



## PRODUCT OVERVIEW

The PEB4500 series of Power over Ethernet board, offers a **completely ready to use High POE** solution, offering up to 40 watts of output power.

It has full functional compliance with the IEEE 802.3af / at Power over Ethernet (PoE) standard, with the exception of higher current input, and is designed to extract power from CAT5 and better Ethernet cable when sourced by an IEEE 802.3af compliant Power Sourcing Equipment (PSE) or an IEEE 802.3at compliant midspan using 2 finger Layer 1 classification.

Its high efficiency DC-DC converter provides a well regulated low noise and low ripple output with in-built overload and output short-circuit protection.

PEB4500 series are compatible with both standard (24.9K $\Omega$ ) and non-standard (12.5K $\Omega$ ) signature detection PSE's<sup>1</sup>.

Various choices in input and output connectors, offering flexibility in interfacing with target devices.

The PEB4500 series provides a quick, easy, and low cost method for Ethernet equipment manufacturers to "PoE enable" their equipment, and removes the need for a local Equipment power source, significantly reducing installation costs.

## PRODUCT FEATURES

- Complete package including data connections. **No external components required.**
- 45W output peak, 40W output RMS load<sup>2</sup>.
- 1500 Volt DC isolation (Input to Output).
- 12V 15V 18V & 24V DC O/P voltage models.
- Choice of I/P and O/P Socket or Wafer connectors.
- Output overload and short circuit protection and **permanent short circuit protection.**
- Input over-current protection
- Wide input voltage (36V to 57V DC)
- RoHS compliant
- Low output ripple and noise
- Input ESD protection included
- Cost Effective & Easy to retrofit
- LED indication for Data Pair / Spare Pair / 4 - Pair injection.

<sup>1</sup> Please refer F.6. – Jumper.

<sup>2</sup> Output power greater than 26W requires Ultra-PoE (60W PSE) and 4 - Pair injection.

## PRODUCT SELECTOR

Part Number	Marking	Nominal Input Voltage <sup>3</sup>	Output Voltage <sup>4</sup>	Efficiency <sup>5</sup>	Power (Max/RMS) <sup>3,4,7</sup>
		(Volts DC)	(Volts DC)	(%)	(Watts)
PEB4512	12	55	12	86	45/40
PEB4515	15	55	15	86	45/40
PEB4518	18	55	18	86	45/40
PEB4524	24	55	24	86	45/40

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

## ABSOLUTE MAXIMUM RATINGS<sup>6,7</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)

## INPUT CHARACTERISTICS

Parameter	Symbol	Min.	Typ <sup>4</sup>	Max.	Units
Input Voltage <sup>8</sup>	V <sub>IN</sub>	36	55	57	Volts
Input Current	I <sub>IN</sub>	100	850 <sup>9</sup>	900 <sup>4,9</sup>	mA
Under Voltage Lockout	V <sub>UVLO</sub>	30		36	Volts
Operating Temperature	T <sub>OP</sub>	-10		70	°C
802.3af / at Power Classification	Class 4				

## DC OUTPUT CHARACTERISTICS

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 <sup>5</sup>	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

<sup>3</sup> Depending on input voltage and the ambient temperature, the corresponding max power output will vary. Please refer to Thermal profile.

<sup>4</sup> At T<sub>A</sub> of 25°C; with nominal input voltage and rated output current.

<sup>5</sup> End to end efficiency including bridge rectifier diodes, at nominal V<sub>IN</sub> with 40 watt output load, at 25°C ambient.

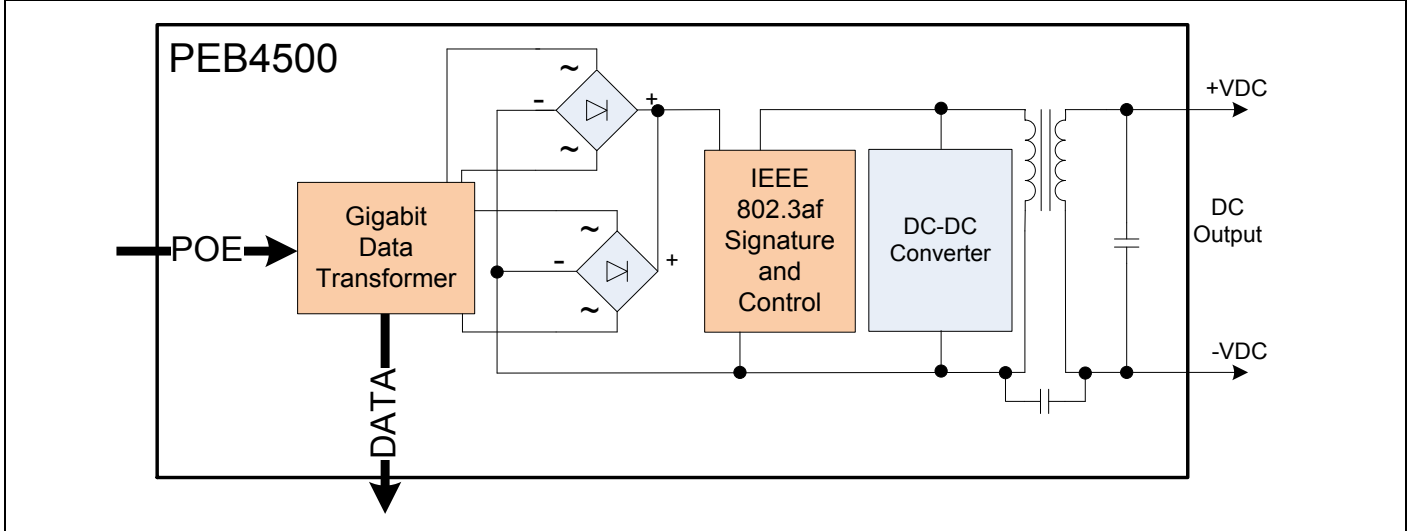
<sup>6</sup> All specifications typical are at T<sub>A</sub> of 25°C with a nominal input voltage and rated output current unless otherwise noted. These are meant as a design aid only and are indicative, and not guaranteed.

<sup>7</sup> Exceeding the absolute maximum ratings may cause permanent damage to the product. We do not imply functional operation under these conditions. These ratings assume free air flow.

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

<sup>9</sup> Input current limited to 700mA with 2 – Pair POE injection. Input current >700mA only on 4 - Pair POE injection.

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



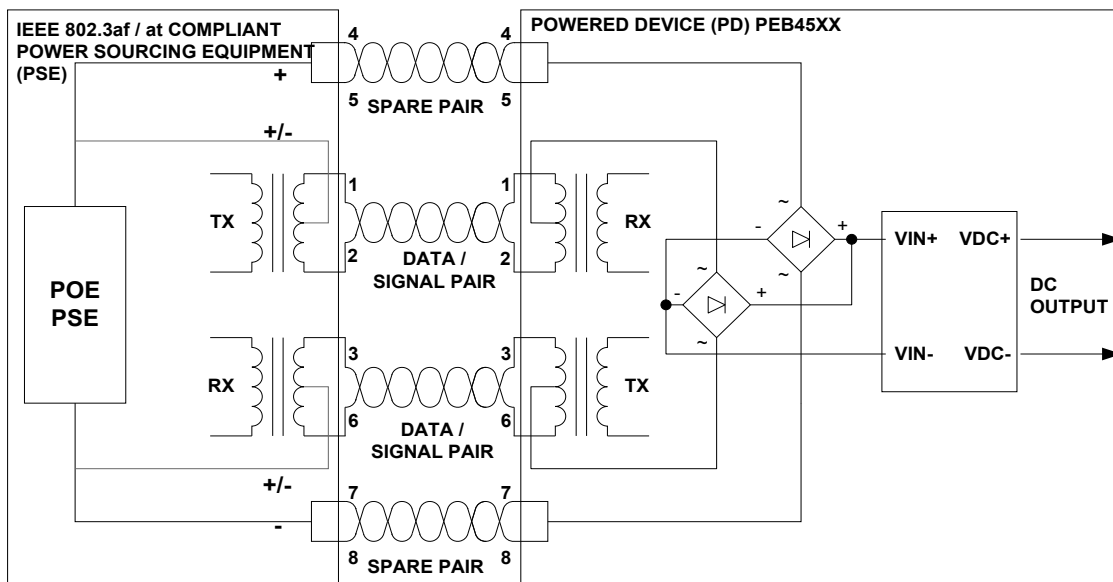
**FUNCTIONAL DESCRIPTION**

**F.1. Inputs**

The PEB4500 is compatible with all IEEE 802.3af / at compliant Power Sourcing Equipment (equipment) 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. For power requirements exceeding limits of Data Pair or Spare Pair, need to use 4 - Pair injection PSEs. The PEB4500 series comes with Class 4 configuration and featured to support for 2 finger Layer 1 classification.

**Figure 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



**F.2. Powered Device (PD) Signature**

When the PEB4500 is connected to a Cat 5e or greater Ethernet cable from an IEEE 802.3af / at 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 PEB4500 will always present a Class 4 signature to the PSE. Provision for jumper provided in PEB4500 in case using with PSEs which seeks 12.5 K Ohms signature resistance.

**F.3. Isolation**

IEEE802.3af / at 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™ PEB4500 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'.

PEB45 is provided with 3No's of M3 Mounting holes with 6mm diameter pads around, and 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.

Provide minimum of 2mm clearance on all the sides between chassis and the PEB45 Board

**F.4. Connector Variants**

PEB45XYYYY*	RRJ	RRW	WRJ	WRW	RWJ	RWW	WWJ	WWW
POE IN	RJ45 JACK	RJ45 JACK	9 PIN WAFER	9 PIN WAFER	RJ45 JACK	RJ45 JACK	9 PIN WAFER	9 PIN WAFER
DATA OUT	RJ45 JACK	RJ45 JACK	RJ45 JACK	RJ45 JACK	9 PIN WAFER	9 PIN WAFER	9 PIN WAFER	9 PIN WAFER
OUT PUT (DC Out)	DC JACK	2 PIN WAFER	DC JACK	2 PIN WAFER	DC JACK	2 PIN WAFER	DC JACK	2 PIN WAFER

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

The RJ45 Jack is standard Tab-up full metal shield connector.

The 9Pin Wafer connector used on the board 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).

The DC connector used on the board is standard DC Jack or 2PIN Wafer (CV-W3961-2 series power-mate-connector or equivalent). The matching header for CV-W3961-2 is the CV-H3961 fitted with CV-T3961 terminal pins or any equivalents.

Please visit Cherng Weei Technology Corporation website [www.cwe.com.tw](http://www.cwe.com.tw) for detailed information on the above mentioned MPN's.

The designers should ensure not to bypass the 1500V isolation provided in PEB45 board, during any of the external connections,

**F.5. 12.5K Ohm Signature PSEs**

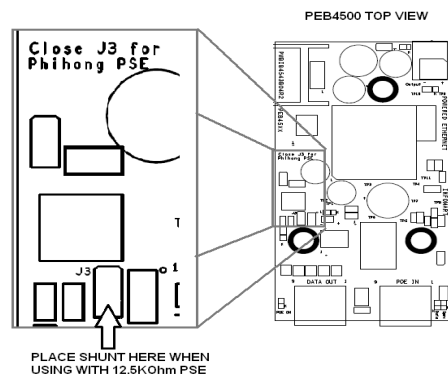
Normally the PoE PSE's seek 24.9K ohms resistance value from the PD as PoE signature detection, whereas certain PSE's (like Phihong) seek 12.5K ohms resistance value.

For using with 12.5K ohms signature PSE's, a jumper (2pin header) is provided on PEB4500 at location J3 as shown in the figure.

By default PEB4500 offers 24.9K ohms signature detection. When the two pins of J3 are shorted, PEB4500 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 J3 open or short.

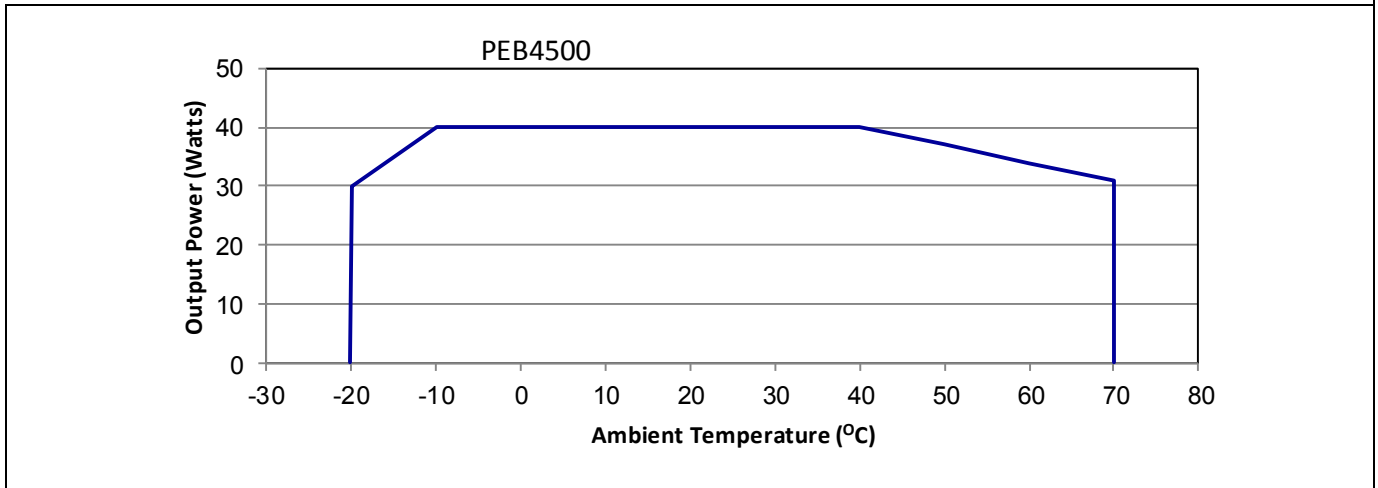
**CAUTION: For 24.9K ohms signature PSE's keep J3 open,**



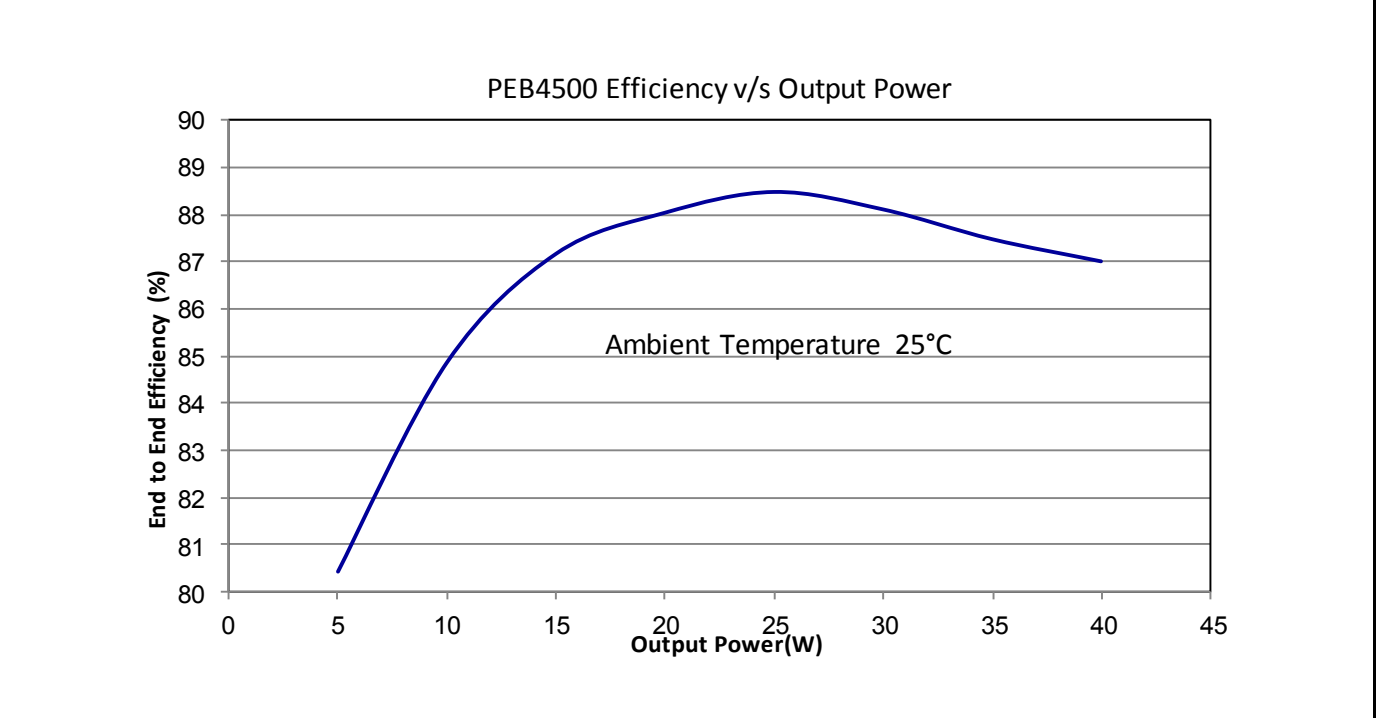
**THERMAL PROFILE**

As with any power component, the PEB4500 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 PEB4500 will depend on the output load it is required to drive. The PEB4500 generates 21 BTU thermal load per hour at full load. The maximum ambient operating temperature is 70°C. *Figure 3* below, shows the thermal performance of the PEB4500 with a nominal 55VDC input. The PEB4500 thermal performance can be improved by forced airflow cooling over the module.

**Figure 3 – Thermal performance profile at nominal  $V_{in}$**



**Figure 6 – Typical end to end system efficiency across output loads\***



\*Indicative values from standard test results. Actual values dependent on the test conditions of unit under test.

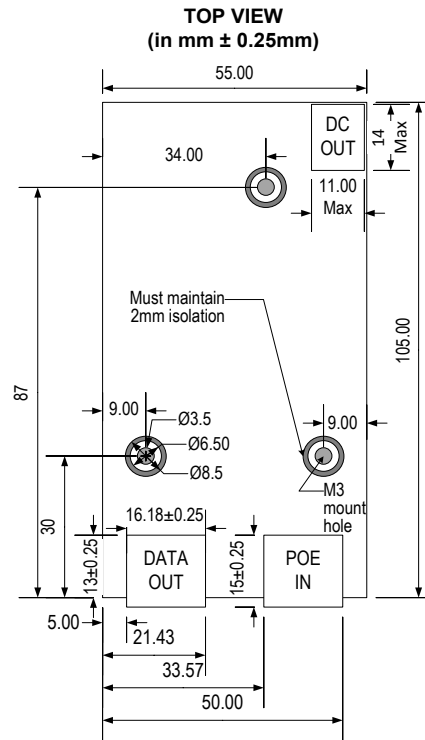
**Figure 4 – PHYSICAL PACKAGE**

Connector Dimensions are dependent on Model. Below shown is PEB45xxRRJ. Please refer to section F.4. Connector Variants

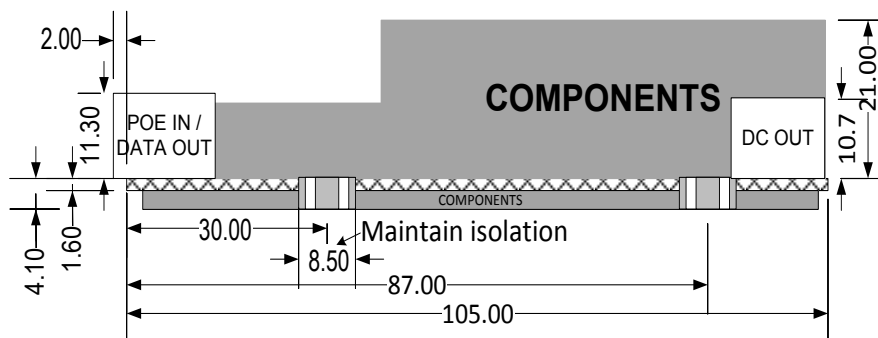
All dimensions in mm and nominal unless stated otherwise

**Note:**

- 5mm clearance from bottom of PCB is recommended. Additional clearance may be required for thermal performance.
- 3 Mounting Holes are non-conductive and free from bottom side component encumbrances. M3 screw recommended.



**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 IEEE802.3af / at. Compliance with this standard ensures inter-operability between devices.

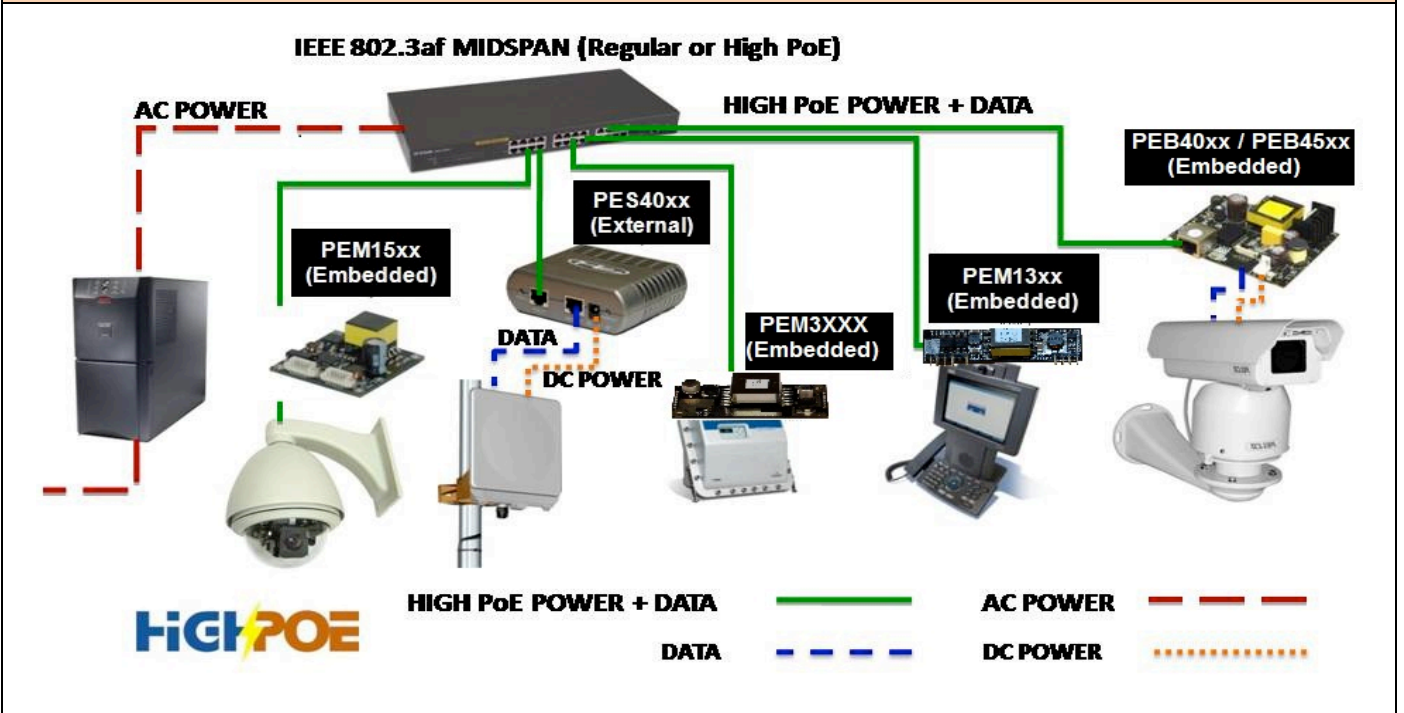
High PoE enables output power up to 40 watts using the existing IEEE802.3at standards. PEB4500 compatible midspans are Pihong POE60U, Microsemi-PowerDsine PD9501, or any IEEE802.3at midspan with 4 - Pair injection with power output of 50W to 60W. PEB4500 are compatible to IEEE802.3af midspans with the output power being dependent on the PSE output.

The PEB4500 series modules offering a modular solution, incorporating full IEEE802.3af / at compatibility signature to the PSE and isolated on-board DC/DC converter. The PEB4500 series are ideal modular system blocks allowing manufacturers of Ethernet equipment to "PoE enable" their equipment with minimal effort and cost. The PEB4500 series offer simple and quicker product development, maximising return on investment.

**APPLICATION AREAS**

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

**Figure 5 – Typical end to end system efficiency across output loads**



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