Migrating from the TI TL770x to the TI TLC770x

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Device functionality

The TI TL770x is a proven processor supervisory circuit built in bipolar technology, however, one of the consequences of using bipolar technology is the requirement for high supply current. To meet the demand of low supply current in battery applications, Texas Instruments introduced the CMOS TLC770x family of supervisors. Since the TL770x and TLC770x are not drop-in compatible, some modifications must be made to convert a design for the bipolar part to a CMOS-based design. Those modifications are detailed in this application note. With the exception of pin 1, the devices are pin-for-pin compatible.

Circuit changes

Pin 1 of the TL770x is a reference pin and a 0.1-µF capacitor is recommended to reduce the influence of fast transients in the supply voltage. This was not deemed necessary for the TLC770x, so the part was given added functionality. On the TLC770x, pin 1 adds power-down support for static RAM. When the TLC770x's pin 1 (CONTROL) is left floating (there is an internal pull-down resistor), RESET will act as active high. The voltage monitor contains additional logic intended for control of static memories with battery backup during power failure. Figure 2 shows the configuration for driving the chip select (/CS) of the memory circuit with the RESET output of the TLC770x while the CONTROL input is driven by the microprocessor's memory bank select signal (/CSH1). The memory circuit is automatically disabled during a power loss. In most applications, this function is not needed and leaving the pin floating retains the part's normal functionality.

Timing

The delay timing of the two parts is also different due to their internal current sources. Figure 3 shows the timing equations used to determine the time delay (t_d) for the A and B version of the bipolar TL770x and for the TLC770x CMOS device.

Another difference between the TL770x and TLC770x is the requirement for pull-up and pull-down resistors on the TLC770x reset outputs; the TLC770x does not have this requirement. The bipolar device uses open collector outputs and the CMOS device has push-pull outputs (see Figure 4).

Finally, the internal reference voltage is different for the two devices. The reference voltage on the bipolar part is 2.5 V, whereas the reference voltage for the CMOS part is 1.1 V. This will only affect the design of the adjustable part when selecting the resistor divider values between the supply and sense lines.

Figure 1. Different functionality of pin 1

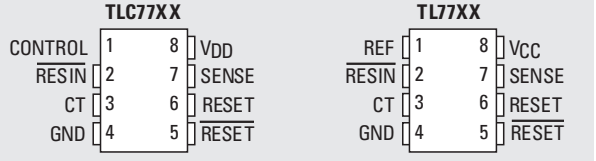


Figure 2. Data retention during power-down

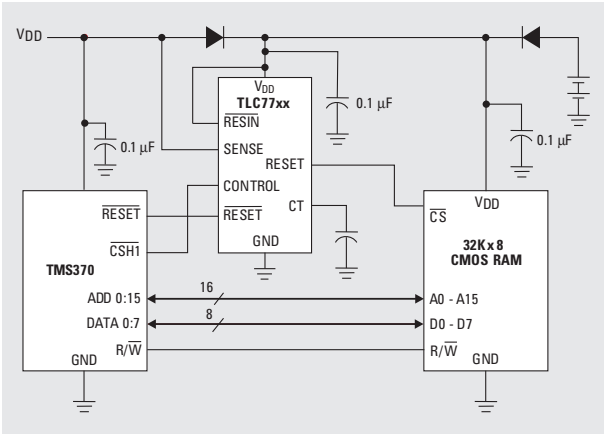
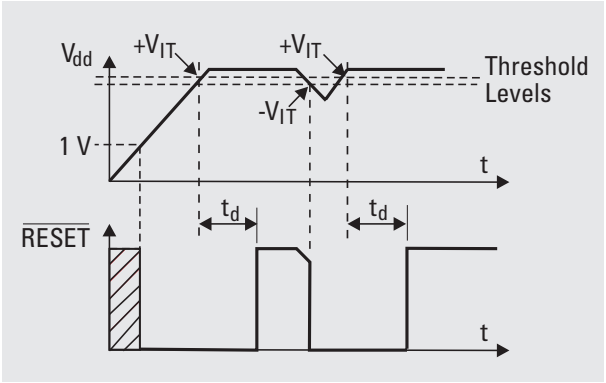


Figure 3. Definition of delay time, t_d



TL770xA: $t_d = 1.3 \times 10E4 \times C_T$ **(1)**
TL770xB: $t_d = 2.6 \times 10E4 \times C_T$ **(2)**
TLC770x: $t_d = 2.1 \times 10E4 \times C_T$ **(3)**

where t_d = delay time in seconds and C_T = capacitance in farads.

Figures 5 and 6 show a comparison of the functional block diagrams of both circuits.

Summary

To convert a design from the bipolar TL770x to the CMOS TLC770x, the following circuit changes must be made:

1. Remove the capacitor on pin 1.
2. Change the value of the timing capacitor according to the timing equations.
3. Remove the pull-up and pull-down resistors on the reset outputs.
4. Recalculate the resistor divider based on the different reference voltage (only necessary for the adjustable part).

Figure 4. Totem-pole vs. open collector outputs

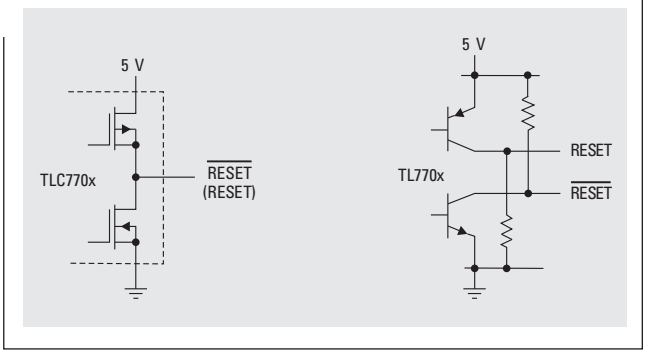


Figure 5. Internal functional diagram of the CMOS TLC770xx

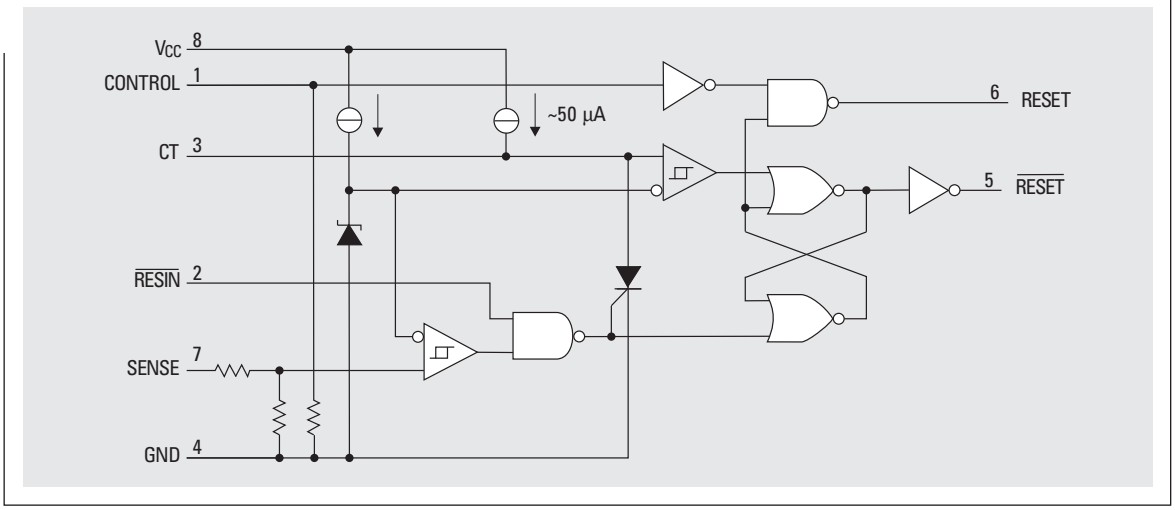
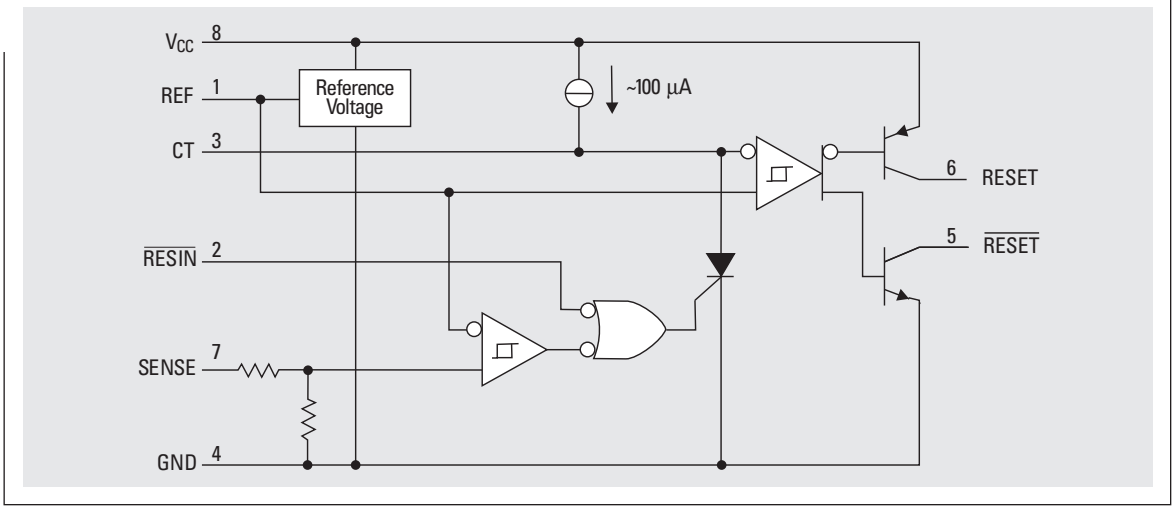


Figure 6. Internal functional diagram of the bipolar TL770xx



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