

# PEM9300BT EVALUATION KIT USER MANUAL

VERSION 1.0 – OCTOBER 2024

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## INTRODUCTION

This manual serves as a guide for using the "PEM9300BT Evaluation Board" with one of the PEM9300BT modules. The evaluation board fully complies with the IEEE 802.3bt Power over Ethernet (PoE) standard and is backward compatible with the IEEE 802.3af and IEEE 802.3at standards. It is designed to support Ethernet data rates of 10/100/1000/10GBASE-T.

The board facilitates the evaluation of PEM9300BT format modules within applications. It is specifically engineered to pass Ethernet data signals from the Midspan PSE or PoE-enabled switch connected to the J1 port (RJ45), while also connecting to the system through the J2 port (RJ45).

## KIT CONTENTS

- 01 x Evaluation Board
- 04 x Mounting Stem- 4nos
- 06 x Jumpers
- 04 x Stem End Cap
- 04 x Bumper Feet

## LAYOUT

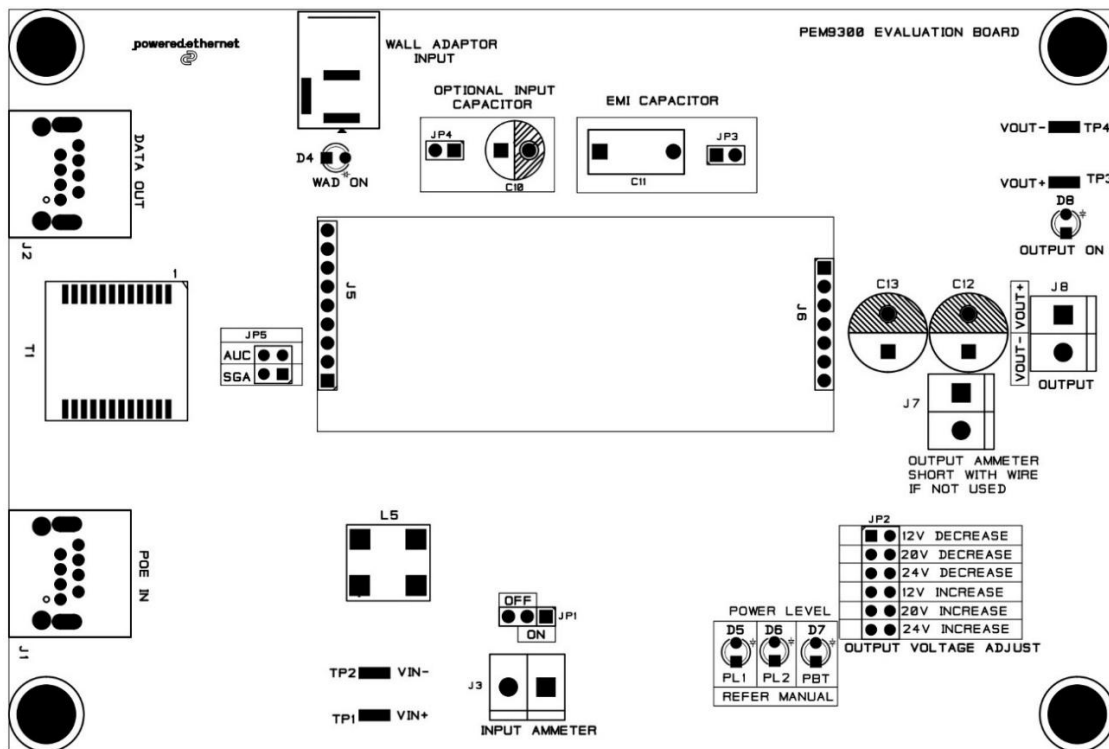


Figure 1- Board Layout

## COMPATIBLE MODULES

Series power	Power Class	Variant	Voltage (V)
PEM9300BT	8	PEM9312BT	12
		PEM9320BT	20
		PEM9324BT	24

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## INPUTS

The PEM9300BT evaluation board can be powered either by a DC power supply or any IEEE 802.3bt PSE. Both data and power input are supplied via the J1 connector (RJ45 port), as shown in Figure 1. The data signals are transmitted through the data transformer (T1) and then passed to the data output connector J2 (RJ45 port)

This board includes the KTA1170 inbuilt bridge rectifier for managing power rectification. For more detailed information, please contact Infomart.

## WALL ADAPTOR (WAP) SUPPLY

When PEM9300BT evaluation board equipped with the auxiliary DC power input. DC power can be directly connected from DC jack of the evaluation board. The system gives priority to the WAD and smoothly switches from POE Input to Wall adaptor Input. When a wall power adapter is detected, the internal isolation MOSFET turns off, the classification current is disabled if VIN is in the classification range, and the Smart MPS comparator is turned off.

## OUTPUT

The output voltage will present on the connector J8 which is 2pin 5mm terminal block. We recommended minimum 18 AWG wire size for DC Out connection.

## DATA OUTPUT

Any data that is provided over the PI (Ethernet cable) connected to the Data & Power port (J1) will be transposed onto the Data output port (J2) via the data transformer (T1). The data traces on the evaluation board have been designed to pass through 10/100/1000/10GBASE-T Ethernet data signals. No processing or amplification of this signal will be performed on the evaluation board

## OPERATION

To ensure that the PSE does not apply power to a non-PoE enabled device the output port first checks for a valid PoE signature. If the PSE does not see a valid signature, then it will disconnect, wait approximately 2 seconds then try again. Once a valid signature has been detected the PSE will then perform classification to determine the power requirement of the PD, only after this has occurred will the PSE supply power to the powered device.

## SGA FEATURE

Place a jumper between SGA pins in JP5 location to provide 12.5Kohm signature resistance required by certain Phihong PSEs. Leave these pins not connected otherwise.

## LED'S INDICATION

In PEM9300BT evaluation board, we provide 5 LEDs for indicating output on, wall adaptor on and power level indication.

LED INDICATION NAME	DESCRIPTION
WAD ON	Wall adaptor is connected
PL1	Power level indication and classification. See the section <i>Power level indication</i> for more details
PL2	
PBT	
OUTPUT ON	Output power on LED

Table 1- LED Indication

## POWER LEVEL INDICATION

PSE Type	PD Class	Class Events	PSE available power	PL1	PL2	PBT
1 or 2	0	1	12.95	OFF	OFF	OFF
1 or 2	1	1	3.84	OFF	OFF	OFF
1 or 2	2	1	6.49	OFF	OFF	OFF
1 or 2	3	1	12.95	OFF	OFF	OFF
2	4	2	25.5	ON	OFF	OFF
3 or 4	0	1	12.95	OFF	OFF	ON
3 or 4	1	1	3.84	OFF	OFF	ON
3 or 4	2	1	6.49	OFF	OFF	ON
3 or 4	3	1	12.95	OFF	OFF	ON
3 or 4	4	2 or 3	25.5	ON	OFF	ON
3 or 4	5	4	38.25	OFF	ON	ON
3 or 4	6	4	51	OFF	ON	ON
4	7	5	62	ON	ON	ON
4	8	5	71.3	ON	ON	ON

**Table 2- Power Level Indication**

## AUTO CLASS FEATURE

Autoclass is a classification mechanism that allows a PD to communicate its effective maximum power consumption to the PSE. This happens in such a way that the PSE will be able to set the power budget to the effective maximum PD power.

Place a jumper between AUC pins in JP5 location, if Autoclass is enabled. Otherwise left the pin open.

AUC (JP5) PIN CONFIGURATION	SUPPORT AUTOCLASS
AUC OPEN	NO
AUC PINS SHORT	YES

**Table 3- Auto Class Feature**

## OPTIONAL INPUT CAPACITOR

In evaluation board, we provide optional input capacitor for system stability. Place a jumper in JP2 location to connect the electrolytic capacitor (recommended min.value-22uF/100V) to the input of the module. Leave these pins not connected otherwise.

## EMI/EMC

In evaluation board, we provide optional capacitor for improving EMI/EMC noise. Place a jumper in JP3 location to connect the EMI filtering capacitor between input and outputs. Leave these pins not connected otherwise.

## MEASUREMENT SECTION

In evaluation board, we provide test points for measuring voltage and current for input and output section.

### INPUT SECTION

Test points TP1 and TP2 are for measuring voltage from input side. For measuring current, we provide 5mm terminal block(J3). If AMMETER is connected, place a jumper on pins 2 and 3 or "ON" (mention in Fig 1.) on JP1, otherwise place on 1 and 2 or "OFF" (mention in Fig 1).

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▪ **OUTPUT SECTION**

Test points TP3 and TP4 are for measuring voltage at the output side of the module. For measuring current, we provide 5mm terminal block(J7). Short the J7 connector with wire, if not used.

**OUTPUT VOLTAGE ADJUSTMENT**

By default, the nominal output voltage of the PEM9300BT module will be present on the output connectors. This can be adjusted up or down using the adjust jumper section (JP2).

Please use proper jumper selection for output voltage as per the below table,

JP2 PINS	FUNCTION
1,2	12V DECREASE
3,4	20V DECREASE
5,6	24V DECREASE
7,8	12V INCREASE
9,10	20V INCREASE
11,12	24V INCREASE

**TEST SETUP**

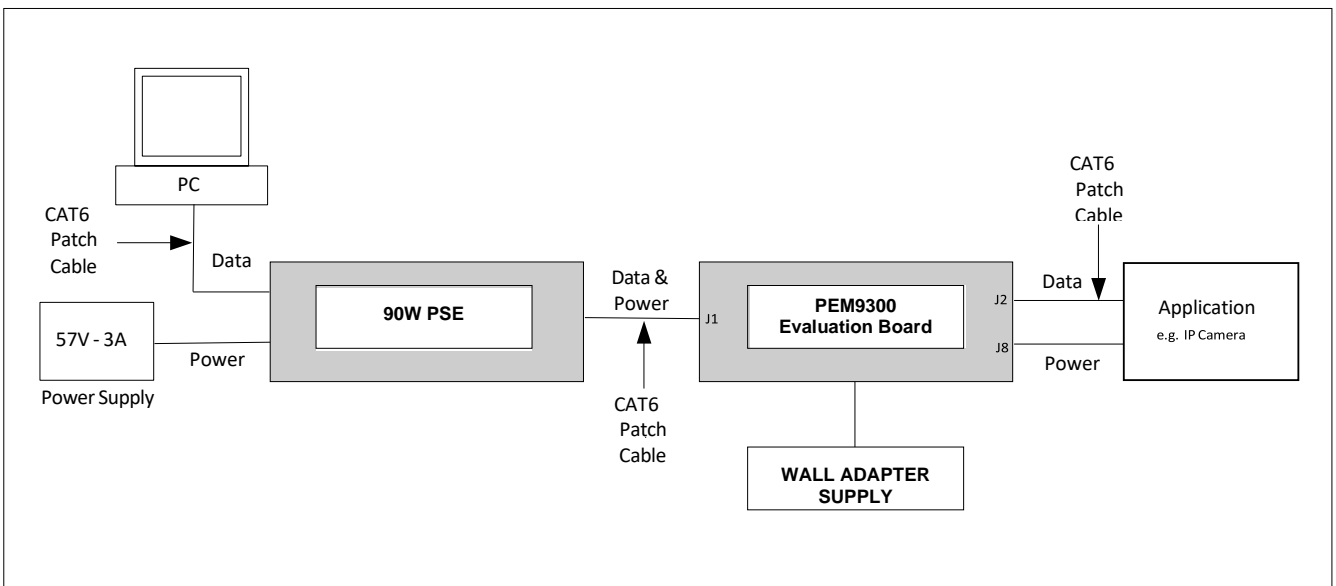
Figure 2 shows the basic set up using the PEM9300 evaluation board powered by 90W PSE.

The equipment required: -

- PEM9300 evaluation board fitted with compatible PEM9300BT Module.IEEE802.3bt compliant PSE
- CAT5e or greater cables
- Application Circuit

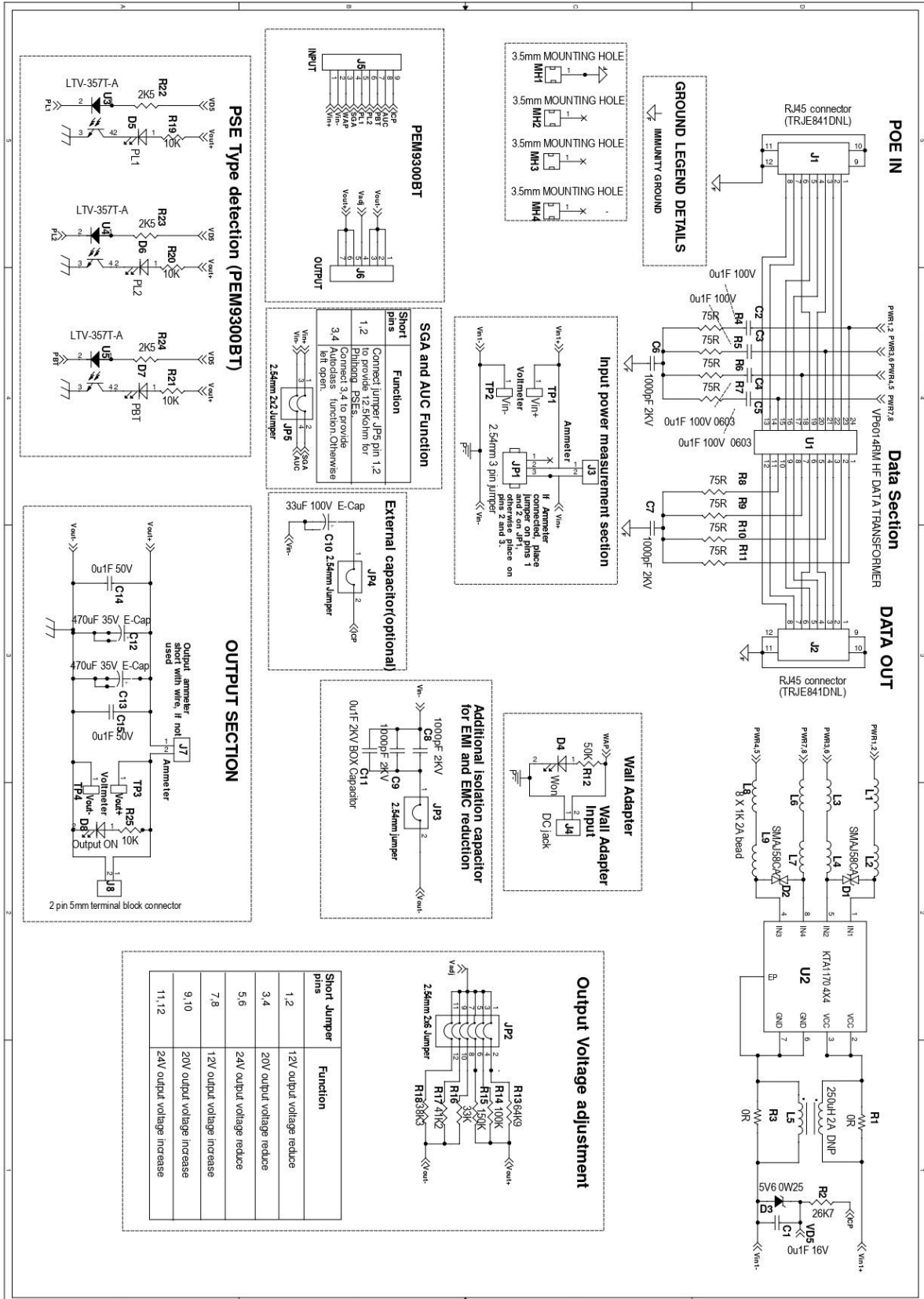
Optional equipment:

Data source e.g. PC



**Figure 2- Test Setup**

## SCHEMATIC



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## BILL OF MATERIALS

PEM9300 EVALUATION BOARD-REV1		21st OCTOBER 2024			
BOM PEM9300 Test Jig					
S.no	Location	Qty	Value	Description	Package
1	C1	1	0u1F 16V 0603	CAPACITOR CERAMIC SMT 0U1F 16V X7R 0603 10%	0603
2	C10	1	33uF 100V E-Cap	CAPACITOR AL E 33UF 100V 105 DEG THD 8X11.5	Through Hole
3	C11	1	0u1F 2KV BOX Capacitor	CAPACITOR BOX POLY FILM 0U1F 305VAC X2 SAFETY 10MM	Through Hole
4	C12,C13	2	470uF 35V E-Cap	CAPACITOR AL E 470UF 35V 105 DEG THD 10x20	Through Hole
5	C14,C15	2	0u1F 50V 0603	CAPACITOR CERAMIC SMT 0U1F 50V X7R 0603 10%	0603
6	C2,C3,C4,C5	4	0u1F 100V 0603	CAPACITOR CERAMIC SMT 0U1F 100V X7R 0603 10%	0603
7	C6,C7,C8,C9	4	1000pF 2KV 1206	CAPACITOR CERAMIC SMT 1000PF 2KVDC X7R 1206 10%	1206
8	D1,D2	2	SMAJ58CA	DIODE TVS BI DIRECTIONAL 58V SMAJ58CA SMA / DO-214AC	SMA
9	D3	1	5V6 0W25 SOD-523	DIODE ZENER 5.6V 500MW SOD-523	SOD-523
10	D4	1	3mm LED	LED GREEN (WAD ON)	Through Hole
11	D5	1	3mm LED	LED GREEN (PL1)	Through Hole
12	D8	1	3mm LED	LED GREEN (OUTPUT ON)	Through Hole
13	D6	1	3mm LED	LED RED (PL2)	Through Hole
14	D7	1	3mm LED	LED YELLOW (PBT)	Through Hole
15	J1, J2	2	RJ45 connector TRJE841DNL	CONNECTOR MODULAR JACK RJ 45 TAB UP METAL SHIELD 8P8C	Through Hole
16	J3,J7,J8	3	5mm terminal block	CONNECTOR - 2PIN TERMINAL BLOCK STRAIGHT THROUGH HOLE 5MM 15A	Through Hole
17	J4	1	DC jack	DC jack	Through Hole
18	J5	1	PN: CES-109-01-T-5	STRAIGHT FEMALE BERG PIN P=2.54, 9PIN	Through Hole
19	J6	1	PN: CES-107-01-T-5	STRAIGHT FEMALE BERG PIN P=2.54, 7PIN	Through Hole
20	JP1	1	2.54mm 3 pin jumper	STRAIGHT MALE BERG PIN P=2.54, 3PIN	Through Hole
21	JP2	1	2.54mm 2x6 Jumper 12 pin	STRAIGHT MALE BERG PIN P=2.54, 12PIN 2X6	Through Hole
22	JP3,JP4	2	2.54mm 2 pin Jumper	STRAIGHT MALE BERG PIN P=2.54, 2PIN	Through Hole
23	JP5	1	2.54mm 2x2 Jumper 4pin	STRAIGHT MALE BERG PIN P=2.54, 4PIN 2X2	Through Hole
24	L1,L2,L3,L4,L6,L7,L8,L9	8	1K 2A 1206	FERRITE BEADS 1K 2A 1206	1206
25	R1,R3	2	0R 1206	RESISTOR SMT 0R 1% 1206 1/4 W	1206
26	R12	1	50K 0603	RESISTOR SMT 49K9 1% 0603 1/10 W	0603
27	R13	1	64K9 0603	RESISTOR SMT 64K9 1% 0603 1/10 W	0603
28	R14	1	100K 0603	RESISTOR SMT 100K 1% 0603 1/10 W	0603
29	R15	1	150K 0603	RESISTOR SMT 150K 1% 0603 1/10 W	0603
30	R16	1	33K 0603	RESISTOR SMT 33K 1% 0603 1/10 W	0603
31	R17	1	41K2 0603	RESISTOR SMT 41K2 1% 0603 1/10 W	0603
32	R18	1	38K3 0603	RESISTOR SMT 38K3 1% 0603 1/10 W	0603
33	R19,R20,R21,R25	4	10K 0603	RESISTOR SMT 10K 1% 0603 1/10 W	0603
34	R2	1	26K7 1206	RESISTOR SMT 26K7 1% 1206 1/4 W	1206
35	R22,R23,R24	3	2K49 0603	RESISTOR SMT 2K49 1% 0603 1/10 W	0603
36	R4,R5,R6,R7,R8,R9,R10,R11	8	75R 0603	RESISTOR SMT 75R 1% 0603 1/10 W	0603
37	TP1	1	PN: RCWCTE	TEST POINTS (Vin+)	1206
38	TP2	1	PN: RCWCTE	TEST POINTS (Vin-)	1206
39	TP3	1	PN: RCWCTE	TEST POINTS (Vout+)	1206
40	TP4	1	PN: RCWCTE	TEST POINTS (Vout-)	1206
41	U1	1	VP6014RM HF DATA TRANSFORMER	GIGABIT IEEE802.3BT DATA TRANSFORMER 3A (-40 °C to +85 °C)	SMD
42	U2	1	KTA1170 4X4	IC Integrated Dual MOSFET Bridge Rectifier KTA1170 DFN4X4	SMT
43	U3,U4,U5	3	LTV-357T-A/SDIP	IC PHOTOCOUPLER 80V 50MA CTR 80%-160% SOP 4 MUST MATCH CTR RANK A	SMT
<b>Total</b>		<b>78</b>			



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## REVISION HISTORY

REVISION NUMBER	DESCRIPTION
24JR1	▪ New release
25BR2	▪ Update in SCHEMATIC



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