

15W Flyback Regulator with Digital Isolator and Integrated Feedback

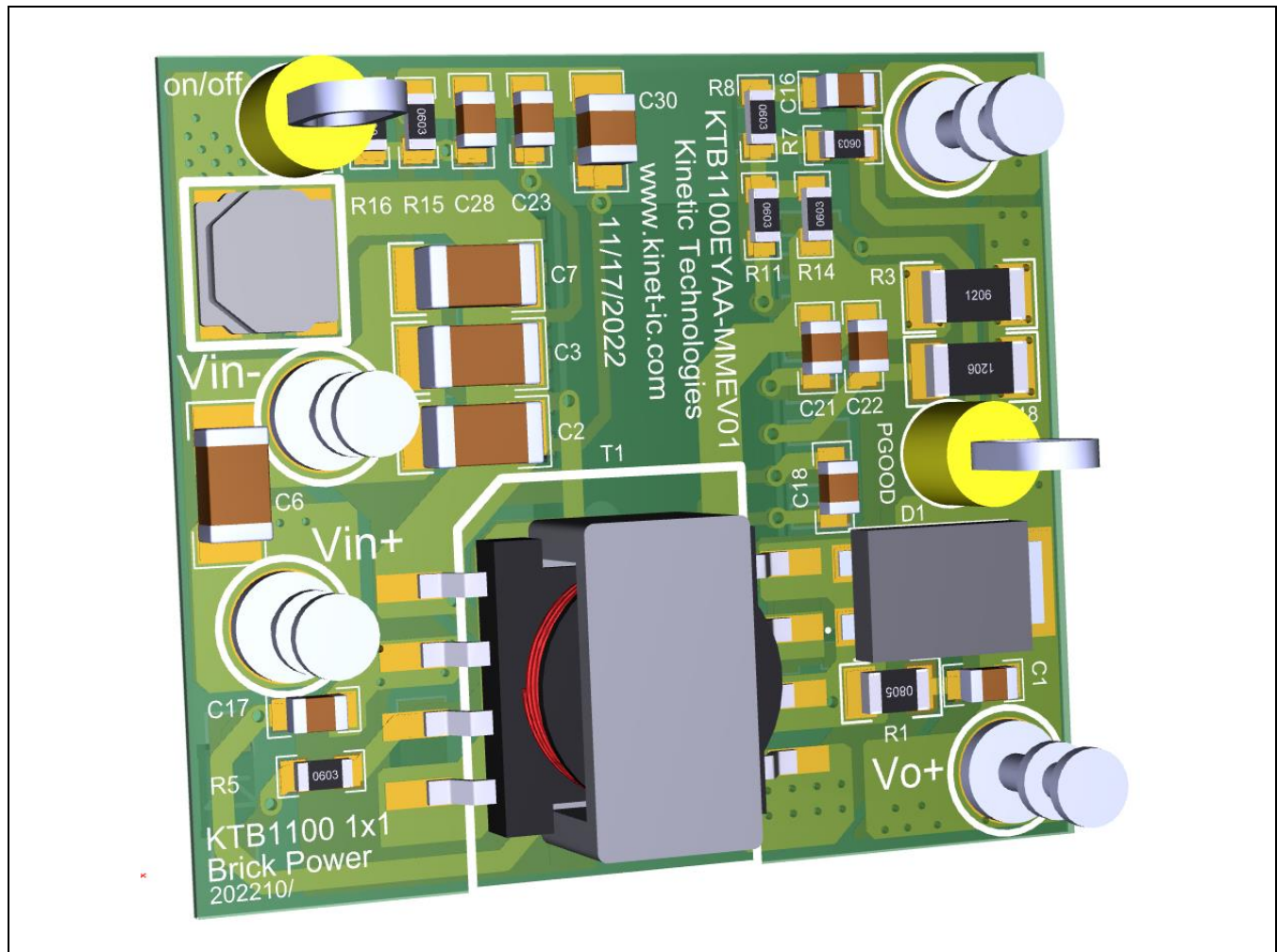
Brief Description

The User's Guide describes the design and operation of the KTB1100 evaluation board. The KTB1100 EVAL Kit contains the performance specifications, the schematic, and the bill of materials for the KTB1100 EVB. The KTB1100 is a highly integrated isolated flyback regulator with integrated primary power MOSFET switch, internal feedback, and integrated digital isolator. It employs valley current-mode constant on-time (COT) control for fast transient response as well as superior output voltage regulation. The KTB1100 EVM is optimized for isolated flyback converter topologies. The EVM is targeted at 9-75Vin, 12Vo, Typical 15W isolated flyback converter applications. Alternative output voltage versions with various components settings are also available. Please refer to the KTB1100 data sheet or contact your nearest sales representative.

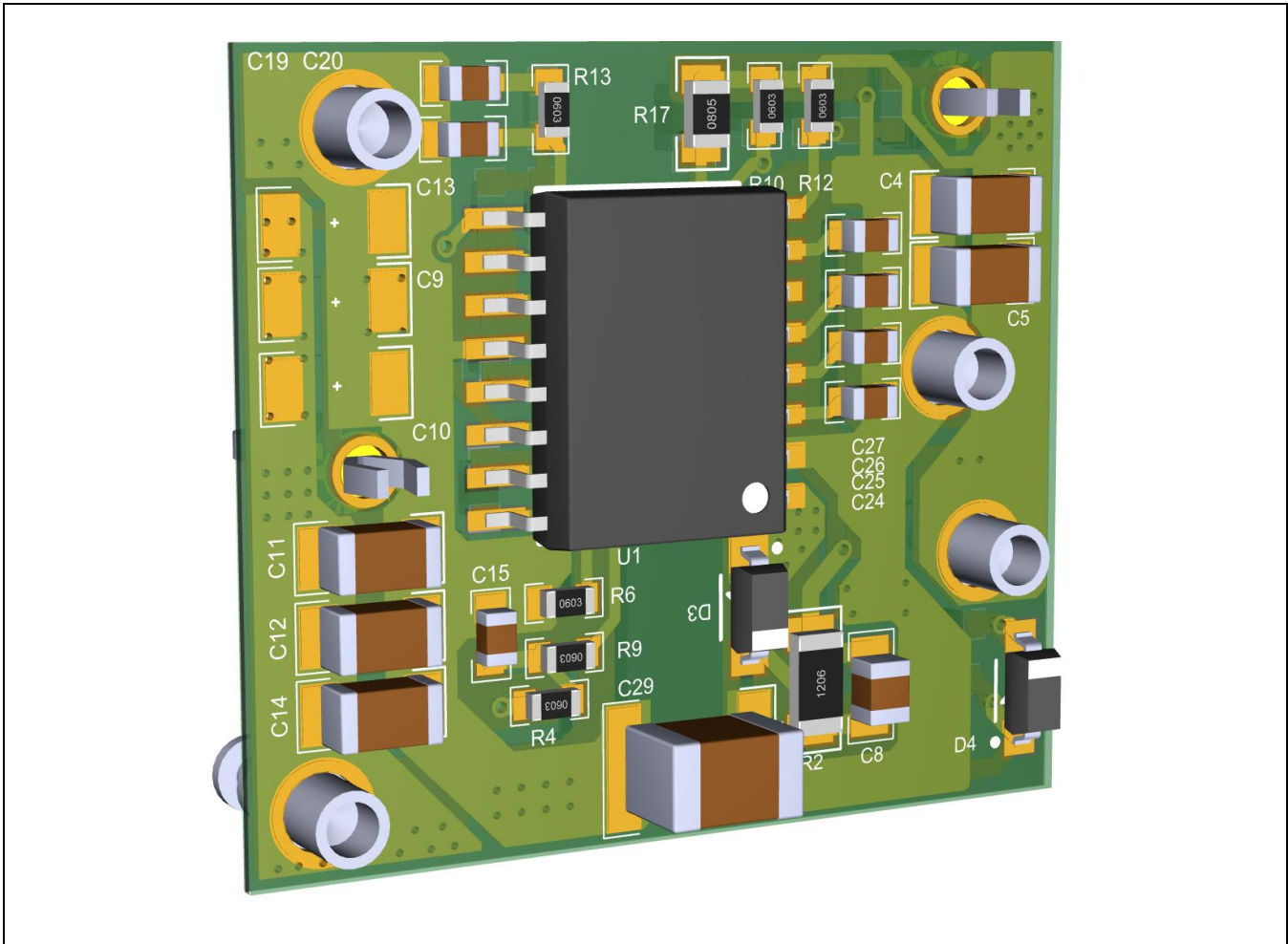
Ordering Information

Part Number	Description	IC Package
KTB1100EYAA-MMEV01	KTB1100 EVAL Kit	SOIC-16

3D CAD Image – Top Side



3D CAD Image – Bottom Side



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTB1100 EVAL fully assembled PCB	1
2	Anti-static bag	1
3	Quick Start Guide, printed 1 page (A4 or US Letter)	1
4	EVAL Kit box	1

QR Links for Documents

IC Landing Page	EVAL Kit Landing Page
 https://www.kinet-ic.com/ktb1100/	 https://www.kinet-ic.com/ktb1100eyaa-mmeev01/

User-Supplied Equipment

1 Required Equipment

1. Bench Power Supply for VIN – 7V to 75V and 0.5A/1A/2A, as needed for the intended application. For testing over-voltage protection and withstand voltage, a 75V adjustable bench power supply is preferred.
2. Digital Multimeter – one or more, used to measure input/output voltages and currents.

2 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.
3. Additional Digital Multimeters

Recommended Operating Conditions

Symbol	Description	Value	Units
VIN, EN(ON/OFF)	Input High Voltage Inputs	9 to 75	V
PGOOD	Output Power Good Voltage	3 to 5	V
VO+	Output Operating Voltage	12	V
IOUT	Output Load Current	0 to 2	A

Jumper Descriptions

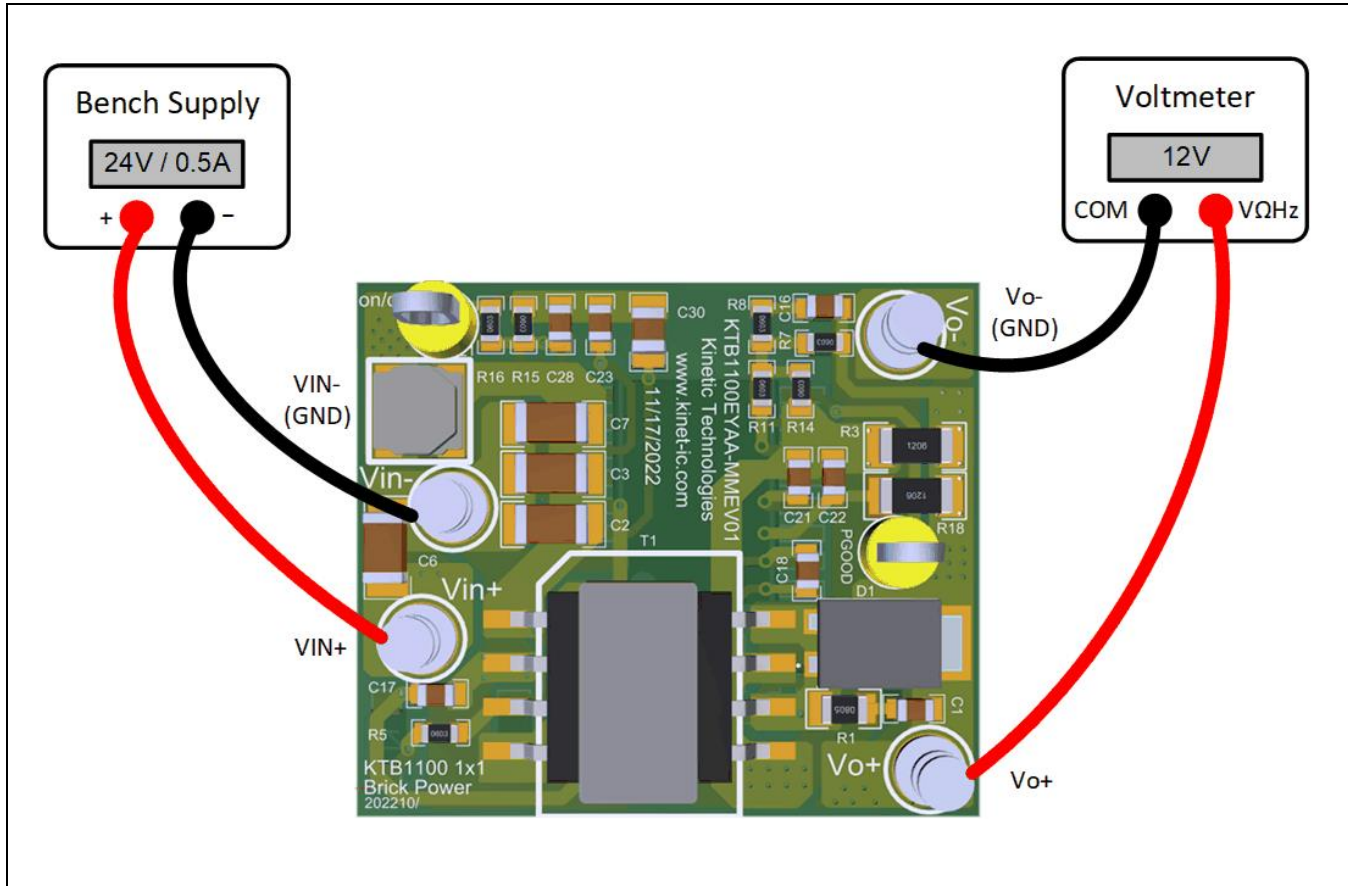
Designator	Name	Description	Default
ON/OFF TP3	EN	Active-High Enable Input L: Shutdown Mode – switch disabled H: Enable Mode – normal switch operation	H

Quick Start Procedures

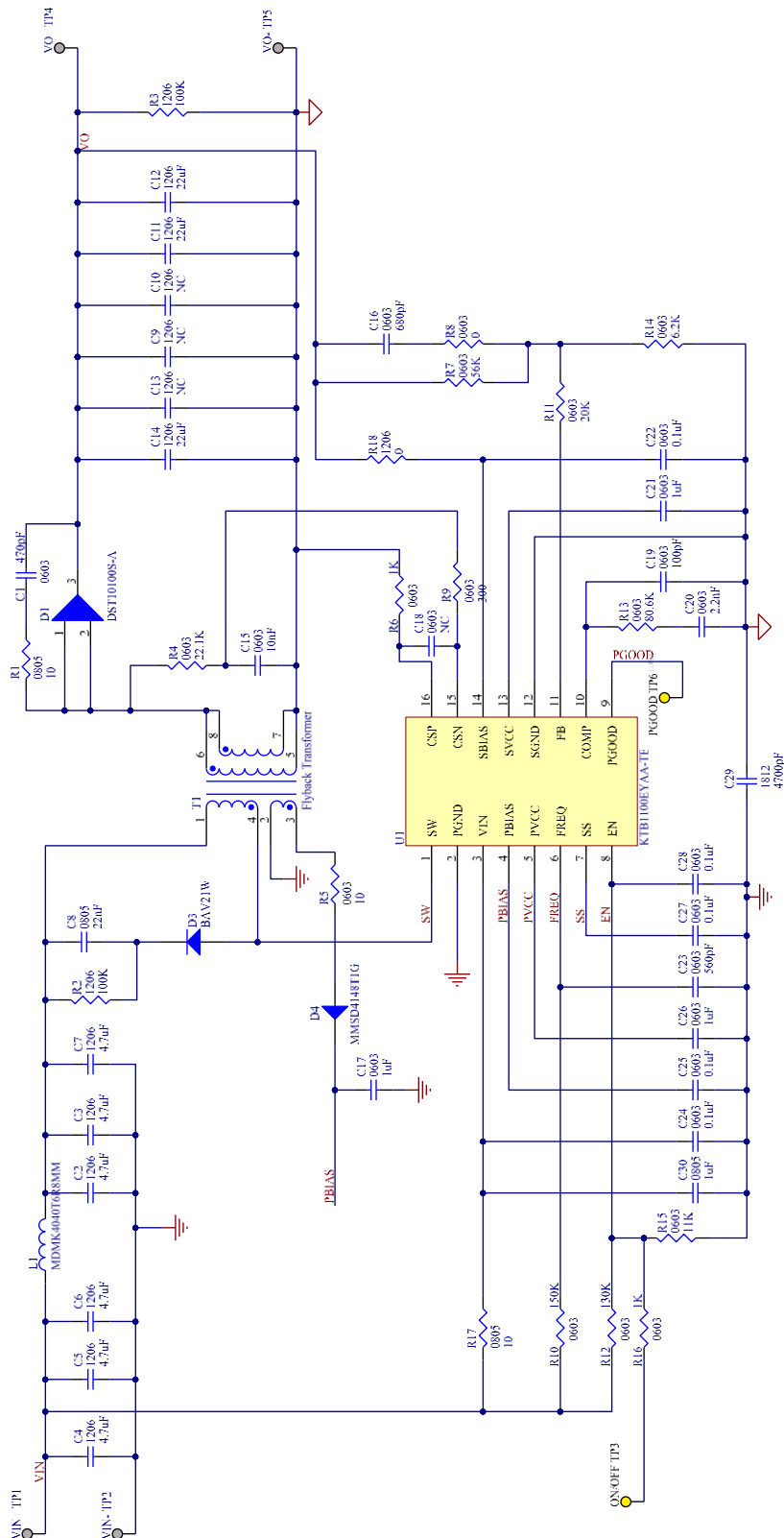
1. Before connecting the EVAL Kit to the VIN bench supply, turn on the supply and adjust the voltage as close to 0V as possible. Then turn off the supply. While off, connect power cables to the VIN+ (TP1 Power) and VIN- (TP2 GND) on the EVAL kit and to VIN+ and VIN- on the bench supply.
2. Turn on the VIN bench supply and very slowly ramp its voltage to an appropriate voltage, such as 24, 36, 48, or 60V. 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.
3. With valid VIN voltage, use a digital multimeter to check the output voltage between the Vo+ and V0- (GND) terminals on the EVAL Kit. It should be 12V.
4. ON/OFF is connected to Vin by default (adjustable UVLO R12 and R15) to enable the output. Connect ON/OFF to VIN- (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

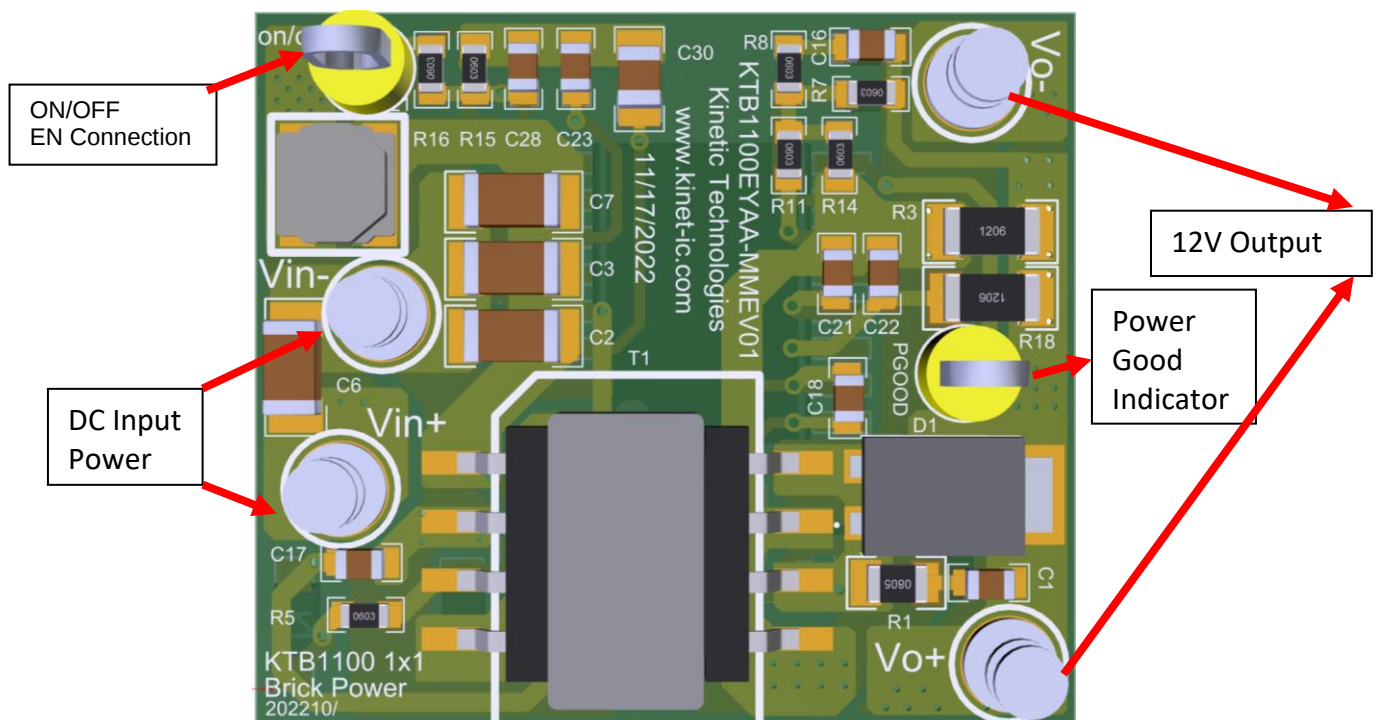
Physical Access

The table below lists the KTB1100 EVB-001 connectors functionality.

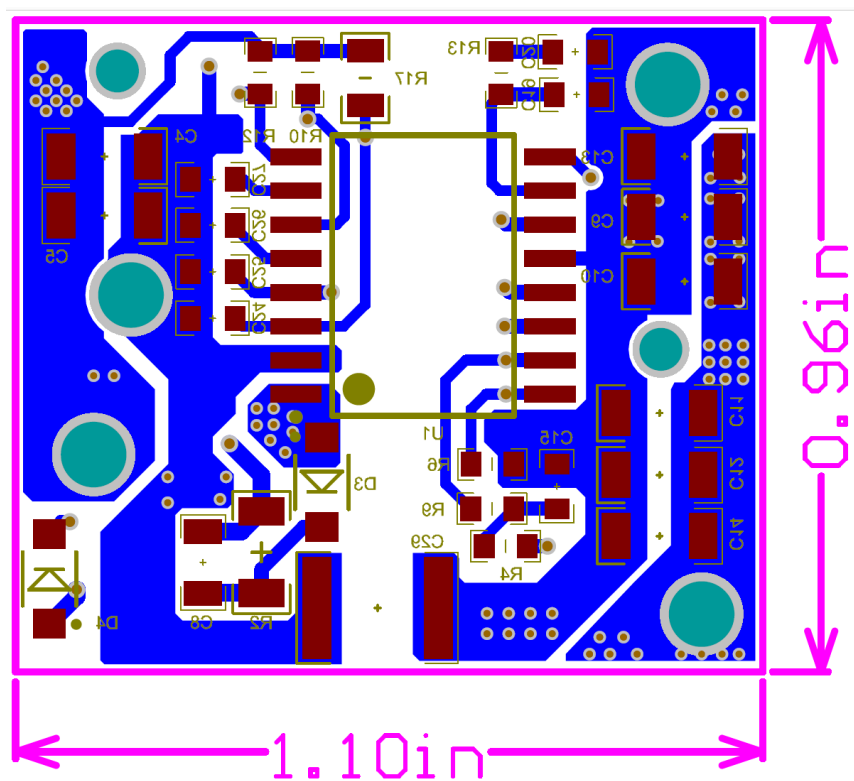
Connector	Description
VIN+ TP1/VIN- TP2	DC input power connector (VIN+ is Positive Pin and VIN- is negative pin)
Vo+ TP4/Vo- TP5	Output voltage connector (Vo+ is Positive Pin and Vo- is negative pin)
ON/OFF TP3	Enable signal connector. (ON/OFF is default connected to Vin to enable To disable, connect ON/OFF to GND)
PGOOD TP6	Power Good Indicator test point. This pin is an open-drain output. A 10kΩ pullup resistor between PGOOD and SVCC or an external logic supply pin is recommended.

Test Setup

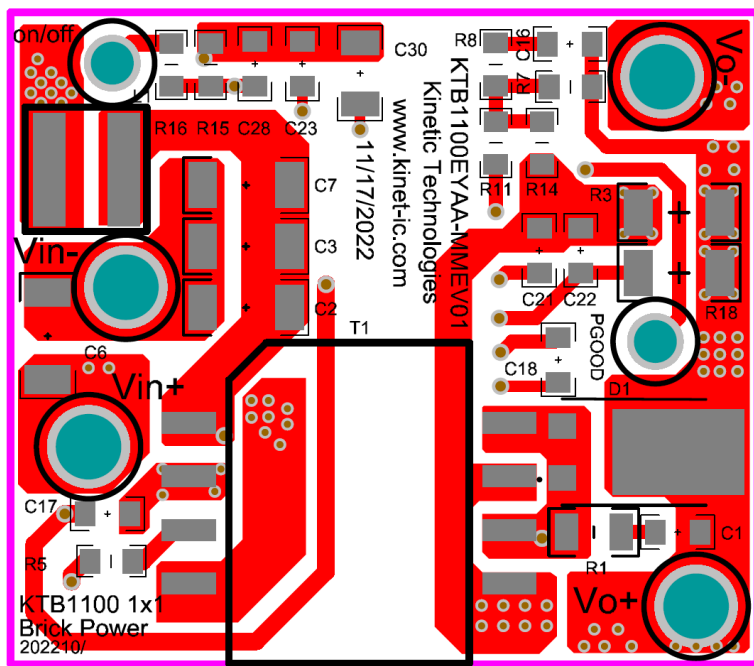
1. The “Typical Test Setup Diagram” shows a typical setup for KTB1100 EVB-001. Input voltage can be applied as described in “Recommended Operating Conditions” Table.
2. ON/OFF is connected to Vin by default (R12 and R15). It can also be connected to GND to disable.
3. The EVB can also be turned on by enable control or by an external signal by removing R12: Apply input power, then switch EN pin from Low logic to high logic.
4. Use a digital multimeter and an eLoad. Consult the KTB1100 datasheet for the expected current range at the VIN voltage condition in use. For conditions of VIN = 48V, EN = H, Vo+ = 12V, IOOUT can be up to 2A.
5. Power good indicator. This pin is an open-drain output. Connect a 10kΩ to 100kΩ pullup resistor between PGOOD and SVCC (C21) or an external logic supply.



Printed Circuit Board (PCB)



Top Side Layout/Routing



Bottom Layer Routing

Layout Guidelines

The PCB layout is divided into primary (input) side and secondary (output) side components and typically separated by an isolation barrier. The primary components should be grouped together, and the secondary components should be grouped together. KTB1100, transform and isolation capacitor are the only components bridging the isolation barrier between the primary and secondary circuitry. Primary and secondary traces, planes and other conductive items should be separated by a gap specified by the safety agency requirements appropriate for the insulation classification required by the application.

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 (Cin, Transformer, Internal FET of KTB1100) and the output loop (Transformer, Co, Rectifier Diode).
2. Use a single point connection between signal GND (SGND of KTB1100) and output power GND (The negative terminal of the output voltage).
3. Ground all the control capacitors to their respective grounds and place the control circuit capacitors close to the IC to decouple noise.
4. Keep the primary and secondary control circuit trace far away from noise sources (such as primary switch node and secondary switch node).
5. CSP and CSN pins should differentially sense the current signal through the sense components. A 100Ω to 1kΩ filter resistor is suggested in series with each CSP and CSN pins. The CSP and CSN traces should not cross any switch nodes.
6. Keep FB and COMP 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.
7. As snubber circuit like RCD should be used to limit peak voltage on the SW pin at turn-off. Minimize the loop from the RCD snubber components to the transformer and IC.

Bill of Materials

Qty	Designator	Description	Value	Package	Manufacturer	Manufacturer Part Number	Mouser Part Number	Digikey Part Number
1	C1	CAP CER 470PF 100V COG/NPO 0603	470pF	0603	Murata	GCM1885C2A471GA16D	81-GCM1885C2A471GA16D	490-GCM1885C2A471GA16DCT-ND
6	C2, C3, C4, C5, C6, C7	CAP 4.7UF 100V X7S 1206	4.7uF	1206	Murata	GRM31CC72A475KE11L	81-GRM31CC72A475KE11L	490-18620-1-ND -
1	C8	CAP CER 0.022UF 200V X7R 0805	22nF	0805	YAGEO	CC0805KKX7RABB223	603-CC805KKX7RABB223	311-4292-1-ND
3	C9, C10, C13	CAP CER 1206	NC	1206				
3	C11, C12, C14	CAP 22UF 16V X5R 1206	22uF	1206	Samsung	CL31A226KOHNNNE	187-CL31A226KOHNNNE	1276-3048-1-ND
1	C15	CAP CER 10nF 50V X7R 0603	10nF	0603	Samsung	CL10B103KB8NNNC	187-CL10B103KB8NNNC	1276-1009-1-ND
1	C16	CAP 680PF 50V X7R 0603	680pF	0603	YAGEO	CC0603KRX7R9BB681	187-CL10C681JB8NNNC	1276-1820-1-ND
3	C17, C21, C26	CAP 1UF 50V X7R 0603	1uF	0603	YAGEO	CC0603KRX7R9BB105	603-CC603KRX7R9BB105	311-2082-1-ND -
1	C18	CAP CER 0603	NC	0603				
1	C19	CAP CER 100PF 50V X7R 0603	100pF	0603	YAGEO	CC0603KRX7R9BB101	603-CC603KRX7R9BB101	311-3601-1-ND
1	C20	CAP CER 2.2nF 50V X7R 0603	2.2nF	0603	YAGEO	CC0603KRX7R9BB222	603-C0603KRX7R9BB222	311-1081-1-ND
4	C22, C25, C27, C28	CAP 0.1uF 50V X7R 0603	0.1uF	0603	Samsung	CL10B104KB8NNNC	187-CL10B104KB8NNNC	1276-1000-1-ND
1	C23	CAP 560PF 100V COG/NPO 0603	560pF	0603	YAGEO	CC0603JRNPO0BN561	603-CC603JRNPO0BN561	311-3943-1-ND
1	C24	CAP 0.1UF 100V X7R 0603	0.1uF	0603	Samsung	CL10B104KC8NNNC	187-CL10B104KC8NNNC	1276-6807-1-ND -
1	C29	CAP CER 4700PF 2KV X7R 1812	4700pF	1812	YAGEO	CC1812KKX7RDBB472	603-CC812KKX7RDBB472	311-3650-1-ND -
1	C30	CAP CER 1UF 100V X7S 0805	1uF	0805	Murata	GCM21BC72A105KE36L	81-GCM21BC72A105KE6L	90-14436-1-ND
1	D1	DIODE SBR 60V 8A POWERDI5		TO277B	Diodes Inc	SBR8U60P5-13	621-SBR8U60P5-13	SBR8U60P5-13DICT-ND
1	D3	DIODE GEN PURP 200V 200MA SOD123		SOD123	Onsemi	MMSD3070	512-MMSD3070	MMSD3070CT-ND
1	D4	DIODE GEN PURP 100V 200MA SOD123		SOD123	onsemi	MMSD4148T1G	863-MMSD4148T1G	2156-MMSD4148T1G-OS-ND
1	L1	FIXED IND 6.8UH 1.6A 230MOHM SMD		SMD	Taiyo Yuden	MDMK4040T6R8MM		587-4135-1-ND
1	R1	RES 10 OHM 1% 1/8W 0805	10	0805	Yageo	RC0805FR-0710RL	603-RC0805FR-0710RL	311-10.0CRCT-ND
2	R2, R3	RES 100K OHM 1% 1/4W 1206	100K	1206	Yageo	RC1206FR-07100KL	603-RC1206FR-07100KL	311-100KFRCT-ND
1	R4	RES 22.1K OHM 1% 1/10W 0603	22.1K	0603	Yageo	RC0603FR-0722K1L	603-RC0603FR-0722K1L	311-22.1KHRCT-ND
1	R5	RES 10 OHM 1% 1/10W 0603	10	0603	Yageo	RC0603FR-0710RL	603-RC0603FR-0710RL	311-10.0HRCT-ND
2	R6, R16	RES 1K OHM 1% 1/10W 0603	1K	0603	Yageo	RC0603FR-071KL	603-RC0603FR-071KL	311-1.00KHRCT-ND
1	R7	RES 56K OHM 1% 1/10W 0603	56K	0603	Yageo	RC0603FR-0756KL	603-RC0603FR-0756KL	311-56KHRCT-ND
1	R8	RES 0 OHM JUMPER 1/10W 0603	0	0603	Yageo	RC0603FR-070RL	603-RC0603FR-070RL	311-0.0HRCT-ND
1	R9	RES 301 OHM 1% 1/10W 0603	300	0603	Yageo	RC0603FR-07301RL	603-RC0603FR-07301RL	311-301HRCT-ND
1	R10	RES 150K OHM 1% 1/10W 0603	150K	0603	Yageo	RC0603FR-07150KL	603-RC0603FR-07150KL	311-150KHRCT-ND
1	R11	RES 20K OHM 1% 1/10W 0603	20K	0603	Yageo	CO603FR-0720KL	603-RC0603FR-0720KL	311-20.0KHRCT-ND
1	R12	RES 130K OHM 1% 1/10W 0603	130K	0603	Yageo	RC0603FR-07130KL	603-RC0603FR-07130KL	311-130KHRCT-ND
1	R13	RES 80.6K OHM 1% 1/10W 0603	80.6K	0603	Yageo	RC0603FR-0780K6L	603-RC0603FR-0780K6L	311-80.6KHRCT-ND
1	R14	RES 6.2K OHM 1% 1/10W 0603	6.2K	0603	Yageo	RC0603FR-076K2L	603-RC0603FR-076K2L	311-6.20KHRCT-ND
1	R15	RES 11K OHM 1% 1/10W 0603	11K	0603	Yageo	RC0603FR-0711KL	603-RC0603FR-0711KL	311-11.0KHRCT-ND
1	R17	RES 10 Ohm 1% 0805	10	0805	Yageo	RC0805FR-0710RL	603-RC0805FR-0710RL	311-10.0CRCT-ND
1	R18	RES 0 OHM JUMPER 1/4W 1206	0	1206	Yageo	RC1206FR-070RL	603-RC1206FR-070RL	YAG3367CT-ND
1	T1					E11022		
4	TP1, TP2, TP4, TP5	TERM TURRET SINGLE L=5.56MM TIN		1POS	Keystone	1502-2	534-1502-2	36-1502-2-ND
2	TP3, TP6	PC TEST POINT MULTIPURPOSE YELLOW		Through Hole	Keystone	5014	534-5014	36-5014-ND
1	U1	15W Flyback Regulator with Digital Isolator Integrated Feedback		SOIC-16	Kinetic Technologies	KTB1100		

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