



In many modern systems there is a need to transmit both high speed data, as well as effectively distribute power, between remote devices. Due to its high-speed capabilities and robust communication protocols, Ethernet is often the communications protocol of choice. Many systems such as VoIP Phones, IP Cameras, Wireless Access Points, Intelligent Lighting Controllers or Remote Point of Sale (PoS) Kiosks do not have convenient, or cost appropriate, access to the power needed to run the system. With this in mind, many designers choose to provide both Power and Data over the 2 twisted pair wires which is known as Power over Ethernet, or PoE.

Typically, a PoE Controller is used to negotiate power levels and control the isolated DC-DC circuitry inside of a product's enclosure. With ever-increasing numbers of PoE controllers commercially available, finding the right power transformer for your PoE Powered Device (PD) design can be daunting. Fortunately, Pulse offers real time support and resources to help assist and simplify the task. When choosing a PoE PD transformer, there are several basic things to consider:

- Power IC and topology to be implemented
- Power Levels
- Physical Size and Mechanical Restrictions
- Number of Auxiliary and Secondary Outputs
- Secondary and Auxiliary Output Voltages and Current

Once these general constraints are known, Pulse can leverage existing catalog designs and common platforms, as well as a team of experienced design and applications engineers to either help select an appropriate product or create a transformer that fits a customer's specific technical and commercial requirements.

The physical size of the transformer will be dictated by the power level, frequency required and any specific mechanical requirements of the end-application, such as height. A summary of the most common platforms can be found in the table below:

Family	Max Power Level	Dimensions (L x W x H)	Pulse Datasheet
EP7	5W	13.34 x 10.7 x 9.27 mm	<a href="#">P744</a>
EP7+	30W	13.2 x 11.5 x 15mm	<a href="#">P846</a>
EP10	30W	15.24 x 13.1 x 11.45 mm	<a href="#">P742</a>
EP10+	40W	15.1 x 13 x 15 mm	<a href="#">P856</a>
EP13	60W	17.7 x 14 x 12.7 mm	<a href="#">P675</a>
EP13+	70W	17.7 x 14.5 x 14 mm	<a href="#">P719</a>
EFD15	40W	22.2 x 17.2 x 8.4 mm	<a href="#">P671</a>
EFD20	95W	29.2 x 21.8 x 11.4 mm	<a href="#">P666</a>
EFD25	105W	32 x 26.4 x 13.7 mm	<a href="#">P674</a>

*"The breadth of our transformer portfolio ensures that Pulse can provide timely and cost-effective designs that meet unique customer challenges."*

**David Wiest** | Product Marketing, Power PBU, Pulse Electronics

Pulse offers a wide range of catalog PoE transformers for flyback and forward topologies. The choice of topology will depend on the selected controller IC, power level and cost and complexity trade-offs. As noted, the most common topologies for PoE are the Flyback Converter, which utilizes a Flyback transformer as an energy storage device, and the Forward Converter that utilizes a Forward transformer as an energy transfer device. In general, both topologies offer high efficiencies, but each has its own strengths and weaknesses. For a given platform, the forward transformer will have higher output power than the flyback transformer. However, this advantage is offset by the higher complexity of the forward, higher Bill of Material (BOM) count and the need for additional components such as an output inductor. As a general rule of thumb, a Flyback transformer will be typically good for output currents up to 10A or output powers up to 60W. At high output currents or high power, large peak currents can make the Flyback a less appealing choice due to EMI issues, excessive losses and core saturation, among other factors.

Detailed analysis must be done to ensure proper operation in the circuit. In general one should ensure that the turn ratio's defined in the datasheet will be conducive to useful duty cycles, that excessive losses (both core losses as outlined in the datasheet and winding loss due to DCR and RMS currents) are within reason, and

that the part will not saturate during operation. For further reading on the details of the EP+ family and a deeper dive into the analysis of transformers for PD Designs, check out our library of [whitepapers!](#)

Customers can use Pulse's on-line Product finder to assist in selecting the correct transformer. By simply selecting the topology, output power range and any mechanical restrictions a list of available solutions is immediately available. Once an appropriate candidate for the application has been selected some further options may also be highlighted by the tool.

