

The Juliet (candle) Trinculo's Attic Spec Sheet

The Trinculo's Attic Juliet Candle is an incredibly small microcontroller-controlled LED candle. In its default mode, it accurately replicates the flicker pattern of a tea light, while it can be easily switched into a high flicker pillar candle mode if desired.

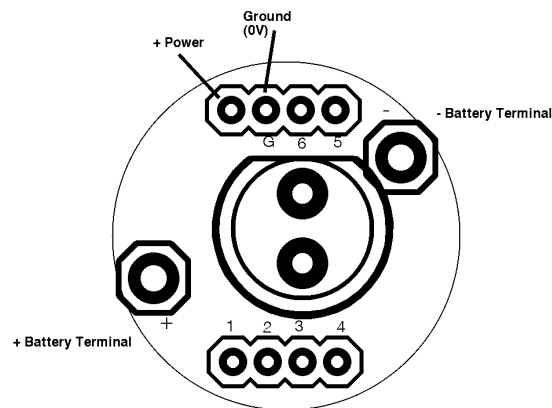
Like a real candle, it does not constantly flicker, but has periods of smooth output interrupted by periods of flicker. When you first turn it on, it may start in a smooth output period; you may need to wait several seconds for the LED to flicker.

Electrical Characteristics

Absolute maximum voltage rating is 5.5V, but it is not recommended to apply more than 3.3V, as operation above 3.3V will reduce the life of the LED.

Pins 1-6 are connected to digital IO pins on the microcontroller. Pin 4 is connected to the LED, but is broken out in case you want to use it for something else.

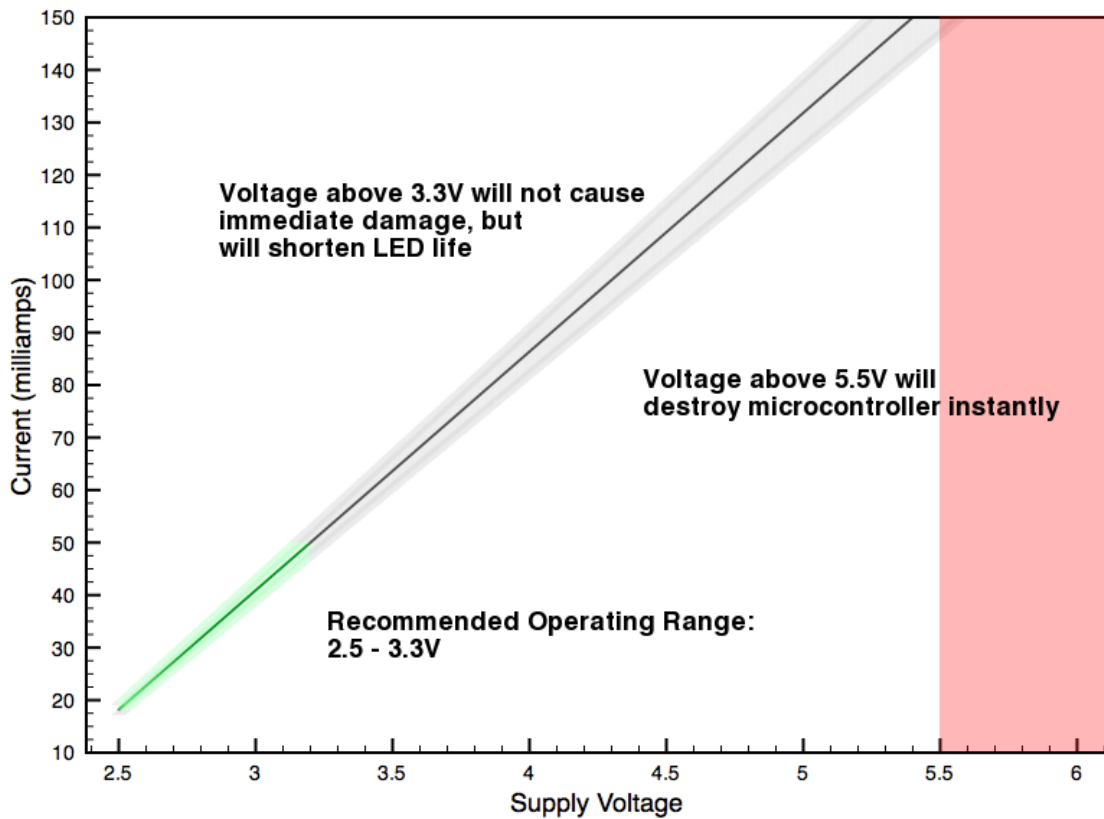
The large power terminals are labeled + and -, but can also be identified by their positions relative to the components on the underside of the candle, or by the relationship to the pin labels on the top side. Generally, the red wire from a battery will connect to the + terminal and the black wire will connect to the - terminal. However, always check polarity before connecting.



Applying reverse voltage to the candle will instantly destroy it. Never connect the + terminal of a power supply or battery to the - terminal on the board.

Applying voltages above 5.5V will instantly destroy the board.

Minimum required voltage to operate is 2.5V, with the current consumption looking like this:



Operation is supported from a single 3V lithium cell, but lifetime before the output begins to dim will be only a few hours.

The Juliet Candle is available in the following colors:

- Amber (standard, default)
- White (standard)
- Red
- Blue
- Green

We can also supply the candle with any 5mm LED you specify.

Photometrics

When supplied with 3.3V, the candle will output approximately 2-3 candela in an oval pattern about 110 degrees wide x 80 degrees tall. When used inside a pillar candle, you can keep the LED pointing straight up; however, if the pillar is only

visible from one side, a better look may be achieved by pointing the LED at the wall of the pillar.

Flicker Profiles

The candle has a total of 100 seconds of flicker profiles stored onboard, split between low flicker (tea light), and high flicker (pillar candle). These profiles are based off of recordings of real candles, and on startup, the candles start at a random point in the recording to avoid syncing between multiple candles. However, if you have more than 18 candles on stage, there is a 50% chance that two or more will start up at the same place in the data.

From the factory, we have four candle profiles available: A, B, C, & D. If you do not specify upon ordering, we'll ship you profile A; if you order more than 18 units, we'll ship you a mixed group. Profiles are very similar in look, but the data is different between all of them, preventing them from syncing up. The factory profile is identifiable by a paint dot on the microcontroller on the bottom of the candle:

- Silver dot, or no dot: A
- White dot: B
- Green dot: C
- Pink dot: D

To switch from low to high flicker mode, use a short piece of 24-28 gauge solid wire (Cat3 phone wire and Cat5 solid ethernet wire are good sources) to connect between Pin 1 and Ground. You will probably not need to solder this in place unless the candle is moved around a bit. To switch back to low mode, simply remove this wire.

Power Supplies

The candle is supplied standard without a power supply. We can supply them with attached or separate power supplies. When ordering attached power supplies other than the Micro Tealight configuration, please specify how much lead you'd like between the battery and the candle.

Micro Tealight

This is a standard configuration that allows the candle to sit upright without additional support. The candle is factory soldered to a CR2032 battery holder, giving it an overall size of 1.25" x 0.875" x 0.875" tall.

In this configuration, the only way to turn the candle on or off is to install or remove the battery. Add-on boards cannot be attached, since the board is tight to the battery holder.

A CR2032 battery has a capacity of 225mAh at 3V, allowing the candle to run for approximately 4 hours at full brightness.

2x AAA Battery With Switch

We can supply the candle attached to a battery holder that takes 2 AAA batteries and has an on/off switch. We can also supply this battery holder separately, without attaching it to the candle. AAA batteries have a capacity of approximately 1000mAh, allowing one candle to operate for 20 hours before starting to dim. You can also run up to 10 candles off of this single battery pack. Dimensions: 2.7" x 1.3" x 0.72", except at the switch where it is 0.77" thick.

2x AA Battery with Switch

We can also supply the candle attached (or not) to a battery holder that takes 2 AA batteries, again with a switch. Two AA batteries will power one candle for about 40 hours, and can run up to 20 candles. Dimensions: 2.5" x 1.0" x 0.6", except at the switch where it is 0.7" thick.

1x AAA battery with switch and boost

Particularly for taper candles, having a skinny battery pack is preferred. We can supply a AAA battery with a boost circuit that raises its voltage to 3.3V. The boost circuit is about 80% efficient, so you will get approximately 6-8 hours of capacity from a single AAA battery. Dimensions: 1.95" x 0.65" x 0.65".

AC Supply

Also available is a plug-in power supply, which connects to 120V AC power (or a dimmer), and can power up to 10 candles. Dimming the AC supply is not recommended; please provide 100% or 0% to avoid unpredictable behavior.

Options

The Juliet Candle has several optional add-on functions and boards. The Integrated Light Sensor is currently available, and the Movement Sensor, Programmer and TrinculoNet Adapter will be available in Fall 2012.

Integrated Light Sensor

This add-on sensor can be supplied standard, and will cause the candle to turn off when the light drops below a certain level. By default, this is programmed to be fairly sensitive, needing close to a full blackout to turn off the candle. This allows you to use a very low light level on the candles to turn them on, setting the scene.

The Light Sensor is equipped with a trimpot that allows the user to make adjustments to the sensor's light threshold.

To calibrate the sensor:

1. Set the stage or room lighting to the level at which you want the candle to turn on.
2. Turn the candle on.
3. Gently turn the screw on the trimpot clockwise until it stops. The candle should be on (if it is not on, check that it's turned all the way clockwise, a AAA battery is installed, and the power switch is actually on).
4. Turn the screw slowly counter-clockwise – after $\frac{3}{4}$ of a turn, you'll hit a stop (the candle will have turned off and back on as you turned). At this point, the candle will be on in almost any lighting conditions – it may not turn off even in a blackout.
5. Rotate the screw back clockwise until the candle just switches off. The candle is now calibrated to the currently lighting conditions, so when you reduce the lighting at all, the candle should turn off.

From this setting, rotating the screw clockwise will move the set point brighter; rotating it counterclockwise will move the set point darker. The set point will vary from unit to unit because of manufacturing differences in the light sensor, so be sure to calibrate each candle individually using the same lighting conditions if you want them to all go out at once.

To set the candle to be ON all the time:

Option 1 (temporary): Rotate the screw of the trimpot all the way clockwise. The point at which it turns back on under normal lighting is the point at which it stops looking for the light sensor and just stays on.

Option 2 (permanent): Remove the trimpot and connect a wire from the + terminal (the red wire) to Pin 5 on the board (this is the pin that the third wire from the trimpot is connected to). This is equivalent to turning the trimpot all the way clockwise, instructing the candle to stay on all the time. Soldering to the tiny board connectors isn't recommended, but you can use the wire already connected to the trimpot to do this.

Other light sensor options:

It is also possible to configure the candles to turn ON in a blackout, having them turn on when the light drops below a certain level and turn off when the lights come back up (if, for instance, you are using the candles as stage markers). Contact us for details.

Tybalt MS (movement sensor)

This add-on board can also be supplied standard, and will switch the operating mode of the candle when it senses movement. In its default configuration, this will cause the candle to start to flicker more (switch from low to high mode) when the candle is moved. This has the effect of causing the candles to flicker more when being picked up and carried, similar to the way a real candle would.

The Tybalt MS can also be configured (with the Nurse Candle Programmer) to turn off the candles when their orientation changes. That is, if a candelabra is knocked over, its candles can turn off when they begin to fall.

Only one Tybalt MS is required per set of candles run from the same power supply, as a single wire run between the candles will cause all to react the same.

TrinculoNet Adapter

This is a small add-on board that converts the pinout of the candle to the standard 4-pin TrinculoNet connector, allowing you to control candles with any of our controllers, including the Rosencrantz DMX Master Controller.

Nurse (candle programmer)

This board is more of a bench tool. It allows you to connect candles to your computer and change the configuration of individual candles. Our easy to use software allows you to load new flicker profiles, configure thresholds for blackouts, and adjust reactions to movement sensors.

The Nurse also functions as a general purpose programmer, allowing you to download your own programs to the candles; it will also program our 328 Controller and Tiny85 Controller.