

## 3A, 2.4MHz, Low-Voltage, I<sup>2</sup>C Programmable Buck Regulator

### Brief Description

This Manual describes the detailed operation of the KTB8331 evaluation board. KTB8331 is a precision adaptive-on-time (AOT) buck switching regulator with class-leading accuracy, transient response, efficiency, and solution size optimized for mobile and non-mobile application. The KTB8331 Evaluation (EVAL) board is used to demonstrate the KTB8331 Buck regulator detailed functionality, performance, and the PCB layout.

The kit includes a fully assembled and tested KTB8331 EVAL board, I<sup>2</sup>C Adaptor, connecting cable, and a printed copy of the Quick Start Guide.

### Ordering Information

Part Number	Description	IC Package
KTB8331DEDAA-MMEV02	KTB8331D EVAL Kit	WLCS-15

### 3D CAD Image



### EVAL Kit Physical Contents

Item #	Description	Included	Download
1	KTB8331 EVAL fully assembled PCB in Anti-static bag	1	
2	I <sup>2</sup> C Adaptor: Adafruit MCP2221A General Purpose USB to GPIO ADC I <sup>2</sup> C	1	
3	Connecting Cable	1 pair	
4	Hard copy of Quick Start Guide, 1 page (A4 or US Letter)	1	
5	EVAL Kit box	1	
6	EVAL Kit Manual, available at clickable URL		1

### QR Links for Documents

IC Datasheet	EVAL Kit Landing Page
 <a href="https://www.kinet-ic.com/ktb8331/">https://www.kinet-ic.com/ktb8331/</a>	 <a href="https://www.kinet-ic.com/ktb8331dedaa-mmev02/">https://www.kinet-ic.com/ktb8331dedaa-mmev02/</a>

### 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 <sub>OUT</sub>	Output Load Current	0 to 3	A

### Jumper Descriptions

Designator	Name	Description	Default
P1	VIO	Connected: Connect VIO to Input Voltage to disable I <sup>2</sup> C Pins Float: Connect to the I <sup>2</sup> 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	VOUT	Connecting Header for VOOUT	-
CN4	GND	Connecting Header for GND	-
CN5	I <sup>2</sup> C	Connecting Header SMD for I <sup>2</sup> C SDA/SCL Input Pins	-

### Quick Start Procedures

1. Install GUI file located on EVAL Kit Landing page (<https://www.kinet-ic.com/ktb8331dedaa-mmev02/>).
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/ktb8331dedaa-mmev02/>).
- 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.

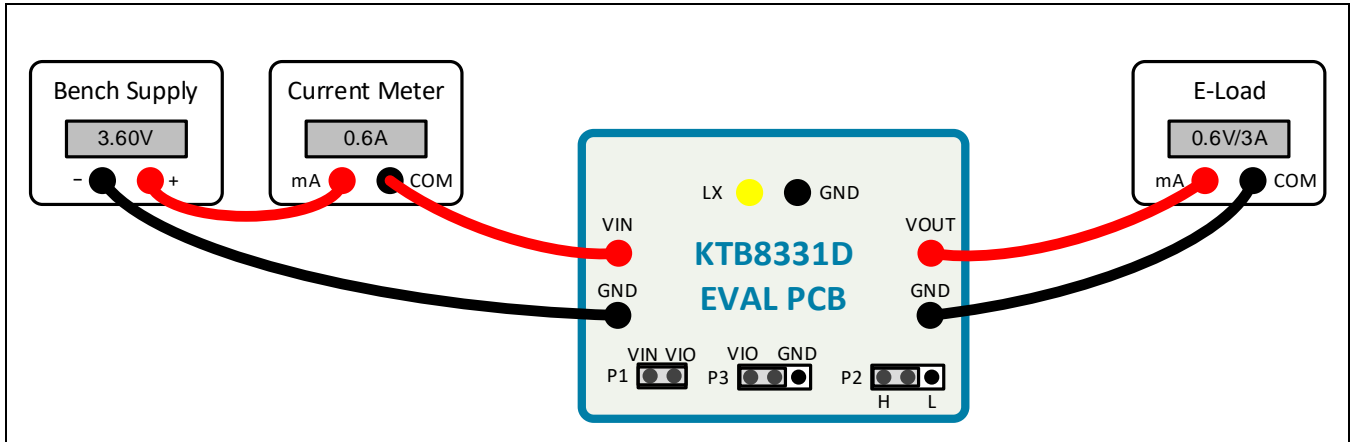
## Additional Test Procedures to Program KTB8331 Using I<sup>2</sup>C Pins

1. Take out P1 and P2 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 “KTB8330/1 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 I<sup>2</sup>C communication, you need to type in the corresponding slave address for the IC under test. Please check KTB8331 datasheet (page 4) for the pre-defined address. Some of them can be found in the table below:

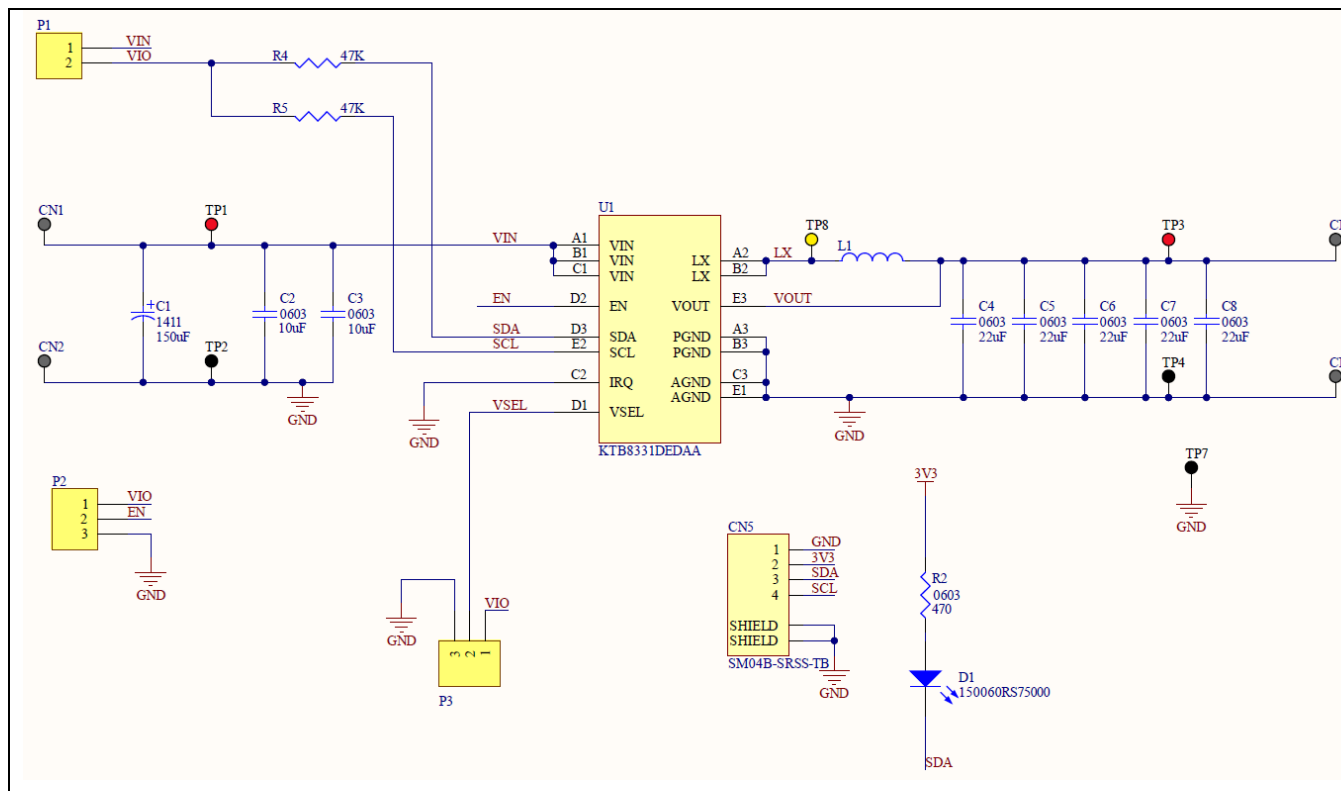
Part Number	7-bit I <sup>2</sup> C Slave Address
KTB8331AEDAA-TR	1100 000=0x60h
KTB8331BEDAA-TR	1100 000=0x60h
KTB8331CEDAA-TR	1100 000=0x60h
KTB8331DEDAA-TR	1010 000=0x50h
KTB8331EEDAA-TR	1010 111=0x57h
KTB8331FEDAA-TR	1010 000=0x50h
KTB8331GEDAA-TR	1010 000=0x50h
KTB8331HEDAA-TR	1010 000=0x50h
KTB8331JEDAA-TR	1010 001=0x51h
KTB8331KEDAA-TR	1100 000=0x60h
KTB8331LEDAA-TR	1100 000=0x60h
KTB8331MEDAA-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.



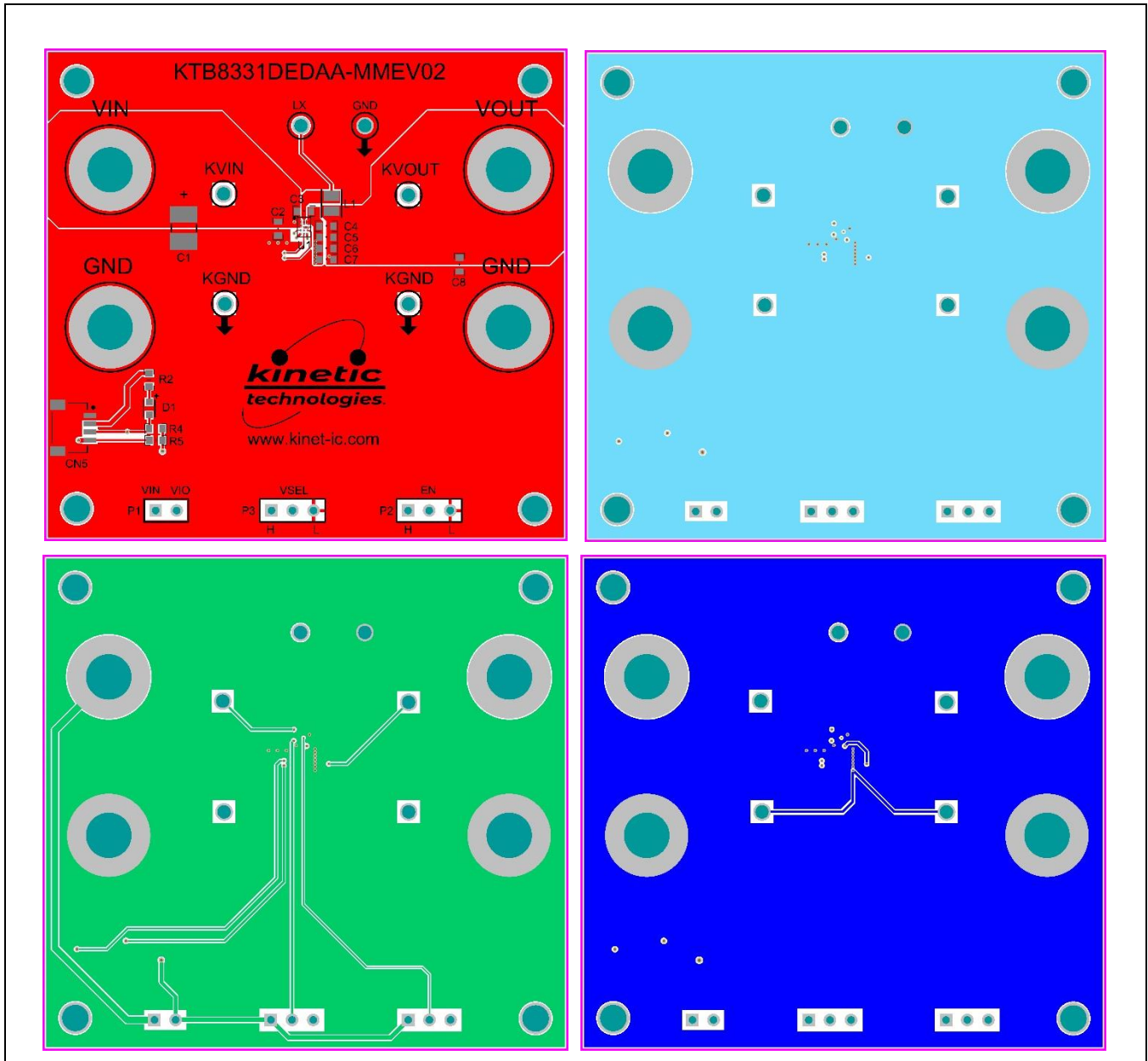
### Electrical Schematic



### Bill of Materials (BOM)

Quantity	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
1	C1	CAP TANT POLY 150UF 6.3V 1411	150uF	1411	Kemet	T520B157M006ATE070	399-4732-1-ND	80-T520B157M6ATE70
2	C2, C3	CAP CER 10UF 6.3V X5R 0603	10uF	0603	Murata	GRM188R61A106ME9D	490-10475-1-ND	81-GRM188R61A106ME9D
5	C4, C5, C6, C7, C8	CAP CER 0.22UF 25V X7R 0603	22uF	0603	Murata	GRM188R60J226MEA0D	490-7611-2-ND	81-GRM188R60J226ME0D
4	CN1, CN2, CN3, CN4	CONN BANANA JACK SOLDER		TH	Keystone Electronics	575-4	36-575-4-ND	534-575-4
1	CN5	CONN HEADER SMD R/A 4POS 1MM		SMD	JST Sales America Inc.	SM04B-SRSS-TB(LF)(SN)	455-1804-1-ND	
1	D1	Red 625nm LED Indication - Discrete 2V 0603 (1608 Metric)		0603	Würth Elektronik	150060RS75000	732-4978-1-ND	710-150060RS75000
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
1	L1	FIXED IND 330NH 3.4A 31 MOHM SMD	330nH	0805	Murata Electronics	DFE201210U-R33M=P2	DFE201210U-R33M=P2-ND	
1	P1	CONN HEADER VERT 2POS 2.54MM		Through Hole	Sullins Connector Solutions	PREC002SAAN-RC	S1012EC-02-ND	
2	P2, P3	CONN HEADER VERT 3POS 2.54MM		TH	Sullins Connector Solutions	PREC003SAAN-RC	S1012EC-03-ND	
1	R2	RES SMD 470 OHM 1% 1/10W 0603	470	0603	YAGEO	AF0603FR-07470RL	311-470LMCT-ND	603-AF0603FR-07470RL
2	R4, R5	RES 47K OHM 1% 1/10W 0603	47K	0603	Yageo	RC0603FR-0747K	311-47.0KHRCT-ND	603-RC0603FR-0747K
2	TP1, TP3	PC TEST POINT MULTIPURPOSE RED		TH	Keystone	5010	36-5010-ND	534-5010
3	TP2, TP4, TP7	PC TEST POINT MULTIPURPOSE BLACK		TH	Keystone	5011	36-5011-ND	534-5011
1	TP8	PC TEST POINT MULTIPURPOSE YELLOW		TH	Keystone	5014	36-5014-ND	534-5014
1	U1	3A, 2.4MHz, Low-Voltage, I2C Programmable Buck Regulator		WLCS-P-15	Kinetic Technologies	KTB8331DEDAA-TR		389-KTB8331DEDAA-TR

**Printed Circuit Board (PCB)**

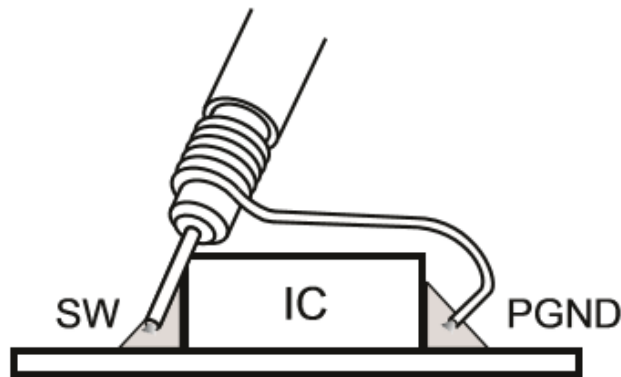


## Buck Regulator Efficiency Measurement

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**