Introduction

This Technical Note describes the implementation of the AC disconnection method (as described at the IEEE 802.3at standard) in a PoE system utilized by Microsemi's PoE integrated solutions.

This document is applicable for applications based on the following Microsemi's PoE managers:

- PD69012
- PD69008

Microsemi's PoE solution supports both AC and DC disconnection methods:

- **AC Disconnection** – Injecting a current limited AC voltage and measuring it's on the PoE lines, the PoE manager can get a load connection indication by measuring the AC voltage wave amplitude
- **DC Disconnection** – Measuring the DC current over PoE lines, the PoE manager can indicate whether a device is connected to a port by measuring the port current

Each disconnection method requires a dedicated HW and software configuration. When implementing a new design, it is highly recommended from component count point of view to use the DC disconnection method.

Furthermore, using the DC disconnect method decrease the system power dissipation and therefore improves the system efficiency.

The main advantages of the **DC Disconnection** method over the **AC Disconnection** method are:

- Fewer components per each PoE port
- Less internal heat dissipation in the PoE system
- Less internal power loss on the port, meaning that each port is capable of delivering additional 0.75W or more

Detailed AC disconnect system design

Some of Microsemi's Application-Notes describe how to implement a PoE system supporting the DC disconnection method; however, the modification to AC disconnection method is simple. It requires PCB modifications, minor software modifications and adding few additional components.

Figure 1 shows the Front-end circuitry of a PoE port which supports DC disconnection.

Figure 2 shows the Front-end circuitry of a PoE port which supports AC disconnection (D57 utilize as the AC Disconnection diode).

The AC disconnect diode to be use should be a 10V Zener diode in an SMA or SMB package.

The user should select the package based on available PCB space and air flow.

The minimum recommendation for spacing between AC disconnect diode to other component should be 5mm and an air flow of 1m/S.

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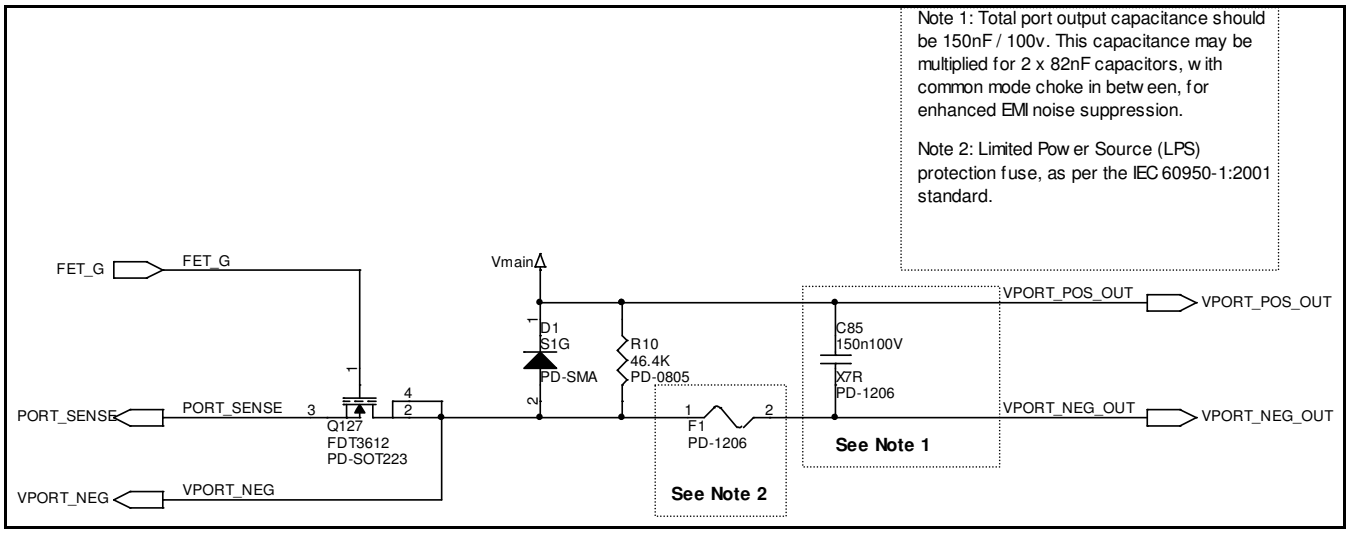

Figure 1: Front End (DC Disconnection)

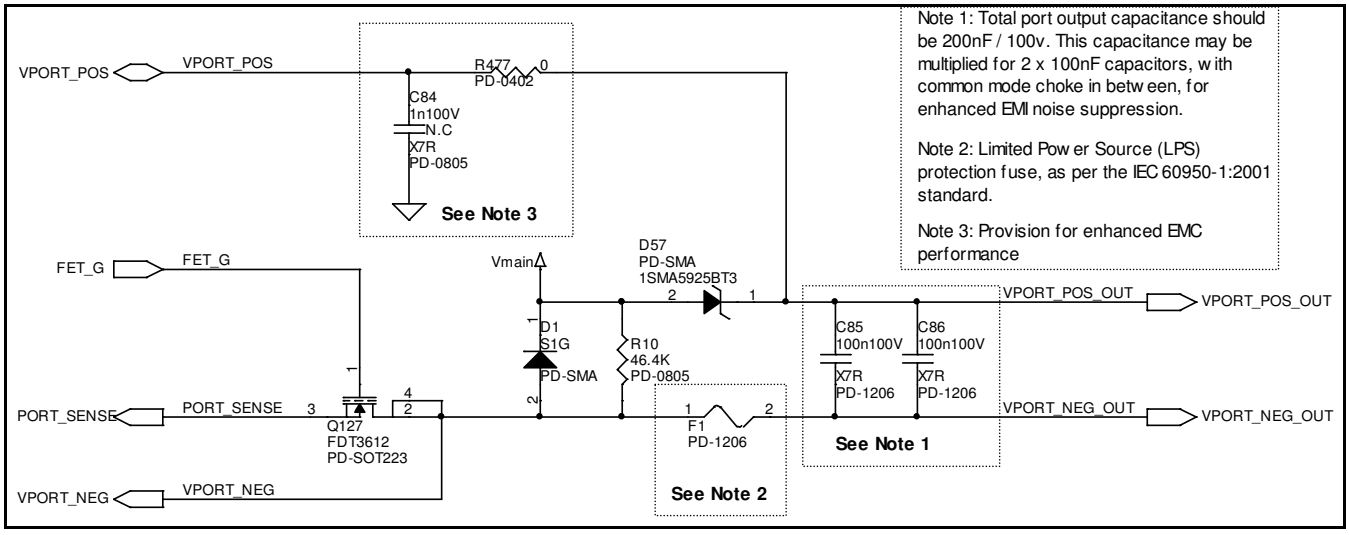

Figure 2: Front End (AC Disconnection)

Layout considerations

The application's thermal design should take into account the temperature derived from the Switch's power dissipation and from the PoE daughter board (PoE manager and associated circuitry) powered at maximum load.

Worst case conditions typically involve operation under maximum ambient temperature, output ports fully loaded at 802.3at power and all other unit functions are fully operational.

Adequate ventilation and airflow should be part of the design so as to avoid thermal over-stress on all the peripheral components.

Note This section details the layout considerations related to the AC disconnection diodes (peripheral components).
For more Layout considerations, refer to AN-175, Layout Design Guidelines for PoE Systems, Cat. No. 06-0055-080

AC Disconnection Diodes

Each port front end circuitry has a single AC Disconnection diode which dissipates about 1W during full load of operation.

The layout design (**Figure 3**) must take into account the power dissipated from the AC disconnection diodes. To dissipate the power, it is recommended to add 40mm to 50mm additional PCB space (compared to DC disconnect application PCB) used for the AC disconnection diode (see **Figure 3**) and to place half of the diodes at the component side and the other half on the print side of the PCB.

It is recommended to add thermal pads for each AC disconnection diode (for robust thermal design add a thermal pad to both PCB sides and short the pads using thermal vias).
Where it is possible (technically wise), connect the pads to the Vmain plane (to dissipate the heat to the air).
The thermal pads to be used should be as big as possible conditioned by the available PCB space.

Enlarge the Vmain plane to occupy the unused available PCB space.

Software Implementation - Enhanced Mode

To set the PoE controller to AC disconnection mode, refer to PD63000 & PD69000/G Serial Communication Protocol User Guide, Cat. No. **06-0032-056**

Software Implementation - Auto Mode

To set the PoE Managers to AC disconnection mode, refer to Auto Mode PD640xx/PD690xx Registers Map, Cat. No. **06-0061-056**

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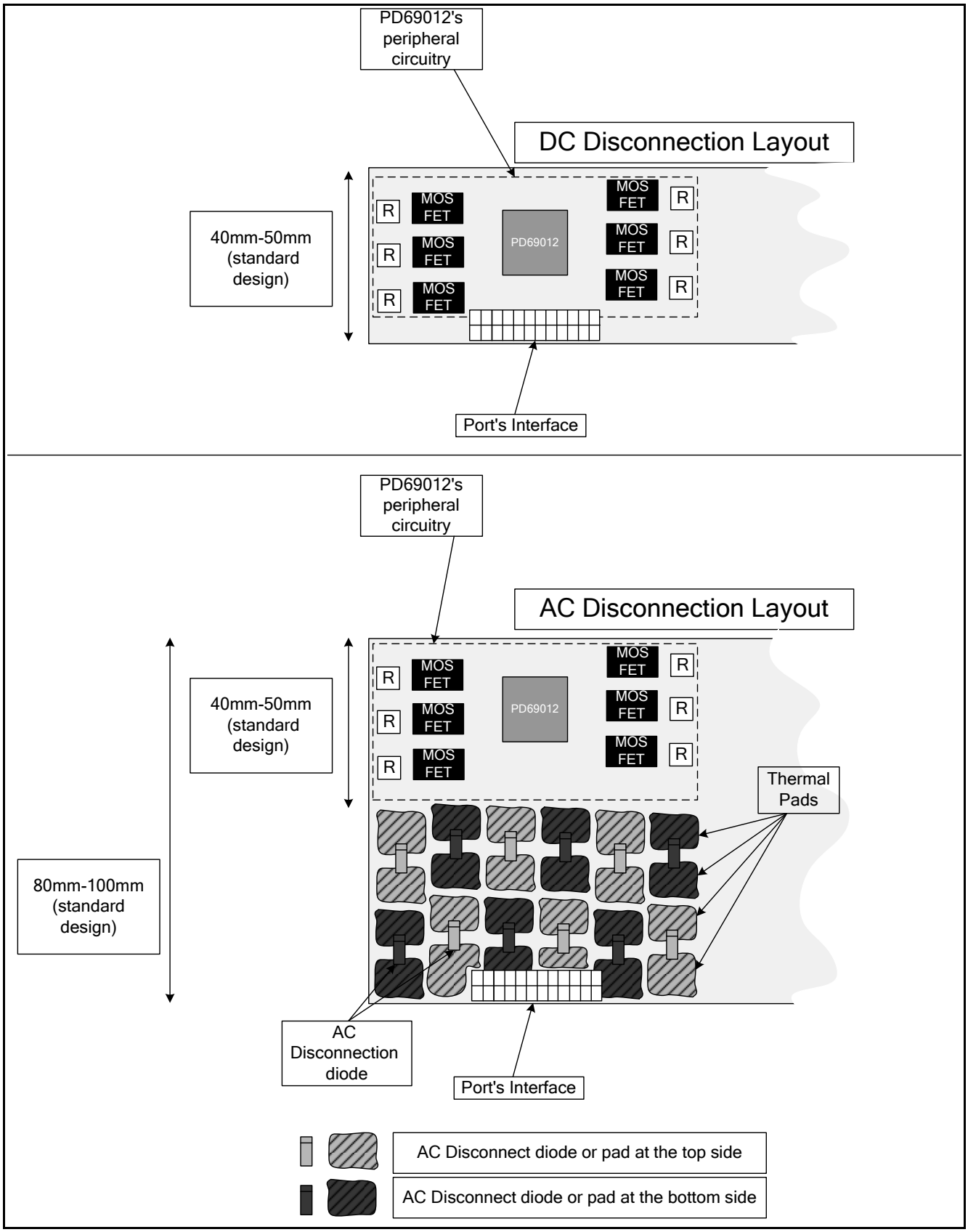

Figure 3: AC and DC Disconnection - Layout Examples

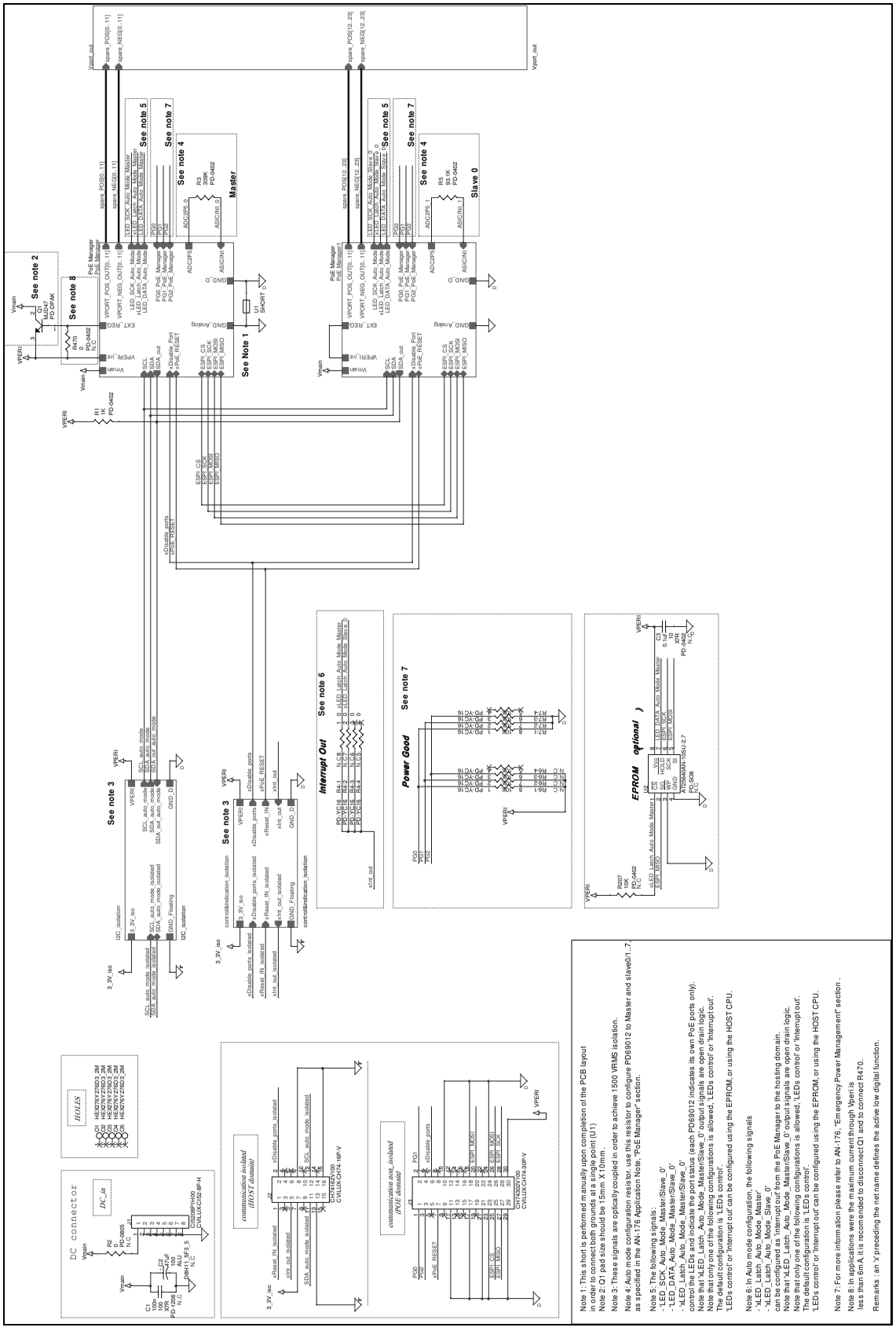

Figure 4: Overall Block Diagram for 24-port AC Disconnection Auto Mode System (I^2C Interface)

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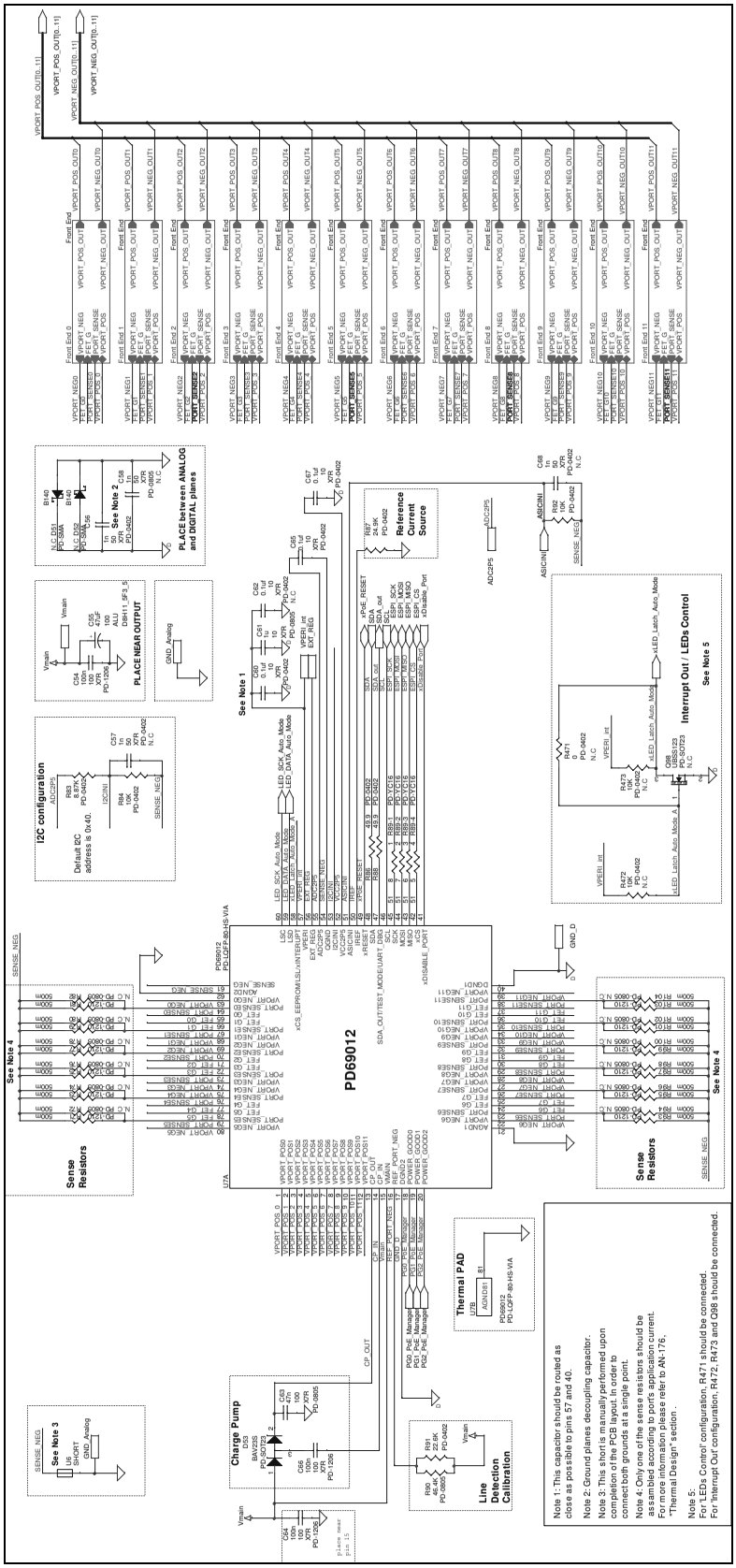

Figure 5: PD69012 Circuitry for PoE Manager #0

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Revision History

Revision Level / Date	Para. Affected	Description
1.0 / 28 May. 09		Initial release

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