IEEE 802.3at PoE PD with Integrated DC-DC Controller

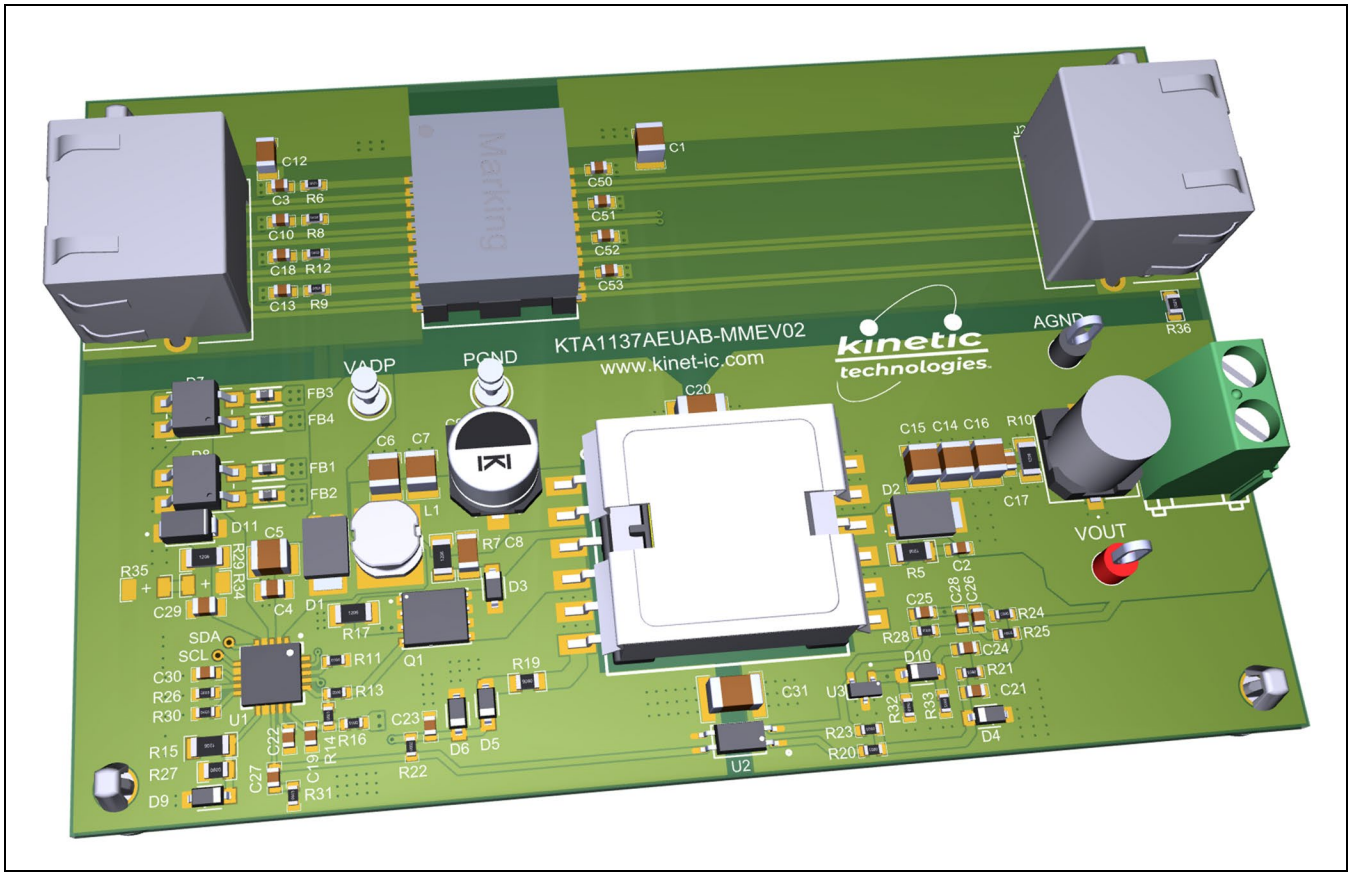
Brief Description

The KTA1137A Evaluation (EVAL) Kit is used to demonstrate and evaluate the KTA1137A functionality, performance, and PCB layout. The kit includes a fully assembled and tested PCB with the KTA1137A IC installed, and a printed copy of the Quick Start Guide. The KTA1137A device is an IEEE 802.3af/at compliant combination powered device (PD) controller and power supply controller optimized for isolated and non-isolated converter topologies. This KTA1137A EVAL board provides power and signal I/O connections and an array of test points for signal observation. A non-synchronous 12V, 25W flyback topology design is featured, but synchronous rectified designs are also possible using synchronous winding of the transformer.

Ordering Information

Part Number	Description	IC Package
KTA1137AEUAB-MMEV02	KTA1137A EVAL Kit – Version 2	QFN55-20

3D CAD Image



EVAL Kit Physical Contents

Item #	Description	Quantity
1	KTA1137A Evaluation board fully assembled PCB	1
2	Anti-static bag	1
3	KTA1137A Quick Start Guide, printed 1 page (A4 or US Letter)	1
4	EVAL Kit box	1

QR Links for Documents

IC Datasheet	EVAL Kit Landing Page
https://www.kinet-ic.com/kta1137a	https://www.kinet-ic.com/kta1137aeuab-mmev02

User-Supplied Equipment

- Power Sourcing Equipment (PSE) or Bench Power Supply for VIN = 37V-57V and 1A as needed for intended application.
- Digital Multimeter – used to measure input/output voltages and currents.
- Load – either power resistors, an E-Load, or an actual system load.

Recommended Operating Conditions

Parameter	Condition		Min	Typ	Max	Units
Power Interface						
Input voltage	Applied to power pins of connectors RJ1 or J1		0		57	V
Operation voltage	After start-up with 37V or above		34		57	V
Input UVLO	Rising input voltage			34		V
	Falling input voltage			30		V
Detection voltage	At device terminals		2.7		13	V
Classification voltage	At device terminals		11		24	V
Classification current	R_{CLASS} = 63.4kΩ		36		44	mA
Inrush current-limit			100		400	mA
Operation current-limit				1200		mA
DC/DC Converter						
Output voltage	$34 \le V_{IN} \le 57V$, $I_{LOAD} \leqq I_{LOAD\ (MAX)}$	12V output				V
Output current	$34 \le V_{IN} \le 57V$	12V output		2.1		A
Output ripple voltage (peak to peak)	V_{IN} = 48V, I_{LOAD} = 2.1A	12V output		50		mV
Efficiency (end to end)	V_{IN} = 48V, I_{LOAD} = 2.1A	12V output		86.61		%
Switching frequency			110		130	kHz

Quick Start Procedures

The output voltage of this board is set to 12V. There are two methods to start KTA1137AEUAB-MMEV02:

Method 1: Connect to PSE

1. Connect a voltage meter to the output VOUT and AGND test pins, it should measure the output voltage.
2. Connect the load to the output VOUT and AGND test pins.
3. Connect the cable coming from the PSE into the Ethernet Jack J1. The board will automatically startup.

Method 2: Connect to Local Power Supply

1. Connect one pair of power cables to the connector of EVAL Kit at VADP (9.5V ~ 57V) and PGND.
2. Before connecting the EVAL Kit to the bench power 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 bench supply.
3. Connect a voltage meter to the output VOUT and AGND test pins, it should measure the output voltage.
4. Connect the load to the output VOUT and AGND test pins.
5. Turn on the VIN bench supply and very slowly ramp its voltage to an appropriate voltage, such as 48V. 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.

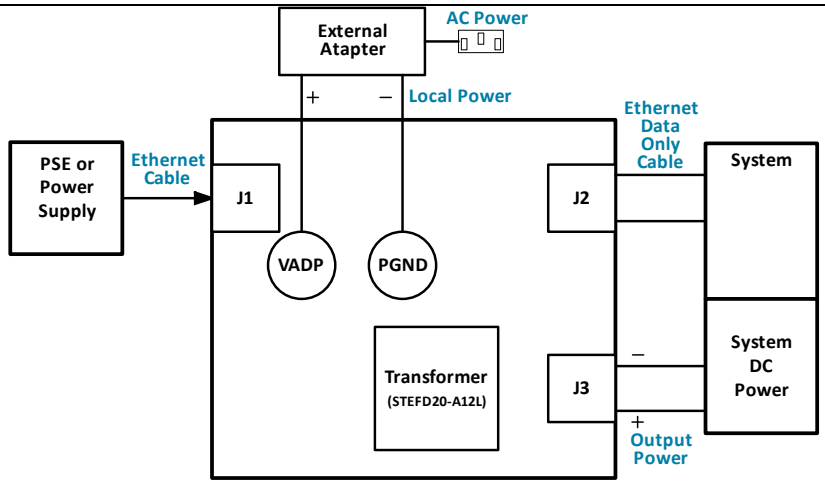
General Configuration

Connector Functionality

Connector	Description
J1	Ethernet power input connector (RJ45 style connector)
J2	Ethernet data port connector (RJ45 style connector)
J3	VOUT (output) to system DC power
PGND	Adapter ground
VADP	External adaptor input (9.5V ~ 57V)

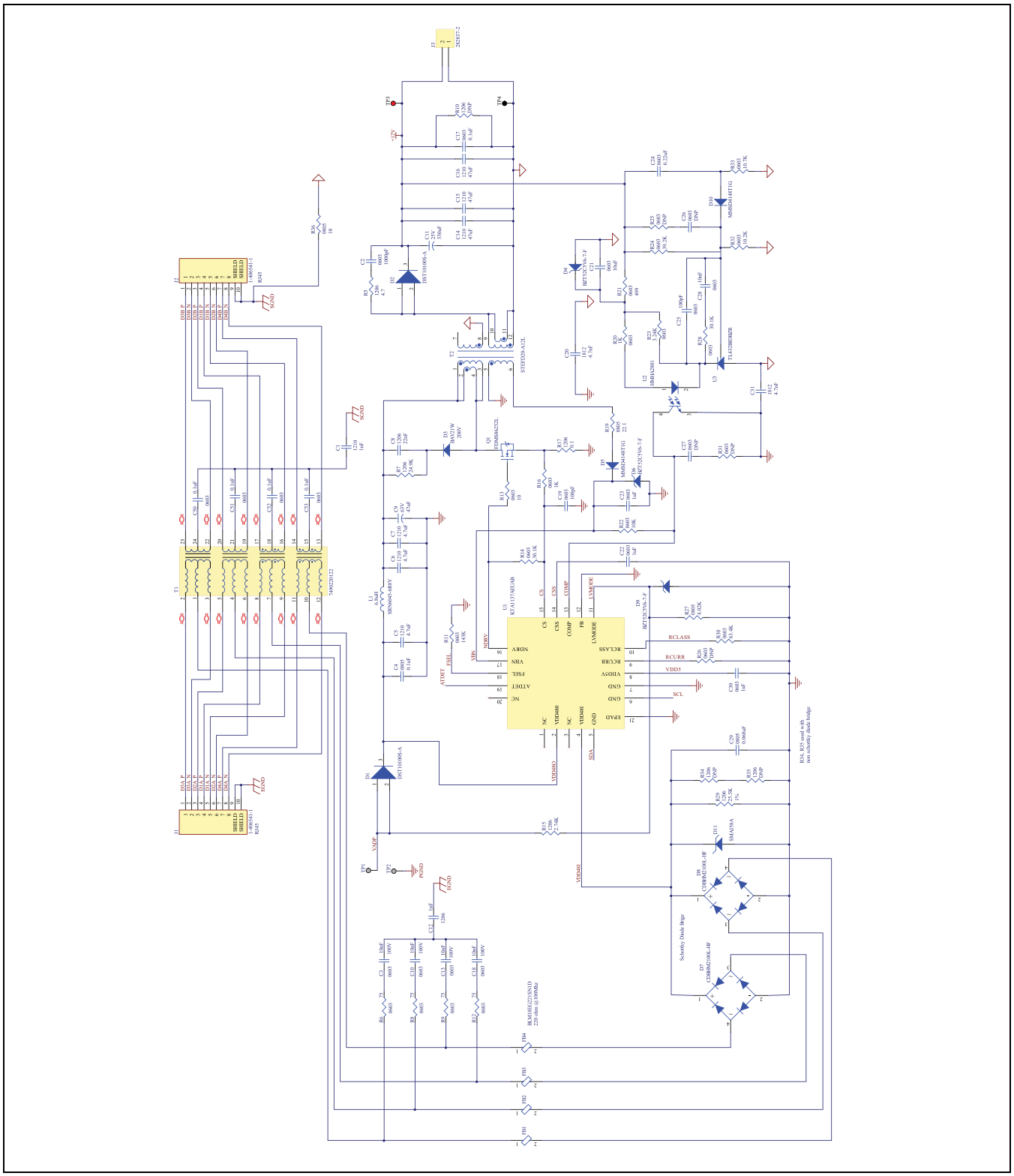
Typical Test Setup Diagram

The figure below shows a typical setup for KTA1137A EVB. Input voltage can be applied as described in the Connector Functionality table above.



Typical KTA1137AEUAB-MMEV02 Test Setup

Electrical Schematic



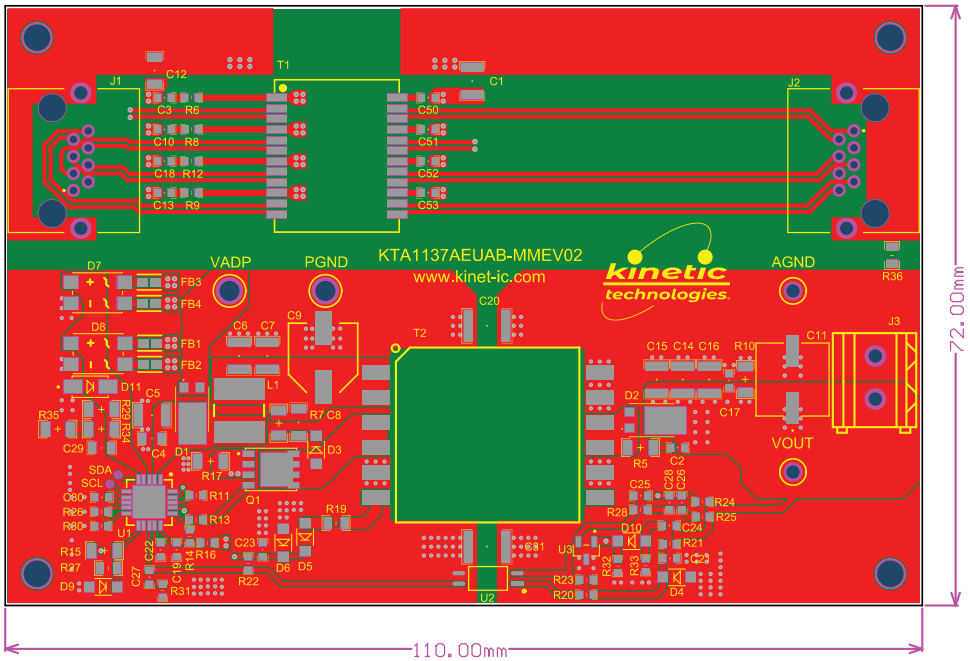
Bill of Materials (BOM)

Designator	Description	Quantity	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
C1	CAP CER 1000pF 2KV X7R 1210	1	Johanson Dielectrics Inc.	202S41W102KV4E	709-1040-1-ND	605-202S41W102KV4E
C2	CAP CER 1000pF 100V X7R 0603	1	Samsung	CL10B102KC8NNNC	1276-1131-1-ND	187-CL10B102KC8NNNC
C3, C10, C13, C18	CAP CER 10nF 100V X7R 0603	4	Samsung	CL10B103KC8NNNC	1276-1196-1-ND	187-CL10B103KC8NNNC
C4	CAP CER 0.1uF 100V X7R 0805	1	Yageo	CC0805KKX7R0BB104	311-2083-1-ND	603-CC805KKX7R0BB104
C5, C6, C7	CAP CER 4.7uF 100V X7S 1210	3	Taiyo Yuden	HMK325C7475KN-TE	587-5038-1-ND	963-HMK325C7475KN-TE
C8	CAP CER 0.022uF 100V X7R 1206	1	Yageo	CC1206KRX7R0BB223	311-1986-1-ND	603-CC126KRX7R0BB223
C9	CAP ALUM 47uF 20% 63V SMD	1	Panasonic	EEE-HA1J470UP	PCE4233CT-ND	667-EEE-HA1J470UP
C11	CAP ALUM 330UF 20% 25V SMD	1	Wurth Electronics	865060453008	732-8537-2-ND	710-865060453008
C12	CAP CER 1000pF 2KV X7R 1206	1	Yageo	CC1206KKX7RDBB102	311-1487-1-ND	603-CC206KKX7RDBB102
C14, C15, C16	CAP CER 47uF 16V X5R 1210	3	Murata	GRM32ER61C476KE15L	490-6539-1-ND	81-GRM32ER61C476KE5L
C17, C50, C51, C52, C53	CAP CER 0.1uF 16V X7R 0603	5	Samsung	CL10B104KO8NNNC	1276-1005-1-ND	187-CL10B104KO8NNNC
C19, C25	CAP CER 100pF 50V C0G/NP0 0603	2	Samsung	CL10C101JB8NNNC	1276-1008-1-ND	187-CL10C101JB8NNNC
C20, C31	CAP CER 4700pF 2KV X7R 1812	2	Yageo	CC1812KKX7RDBB472	311-3650-1-ND	603-CC812KKX7RDBB47
C21	CAP CER 10uF 16V X5R 0603	1	Murata	GRM188R61C106MA73D	490-7201-1-ND	81-GRM188R61C106MA3D
C22, C23, C30	CAP CER 1UF 16V X5R 0603	3	Samsung	CL10A105KO8NNNC	1276-1034-1-ND	187-CL10A105KO8NNNC
C24	CAP CER 0.22uF 25V X7R 0603	1	Samsung	CL10B224KA8NNNC	1276-1111-1-ND	187-CL10B224KA8NNNC
C26, C27	DNP	2				
C28	CAP CER 0.01uF 50V X7R 0603	1	Samsung	CL10B103KB8NNNC	1276-1009-1-ND	187-CL10B103KB8NNNC
C29	CAP CER 0.068uF 100V X7R 0805	1	Yageo	CC0805KKX7R0BB683	311-4287-1-ND	603-CC0805KR0BB683
D1, D2	DIODE SCHOTTKY 100V 10A TO277B	2	LITTELFUSE	DST10100S-A	F10098CT-ND	576-DST10100S-A
D3	DIODE GEN PURP 200V 200MA SOD123	1	SMC Diode Solutions	BAV21W	1655-BAV21WTR-ND	621-BAV21W-F
D4, D6, D9	DIODE ZENER 5.6V 500MW SOD123	3	Diodes Inc	BZT52C5V6-7-F	BZT52C5V6-FDICT-ND	621-BZT52C5V6-F
D5, D10	DIODE GEN PURP 100V 200MA SOD123	2	onsemi	MMSD4148T1G	2156-MMSD4148T1G-OS-ND	863-MMSD4148T1G
D7, D8	BRIDGE RECT 1PHASE 100V 2A MBS-2	2	Comchip Technology	CDBHM2100L-HF	641-1432-1-ND	750-CDBHM2100L-HF
D11	TVS DIODE 58VWM 93.6VC DO214AC	1	Littelfuse Inc.	SMAJ58A	SMAJ58ALFCT-ND	576-SMAJ58A
FB1, FB2, FB3, FB4	FERRITE BEAD 220 OHM 0603 1LN	4	Murata Electronics	BLM18EG221SN1D	490-3992-1-ND	81-BLM18EG221SN1D
H1, H2, H3, H4	BRD SPT SNAP LOCK REST MNT 4MM	4	Essentra Components	PSD-4M-19	PSD-4M-19-ND	144-PSD-4M-19
J1, J2	CONN MOD JACK 8P8C R/A SHIELDED	2	TE Connectivity	1-406541-1	A97716-ND	571-1-406541-1
J3	TERM BLK 2P SIDE ENT 5.08MM PCB	1	TE Connectivity	282837-2	A113320-ND	571-2828372
L1	FIXED IND 6.8UH 2.8A 47.3MOHM SM	1	Bourns Electronics	SRN6045-6R8Y	SRN6045-6R8YCT-ND	652-SRN6045-6R8Y
Q1	MOSFET N-CH 150V 4.4A 8PQFN	1	ON Semiconductor	FDMS86252L	FDMS86252LCT-ND	512-FDMS86252L

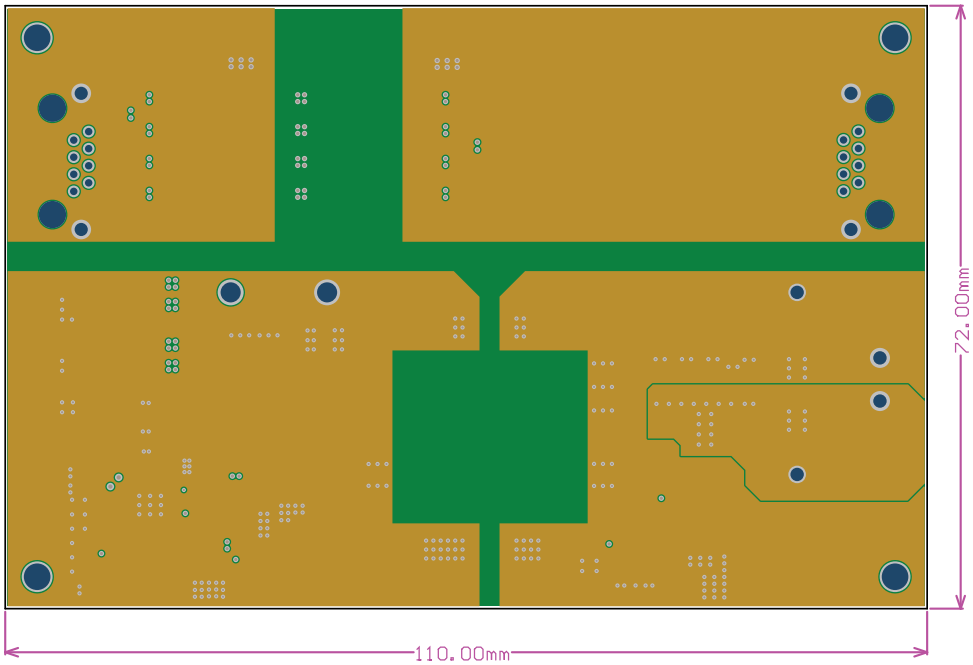
Designator	Description	Quantity	Manufacturer	Manufacturer Part Number	Digikey Part Number	Mouser Part Number
R5	RES SMD 4.7 OHM 1% 1/4W 1206	1	Yageo	RC1206FR-074R7L	311-4.70FRCT-ND	603-RC1206FR-074R7L
R6, R8, R9, R12	RES SMD 75 OHM 1% 1/10W 0603	4	Yageo	RC0603FR-0775RL	311-75.0HRCT-ND	603-RC0603FR-0775RL
R7	RES SMD 24.9K OHM 1% 1/4W 1206	1	Yageo	RC1206FR-0724K9L	311-24.9KFRCT-ND	603-RC1206FR-0724K9L
R10	DNP	1				
R11	RES SMD 143K 1% 1/10W 0603	1	Yageo	RC0603FR-07143KL	311-143KHRCT-ND	603-RC0603FR-07143KL
R13	RES SMD 10 OHM 1% 1/10W 0603	1	Yageo	RC0603FR-0710RL	311-10.0HRCT-ND	603-RC0603FR-0710RL
R14, R28	RES SMD 30.1K 1% 1/10W 0603	2	Yageo	RC0603FR-0730K1L	311-30.1KHRCT-ND	603-RC0603FR-0730K1L
R15	RES SMD 2.74k 1% 1/4W 1206	1	Yageo	RC1206FR-072K74L	311-2.74KFRCT-ND	603-RC1206FR-072K74L
R16, R20	RES SMD 1K 1% 1/10W 0603	2	Yageo	RC0603FR-071KL	311-1.00KHRCT-ND	603-RC0603FR-071KL
R17	RES SMD 100mOHM 1% 1/4W 1206	1	Yageo	RL1206FR-070R1L	311-0.1LWCT-ND	603-RL1206FR070R1L
R19	RES SMD 22.1 OHM 1% 1/10W 0805	1	Yageo	RC0805FR-0722R1L	311-22.1CRCT-ND	603-RC0805FR-0722R1L
R21	RES SMD 499 OHM 1% 1/10W 0603	1	Yageo	RC0603FR-07499RL	311-499HRCT-ND	603-RC0603FR-07499RL
R22	RES SMD 10K 1% 1/10W 0603	1	Yageo	RC0603FR-0710KL	311-10.0KHRCT-ND	603-RC0603FR-0710KL
R23	RES SMD 3.24K 1% 1/10W 0603	1	Yageo	RC0603FR-073K24L	311-3.24KHRCT-ND	603-RC0603FR-073K24L
R24	RES SMD 39.2K 1% 1/10W 0603	1	Yageo	RC0603FR-0739K2L	311-39.2KHRCT-ND	603-RC0603FR-0739K2L
R25, R26, R31	DNP	3				
R27	RES SMD 4.02K 1% 1/10W 0805	1	Yageo	RC0805FR-074K02L	311-4.02KCRCT-ND	603-RC0805FR-074K02L
R29	RES SMD 25.5K 1% 1/4W 1206	1	Yageo	RC1206FR-0725K5L	311-25.5KFRCT-ND	603-RC1206FR-0725K5L
R30	RES SMD 63.4K 1% 1/10W 0603	1	Yageo	RC0603FR-0763K4L	311-63.4KHRCT-ND	603-RC0603FR-0763K4L
R32	RES SMD 10.2K 1% 1/10W 0603	1	Yageo	RC0603FR-0710K2L	311-10.2KHRCT-ND	603-RC0603FR-0710K2L
R33	RES SMD 10.7K 1% 1/10W 0603	1	Yageo	RC0603FR-0710K7L	311-10.7KHRCT-ND	603-RC0603FR-0710K7L
R34, R35	DNP	2				
R36	RES SMD 10 OHM 1% 1/10W 0805	1	Yageo	RC0805FR-0710RL	311-10.0CRCT-ND	603-RC0805FR-0710RL
T1	WE-LAN LAN Transformer, SMT, 1000 Base-T, 1 port	1	Wurth Elektronik	7490220122	732-10731-1-ND	710-7490220122
T2	POE 12V 30W Power Transformer	1	Samwha	STEFD20-A12L		
TP1, TP2	TERM TURRET SINGLE L=5.56MM TIN	2	Keystone	1502-2	36-1502-2-ND	534-1502-2
TP3	PC TEST POINT MULTIPURPOSE RED	1	Keystone	5010	36-5010-ND	534-5010
TP4	PC TEST POINT MULTIPURPOSE BLACK	1	Keystone	5011	36-5011-ND	534-5011
U1	Power Over Ethernet Controller 1 Channel 802.3at (PoE+), 802.3af (PoE) 20-TQFN (5x5)	1	Kinetic Technologies	KTA1137AEUAB	2763-KTA1137AEUAB-TRCT-ND	389-KTA1137AEUAB-TR
U2	OPTOISO 3.75KV TRANSISTOR 4SMD	1	ON Semiconductor / Fairchild	HMHA2801A	HMHA2801A-ND	512-HMHA2801
U3	IC VREF SHUNT ADJ 0.5% SOT23-3	1	Texas Instruments	TL432BIDBZR	TL432BIDBZR	595-TL432BIDBZR

Printed Circuit Board (PCB)

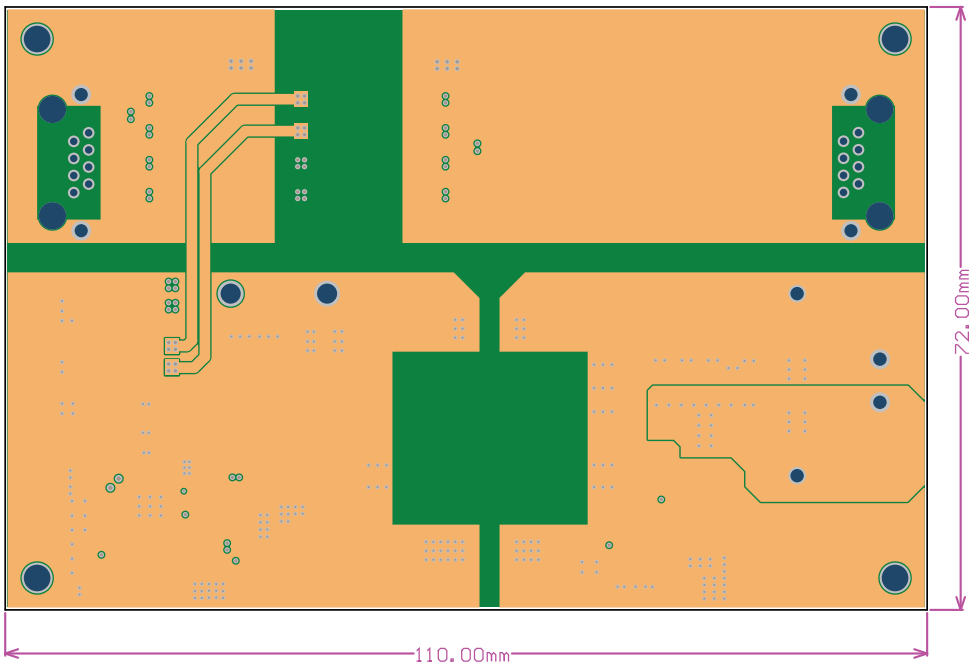
Top Side Layout/Routing



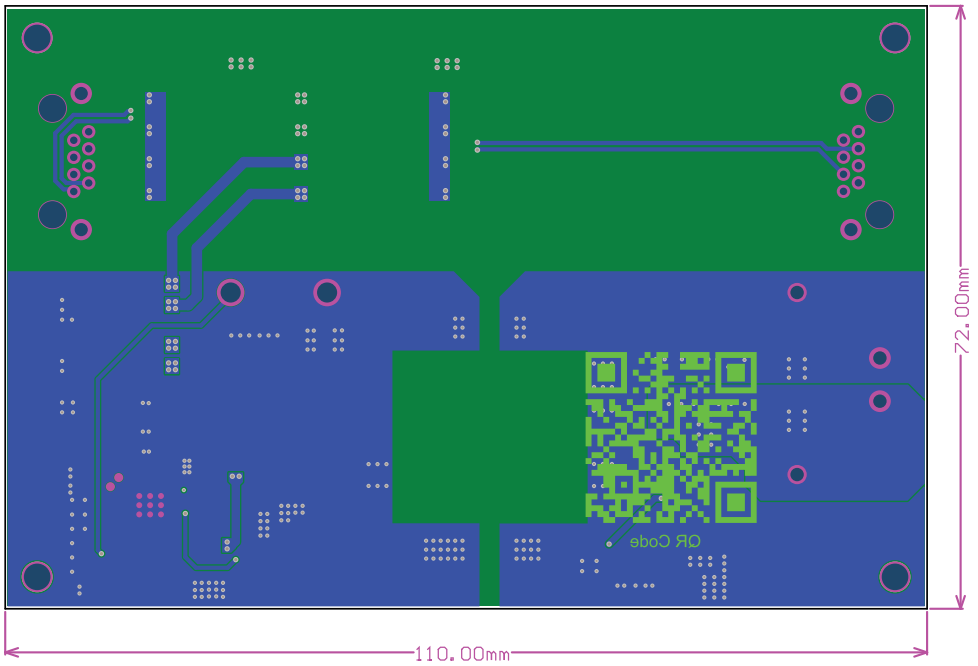
Layer Two Routing



Layer Three Routing



Bottom Layer Routing



Troubleshooting

Please contact a Kinetic Technologies Sales Representative to help troubleshoot and solve symptoms / root causes for issues with this EVB.

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