DESCRIPTION

Demonstration circuit 1139A features the LTC4259A, a quad –54V Hot Swap™ controller designed for use in HIGH Power / IEEE 802.3af compliant Power Sourcing Equipment (PSE). Each port has output current limit, short-circuit protection, complete Powered Device (PD) detection and classification capability, and programmable PD disconnect using AC or DC sensing all performed by the LTC4259A. Used with power MOSFETs and passives, the LTC4259A is implemented in an interchangeable High power / IEEE 802.3af-compliant PSE. By using jumper ports can be set as either IEEE802.3af or High Power.

1139A have 3 ports available. These are:

- Port 1 – 2 Pair Adjustable IEEE802.3af / High Power
- Port 2-3 – 4 Pair Adjustable IEEE802.3af / High Power
- Port 4 – 2 Pair Fixed High Power

Port 1 is available as a 2 pair solution. The power levels for this port can be adjusted using J2 jumper to either IEEE802.3af or High Power levels. On this port the High Power level can provide up to 800mA of current.

Port 2-3 is available as a 4 pair solution. LTC4259 Port 2 is connected to the data pairs of the RJ45 connector J9 where as LTC4259 Port 3 is connected to the spare pairs of the same connector. These ports operate independent from each other. Because of this they will class and detect individually. Therefore two separate PD interfaces must be connected to data pairs and spare pairs for valid detection. If a single PD interface is connected to both the data and the spare pairs, invalid detection will occur. This is caused by 4259 Port 2 and 3 effecting each others detection. The power levels for these ports can be adjusted using J3 jumper to either IEEE802.3af or High Power levels. On these ports the High Power level can provide up to 800mA of current for a total of 1.6A. The jumper is designed to adjust power levels for both ports simultaneously and not independently.

Port 4 is available as a 2 pair solution. The power level for this port is fixed for High Power levels where 800mA of current is provided.

The LTC4259A can operate autonomously or be controlled by an I2C™ serial interface. Up to 16 distinct LTC4259As addresses may coexist on the same data bus, potentially allowing for up to 64 powered Ethernet ports to be controlled with only two digital lines. Fault conditions are signaled with a programmable /INT pin to eliminate software polling.

External power MOSFETs, current sense resistors and diodes allow easy scaling of current and power dissipation levels and provide protection against voltage and current spikes and ESD events.

The LTC4259A used on this board is in a 52-pin QFN package.

On the DC1139A, an LTC3803 is used in a boost topology to provide the 3.3V digital supply to all LTC4259As. An LTC1490 and external RCs generate a sine wave that connects to OSCIN of the LTC4259As used for AC disconnect.

DC1139A can run in Auto mode without any micro-control. In this mode the LTC4259A, after a power cycle or reset, will automatically perform PD detection, port power on, and AC disconnect.

Linear Technology also provides solutions for High Power PD applications with the LTC4264.

This QuickStart Guide provides a brief overview of the setup of the DC1139A. For further description of the hardware and software, contact Applications Engi-
neering. Refer to the LTC4259A data sheet for operation with the part.

Design files for this circuit board are available. Call the LTC factory.

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Table 1. Typical Setup and Performance Summary (T_A = 25°C)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>VALUE (TYP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum to Maximum Input VEE Voltage</td>
<td>GND to VEE</td>
<td>-48V to -57V</td>
</tr>
<tr>
<td>VDD Output voltage</td>
<td>Onboard -48V to 3.3V with LTC3803, VDD to GND</td>
<td>3.3V +/-2%, 500 mA</td>
</tr>
<tr>
<td>Maximum DC current at port output</td>
<td>IEEE 802.3af / High Power</td>
<td>350 to 400mA / 700 to 800 mA</td>
</tr>
<tr>
<td>On-board sine wave, (LT1490 circuit)</td>
<td>Frequency</td>
<td>105Hz</td>
</tr>
<tr>
<td></td>
<td>Offset Voltage</td>
<td>1.2Vos</td>
</tr>
<tr>
<td></td>
<td>Peak-to-Peak Voltage</td>
<td>2.2Vpp</td>
</tr>
<tr>
<td>Disconnect (AC or DC)</td>
<td>DC1139A, Factory Preset, Changed upon Request</td>
<td>AC Disconnect</td>
</tr>
</tbody>
</table>
FIGURE 1. PROPER HIGH POWER POE OPERATION SETUP
QUICK START PROCEDURE

Demonstration Circuit 1139A is setup for High Power evaluation of the LTC4259A. Please refer to Figure 1 and follow the procedure below for proper operation.

1. Place jumpers in the following positions:

   **J1- AUTO ENABLE**

   **J2 - HPOE** If the PD connected to Port1 is High Power place J2 jumper to HPOE position. Otherwise place J2 jumper to VEE position. If using the PC software do not place the jumper to any position. (LED1 indicator intended for PC interface only. It will not turn ON via the jumper selection)

   **J3 – HPOE** If the PD(s) connected to 4259 Port 2-3 is(are) High Power place J3 jumper to HPOE position. If the PD(s) connected to 4259 Port 2-3 is(are) AF power place J3 jumper to VEE position. If using the PC software do not place the jumper to any position. (LED2 indicator intended for PC interface only. It will not turn ON via the jumper selection)

2. Connect –54V across GND and VEE.

3. Connect a valid PD to any one of the ports.

Supply Voltages:

Connect —-54V to the DC1139A. A green LED by VEE will indicate when —39V is exceeded with proper polarity. For normal operation with the LTC4259A and for IEEE802.3af compliance, this VEE should remain within the range of —48V to —57V. Diode D18 protects the DC1139A against inadvertent reverse polarity of the -54V supply and is not needed in a final design.

VDD pin on the LTC4259A is connected to the output of the LTC3803 —54V to +3.3V DC/DC boost converter on the board. The green VDD LED indicates VDD is supplied with power.

QuickEval

Use the QuickEval system by connecting the 14-pin ribbon cable from the DC590 board to the DC1139A*. Open the QuickEval, which will identify the DC1139A and bring up the LTC4259A interface on the PC. The QuickEval components are for demonstration purposes only and not needed in the final design.

The QuickEval system is used for quick interfacing with the LTC4259A. An external host controller can be connected directly to the SDA and SCL lines. The LTC4259A can also run autonomously without the need for a PC or a microcontroller.

Each port is displayed with its operating mode, detect status, and class status. This display is updated every poll cycle. The operating mode for the port is displayed first. The mode is set by writing to the Operating Mode register (12)h or selecting the mode in the drop down menu.

The Turn ON (Turn OFF) button sets the respective port bit in the Power Enable PB (19)h register and powers on or off the port. An indicator on the interface turns green to indicate the power is good at the port and turns red when the port is off.

Reset sets the corresponding Reset Port bit in the Global PB (1A)h register and resets the port. The port is turned off if it was on and detect and class are disabled. This is a Pushbutton (PB) bit and will return to zero.

The Detect button and Class button will step a single detection or classification cycle in manual mode or enable in Semiauto or Auto mode. The bits are set in the Detect/Class Restart PB (18)h register but returns to zeros.

Hide/Advanced:

When the form is opened, a basic interface is shown. For more advanced options, click on the “Events and Interrupts>>” button. To hide these advanced features, click on “Hide<<”.

*QuickEval components are for demonstration purposes only and not needed in the final design.
Each port is displayed with its operating mode, detect status, and class status. This display is updated every poll cycle.

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Reset sets the corresponding Reset Port bit in the Global PB (1A)h register and resets the port. The port is turned off if it was on and detect and class are disabled. This is a Pushbutton (PB) bit and will return to zero.
DC1139A is configured to provide Endpoint PSE handshaking with a PD.

An Endpoint PSE is coincident with a DTE/Router/Switch and provides power across the signal pairs (pairs 1/2 and 3/6) and/or spare pairs (pairs 4/5 and 7/8). The DC1139A connects 54V to the center taps of transformers, which distributes the power across the differential lines for each port. The board can be inserted into existing systems by connecting the cable from the DTE/Router/Switch to the “IN FROM PHY” RJ45 connectors on the left side of the board and the PD to the “OUT TO PD” on the right side of the board.

For Midspan applications please contact Application Engineering department.

**Events:**

The RO Events registers are read during each poll cycle and the statuses are displayed. The port numbers next to the first seven events indicate that particular event for that port has occurred. For the supply events, a True or False denotes if an Over Temperature, OSC Fail, VDDUVLO, or VEEUVLO condition has occurred. To clear a particular Events register, click on the adjacent clear button to send a read command to the appropriate CoR register.
Even if the register is cleared out, the bits remain set if the event is still present.

**Interrupts:**

The interrupt pin is enabled by setting the eighth bit in the Miscellaneous Configuration (17)h register. The bits in the Interrupt Mask (01)h register are set by checking the interrupts. An indicator on the interface is displayed for each of the selected interrupts. If the interrupt is present, the corresponding bit in the Interrupt (00)h register will be set and that indicator will turn on. To assert the Interrupt Pin of the LTC4259A low, the Interrupt Pin must be enabled, an Interrupt Mask bit must be set, and the interrupt condition of the masked bit must occur.

The Clear Pin and Clear Ints buttons set bit 6 and 7 of the Global PB (1A)h register respectively. Clearing the interrupt pin releases the Interrupt pin. Clearing the interrupts releases the Interrupt pin, clears all the Event registers, and the Supply Fault bit in the Supply Status register.
**QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1139A**

**QUAD HIGH POWER ETHERNET CONTROLLER**

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**Diagram**

SWITCHER FOR VDD (Isolated -54V to 3.3V)

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**Table**

<table>
<thead>
<tr>
<th>Approvals</th>
<th>Quad High Power Ethernet Controller</th>
</tr>
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<tbody>
<tr>
<td>DRAWN:</td>
<td>Linear Technology Corporation 1630 McCarty Rd San Jose CA 95035 © 2007 Linear Technology Corporation For Use Only With Linear Technology Devices - Confidential Information</td>
</tr>
<tr>
<td>ENGINEERED:</td>
<td>A. K.</td>
</tr>
<tr>
<td>APPROVED:</td>
<td></td>
</tr>
<tr>
<td>CHECKED:</td>
<td></td>
</tr>
</tbody>
</table>

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**Notes**

- The diagram shows a schematic for the switcher for VDD, which can handle an input voltage range of -54V to 3.3V.
- Refer to the table for the approver details, which includes the name and contact information.

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**Diagram Details**

- Key components include resistors (R2, R3, R4, etc.), capacitors (C1, C2, etc.), and power switches (Q1, Q2, etc.).
- Specific values like 100µF, 100kΩ, 0.1µF, etc., are marked on the diagram for accuracy.

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**Conclusion**

This quick start guide provides essential information for setting up and using the demonstration circuit 1139A, including the correct wiring and power handling details. The diagram and table together help ensure a smooth setup process.
(OPTIONAL CIRCUIT)

OSCILLATOR FOR AC DISCONNECT

~100Hz, 2Vpp Sine wave type output

NOTE:
1. This Oscillator circuit is required only for the LTC4259A’s AC Disconnect feature.
2. Oscillator is not needed when LTC4258 is used or AC Disconnect is not enabled on the LTC4259.