

Ditto Manual

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Welcome to the miniature world of LED lighting! Whether a first-time or long-time electronics enthusiast, our goal is to make lighting your projects simple, painless, and fun!

The *Ditto* has been designed to duplicate an input signal to 6 *LED ports*, all within a footprint of 32mm x 16mm. Each port is driven independent of the others. These devices may be chained together to drive as many LED's as desired.

This manual explains how to connect the *Ditto* with different LED's and power sources. It also explains how to set LED brightness using the **CC** pin.

How to Connect...

...LED's to the Ditto

Most LED's work with the *Ditto*, including 3V resistorless LED's (micro, 3mm, 5mm, etc) and inline resistor LED's designed to operate between 4-24V. Compound LED's, such as LED strips or LED's with other circuits will not work.

The green connectors house 6 *LED ports* that accept either bare LED leads or wires that go to the LED's. The ports are labeled **o+**. The **+** indicates the positive side of the LED, known as the *anode*. This is typically red when wired, or the longer lead if bare. This side will always be at 5V. The **o** indicates the negative side of the LED, known as the *cathode*, and is typically black when wired. This side will vary from 5V down to 0V.

If the LED doesn't light, the connection may be reversed.

Avoid connecting the **G** pin to the LED cathode as it may damage the LED.

Warning: Do not use inductive circuits or coils (such as motors) with the LED ports, or the product may be damaged!

...Power to the Ditto

The *Ditto* is designed to work with one of the following:

- Another PowerCookie Board device to “daisy chain” to this one
- Battery pack with 3xAA or 3xAAA batteries

“Daisy chaining” power

There are two identical rows of **G/5V/CC** pins on the *Ditto*. Connect one row of the **G/5V/CC** pins of the *Ditto* to the **G/5V/CC** pins of another device using a typical servo cable (female-female) or *Daisy chaining wires* available from PowerCookie Boards. The second **G/5V/CC** row may be used to connect to more *Dittos* or other PowerCookie Boards devices.

Battery pack

A battery pack with less than 5.99 volts when fully charged may be used. The positive side (typically red) must connect to the **5V** pin of the *Ditto*. The negative side (typically black) must connect to the **G** pin. With only these two pins connected, the LED's should operate at full brightness. If they do not, check connections and try again.

Setting LED Brightness

The **Chained Control (CC)** pin controls the brightness of the *Ditto* from an external source. Each *Ditto* in a “daisy chain” is affected in the same way.

If left unconnected, the **CC** pin will be pulled down internally to **G** (0 volts) and the *Ditto* will light LED's at full brightness.

If the **CC** pin is pulled to between 2 and 5.99 volts, the *Ditto* will turn off. A switch connected between **CC** and **5V** would function as a light switch.

Finally, if the **CC** pin is connected to a *Light Valve's CCout* or connected to the lettered side of an *LED port* from a *Morsel*, the brightness or effect will be duplicated across the *Ditto's LED ports*.

“Daisy chain” Limits

There is no practical limit to the number of *Ditto* and other PowerCookie Boards devices that can be “daisy chained” together by observing the following guidelines.

Power Distribution

Additional power should be distributed every 10 to 30 boards, the exact number depending on cable length and LED's used. If LED's appear less bright, add more power further down the “daisy chain”. For example, if USB power will be used, periodically include devices in the chain that accept USB power.

If a system contains multiple *Light Valve's* or *Morsel's*, it is possible a faint flicker will appear on some LED's. This is because LED's operating together can cause power surges that affect other LED's. The solution is simply to use a separate power source for each chain.

CC Propagation

If the **CC** pin is being used on the *Ditto*, the pin needs a repeater about every 100 devices to propagate the signal reliably. One *LED port* of a *Ditto* can be used as a repeater by connecting the **lettered side** of the *LED port* to the **CC** pin of the next device in the chain.

Technical Specifications

Operating Voltage: 2.4 - 5.99 Volts

Operating Current (no LED's attached): 3mA

Maximum Current (all bare LED's attached, full on): 120-180mA, depending on color.

Dimensions: 31.8mm x 15.8mm x 12mm plus connectors

Hole size: 5.1mm. Hole center spacing: 8mm V, 24mm H.

Underside spacers recommended: 2mm thick, plastic.

