DESCRIPTION

Demonstration circuits 826C-A and 826C-B feature the LTC®2950-2 and the LTC2951-2 respectively, which are low power, wide input voltage range, pushbutton on/off controllers. A pushbutton switch shorts the PB pin to ground which in turn sets the EN pin low (see Note 1). Shorting PB to ground a second time subsequently resets the EN pin high. The EN pin is used to connect to a DC/DC converter shutdown to control the turn on and off of the circuit, simulated with a green LED on the DC826C-A/DC826C-B.

JP1 and JP2 on the DC826C-A provide the selection of timing options for the PB on and off times. For the DC826C-B, JP1 selects KILL times while JP2 selects off times. JP3 ties and unties KILL to INT for immediate or delayed turn off. The INT status is shown with a red LED. DC826C-A/DC826C-B accepts an input voltage range of 2.7V to 26.4V or a 9V battery for portable demonstration and evaluation.

Note 1: The inversion of EN of the LTC2950-2/LTC2951-2 is found in the LTC2950-1/LTC2951-1. Table 1 provides an IC selection guide.

Design files for this circuit board are available at http://www.linear.com/demo/DC826C

IC SELECTION GUIDE

Table 1. LTC2950/LTC2951 Selection Guide (Typical Timing Values, Cap. Adjust = 212ms on DC826C-A/DC826C-B)

<table>
<thead>
<tr>
<th>PART</th>
<th>ENABLE</th>
<th>ONT</th>
<th>OFFT</th>
<th>KILLT</th>
<th>DEMO BOARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTC2950-1</td>
<td>EN</td>
<td>32ms + Cap. Adjust*</td>
<td>32ms + Cap. Adjust*</td>
<td>1000ms</td>
<td>N/A</td>
</tr>
<tr>
<td>LTC2950-2</td>
<td>EN</td>
<td>32ms + Cap. Adjust*</td>
<td>32ms + Cap. Adjust*</td>
<td>1000ms</td>
<td>DC826C-A</td>
</tr>
<tr>
<td>LTC2951-1</td>
<td>EN</td>
<td>128ms</td>
<td>32ms + Cap. Adjust*</td>
<td>128ms + Cap. Adjust*</td>
<td>N/A</td>
</tr>
<tr>
<td>LTC2951-2</td>
<td>EN</td>
<td>128ms</td>
<td>32ms + Cap. Adjust*</td>
<td>128ms + Cap. Adjust*</td>
<td>DC826C-B</td>
</tr>
</tbody>
</table>

*The additional Cap. Adjust time is selected by an external capacitor. The DC826C-A and DC826C-B adjust times have been pre-selected with a 0.033μF capacitor to provide an additional 212ms. The additional time is calculated with the following equations as shown in the LTC2950/LTC2951 data sheets:

\[ C_{ONT} = 1.56e-4 \text{ [μF/ms]} \times (t_{ONT} - 1\text{ms}) \]
\[ C_{OFFT} = 1.56e-4 \text{ [μF/ms]} \times (t_{OFFT} - 1\text{ms}) \]
\[ C_{KILLT} = 1.56e-4 \text{ [μF/ms]} \times (t_{KILL, OFF\ DELAY, ADDITIONAL} - 1\text{ms}) \]
QUICK START PROCEDURE

Demonstration circuit 826C-A/826C-B is easy to set up to evaluate the performance of the LTC2950-2/LTC2951-2:

1. Place jumpers in the following positions:
   - JP1: 0.033μF
   - JP2: 0.033μF
   - JP3: UNTIE

2. Connect the input power supply of 2.7V to 26.4V across VIN and GND or a 9V battery to the battery connector.

3. Push and hold the pushbutton once to turn on the green LED.

4. Push and hold the pushbutton again to turn off the green LED.

OPERATING PRINCIPLES

The duration that PB must be shorted to ground in order to turn on/off the DC/DC converter is independently programmed (LTC2950-2) by two external capacitors C1 and C2 and selected on the DC826C-A with jumper JP1 and JP2. The status of the EN pin, and simulation of the turn on/off of a DC/DC converter, is displayed with green LED D2 on the board.

Figure 1 shows how the EN is connected to the SHDN pin of a DC/DC converter and how INT and KILL interfaces with a μP or μC. An internal 500ms timer blanks (ignores) the KILL signal during system power up. This allows sufficient time for the DC/DC converter and a μP to perform power up tasks. During turn off, a power down timer provides a delay (LTC2950-2: 1000ms, LTC2951-2: adjustable) from interrupting the μP (INT = low) to turning off the DC/DC converter (EN = high). This delay gives the μP time to perform power down and housekeeping tasks. On the DC826C-B, JP1 selects the power down timer, while JP2 is used to adjust the turn off PB duration. The red LED D1 shows the state of the INT pin. A μP can turn off the converter with no delay by asserting KILL low. By tying KILL to INT through JP3, KILL is forced low during the INT blanking time and thus forces a turn off.

The RC (R_{RPP} and C_{RPP}) at VIN on the DC826 provides reverse polarity protection to the LTC2950-2/LTC2951-2. If power is connected in an application such that the polarities are ensured to be in the correct configuration, this RC may be removed from the circuit.

An additional RC (RF and CF), located at the PB pin, acts as a filter and is used in an application where the switch is located far from the LTC2950-2/LTC2951-2. In such a case, the RC would be placed next to the switch rather than the part. If the switch is located near the LTC2950-2/LTC2951-2, then the RC may be removed from the circuit.

An LDO (U2) is used on the DC826 to provide a pull-up voltage of 2.6V which is well below the absolute maximum on the INT, EN, and KILL pins for the full range of input voltage of 2.7V to 26.4V. In an application, pull these pins up to a voltage no higher than their rated absolute maximum shown in the data sheet. Optional Zener diodes (D3 – D5) can be used if the pull-up voltage exceeds the rated absolute maximum. (If the interface pins on the DC826C-A /DC826C-B will be pulled up to an external supply, LEDs D1 and D2 should be removed.)
Fig. 1. DC826C-A/DC826C-B Example Setup
SCHEMATIC DIAGRAM
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