Flickering Christmas Candle

Hardware and Software design by Cliff Leitch

A flickering blow mold LED Noel candle

This is a conversion of a 39” high General Foam Plastics / Empire Noel Candle to use LED’s that flicker instead of the original 15 or 25 watt incandescent bulb. The converted candle is about as bright as with the original incandescent bulb.

Blow mold decorations are scarce these days, but I bought 2 candles from http://paulsoutdoordecorations.com/, and they are probably available from other sources in the months before Christmas.

An Atmel AVR ATtiny25 microcontroller is used.

The circuit could be easily adapted to control smaller single LED candles, as well.

Principle of Operation

The microcontroller is programmed to generate a pseudorandom sequence of numbers to control the flicker effect. The sequence does not repeat for about 15 minutes, so the flicker appears very random, with no noticeable pattern.

The output signal is pulse width modulated to control LED brightness. Timing is set for about 70 samples/sec output with the default internal clock of 1.0 MHz.

Several parameters in the code can be changed to control the flicker effect. See the notes in file Candle.asm.

Caution: The LED’s are operated near their maximum rating, so it is important that a regulated power supply be used. A voltage even slightly higher than the 12 volts specified could damage the LED’s. Most AC adapters are not regulated and will put out a voltage as much as 8 volts higher than their label rating. However, the Walmart #5008 has internal regulation to keep the voltage constant at very close to 12.0 volts.

The 12 volts must be reduced to < 5 volts for the microcontroller, and that is the purpose of the white LED connected between the VCC and GND terminals of the microcontroller.

Files included in this Package

Candle.asm – Software for the ATtiny25 microcontroller in AVR Studio 4 assembly language.

Candle.hex – Software for the microcontroller in binary format, ready to program into the microcontroller's flash memory.

CandleSchematic.emf – Schematic diagram in Windows Metafile format

CandleSchematic.sch – Schematic diagram in ExpressPCB format

CandleConstruction.jpg – A photo of the candle with the plastic flame removed. The circuit is built on a transparent sheet of Lexan (polycarbonate) so the light from the LED's can illuminate both sides of the flame. The Lexan panel was cut from an 8" X 10" replacement window pane from Home Depot.

Holes were drilled in the panel to mount the LED's and other parts though the panel, and they were soldered in place. The polycarbonate material can tolerate the heat of soldering without melting.

40 general purpose wide angle yellow LED's illuminate the flame, and 9 wide angle warm white LED's are pointed down into the body of the candle to illuminate it.