LTC2950-2/LTC2951-2 Pushbutton On/Off Controller

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 $\overline{\text{PB}}$ pin to ground which in turn sets the $\overline{\text{EN}}$ pin low (see Note 1). Shorting $\overline{\text{PB}}$ to ground a second time subsequently resets the $\overline{\text{EN}}$ pin high. The $\overline{\text{EN}}$ 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 $\overline{\text{PB}}$ on and off times. For the DC826C-B, JP1 selects $\overline{\text{KILL}}$ times while JP2 selects off times. JP3 ties and unties $\overline{\text{KILL}}$ to $\overline{\text{INT}}$ for immediate or delayed turn off. The $\overline{\text{INT}}$ 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 $\overline{\text{EN}}$ 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)

PART	ENABLE	ONT	OFFT	KILLT	DEMO BOARD
LTC2950-1	EN	32ms + Cap. Adjust*	32ms + Cap. Adjust*	1000ms	N/A
LTC2950-2	$\overline{\text{EN}}$	32ms + Cap. Adjust*	32ms + Cap. Adjust*	1000ms	DC826C-A
LTC2951-1	EN	128ms	32ms + Cap. Adjust*	128ms + Cap. Adjust*	N/A
LTC2951-2	$\overline{\text{EN}}$	128ms	32ms + Cap. Adjust*	128ms + Cap. Adjust*	DC826C-B

*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 [µF/ms] • (t_{ONT} – 1ms)

C_{OFFT} = 1.56e-4 [µF/ms] • (t_{OFFT} – 1ms)

C_{KILLT} = 1.56e-4 [µF/ms] • ($t_{\overline{KILL}, \text{ OFF DELAY, ADDITIONAL}}$ – 1ms)

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 V_{IN} 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 $\overline{PB}$ 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 $\overline{EN}$ 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 $\overline{EN}$ is connected to the $\overline{SHDN}$ pin of a DC/DC converter and how $\overline{INT}$ and $\overline{KILL}$ interfaces with a µP or µC. An internal 500ms timer blanks (ignores) the $\overline{KILL}$ 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 ($\overline{INT}$ = low) to turning off the DC/DC converter ($\overline{EN}$ = 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 $\overline{PB}$ duration. The red LED D1 shows the state of the $\overline{INT}$ pin. A µP can turn off the converter with no delay by asserting $\overline{KILL}$ low. By tying $\overline{KILL}$ to $\overline{INT}$ through JP3, $\overline{KILL}$ is forced low during the $\overline{INT}$ blanking time and thus forces a turn off.

The RC (R_{RPP} and C_{RPP}) at V_{IN} 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 $\overline{PB}$ 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 $\overline{INT}$, $\overline{EN}$, and $\overline{KILL}$ 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.)

OPERATING PRINCIPLES

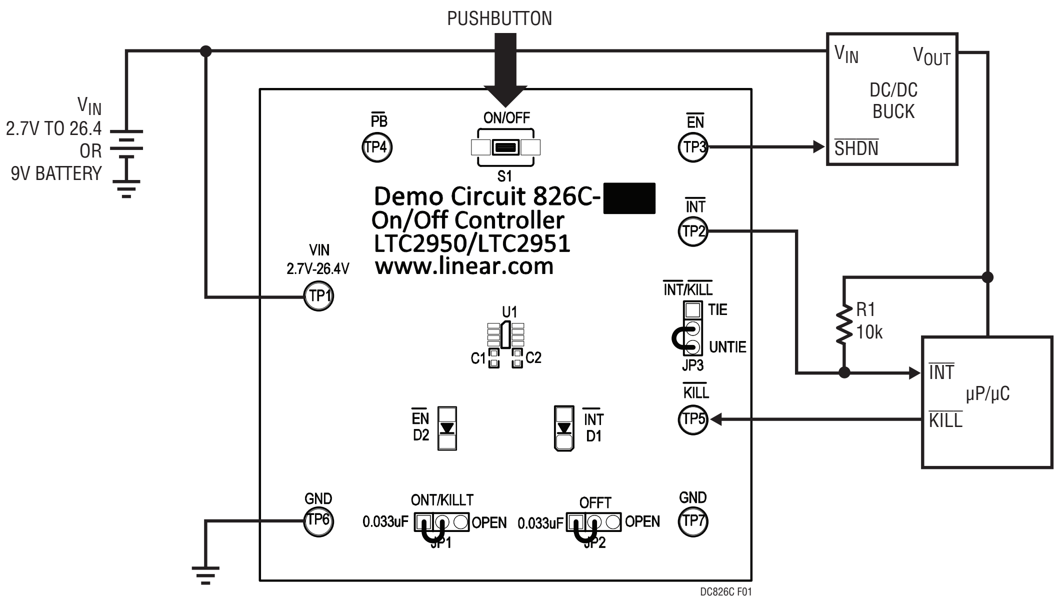
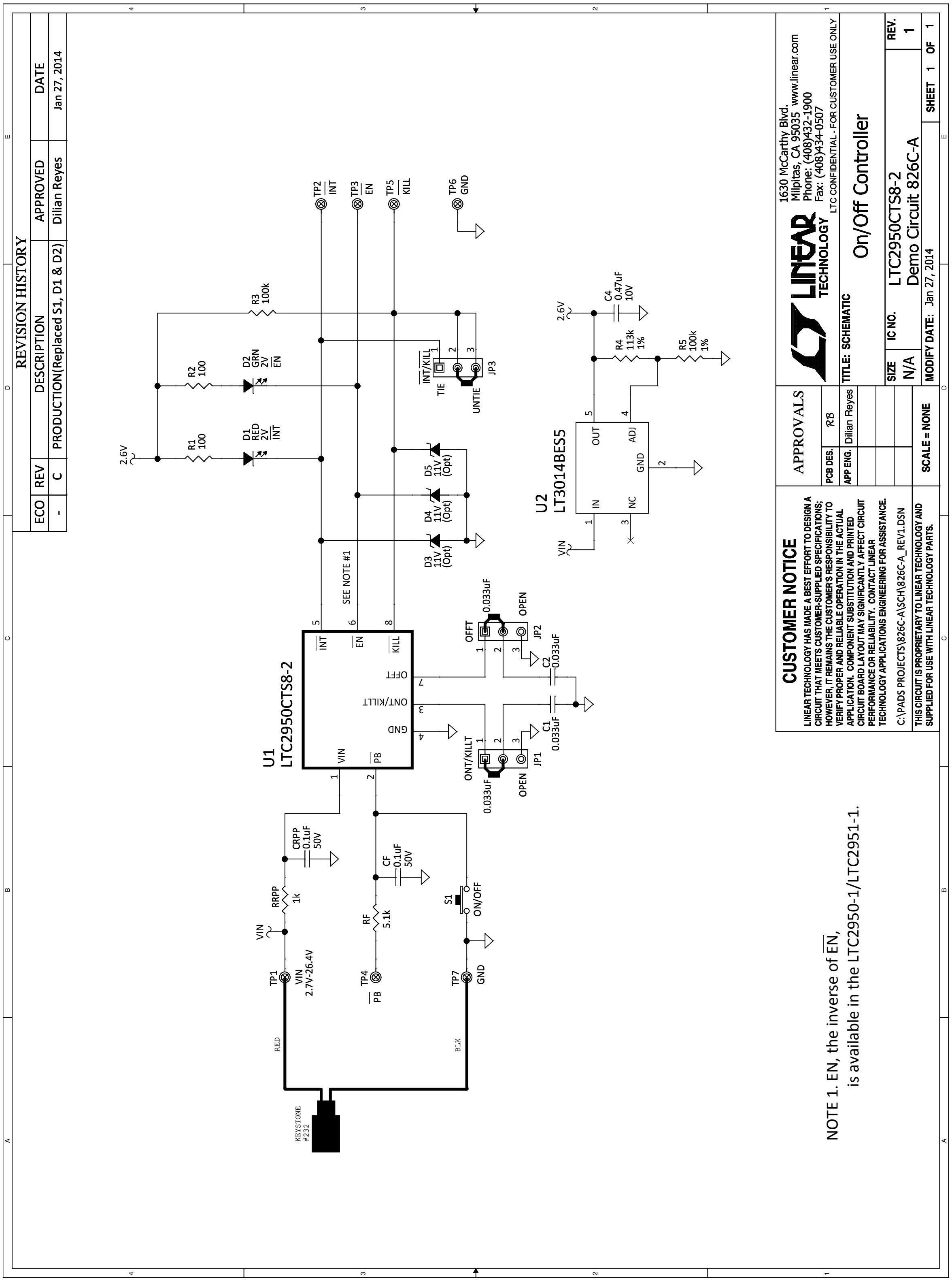


Figure 1. DC826C-A/DC826C-B Example Setup

SCHEMATIC DIAGRAM



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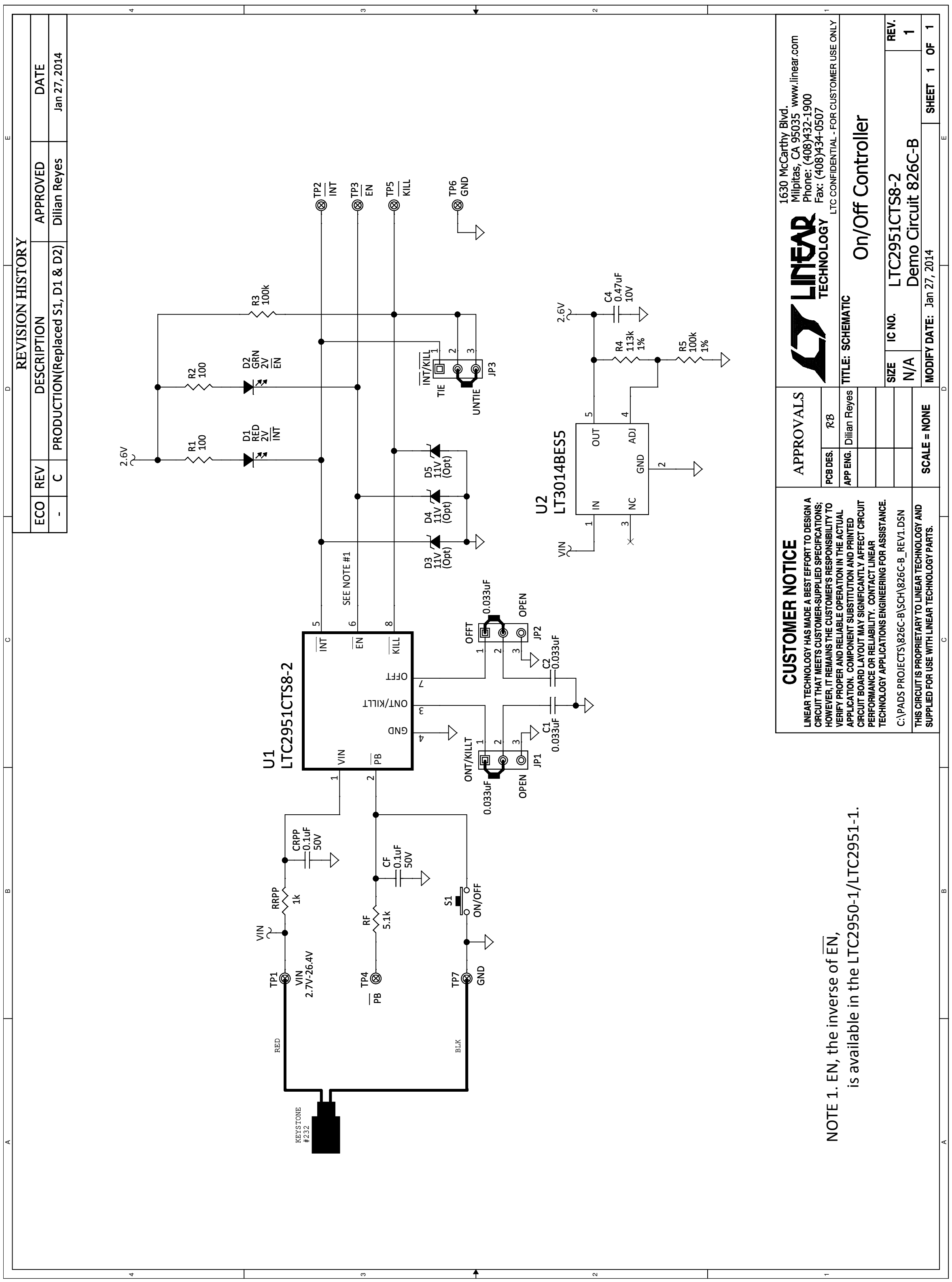

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Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 ● FAX: (408) 434-0507 ● www.linear.com

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