SAM DAVIS, Editor-in-Chief

Quad PSE Controller IC Meets IEEE 802.3at (PoE+) and IEEE802.3af (PoE)

Capable of controlling four powered devices, the LTC4266 power-sourcing-equipment IC is compliant with both PoE Standards.

INEAR TECHNOLOGY'S LTC4266 is a four-port Power over Ethernet (PoE) controller IC for power-sourcing equipment (PSE) that can provide IEEE 802.3at (25.5 W) and proprietary higher power levels (*Fig. 1*). The output from each of the ports is applied to a circuit similar to that in *Fig. 2*.

Next-generation PoE applications will call for more power to support demanding features, and at the same time demand increased power efficiency in an effort to be more "green" and reduce costs. The LTC4266 provides up to 100 W over four-pair Ethernet cabling, is fully compliant with the new IEEE 802.3at (PoE+) standard, and is backward-compatible with the prior IEEE 802.3af (PoE) standard. This allows users to mix and match up to four PoE and PoE+ powered devices (PDs). It incorporates older recognition and classification schemes as well as the new ones for PoE+.

The LTC4266 must supply 50 V to 57 V (isolated), 30 W minimum, unless classified lower. To be PoE+-compliant, the LTC4266 can provide power either over an Ethernet cable signal or spare pairs. A comparison of the PSE and cable requirements for PoE and PoE+ is offered in the *Table*.

Before applying power to the PD, the PSE must use the discovery mode to check the PD's signature. If it identifies the 25-kΩ signature resistance across the PD input, it concludes that it is a valid PD and is requesting power. The LTC4266's PD discovery uses a proprietary dual-mode four-point detection mechanism to ensure the best immunity from false PD detection. Midspan PSEs are supported with two-event classification and a two-second back-off timer to ensure endspans and midspans do not collide during PD detection. Legacy high-capacitance device detection is available. The LTC4266

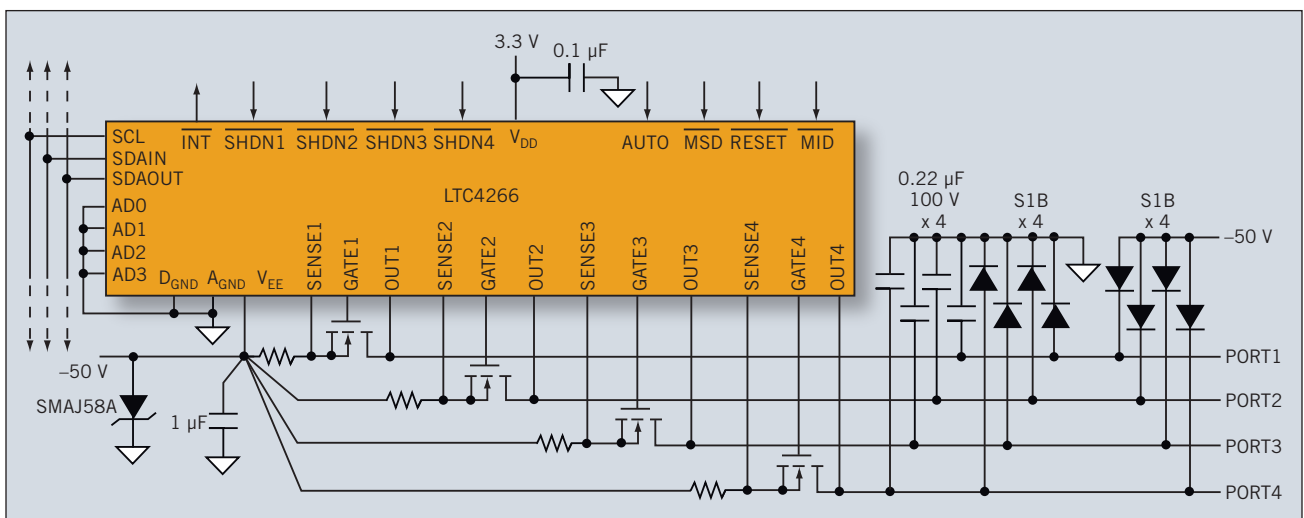| COMPARISON OF PSE AND CABLE REQUIREMENT FOR PoE AND PoE+		
POE PARAMETER	**IEEE802.3af (PoE)**	**IEEE802.3at (PoE+)**
Minimum PSE Output Voltage	44 V	50V
Maximum Current	350 mA	600 mA
Total Cable Resistance	20Ω	12.5Ω
Maximum Cable Voltage Drop	7.0 V	7.5 V
Cable Type	CAT-3	CAT-5

Fig. 1. The LTC4266 quad-PSE IC employs external power MOSFETs switches for each of the four ports it controls.
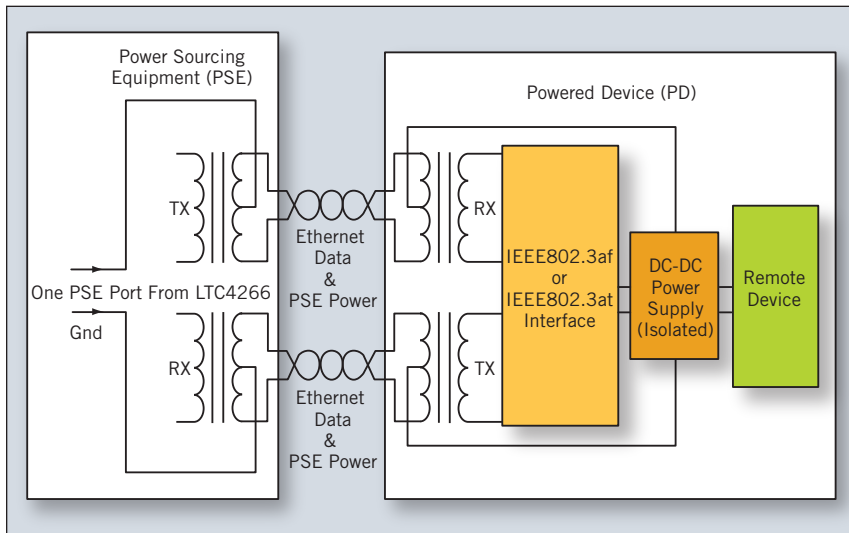
Fig. 2. A PoE system that accepts the output from one port of the LTC4266 supplies power to a remote device using the existing Ethernet data cables.

includes an I²C serial interface operable up to 1 MHz. The IC can also work with proprietary PoE systems that may require more power than the new IEEE 802.3at standard allows.

The next step is the classification mode. In the IEEE802.3at

LTC4266 FEATURES

- Lowest Channel Resistance Eliminates Heat Sink
- Damaged Channels Do Not Affect Adjacent Channels
- Smallest-in-industry Package for a Quad PSE
- First Full IEEE 802.3at Compliant PSE
- High-capacitance legacy device detection
- Future-proof IEEE 802.3at
- Capable of sourcing 50 W over two pairs for proprietary high-power applications
- 100%-compliant with PoETec Register Map

WHERE ARE POE SYSTEMS USED?

- IP Telephony (VOIP)
- Wireless Access Points (WAPs)
- Video Surveillance and Security Systems
- RFID/Retail Point-of-Sale Readers
- WiMax Transmitters
- Femtocell Basestation
- Distributed Industrial Control
- Single & Multiport Power Injectors
- FTTH (Fiber to the Home) Domestic Terminals
- Laptop and PDA docking stations
- Machine Vision Technology
- Medical Monitoring
- Flat panel/Touch screen displays

standard the classification mechanism allows PSEs and PDs to mutually identify each other to ensure interoperability between both PSEs and PDs across both standards. PoE+ employs a new two-event hardware classification which involves the PSE essentially repeating the 802.3af voltage probe twice. In addition, PSEs can classify the PD over the data layer using LLDP (link layer discovery protocol), which is transparent to the PSE controller but is a new, optional means of power classification and allocation.

The LTC4266 employs several techniques to effectively deliver power to a PD. To be 802.3at-compliant, a PSE must be able to provide 30 W at the output of the PSE connector so that after cable losses are accounted for (roughly 4.5 W, assuming 600 mA is sourced through 12.5 Ω), 25.5 W is available to the PD. The LTC4266 provides 30 W, but does so while minimizing heat dissipation. Its accuracy allows the use of low-value resistors and low-$R_{DS(ON)}$ MOSFETs when managing line currents and voltages. Values can be as low as 0.25 Ω for the sense resistor and 0.09 Ω for the MOSFET, providing a maximum total channel resistance that is lower than most other PSE controllers. As a result, power and heat dissipation is significantly reduced, allowing designers to use the LTC4266 without a heat sink.

Advanced power management features include:
- Prioritized fast shutdown
- Selectable high-speed 9.5-bit (1 kHz) or high-resolution 14.5-bit current and voltage readback
- 7-bit DAC for overcurrent protection (I_{CUT})
- Nonlinear 8-bit programmable current limit (I_{LIM}) and versatile quick shutdown of preselected ports.

The LTC4266 is ideal for a range of applications in telecommunications, industrial and medical markets. It is targeted at both midspans and endspans, including next-generation routers, switches and hubs. A PoE midspan is situated between the LAN switch and the PD and inserts power onto the Ethernet cable. Typically, midspans are added to existing networks to inject power without affecting the data path. An endspan is typically a switch that incorporates PoE capabilities. To avoid adding midspans as well as a switch, endpoint devices are often implemented when creating a new network.

The LTC4266 is offered in commercial and industrial temperature grades, and is available in RoHS-compliant 5-mm x 7-mm QFN-38 or SSOP-36 package. The IC provides an upgrade path from Linear's existing PSE controllers, including the IEEE 802.3af pin-compatible LTC4258 or LTC4259A-1. ⏻