measure items 3 and 4 in the Quick Start Procedures.



Electrical Schematic



General Configuration and Description

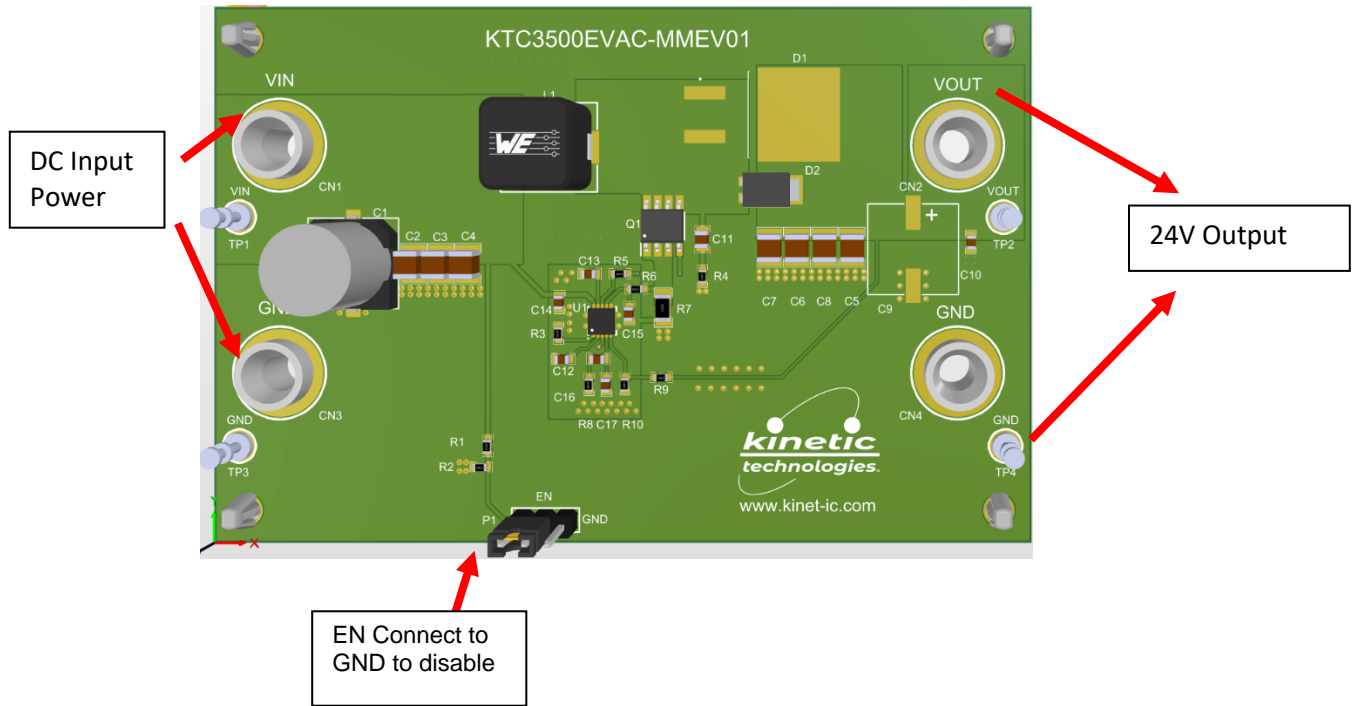
Physical Access

The table below lists the KTC3500-MMEV01/connectors functionality.

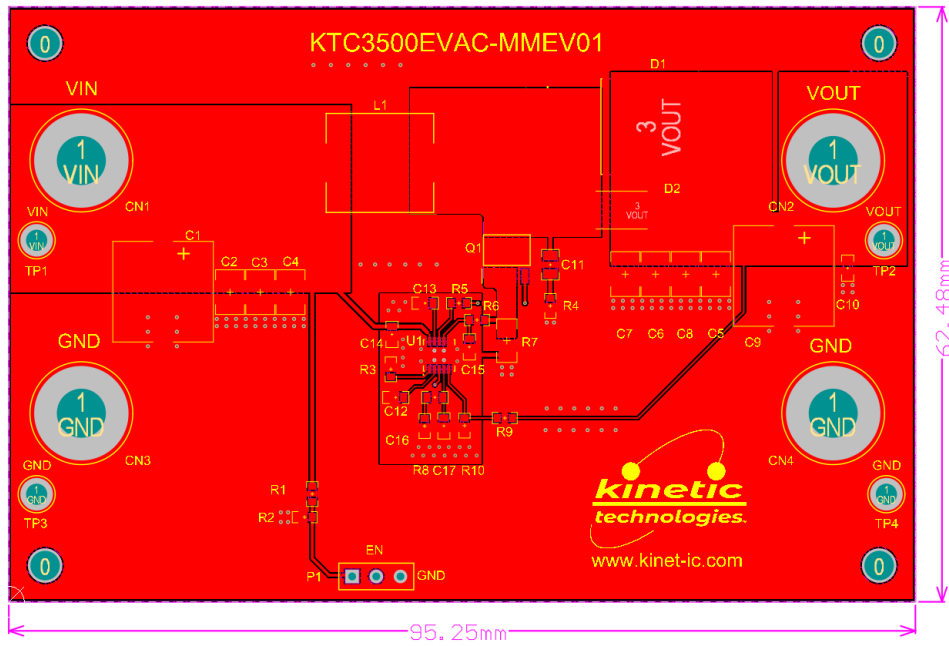
Connector	Description
VIN+ CN1/GND CN3	DC input power connector (VIN+ is Positive Pin and VIN- is negative pin)
VOUT+ CN2/GND CN4	Output voltage connector (VOUT+ is Positive Pin and Vo- is negative pin)
EN P1	Enable signal connector. (EN is default connected to Vin to enable To disable, connect ON/OFF to GND)
TEST POINT	TP1(VIN), TP3(GND), TP2(VOUT), TP4(GND)

Test Setup

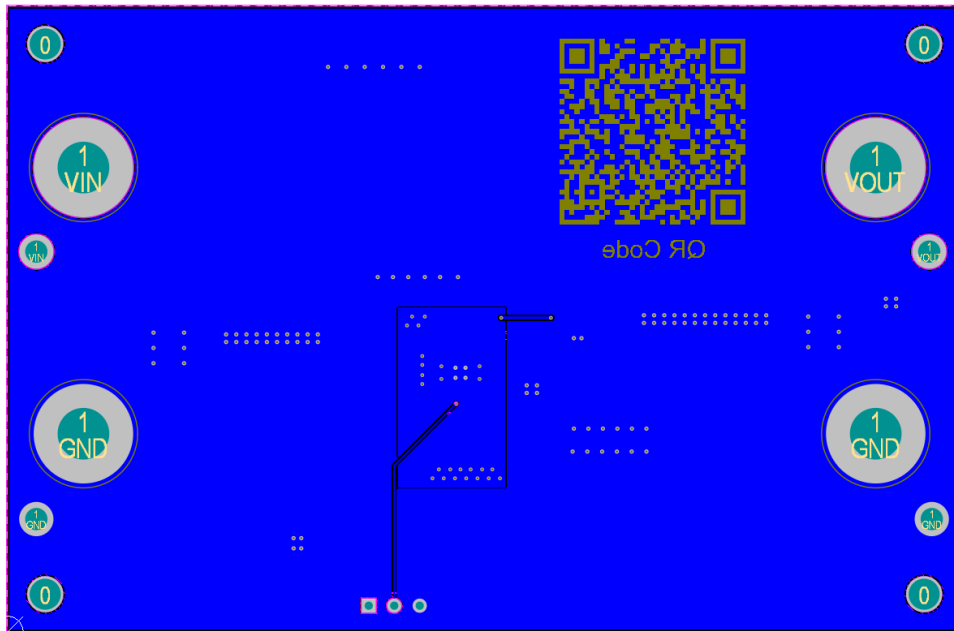
1. The “Typical Test Setup Diagram” shows a typical setup for KTC3500-MMEV01. Input voltage can be applied as described in “Recommended Operating Conditions”.
2. EN is connected to Vin by default through R1 and R2. It can also be connected to GND to disable.
3. The EVB can also be turned on by enable control or by an external signal by removing R1: Apply input power, then switch EN pin from Low logic to high logic.
4. Use a digital multimeter and an eLoad. For input voltages ranging from 7V to 17V, the output voltage is 24V. The maximum output current is 2A.



Printed Circuit Board (PCB)



Top Side Layout/Routing



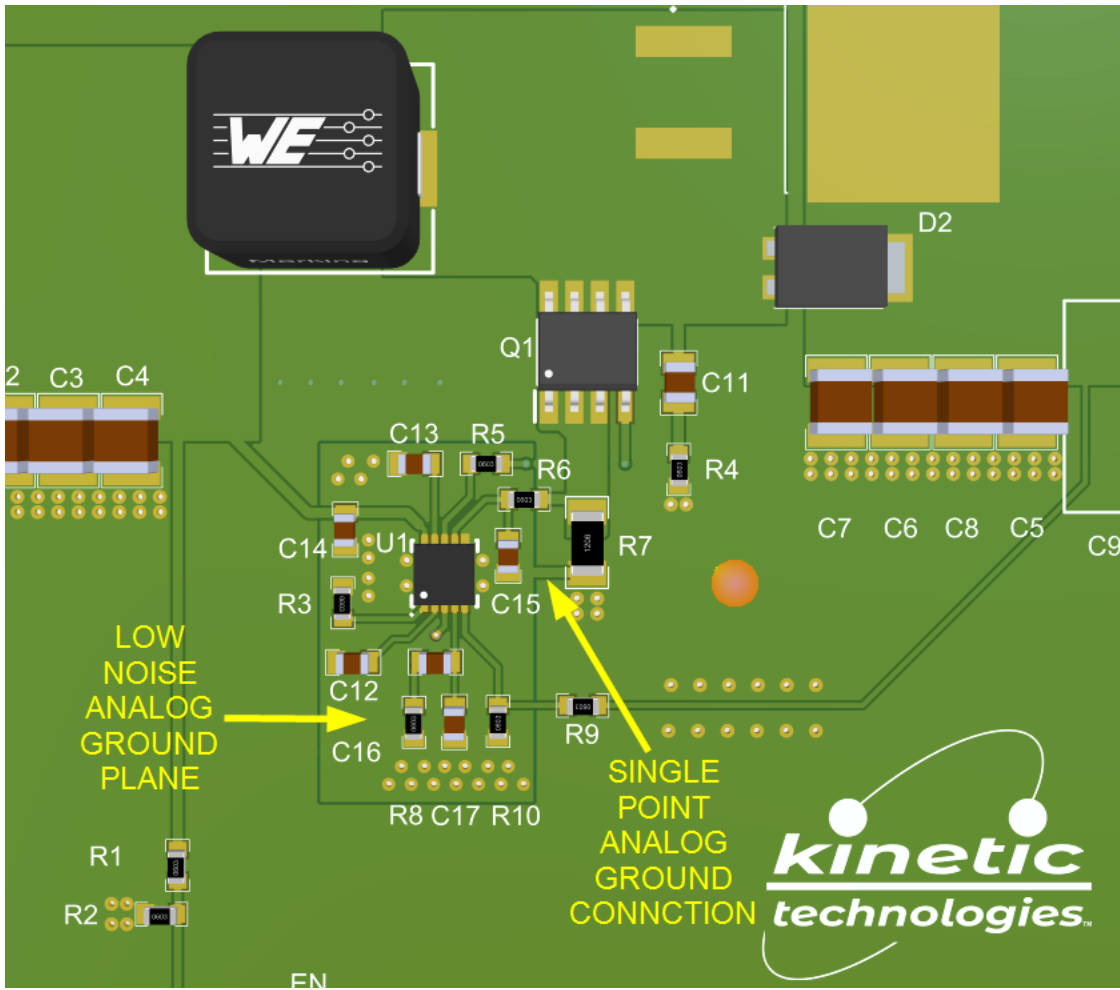
Bottom Layer Routing

Layout Guidelines

The PCB layout is divided into power ground and analog ground. The primary (input) side and secondary (output) side power components share a common power ground plane. The IC control components should be grouped together to share an analog ground plane. The power ground and analog ground converge at the IC controller as a single grounding point connection.

The following layout guidelines are recommended for optimum performance.

1. Keep the power stage loop area as small as possible. This includes the input loop (C4, L1, Q1 and R7) and the output loop (L1, C7 and D2).
2. Use a single point connection between AGND (GND of KTC3500) and power GND (See diagram below).
3. Ground all the KTC3500 control components (R2, R3, R8, R10, C12, C13, C14, C15) to AGND, close to the IC.
4. Keep the low level control circuit trace far away from noisy switching Voltages and Currents.
5. CS pin should sense the current signal through shunt resistor, R7. A 100Ω to 1kΩ (R6) and 100pF to 1nF Cap (C15) is used to form an RC filter. It is placed in series CS pin and C15 should terminate in the AGND near the KTC3500.
6. Keep FB, COMP and CS pins far from high noise sources. In some high output current applications, a typically 10kΩ resistor is suggested to insert between FB pin and output resistor divider network to filter noise. Small capacitors can be added on FB, Comp and CS without effecting stability.



Bill of Materials (BOM)

Designator	Description	QTY	Manufacturer	Manufacturer Part Number
C1	CAP ALUM HYB 100UF 20% 50V SMD	1	Rubycon	50PEV100M10X10.5
C2, C3, C4, C5, C6, C7, C8	CAP CER 10uF 50V X5R 1210	7	Samsung	CL32A106KBJNNNE
C10	CAP CER 0.1UF 50V X5R 0603	1	Yageo	CC0603KRX5R9BB104
C12	CAP CER 0.22UF 50V X5R 0603	1	Samsung	CL10A224KB8NNNC
C13, C14	CAP CER 1UF 50V X5R 0603	2	Samsung	CL10A105KB8NNNC
C15	CAP CER 1000PF 50V X5R 0603	1	TDK Corporation	C1608X5R1H102K080AA
C16	CAP CER 2200PF 50V X5R 0603	1	TDK Corporation	C1608X5R1H222K080AA
D2	DIODE SBR 60V 8A POWERDI5	1	Diodes Incorporated	SBR8U60P5-7
L1	FIXED IND 10UH 9A 23.1 MOHM SMD	1	Würth Elektronik	7443331000
Q1	MOSFET N-CH 30V 11A 8SO	1	Vishay Siliconix	SI4386DY-T1-E3
R1	RES 20K OHM 0603	1	Yageo	C0603FR-0720KL
R2	RES 7.5K OHM 1% 1/10W 0603	1	Yageo	RC0603FR-077K5L
R3	RES 39K OHM 1% 1/10W 0603	1	Yageo	RC0603FR-0739KL
R5	RES 0 OHM JUMPER 1/10W 0603	1	Yageo	RC0603JR-070RL
R6	RES 100 OHM 1% 1/10W 0603	1	Yageo	RC0603FR-07100RL
R7	RES 0.005 OHM 1% 1W 1206	1	Yageo	PA1206FRF470R005L
R8	RES 18K OHM 1% 1/10W 0603	1	Yageo	RC0603FR-0718KL
R9	RES 560K OHM 1% 1/10W 0603	1	Yageo	RC0603FR-07560KL
R10	RES 30K OHM 1% 1/10W 0603	1	Yageo	RC0603FR-0730KL
U1	3.5V to 60V Input Boost/SEPIC/Flyback DC-DC Controller	1	Kinetic Technologies	KTC3500EVAC-TB

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