

Low-Voltage Buck Regulator with Accurate F_{SW} and Fast Transient Response

Brief Description

This Manual describes the detailed operation of the KTB8400 evaluation board. KTB8400 is a unique OptiComp™ buck switching regulator with class-leading accuracy, transient response, efficiency, and solution size optimized for mobile and non-mobile applications. The KTB8400 Evaluation (EVAL) board is used to demonstrate the KTB8400 Buck regulator detailed functionality, performance, and the PCB layout.

The kit includes a fully assembled and tested KTB8400 EVAL board, I²C Adaptor, connecting cable, and a printed copy of the Quick Start Guide.

Ordering Information

Part Number	Description	IC Package
KTB8400AEDAA-MMEV01	KTB8400 EVAL Kit	WLCSP-15

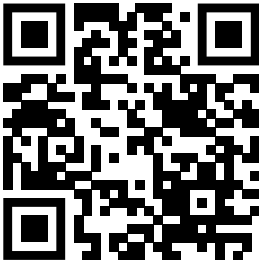
3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Included	Download
1	KTB8400 EVAL fully assembled PCB in Anti-static bag	1	
2	I ² C Adaptor: Adafruit MCP2221A General Purpose USB to GPIO ADC I ² C	1	
3	STEMMA QT 4-pin Cable	1	
4	Hard copy for the Quick Start Guide, 1 page (A4 or US Letter)	1	
5	EVAL Kit box	1	
6	EVAL Kit Manual, available at clickable URL		1
7	GUI, available at clickable URL		1

QR Links for Documents

IC Datasheet	EVAL Kit Landing Page
 https://www.kinet-ic.com/ktb8400/	 https://www.kinet-ic.com/ktb8400aadaa-mmev01/

User-Supplied Equipment

Required Equipment

1. Bench Power Supply for VIN – 5V/9V and 3A 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 Withstand Voltage	-0.3 to 6	V
	Input Operating Voltage	2.5 to 5.5	V
VIO	VIO Operating Voltage	1.15 to 5.5	V
I _{OUT}	Output Load Current	0 to 3	A

Jumper Descriptions

Designator	Name	Description	Default
P1	VIO	Connected: Connect VIO to Input Voltage to disable I ² C Pins Float: Connect to the I ² C pins	Connected
P2	EN	Active-Low Enable Input: L: Shutdown Mode – switch disabled H: Enable Mode through VIO – normal switch operation	H
P3	VSEL	Auto-Skip vs. Forced-PWM Mode Select logic input Pin: L: Auto-Skip Mode H: Forced-PWM Mode through VIO	H
CN1	VIN	Connecting Header for VIN	-
CN2	GND	Connecting Header for GND	-
CN3	VOOUT	Connecting Header for VOOUT	-
CN4	GND	Connecting Header for GND	-
CN5	I ² C	Connecting Header SMD for I ² C SDA/SCL Input Pins	-

Quick Start Procedures

1. Install GUI file located on EVAL Kit Landing page (<https://www.kinet-ic.com/ktb8400aadaa-mmev01/>).
2. Check the Jumpers for default setting.
3. Connect one pair of power cables to the connector of EVAL Kit at VIN and GND.
4. 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 power cables ends to the VIN bench supply.
5. Turn on the VIN bench supply and very slowly ramp its voltage to an appropriate voltage, such as 3.6V. 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.
6. To hardware shutdown the buck regulator, simply use a jumper at P2 to connect EN to GND.
7. Connect a voltage meter to the output KVOOUT and KGND test pins, it should measure the voltage of the buck regulator, which is specified on Page 4 of the datasheet.

Graphical User Interface (GUI)

- Download and install GUI software located on EVAL Kit Page (<https://www.kinet-ic.com/ktb8400aadaa-mmev01/>).
- After installing software, the interface will appear with the status message “USB Device Attached” at the bottom left side of the window.
- If the displayed message is “USB Device Detached”, make sure the computer is properly connected to the board.

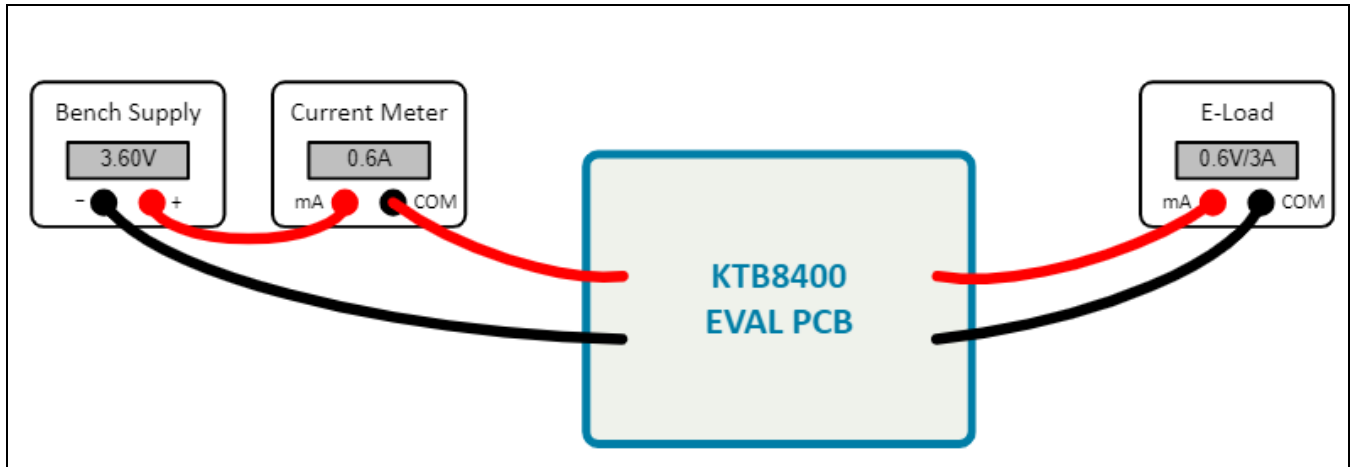
Additional Test Procedures to Program KTB400 Using I²C Pins

1. Take out P1 and P3 connectors.
2. Connect SDA, SCL and GND from the USB Adapter (Adafruit MCP2221A) to connector Logic Pins CN1.
3. Connect the USB end of the Adapter to the USB port of the computer.
4. Connect a DC power supply between the EVB test points VIN and GND.
5. With the power supply output turned off, configure the voltage to 3.6V.
6. Connect a voltage meter between the KVOOUT and KGND.
7. Turn on the power supply output.
8. Start the "KTB8400 Control Panel" GUI program on the computer.
9. Verify that the USB Adapter has been detected in the GUI.
10. In order to establish the I²C communication, you need to type in the corresponding slave address for the IC under test. Please check KTB8400 datasheet (page 4) for the pre-defined address. Some of them can be found in the table below:

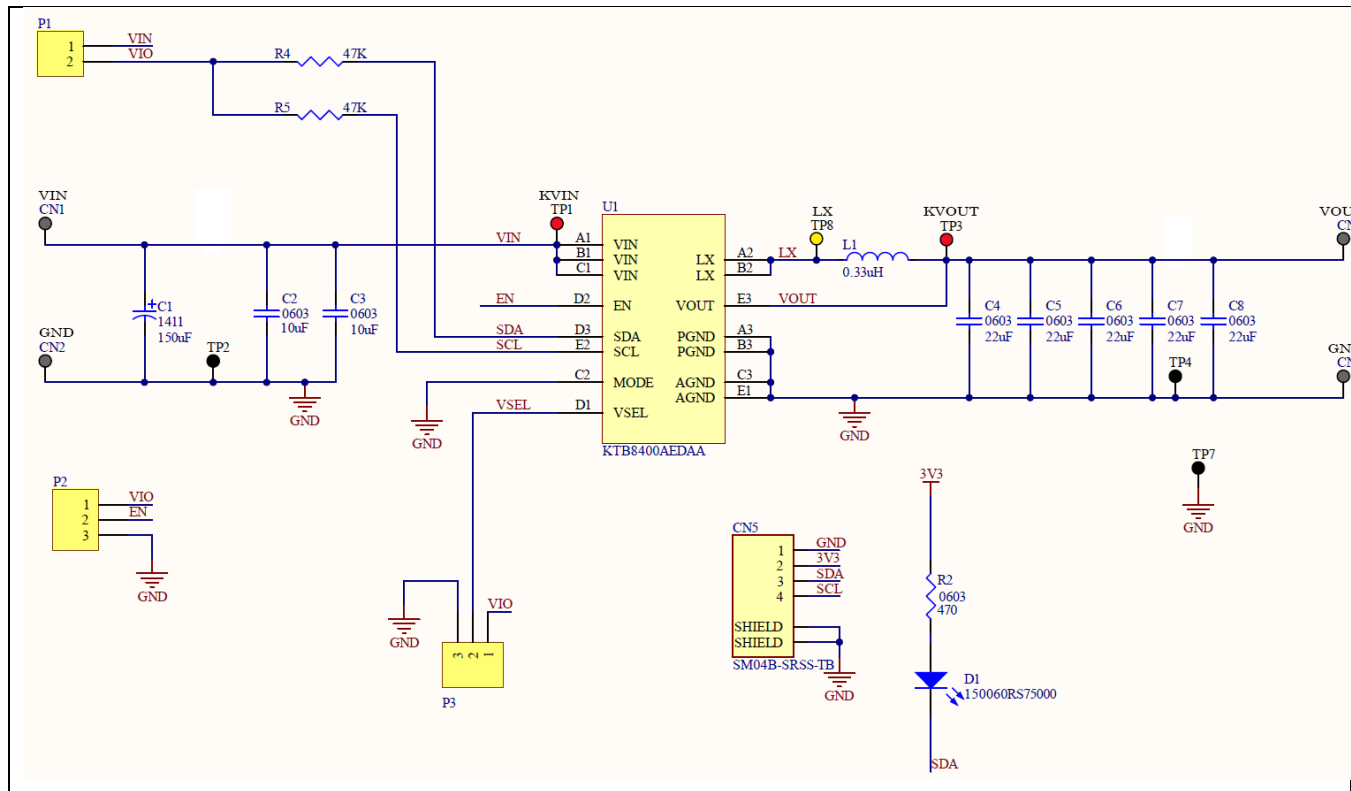
Part Number	7-bit I ² C Slave Address
KTB8400AEDAA-TR	1100 000=0x60h

Typical Test Setup Diagram

As an example, use the following test setup to measure input/output in the Quick Start Procedures.



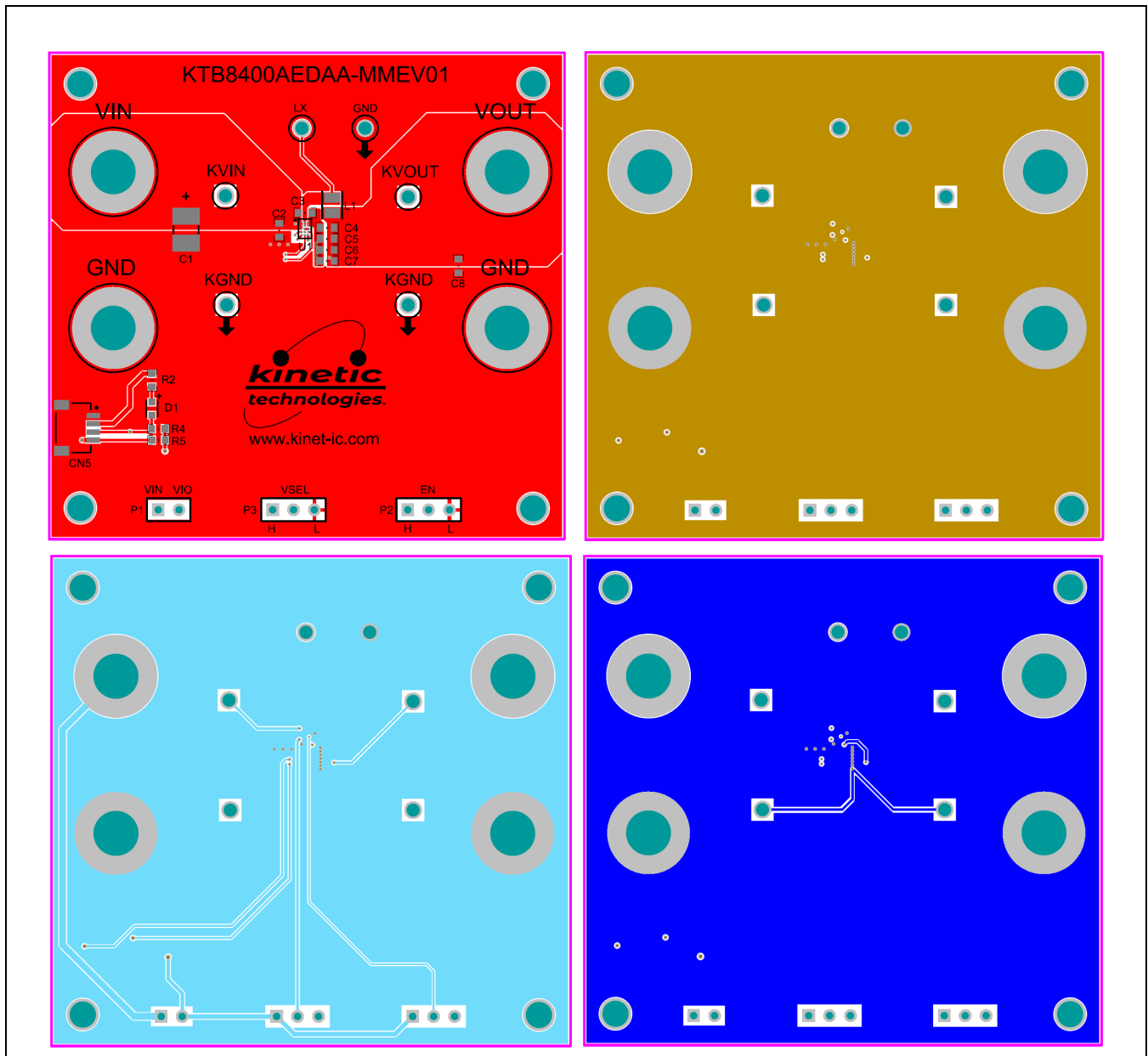
Electrical Schematic



Bill of Materials (BOM)

Quantity	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number
1	C1	CAP TANT POLY 150UF 6.3V 1411	150uF	1411	Kemet	T520B157M006ATE070
2	C2, C3	CAP CER 10UF 6.3V X5R 0603	10uF	0603	Murata	GRM188R61A106ME69D
5	C4, C5, C6, C7, C8	CAP CER 0.22UF 25V X7R 0603	22uF	0603	Murata	GRM188R60J226MEA0D
4	CN1, CN2, CN3, CN4	CONN BANANA JACK SOLDER		TH	Keystone Electronics	575-4
1	CN5	CONN HEADER SMD R/A 4POS 1MM		SMD	JST Sales America Inc.	SM04B-SRSS-TB(LF)(SN)
1	D1	Red 625nm LED Indication - Discrete 2V 0603 (1608 Metric)		0603	Würth Elektronik	150060RS75000
4	H1, H2, H3, H4	BRD SPT SNAP LOCK REST MNT 4MM			Essentra Components	PSD-4M-19
1	L1	FIXED IND 330NH 4A 26 MOHM SMD	0.33uH	0806	Murata Electronics	DFE201610E-R33M-P2
1	P1	CONN HEADER VERT 2POS 2.54MM		Through Hole	Sullins Connector Solutions	PREC002SAAN-RC
2	P2, P3	CONN HEADER VERT 3POS 2.54MM		TH	Sullins Connector Solutions	PREC003SAAN-RC
1	R2	RES SMD 470 OHM 1% 1/10W 0603	470	0603	YAGEO	AF0603FR-07470RL
2	R4, R5	RES 47K OHM 1% 1/10W 0603	47K	0603	Yageo	RC0603FR-0747K
2	TP1, TP3	PC TEST POINT MULTIPURPOSE RED		TH	Keystone	5010
3	TP2, TP4, TP7	PC TEST POINT MULTIPURPOSE BLACK		TH	Keystone	5011
1	TP8	PC TEST POINT MULTIPURPOSE YELLOW		TH	Keystone	5014
1	U1	Low Voltage Buck with Accurate Fsw and Fast Transient Response		WLCSP-15	Kinetic Technologies	KTB8400AEDAA-TR

Printed Circuit Board (PCB)

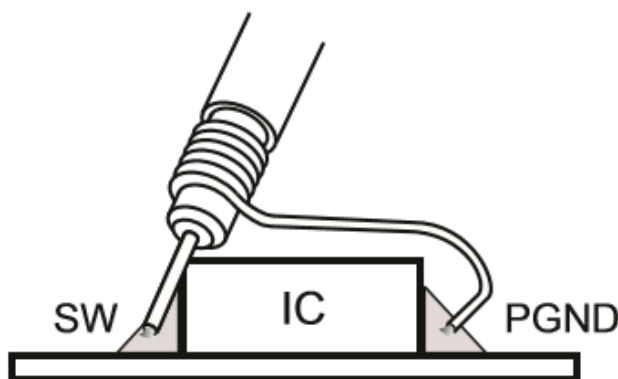


Buck Regulator Efficiency Measurement

Use a voltage meter to probe EVB test pins KVIN and KGND to measure input voltage, and KVOUT and KGND to measure output voltage. Also, connect current meter in series to input voltage source and output load.

The efficiency can be determined using equation:

$$\text{Efficiency (\%)} = [(V_{\text{out}} \times I_{\text{out}}) / (V_{\text{in}} \times I_{\text{in}})] \times 100\%$$



Low Inductance Probe Connection

Important Notices

Legal notice

Copyright © Kinetic Technologies. Other names, brands and trademarks are the property of others.

Kinetic Technologies assumes no responsibility or liability for information contained in this document. Kinetic Technologies reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or services without notice. The information contained herein is believed to be accurate and reliable at the time of printing.

Reference design policy

This document is provided as a design reference and Kinetic Technologies assumes no responsibility or liability for the information contained in this document. Kinetic Technologies reserves the right to make corrections, modifications, enhancements, improvements, and other changes to this reference design documentation without notice.

Reference designs are created using Kinetic Technologies' published specifications as well as the published specifications of other device manufacturers. This information may not be current at the time the reference design is built. Kinetic Technologies and/or its licensors do not warrant the accuracy or completeness of the specifications or any information contained therein.

Kinetic Technologies does not warrant that the designs are production worthy. Customer should completely validate and test the design implementation to confirm the system functionality for the end use application.

Kinetic Technologies provides its customers with limited product warranties, according to the standard Kinetic Technologies terms and conditions.

For the most current product information visit us at www.kinet-ic.com

Life support policy

LIFE SUPPORT: KINETIC TECHNOLOGIES' PRODUCTS ARE NOT DESIGNED, INTENDED, OR AUTHORIZED FOR USE AS COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS. NO WARRANTY, EXPRESS OR IMPLIED, IS MADE FOR THIS USE. AUTHORIZATION FOR SUCH USE SHALL NOT BE GIVEN BY KINETIC TECHNOLOGIES, AND THE PRODUCTS SHALL NOT BE USED IN SUCH DEVICES OR SYSTEMS, EXCEPT UPON THE WRITTEN APPROVAL OF THE PRESIDENT OF KINETIC TECHNOLOGIES FOLLOWING A DETERMINATION BY KINETIC TECHNOLOGIES THAT SUCH USE IS FEASIBLE. SUCH APPROVAL MAY BE WITHHELD FOR ANY OR NO REASON.

"Life support devices or systems" are devices or systems which (1) are intended for surgical implant into the human body, (2) support or sustain human life, or (3) monitor critical bodily functions including, but not limited to, cardiac, respirator, and neurological functions, and whose failure to perform can be reasonably expected to result in a significant bodily injury to the user. A "critical component" is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

SUBSTANCE COMPLIANCE

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.