



PRODUCT FEATURES

- IEEE802.3bt POE PD all-in-one-board
- Complete plug and play, no external components required
- Type 4, Class 8 POE PD board
- Very High Efficiency (>93%)
- 12V, 20V, 24V DC output voltage models
- Compact Size 60mm x 80mm
- Maintain Power Signature (MPS) for low power operation
- IEEE802.3bt Auto-Class function support
- In-built auxiliary wall adapter support
- 20V variant for USB-C power delivery
- High thermal efficiency. Full power without heat sinking or airflow
- Low electromagnetic interference (EMI)
- Input ESD protection included
- Output Short Circuit Protection
- Output power up to 90 watts
- Highly efficient 1500V isolated DC-DC converter
- Low heat generation
- Support for Phihong 12.5K signature
- RJ45 & 9 pin wafer header connector options
- Low Output Ripple and Noise
- Choice of Input Connector

PRODUCT OVERVIEW

The PEB9300BT series of Power over Ethernet (POE) board, offers a completely ready to use all in one board IEEE802.3bt POE solution, offering type 4, Class 8 and output power up to 90 Watts when sourced from a compatible POE Power Sourcing Equipment (PSE).

The PEB9300BT has full functional compliance with the IEEE 802.3bt Power over Ethernet (PoE) standard and backward compliance to IEEE802.3af & IEEE802.3at standards.

The PEB9300BT provides functionalities like Under voltage protection, over-temperature protection and MPS (Maintain Power Signature) to avoid the power disconnect from PSE. PL1, PL2 and PBT pins indicates the class level of modules.

Advance Circuit topology of PEB9300BT provides very high efficiency up to 93% and well-regulated low noise and low ripple output with the in-built overload, output short-circuit and in-rush current protections.

The devices provide optional feature that can detect the presence of wall adapter power and allow a smooth switch-over from the PoE power source to the wall adapter.

APPLICATION AREAS

- Thin Client computers, LED intelligent lighting
- Security and alarm systems
- High power Pan-Tilt-Zoom (PTZ) IP video surveillance cameras
- LCD displays, video panels, kiosks, Network monitors
- Small computers, Digital Signage
- Public address systems
- 802.11n wireless, mesh networks, Bluetooth access points
- Environmental control, sensors, transducers and telemetry

- Thin clients and Single board computers
- Industrial control and automation

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PRODUCT SELECTOR¹

Part Number	Marking	Output Voltage ²	Efficiency ³	Maximum Output Power
		(Volts DC)	(%)	(Watts)
PEB9312BT	12	12	93	90
PEB9320BT	20	20	93	90
PEB9324BT	24	24	93	90

INPUT CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Voltage (V_{IN})	V_{IN}	42	55	57	Volts
Input Current (DC) ⁴	I_{IN}	0		1.70	A
Maximum Inrush Current	I_{PK}			1.80	A
Under Voltage Lockout	V_{UVLO}	39		42	Volts
Operating Temperature	T_{OP}	-20		70	°C
802.3bt Power Classification	Type 4 Class 8				

DC OUTPUT CHARACTERISTICS

Parameter	Symbol	Min.	Typ ³	Max.	Units
Line Regulation	V_{LNRG}		0.1%		%
Load Regulation	V_{LDRG}		0.2%		%
Output Ripple and Noise	V_{RIP}		100	150	mV
Isolation Voltage (DC)	V_{ISOL}			1500	V
Temperature Coefficient	TC		100	300	ppm/°C
Output Short Circuit Duration				∞	Sec

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC})	0V ~ 57V DC
Input Current (A)	2A
Storage Temperature (T_S)	-25°C ~ +100°C
Output Voltage (V_{OUT})	0V to controlled output voltage (operating or non-operating)

¹ All specifications typical are at T_A 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.

² Output typical $\pm 3\%$ at T_A of 25°C; with a typical input voltage.

³ at typical V_{IN} with >75% output load, at 25°C ambient.

⁴ Please refer to IEEE802.3af / 802.3at / 802.3bt standards document. Maximum input and inrush current are dependent on power class.

BLOCK DIAGRAM

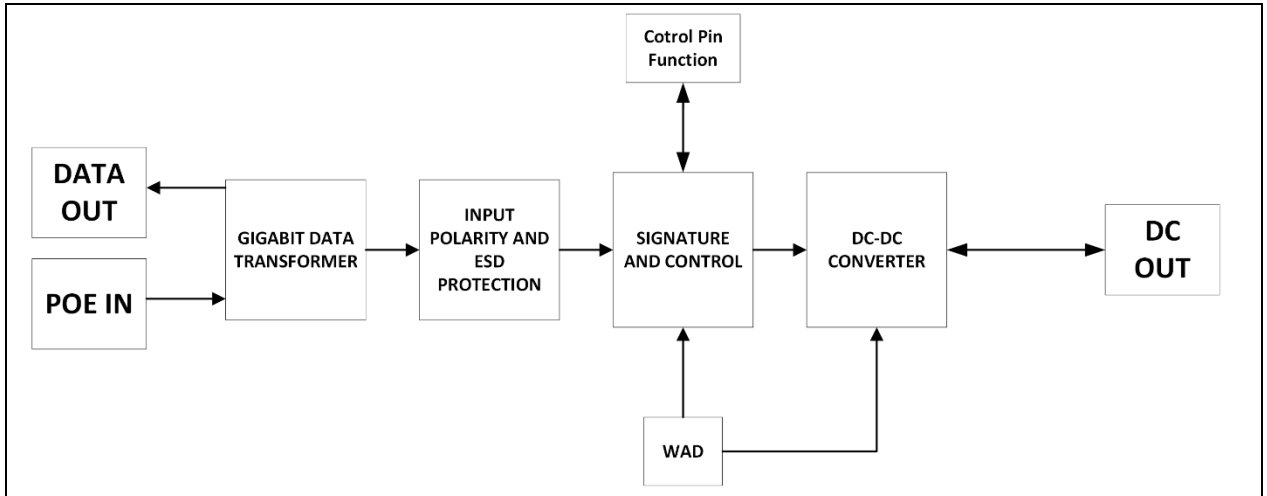


Figure 1- Block Diagram

PIN CONFIGURATIONS

Input Connectors:

POE IN	RJ45 connector, Tab-Up / Optional alternate 9 pin Header 1.25mm pitch ⁵
WAD	For models fitted with optional wall adapter support

Output Connector:

DATA OUT	RJ45 connector, Tab-Up / Optional alternate 9 pin Header 1.25mm pitch
DC OUT	2 pin Terminal Block ⁶

Control Pins (J5 Header Pin Block):

1,2	SGA: Connect pins 1 and 2 to provide 12.5K ohm signature resistance required by certain Phihong PSEs. Leave these pins not connected otherwise.
3	PL1: PSE Type and Power level Indicator. See <i>POWER LEVEL INDICATION</i> section for the truth table.
4	PL2: PSE Type and Power level Indicator. See <i>POWER LEVEL INDICATION</i> section for the truth table.
5	PBT: PSE Type and Indicator. See <i>POWER LEVEL INDICATION</i> section for the truth table.
6	NC: No connection.
7	PGND: Power ground.
8	AUC: Auto Class configuration. See <i>AUTO-CLASS FEATURE</i> section. Connect via jumper to pin 7 to enable.

POE INPUT

The PEB9300BT is IEEE802.3bt compliant, and backward compatible with IEEE 802.3af and 802.3at compliant Power Sourcing Equipment (PSE) and supports the different power injection options of 4 - Pair or Data/Signal Pair configuration and featured to support power level indication. PEB9300BT is capable to take 85Watt input. The PEB9300BT gives choice POE IN connector of RJ45 and 9 Pin Header.

⁵ Before ordering check with Infomart for MOQ and availability

⁶ Ensure adequate current rating of the output wires for the rated O//P current of the unit.

WALL ADAPTOR (WAD) AUXILIARY SUPPLY

PEB9300BT boards equipped with the optional auxiliary DC power input. DC power can be directly connected to the WAD pins. The PEB9300BT detects the power from wall adapter when the voltage to the WAD connector is greater than 48V. 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. The LED (WON) indicator lights up to confirm the activation of the wall adaptor input.

POWERED SIGNATURE CLASSIFICATION

The PEB9300BT is type 4 Class 8 PD requesting the highest nominal amount of power from an IEEE 802.3bt PSE. If the PEB9300BT is connected to an IEEE802.3at PSE, the PSE will recognize the initial Class 4 pulse from the as a Type 2 PD and provide 25W.

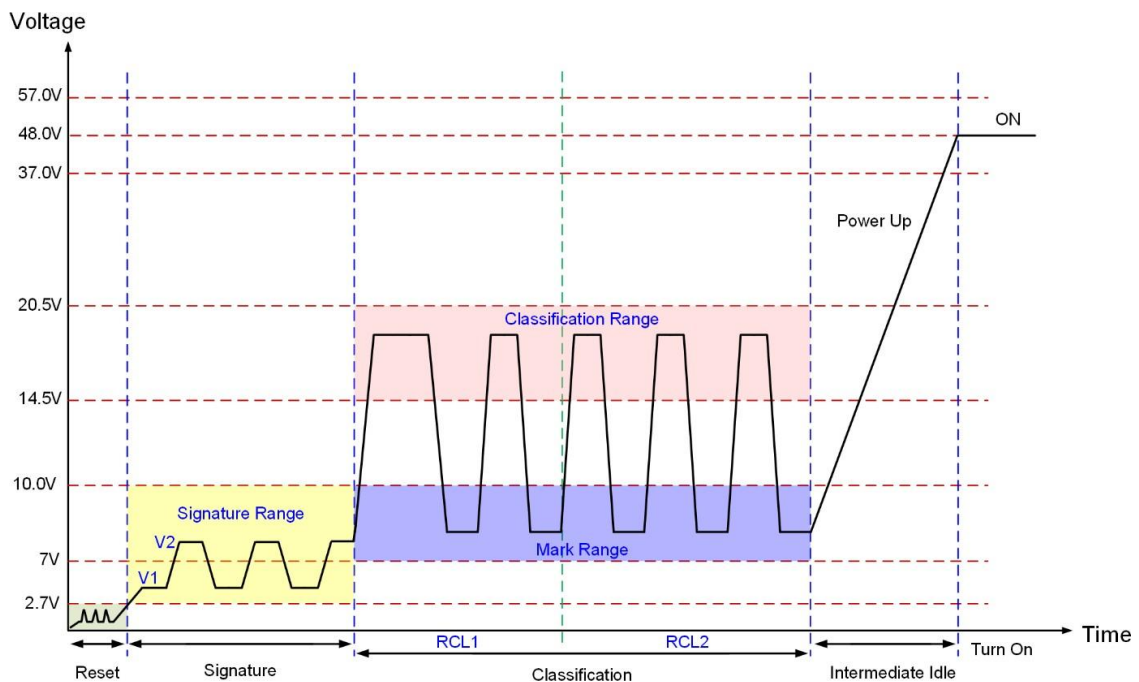


Figure 2- Power Signature Classification

Voltages V1 and V2 with minimum 1V differences are applied by the PSE to extract a signature value. At this time, the PD presents a load current determined by the resistances connected to the RCLASS pins(RCL1 and RCL2). After the PSE measures the PD load current, if it is a high-power PSE, it presents a mark voltage (6.9-10V) followed by a classification voltage (14.5-20.5V). The PD responds by presenting a load current as determined by RCL1 and RCL2. After the PSE measures the PD load current during several class events and determines that it can deliver the requested power, it moves into the on state by raising the voltage to approximately 48V in PoE.BT power levels.

MAINTAIN POWER SIGNATURE (MPS)

The MPS feature is provided by PEB9300BT. Which enables applications that require low-power standby modes. The MPS current is generated to comply with the IEEE 802.3bt standard for PSE to maintain power on in standby modes. A minimum current (10mA) of the port can be maintained with MPS mode to avoid the power disconnection from the PSE. To maintain PSE power in a very low current situation, the PWM-PD controller generates a pulsed current to reaches the required threshold to maintain the power.

The devices automatically enter MPS mode when the port current is lower than 16mA and exit MPS mode when the port current is greater than 16mA. The pulsed current amplitude and period are automatically selected according to PSE Type (1-2, 3-4), to maintain PSE power while minimizing power consumption.

PSE type	Duty Cycle	Ton	Toff	MPS current
3,4	8.1%	16ms	184ms	16 mA

Table 1- MPS feature

POWER LEVEL INDICATION

PL1 and PL2 are Open Drain active-low output pins that indicate PSE type and power level. PBT pin provides an indicator when Type 3 or 4 PSE (bt PSE) is detected, PL1 and PL2 output pins indicate the allocated power level. The PBT, PL1, PL2 pins will be set low once the PD recognizes the related conditions and completion of internal PG signal set to high after VOD power up, the pins will remain low and will only be reset high by the occurrence of a Reset or a power-down event.

We are providing two types of BT indications; One is LED's indication to see easily identify the power class and other one is signal indication to MCU. The connector (J5) pins (3,4 and 5) are type and power level indication to PSE.

PSE Type	PD Class	Class Events	PSE available power(W)	PL1		PL2		PBT	
				J5-3	P1 (LED)	J5-4	P2 (LED)	J5-5	PS (LED)
1 or 2	0	1	12.95	High	Off	High	Off	High	Off
1 or 2	1	1	3.84	High	Off	High	Off	High	Off
1 or 2	2	1	6.49	High	Off	High	Off	High	Off
1 or 2	3	1	12.95	High	Off	High	Off	High	Off
2	4	2	25.5	Low	On	High	Off	High	Off
3 or 4	0	1	12.95	High	Off	High	Off	Low	On
3 or 4	1	1	3.84	High	Off	High	Off	Low	On
3 or 4	2	1	6.49	High	Off	High	Off	Low	On
3 or 4	3	1	12.95	High	Off	High	Off	Low	On
3 or 4	4	2 or 3	25.5	Low	On	High	Off	Low	On
3 or 4	5	4	38.25	High	Off	Low	On	Low	On
3 or 4	6	4	51	High	Off	Low	On	Low	On
4	7	5	62	Low	On	Low	On	Low	On
4	8	5	71.3	Low	On	Low	On	Low	On

Table 2- Power level indication

AUTO-CLASS FEATURE

Auto-class 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.

This new feature was introduced in the IEEE802.3bt standard to allow a more efficient use of the available power since only the effectively used power needs to be budgeted. The Type 3 or Type 4 PD may optionally support Auto-class whereas a Type 3 or Type 4 PSE may make use of it to optimize its power management.

A PSE implementing Auto-class uses the first-class event to inquire if the PD supports Auto-class, looking for the class current to fall to class 0 current level. If it is the case, the PSE can then proceed to Auto-class measurement immediately

after power up, the PD being required to draw its highest power throughout the bounded period using sliding time window to calculate the power.

Connect AUT pin to PGND (or use shunt header/jumper and short J5 connector pins 7 and 8) to enable the Auto-class function during classification. Leave the pin open otherwise.

ISOLATION

IEEE POE specifications call 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® Powered Ethernet™ PEB9300BT modules meet or exceed 1500V impulse test. This is also referred to as ‘Hi-Pot Test’, ‘Flash Test’, ‘Withstand Voltage’, ‘Proof Voltage’, ‘Dielectric Withstand Voltage’ & ‘Isolation Test Voltage’. PEB9300BT is provided with 3No’s of M3 Mounting holes with 6mm diameter pads around. MH1 and MH2 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 into the white band. MH2 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 PEB9300BT Board.

THERMAL MANAGEMENT

As with any power component, the PEB9300BT 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 PEB9300BT will depend on the output load it is required to drive. The maximum ambient operating temperature is 70°C. Figure below, shows the thermal performance of the PEB9300BT with a 51VDC input. The PEB9300BT thermal performance can be improved by forced airflow cooling over the module.

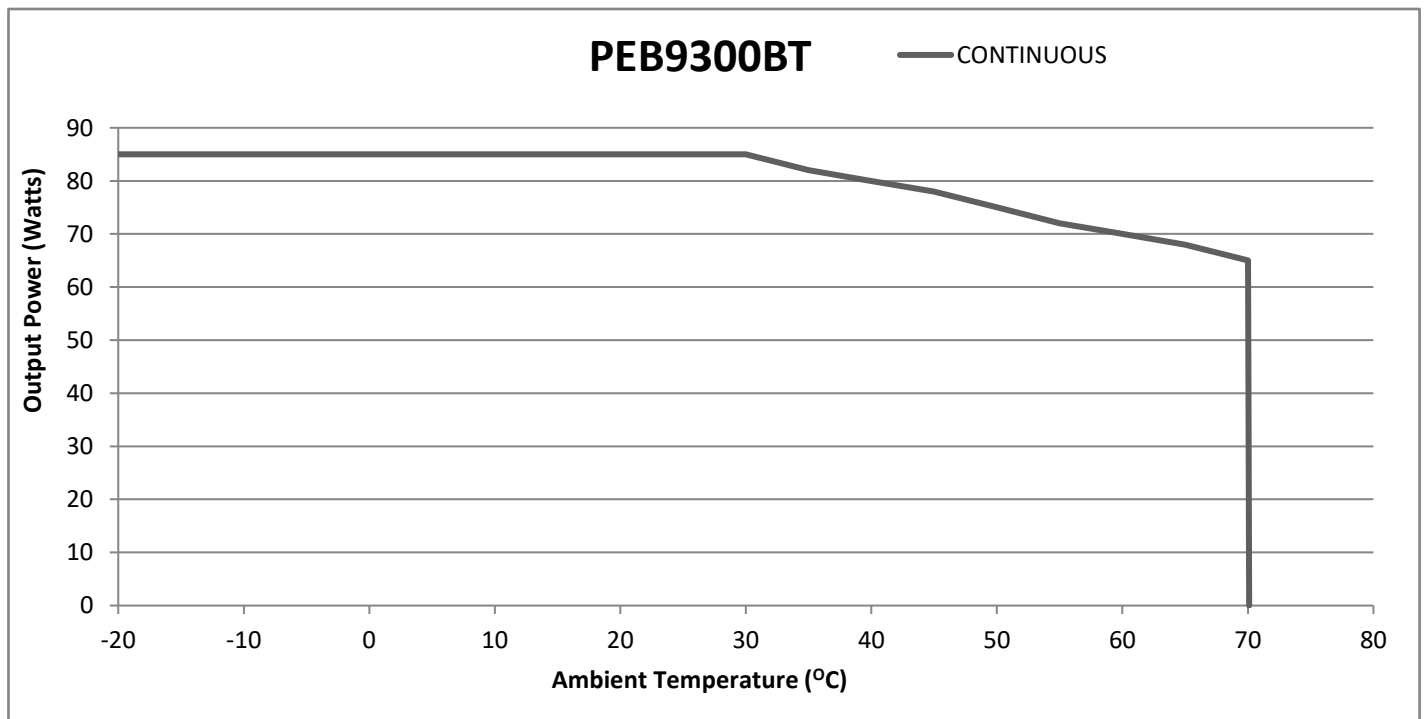


Figure 3- Thermal Performance profile at nominal V_{in}

PHYSICAL PACKAGE

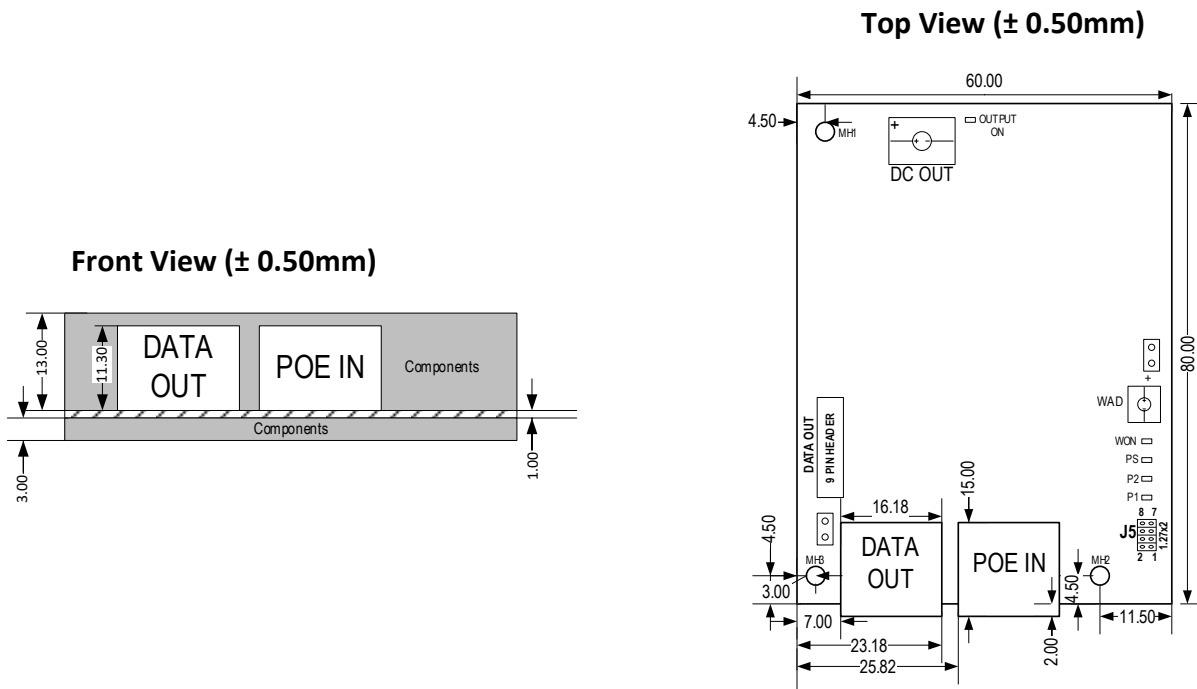


Figure 4- Mechanical Dimensions

All dimensions in mm and nominal unless stated otherwise

Note:

- M3 screw for MH1, MH2 and M2.5 screw for MH3 are recommended
- Mounting hole MH2 is internally connected to the metal shield of the POE IN and DATA OUT connectors
- Mounting holes MH1 and MH3 are non-conductive and free from bottom side component encumbrances

PART NUMBERING SYSTEM

PEB93	XX	BT	X	X	W
Series	Voltage	IEEE Standard	POE In Connector	Data Out Connector	Wall Adapter Option
	12 = 12V out 20 = 20V out 24 = 24V out	IEEE 802.3bt	J = RJ45 H = Header	J = RJ45 H = Header D = Dual	W = Wall Adapter Option enabled Blank = No wall adapter

Table 3- Part Number

- The RJ45 Jack is horizontal entry tab-up full metal shield connector.
- The 9Pin Header connector is 1.25mm wafer connector from Würth. We recommended Würth part numbers 65300113722DEC and 653009113322 for cable housing and terminal pins respectively.
- Pin 9 of Input and Output connector is tied common to the Ground. In turn the Ground connects to the metal body or Immunity Ground (Chassis).
- DC Out connector is a terminal block. We recommended minimum 18 AWG wire size for DC Out connection.
- The designers should ensure not to bypass the 1500V isolation provided in PEB9300BT board.

ROHS, REACH and CONFLICT MINERALS COMPLIANCE

ROHS, REACH and Conflict Minerals compliance details are available on our website

REVISION HISTORY

REVISION NUMBER	DESCRIPTION
24JR1	▪ New release
24LR1	▪ Updated IEEE802.3 POWER LEVELS AND CLASSES
25AR3	▪ Update in PRODUCT FEATURES
25BR4	▪ Update in PRODUCT FEATURES
25CR5	▪ Update in PHYSICAL PACKAGE

IEEE802.3 POWER LEVELS AND CLASSES
IEEE 802.3 Power levels and Classifications for POE Powered Devices

IEEE Standard	Common Name	PD Class	PD / PSE Type	Max num. of events	PD Power ¹	PSE Power ²	Wire pairs energised	AUC ³
802.3af	POE	0	1	-	12.95W	15.4W	2	No Support
802.3af	POE	1	1	1	3.84W	4W	2	No Support
802.3af	POE	2	1	1	6.49W	7W	2	No Support
802.3af	POE	3	1	1	12.95W	15.4W	2	No Support
802.3at	POE+	4	2	2	25.5W	30W	2	No Support
802.3bt	POE++	5	3	4	38.25W	45W	4	Optional
802.3bt	POE++	6	3	4	51W	60W	4	Optional
802.3bt	POE+++	7	4	5	62W	75W	4	Optional
802.3bt	POE+++	8	4	5	71.3W	90W	4	Optional

¹ Min. power delivered to PD / Module input. Max. PD / module output depends on operating conditions

² Power delivered from the Power Sourcing Equipment (PSE) (switch or injector) at its output port

³ Auto Class is supported. It is optional to enable or not.

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