



## PRODUCT OVERVIEW

The PEB9500 series of Power over Ethernet (POE) board, offers a **completely ready to use highest power POE** solution, offering upto 82Watts<sup>1</sup> power when sourced from a compatible POE Power Sourcing Equipment (PSE).

It has full functional compliance with the IEEE 802.3af / 802.3at Power over Ethernet (PoE) standard, and is designed to extract power from CAT5e and better Ethernet cable when sourced by an IEEE 802.3af or an IEEE 802.3at compliant POE PSEs, and is compatible with both, the 4 pair and the 2 pair injection method.

PEB9500 is designed to take the full power available from the 95Watt POE PSEs, such as Mega POE and Power Over HDBaseT (PoH).

The PEB9500 series provide full two event PoE+ and single event POE signature for layer 1 (physical layer) classification. Its high efficiency DC-DC converter provides a well-regulated low noise and low ripple output with in-built in-rush current, overload and output short-circuit protections.

PEB9500 series is compatible with both standard (24.9K $\Omega$ ) and non-standard (12.5K $\Omega$ ) signature detection PSEs<sup>2</sup>.

The PEB9500 series provides a quick, easy, and low cost method for manufacturers of Ethernet equipment like Digital Ceiling, Digital Signage, IOT, PTZ cameras with housing, WiMAX<sup>®</sup> tower and access points, Thin client terminals, AV displays, Network monitors, Access control systems etc., to "PoE enable" their equipment, and removes the need for a local Equipment power source, significantly reducing installation costs. Various choices in input and output connectors, offering flexibility in interfacing with target devices.

## PRODUCT FEATURES

<ul style="list-style-type: none"> <li>Complete package including data connections. <b>No external components required.</b></li> </ul>	<ul style="list-style-type: none"> <li>Output overload and <b>permanent short circuit protection.</b></li> </ul>	<ul style="list-style-type: none"> <li>Low output ripple and noise.</li> </ul>
<ul style="list-style-type: none"> <li>Up to 82Watt output<sup>1</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>Input over-current protection; under voltage lock out.</li> </ul>	<ul style="list-style-type: none"> <li>Input ESD protection included.</li> </ul>
<ul style="list-style-type: none"> <li>1500 Volt isolation (Input to Output).</li> </ul>	<ul style="list-style-type: none"> <li>Frequency dithering</li> </ul>	<ul style="list-style-type: none"> <li>Cost Effective &amp; Easy to retrofit.</li> </ul>
<ul style="list-style-type: none"> <li>12V, 15V, 18V &amp; 24V DC O/P voltage models</li> </ul>	<ul style="list-style-type: none"> <li>Input voltage 45V to 57V DC.</li> </ul>	<ul style="list-style-type: none"> <li>Supports Data Pair, Spare Pair and 4-Pair injection.</li> </ul>
<ul style="list-style-type: none"> <li>Choice of I/P connectors<sup>3</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>RoHS compliant.</li> </ul>	

<sup>1</sup> PEB9500 can deliver up to 82Watt when powered from a POE PSE of adequate capacity. Depending on the available input power from the PSE, voltage drop due to cable loss, and the ambient temperature, the corresponding max power output will vary. Please refer to Maximum Power Output and to Thermal profile.

<sup>2</sup> Please refer Functional Description 7 –12.5K Ohm Signature PSEs.

<sup>3</sup> Please refer Functional Description 6 Connector Variants

**PRODUCT SELECTOR<sup>4</sup>**

Part Number	Marking	Output Voltage <sup>5</sup>	Efficiency <sup>6</sup>	Maximum Output Power <sup>1</sup>
		(Volts DC)	(%)	(Amps DC)
PEB9512	12	12	TBD	6.83
PEB9515	15	15	TBD	5.47
PEB9518	18	18	TBD	4.56
PEB9524	24	24	89	3.42

\* Custom voltages are available as special and make-to-order products.

**INPUT CHARACTERISTICS<sup>4</sup>**

Parameter	Symbol	Min.	Typ <sup>4</sup>	Max.	Units
Input Voltage	V <sub>IN</sub>	41	51	57	Volts
Input Current (DC) <sup>7</sup>	I <sub>IN</sub>	0.1 <sup>8</sup>		1.70 <sup>9</sup>	A
Maximum Inrush Current	I <sub>PK</sub>			1.80 <sup>10</sup>	A
Under Voltage Lockout	V <sub>UVLO</sub>	37		41	Volts
Operating Temperature	T <sub>OP</sub>	-10		70	°C
802.3af / at Power Classification	Class 4				

**DC OUTPUT CHARACTERISTICS<sup>4</sup>**

Parameter	Symbol	Min.	Typ <sup>4</sup>	Max.	Units
Line Regulation	V <sub>LNRG</sub>		0.2%		
Load Regulation	V <sub>LDRG</sub>		0.5%		
Output Ripple and Noise	V <sub>RIP</sub>		80		mV p-p
Isolation Voltage	V <sub>ISOL</sub>			1500	V DC
Temperature Coefficient (Slope)	TC		100	300	ppm °C
Output Short Circuit Duration				∞	Sec

**ABSOLUTE MAXIMUM RATINGS<sup>11</sup>**

Supply Voltage (V <sub>CC</sub> )	0V ~ 57V DC
Storage Temperature (T <sub>S</sub> )	-25 °C ~ 100 °C
Output Voltage (V <sub>OUT</sub> )	0V to controlled output voltage (operating or non-operating)

<sup>4</sup> All specifications typical are at T<sub>A</sub> of 25°C with a nominal input voltage and rated output current unless otherwise noted. These are meant as a design aid only and are indicative, and not guaranteed.

<sup>5</sup> Output typical ±3% at T<sub>A</sub> of 25°C; with a nominal input voltage.

<sup>6</sup> End to end efficiency including bridge rectifier diodes, at nominal V<sub>IN</sub> with >75% output load, at 25°C ambient. Refer Functional Description 9 – Typical end to end system efficiency across output loads

<sup>7</sup> Please refer to IEEE802.3af / 802.3at standards document. Maximum input and inrush current are dependent on power class.

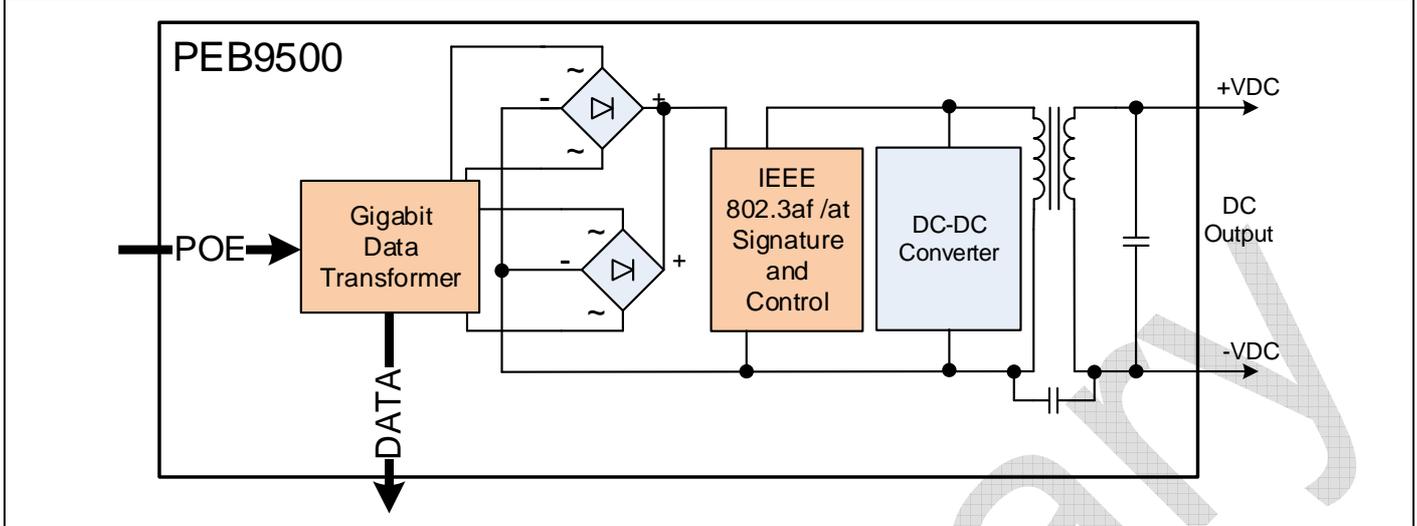
<sup>8</sup> Ensure minimum output load of 3 Watt or 100mA input current whichever is higher

<sup>9</sup> Maximum input current 850mA each on data pair and spare pair.

<sup>10</sup> Maximum inrush current 900mA each on data pair and spare pair

<sup>11</sup> Exceeding the absolute maximum ratings may cause permanent damage to the product. We do not imply functional operation under these conditions.

**Figure 1 - BLOCK DIAGRAM and TYPICAL CONNECTIONS**



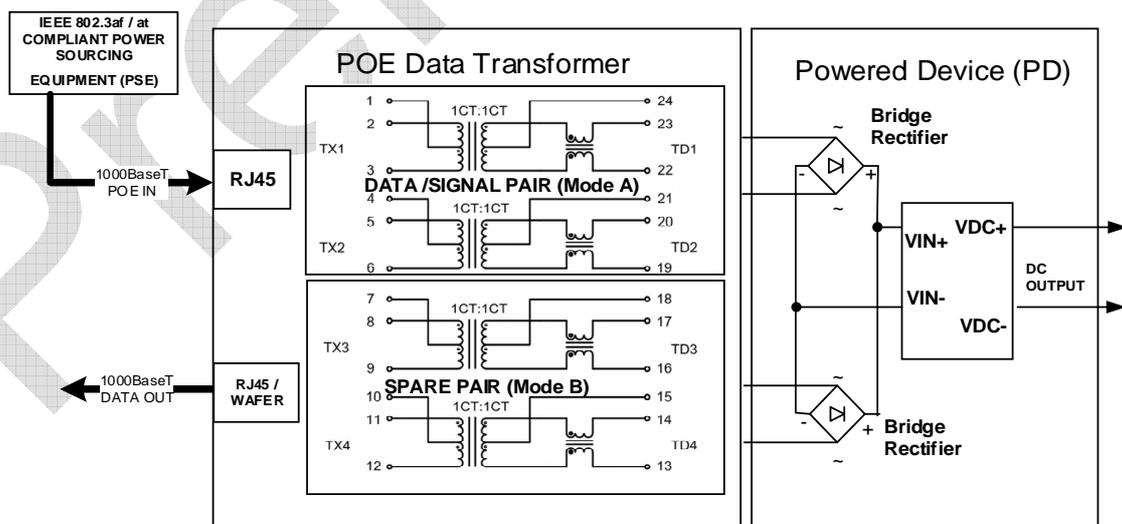
**FUNCTIONAL DESCRIPTION**

**1. Inputs**

The PEB9500 is compatible with all IEEE 802.3af / 802.3at compliant Power Sourcing Equipment (PSE) and supports the different power injection options of 4 - Pair or Data/Signal Pair (Mode A) or Spare Pair (Mode B). See Figure 2 – Typical System Configuration. The PEB9500 series comes with Class 4 configuration and featured to support two event layer1 classification. PEB9500 is meant and capable to take 95Watt input.

**2. – Typical System Configuration**

In Mode A – Signal Pair injection, the signal lines carry both data and power. In Mode B – Spare Pair injection, the Signal Pair carries only data, and the Spare Pair carries power. In 4 - Pair injection, both Signal and Spare Pair carries power



**Figure 2**

**3. Powered Device (PD) Signature**

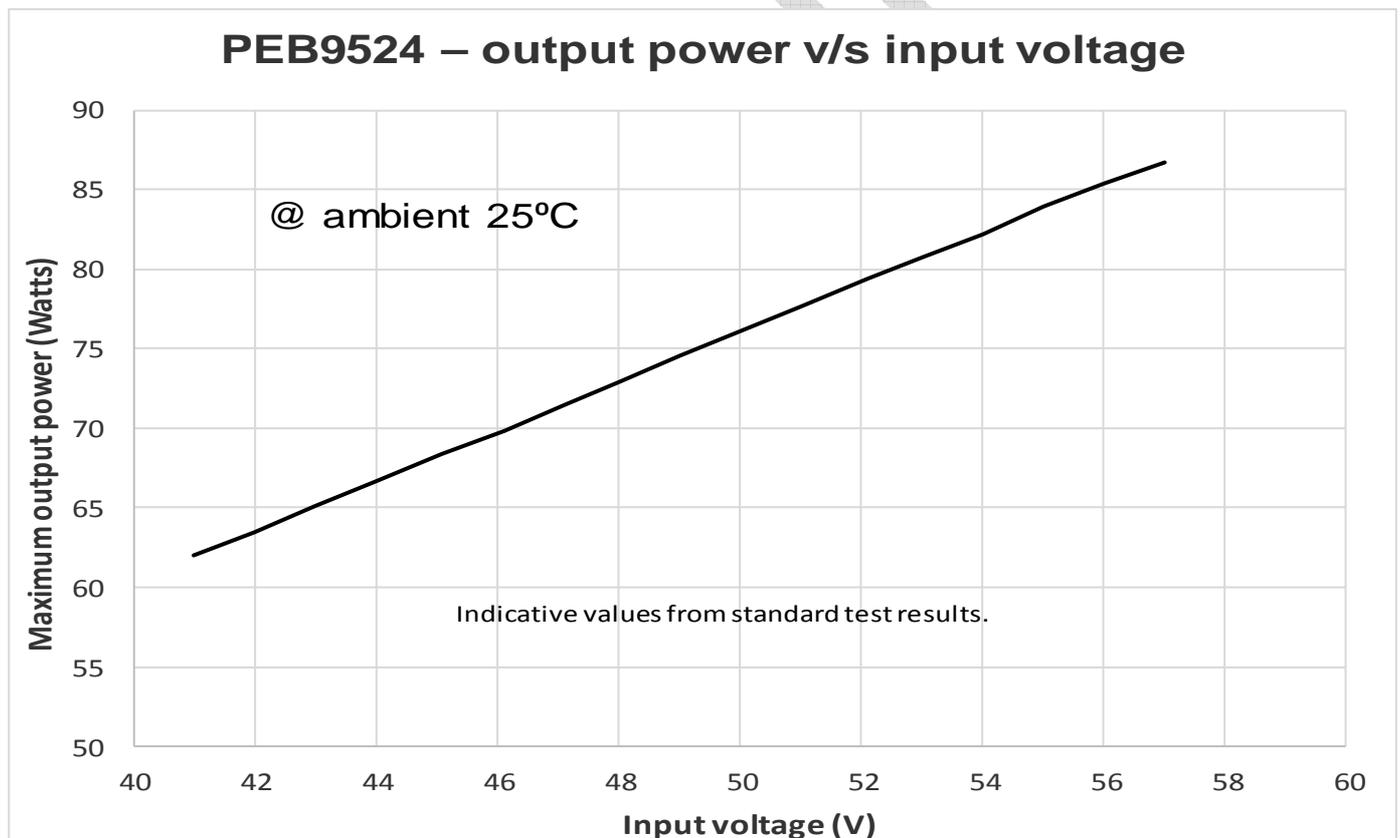
When the PEB9500 is connected to a Cat 5e or greater Ethernet cable from an IEEE 802.3af / 802.3at compliant Power Sourcing Equipment (PSE), Endspan or Midspan, it will automatically present a Powered Device (PD) signature to the PSE, as and when requested. The PSE will then recognise that a PD is connected to that line and supply power. The PEB9500 will always present a Class 4 signature to the PSE. Provision for jumper provided in PEB9500 in case using with PSEs which seek 12.5 K Ohms signature resistance.

**4. Isolation**

IEEE 802.3af / 802.3at section 33.4.1 calls for a Powered Device (PD) to meet safety isolation requirement by meeting the electrical strength test of IEC 60950 sub clause 6.2. Infomart's® PoweredEthernet™ PEB9500 modules meet or exceed 1500V impulse test. This is also referred to as 'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage'. PEB9500 is provided with 3No's of M3 Mounting holes with 6mm diameter pads around. MH2 and MH3 are having 1500V isolation with the surrounding circuit. The isolation area is highlighted with a 2mm white boundary. Ensure the head of the mounting screws does not extend in to the white band. MH1 is internally connected to the metal body of POE IN and DATA OUT connectors. Provide minimum of 2mm clearance on all the sides between chassis and the PEB9500 Board

**5. Maximum Power Output**

PEB9500 can deliver up to 82 Watt. The maximum output available from an IEEE802.3at POE PSE is 600 mA, and from a 95Watt POE PSE is 1.7A. The input voltage can drop down depending on the length of the input cable from PSE to PEB9500. Hence the maximum output from PEB9500 is dependent on available input power. Below figure is an example to indicate maximum power expected from PEB9524 at different input voltages.



**Figure 3**

## 6. Connector Variants

PEB95XX YYY*	RRT	WRT	RWT	WWT
POE IN	RJ45 JACK	9 PIN WAFER	RJ45 JACK	9 PIN WAFER
DATA OUT	RJ45 JACK	RJ45 JACK	9 PIN WAFER	9 PIN WAFER
OUT PUT (DC Out)	TERMINAL BLOCK	TERMINAL BLOCK	TERMINAL BLOCK	TERMINAL BLOCK

\* XX = Voltage variant; YYY = Connector variant.

The RJ45 Jack is horizontal entry tab-up full metal shield connector. Contact Infomart for the optional top entry RJ45 connectors.

The 9Pin Wafer connector is standard relay-mate-connectors (CCX-W125-09-SMT series wafer or equivalent). The matching header or cable housing is the CX-H125-09 fitted with CX-T125-F terminal pins or any equivalents.

Pin 9 of Input and Output wafer connector is tied common to the Ground. In turn the Ground connects to the metal body or Immunity Ground (Chassis).

DC Out connector is Terminal Block. Customers should use cables of adequate current rating.

The designers should ensure not to bypass the 1500V isolation provided in PEB9500 board, during any of the external connections.

## 7. 12.5K Ohm Signature PSEs

The PEB9500 series provides the IEEE standard signature detection by default. Certain PSE's like Pihong, use a non-standard resistance of 12.5KΩ for 60W signature detection.

For using with 12.5k ohms signature PSE's, a jumper (2pin header) is provided on PEB9500 at location **J6** as shown in the figure.

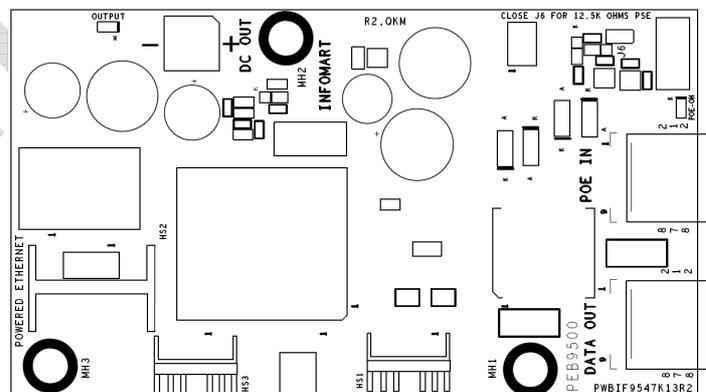
When the two pins of J6 are shorted, PEB9500 offers 12.5k Ohms signature detection. Example of shunt header MPN: 382811-6 or 2-382811-1(TE Connectivity)

Users are required to verify the PSE's variant and decide to keep J6 open or short.

**CAUTION: For 24.9K ohms signature PSE's keep J6 open**

**Figure 4 PEB9500 TOP VIEW**

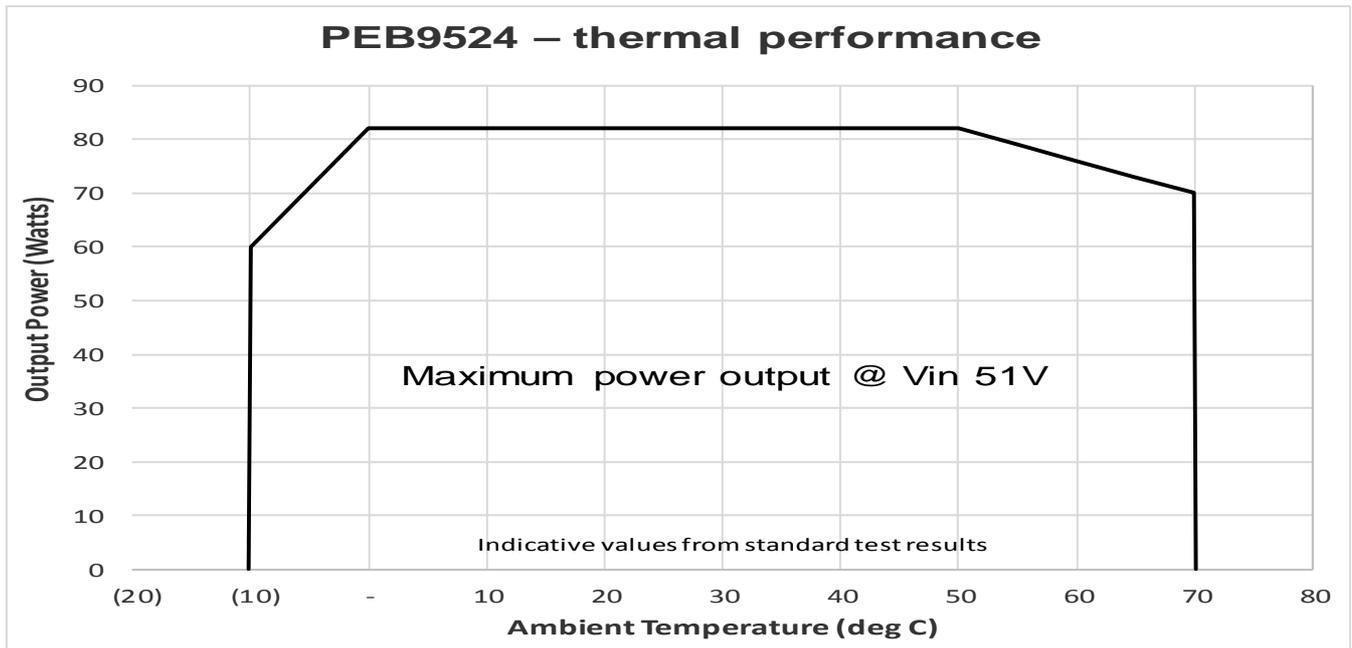
Place Shunt here for using with 12.5K Ohms signature PSEs  **J6**



## 8. Thermal Management

As with any power component, the PEB9500 boards generate heat. It is important that adequate ventilation and airflow be taken into consideration at the design stage. The quantum of heat generated by the PEB9500 will depend on the output load it is required to drive. The maximum ambient operating temperature is 70°C. Figure 5 below, shows the thermal performance of the PEB9500 with a 51VDC input. The PEB9500 thermal performance can be improved by forced airflow cooling over the module.

Figure 5 – Thermal Performance profile at nominal  $V_{in}$



9. Typical end to end system efficiency across output loads

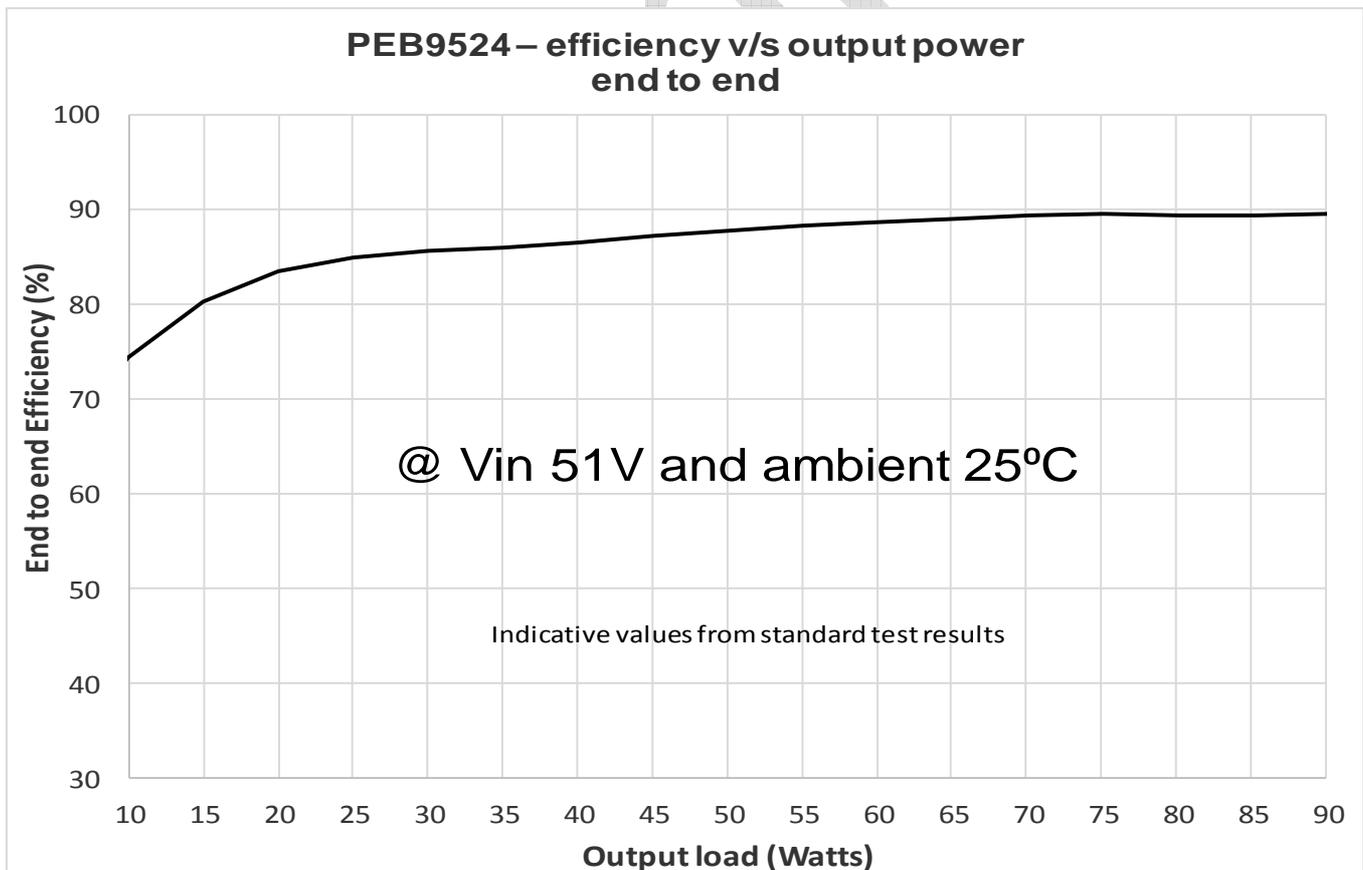


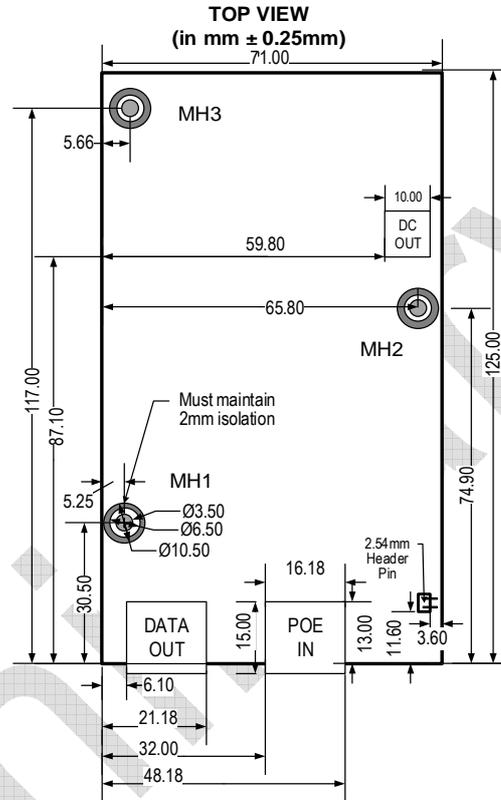
Figure 6

Figure 7 – PHYSICAL PACKAGE

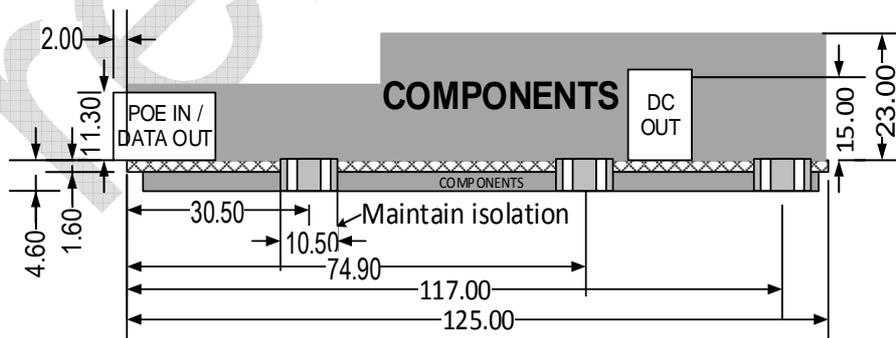
All dimensions in mm and nominal unless stated otherwise

**Note:**

- 5mm clearance from bottom of PCB is recommended. Additional clearance may be required for thermal performance.
- M3 screw recommended for MH1, MH2 and MH3.
- Mounting hole MH1 is internally connected to the metal shield of the POE IN and DATA OUT connectors.
- Mounting holes MH2 and MH3 are non-conductive and free from bottom side component encumbrances.



**SIDE VIEW (in mm ± 0.25mm)**



**APPLICATION NOTES**

Power Over Ethernet (PoE) is a technology for wired Ethernet, the most widely installed local area network technology in use today. PoE allows the electrical power necessary for the operation of each end-device to be carried by data cables along with the data, rather than by separate power cords. Thus, it minimizes the number of wires used to install the network, resulting in lower cost, less downtime, easier maintenance and greater installation flexibility. The IEEE standard governing PoE is IEEE 802.3af / 802.3at. Compliance with this standard ensures inter-operability between

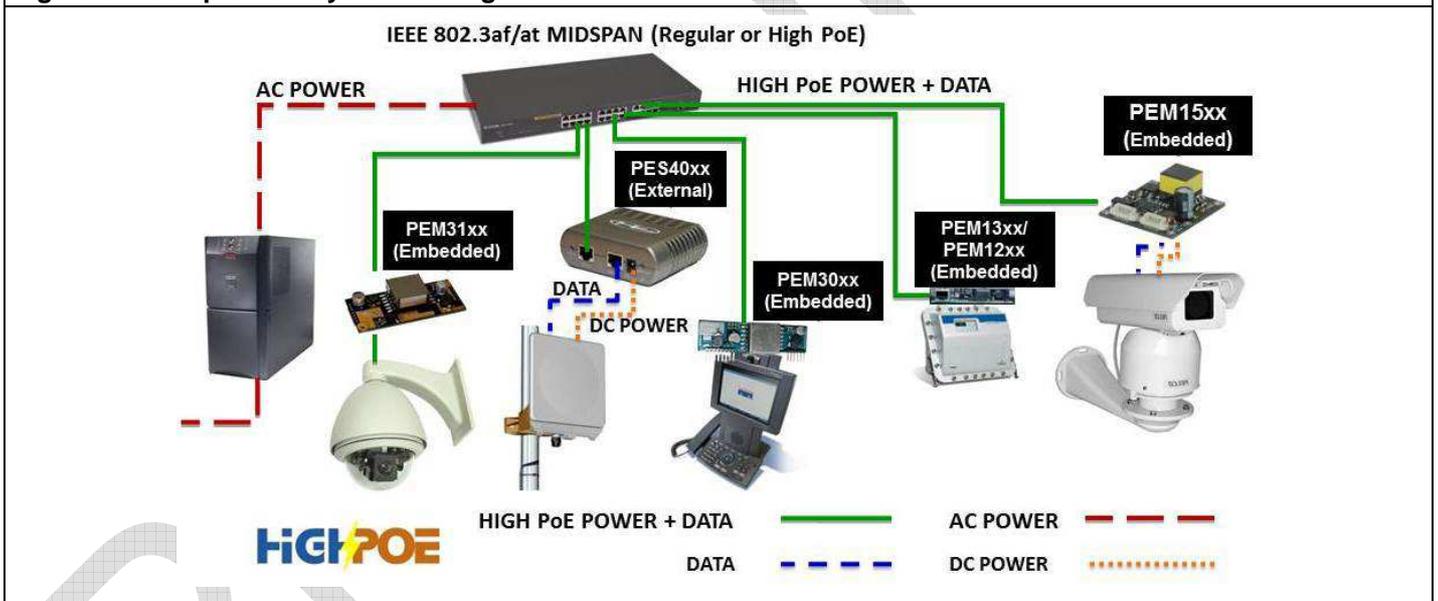
devices. When used with Mega POE / Power Over HDBaseT (PoH), it enables PEB9500 to deliver 82Watts. PEB9500 compatible midspans are Pihong POE60U, Pihong POE75U, Microsemi-PowerDsine PD9501, or any IEEE802.3at midspan with 4 - Pair injection. PEB9500 are compatible to IEEE 802.3af / 802.3at midspans of 2-pair injection as well, with the output power being dependent on the PSE output.

The PEB9500 series modules offering a modular solution, incorporating full IEEE802.3af / at compatibility signature to the PSE and isolated on-board DC/DC converter. The PEB9500 series are ideal modular system blocks allowing manufacturers of Ethernet equipment to "PoE enable" their equipment with minimal effort and cost. The PEB9500 series offer simple and quicker product development, maximising return on investment.

**APPLICATION AREAS**

- Security and alarm systems,
- Access and physical control systems
- Thin clients and Single board computers
- High power Pan-Tilt-Zoom (PTZ) IP video surveillance cameras
- LCD displays, video panels, kiosks, Network monitors
- Public address systems
- 802.11n wireless, mesh networks, Bluetooth access points
- Environmental control, sensors, transducers and telemetry
- Industrial control and automation

**Figure 8 – Sample PoE System Configuration**



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