ISL88550A integrates a synchronous buck PWM controller to generate VDDQ, a sourcing and sinking LDO linear regulator to generate VTT, and a 10mA reference output buffer to generate VTTR. The buck controller drives two external N-Channel MOSFETs to generate output voltages down to 0.7V from a 2V to 25V input with output currents up to 15A. The LDO can sink or source up to 1.5A continuous and 2.5A peak current with fast response. Both the LDO output and the 10mA reference buffer output can be made to track the REFIN voltage via a built-in resistive divider. These features make the ISL88550A ideally suited for DDR memory applications in desktops, notebooks and graphic cards.

The PWM controller in the ISL88550A uses constant-on-time PWM architecture with a programmable switching frequency of up to 600kHz. This control scheme handles wide input/output voltage ratios with ease and provides 100ns “instant-on” response to load transients while maintaining high efficiency and a relatively constant switching frequency. The ISL88550A offers full programmable UVP/OVP and skip mode options ideal in portable applications. Skip mode allows for improved efficiency at lighter loads.

The VTT and VTTR outputs track to within 1% of VREFIN/2. The high bandwidth of this LDO regulator allows excellent transient response without the need for bulk capacitors, thus reducing the cost and size.

**Pinout**

**Features**

**Buck Controller**
- Constant-On PWM with 100ns Load-Step Response
- Up to 95% Efficiency
- 2V to 25V Input Voltage Range
- 1.8V/2.5V fixed or 0.7V to 3.5V Adjustable Output
- 200kHz, 300kHz, 450kHz, 600kHz Switching Frequencies
- Programmable Current Limit with Foldback Capability
- 1.7ms Digital Soft-Start and Independent Shutdown
- Overvoltage/Undervoltage Protection Option
- Power-Good Window Comparator

**LDO Section**
- Fully Integrated VTT and VTTR Capability
- VTT has ±2.5A Sourcing/Sinking Capability
- VTT and VTTR Outputs Track VREFIN/2
- VTT and VTTR within 1% of VREFIN/2
- All Ceramic Output Capacitor Designs
- 1.0V to 2.8V Input REFIN Range
- Analog Soft-Start Option and Independent Shutdown
- Power-Good Window Comparator

**Applications**
- DDR I and DDR II Memory Power Supplies
- Desktop Computers
- Notebooks and Desknos
- Graphics Cards
- Game Consoles
- Networking and RAID

**Ordering Information**

<table>
<thead>
<tr>
<th>PART</th>
<th>PACKAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISL88550AEVAL1Z</td>
<td>Evaluation Board</td>
</tr>
</tbody>
</table>
What's Inside

The Evaluation Board Kit contains the following materials:

- The ISL88550AEVAL1Z REVA board
- The ISL88550A data sheet
- ISL88550AEVAL1Z Kit (this document)

Recommended Equipment

The following materials are recommended to perform testing:

- 0V to 22V power supply with at least 15A source current capability, battery, notebook AC-adapter
- 5V Bias supply for VDD
- Two electronic loads capable of sinking current up to 15A
- Dummy loads for the LDO’s
- Digital multimeters (DMMs)
- 100MHz quad-trace oscilloscope
- Signal generator

Quick Setup Guide

1. Ensure that the circuit is correctly connected to the supply and loads prior to applying any power.
2. Connect the bias supply to VDD, the + terminal to P3 (VDD) and - return to TP5 (AGND).
3. Verify that position 2’s are ON for SW1, SW2, SW3, and SW5. Verify that position 1 is ON for SW4. Make sure that no other switch position is ON at the same time.
4. Turn on the VIN power supply.
5. Turn on 5V bias supply.
6. Verify the outputs voltages are 1.8V for VDDQ and 0.9V for VTT.

Evaluating the Other Output Voltage

The ISL8850EVAL1Z kit outputs are preset to 1.8V and 0.9V; however, VDDQ output voltage can be adjusted from 0.8V to 3.5V by using Equation 1:

\[ R_{10} = \frac{R_8}{[(VOUT/VFB) - 1]} \]  

(EQ. 1)

Set R8 to 25kΩ; and VFB to 0.7V

VDDQ output can also be set to 2.5V by shorting FB pin to GND with R10.

VTT output voltage is half on VDDQ in DDR application. VTTI can be powered directly from VDDQ. For better efficiency, VTTI can be powered from an external power supply. Make sure that R13 is removed.

**TABLE 1. SWITCH 1 SETTINGS**

<table>
<thead>
<tr>
<th>SW1</th>
<th>SKIP</th>
<th>OPERATING MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to GND</td>
<td>Normal operation mode, allow automatic PWM/PFM switchover for pulse-skipping at light load.</td>
</tr>
<tr>
<td>2</td>
<td>Connect to AVDD</td>
<td>Low noise, fixed-frequency PWM mode.</td>
</tr>
<tr>
<td>3</td>
<td>No Connection</td>
<td>NA</td>
</tr>
</tbody>
</table>

NOTE: Only toggle one position at a time

**TABLE 2. SWITCH 2 SETTINGS**

<table>
<thead>
<tr>
<th>SW2</th>
<th>SHDNA#</th>
<th>SHUTDOWN CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to GND</td>
<td>Shutdown mode. VDDQ, VTR, and VTT output.</td>
</tr>
<tr>
<td>2</td>
<td>Connect to AVDD</td>
<td>Enable ISL88550. Rising edge clear the fault protection. Connect to AVDD for normal operation.</td>
</tr>
<tr>
<td>3</td>
<td>No Connection</td>
<td>NA</td>
</tr>
</tbody>
</table>

NOTE: Only toggle one position at a time

**TABLE 3. SWITCH 3 SETTINGS**

<table>
<thead>
<tr>
<th>SW3</th>
<th>tON</th>
<th>tON ON-TIME SELECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to GND</td>
<td>tON set to 600kHz frequency</td>
</tr>
<tr>
<td>2</td>
<td>Connect to AVDD</td>
<td>tON set to 200kHz frequency</td>
</tr>
<tr>
<td>3</td>
<td>Connect to REF</td>
<td>tON set to 450kHz frequency</td>
</tr>
<tr>
<td>-</td>
<td>OPEN</td>
<td>tON set to 300kHz frequency</td>
</tr>
</tbody>
</table>

NOTE: Only toggle one position at a time

**TABLE 4. SWITCH 4 SETTINGS**

<table>
<thead>
<tr>
<th>SW4</th>
<th>OVP/UVP</th>
<th>FAULT PROTECTION CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to GND</td>
<td>Disable OVP and UVP</td>
</tr>
<tr>
<td>2</td>
<td>Connect to AVDD</td>
<td>Enable OVP and UVP</td>
</tr>
<tr>
<td>3</td>
<td>Connect to REF</td>
<td>Disable OVP and enable UVP</td>
</tr>
<tr>
<td>-</td>
<td>OPEN</td>
<td>Enable OVP and disable UVP</td>
</tr>
</tbody>
</table>

NOTE: Only toggle one position at a time

**TABLE 5. SWITCH 5 SETTINGS**

<table>
<thead>
<tr>
<th>SW5</th>
<th>STBY#</th>
<th>FAULT PROTECTION CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to GND</td>
<td>Shutdown VTT in high impedance state. VTR is still active.</td>
</tr>
<tr>
<td>2</td>
<td>Connect to VCC</td>
<td>Enable VTT</td>
</tr>
<tr>
<td>3</td>
<td>No Connection</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Only toggle one position at a time
### TABLE 6. COMPONENT LIST

<table>
<thead>
<tr>
<th>REF DES</th>
<th>QTY</th>
<th>VALUE</th>
<th>TOL.</th>
<th>VOLTAGE</th>
<th>PACKAGE</th>
<th>PART NUMBER</th>
<th>MANUFACTURER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C10</td>
<td>2</td>
<td>0.22µF</td>
<td>10%</td>
<td>50V</td>
<td>SM0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C2, C3, C9</td>
<td>3</td>
<td>10µF</td>
<td>10%</td>
<td>&gt;6.3V</td>
<td>SMD0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C14, C16</td>
<td>2</td>
<td>10µF</td>
<td>10%</td>
<td>25V</td>
<td>SMD1812</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>X5R Capacitor</td>
</tr>
<tr>
<td>C4, C6</td>
<td>2</td>
<td>1µF</td>
<td>10%</td>
<td>10V</td>
<td>SM0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C11</td>
<td>1</td>
<td>4.7µF</td>
<td>10%</td>
<td>10V</td>
<td>SM0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C27</td>
<td>0</td>
<td>OPEN</td>
<td>20%</td>
<td>10V</td>
<td>SMD1210</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>C Series Capacitor (EIA:CC1210)</td>
</tr>
<tr>
<td>C29, C29</td>
<td>2</td>
<td>220µF</td>
<td>20%</td>
<td>4.0V</td>
<td>EIA_CASE_D</td>
<td>EEFU0G221R</td>
<td>Panasonic</td>
<td>AL POLYMER</td>
</tr>
<tr>
<td>C17</td>
<td>1</td>
<td>470pF</td>
<td>10%</td>
<td>50V</td>
<td>SM0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C24</td>
<td>1</td>
<td>0.1µF</td>
<td>10%</td>
<td>50V</td>
<td>SM0805</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>C5, C7, C8, C12, C13, C15, C18, C23</td>
<td>0</td>
<td>Open</td>
<td>10%</td>
<td>50V</td>
<td>SM0805/SM1206</td>
<td>-</td>
<td>AVX, Samsung, TDK, Murata</td>
<td>Multilayer Capacitor</td>
</tr>
<tr>
<td>D3</td>
<td>0</td>
<td>Open</td>
<td>-</td>
<td>30V</td>
<td>SOT23</td>
<td>BAT54WT1</td>
<td>On-Semi</td>
<td>30V Schottky Barrier Diode</td>
</tr>
<tr>
<td>D4</td>
<td>1</td>
<td>-</td>
<td>3A</td>
<td>40V</td>
<td>SMA</td>
<td>B340LA</td>
<td>Diodes-Inc</td>
<td>3A Low VF Schottky Barrier</td>
</tr>
<tr>
<td>L1</td>
<td>1</td>
<td>1.0µH</td>
<td>20%</td>
<td>2mΩ</td>
<td>13_5x13_5</td>
<td>SD10L1HM65-H1R0</td>
<td>Falco BI Sumida Toko</td>
<td>Shielded SMD Inductor</td>
</tr>
<tr>
<td>Q1</td>
<td>1</td>
<td>-</td>
<td>11A</td>
<td>30V</td>
<td>SOIC8</td>
<td>IRF7821V</td>
<td>IR</td>
<td>30V 8.3A N-Power MOSFET</td>
</tr>
<tr>
<td>Q2</td>
<td>1</td>
<td>-</td>
<td>16A</td>
<td>30V</td>
<td>SOIC8</td>
<td>IRF7811AV</td>
<td>IR</td>
<td>30V 10.8A N-Power MOSFET</td>
</tr>
<tr>
<td>R1, R2, R3, R6, R13, R14</td>
<td>8</td>
<td>0</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R12</td>
<td>1</td>
<td>20k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R9</td>
<td>1</td>
<td>56.2k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R4, R11</td>
<td>2</td>
<td>100k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R16</td>
<td>1</td>
<td>182k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R15</td>
<td>1</td>
<td>200k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R5, R25</td>
<td>0</td>
<td>Open</td>
<td>1%</td>
<td>150V</td>
<td>0805/1206</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R8</td>
<td>1</td>
<td>15.8k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>R10</td>
<td>1</td>
<td>10k</td>
<td>1%</td>
<td>150V</td>
<td>0805</td>
<td>-</td>
<td>Generic</td>
<td>Thick Film Chip Resistor</td>
</tr>
<tr>
<td>SW1-SW5</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>DIP06</td>
<td>DIP06-SW03</td>
<td>Grayhill</td>
<td>Dip Switch SPST</td>
</tr>
<tr>
<td>U1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>TQFN</td>
<td>ISL88550A</td>
<td>Intersil</td>
<td>High Efficiency Output Rectifier Controller</td>
</tr>
</tbody>
</table>
ISL88550AEVAL1Z Board Layout

FIGURE 1. TOP COMPONENTS

FIGURE 2. TOP LAYER ETCH
FIGURE 3. 2ND LAYER ETCH

FIGURE 4. 3RD LAYER ETCH
FIGURE 5. BOTTOM LAYER COMPONENTS (MIRRORED)

FIGURE 6. BOTTOM LAYER ETCH (MIRRORED)
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