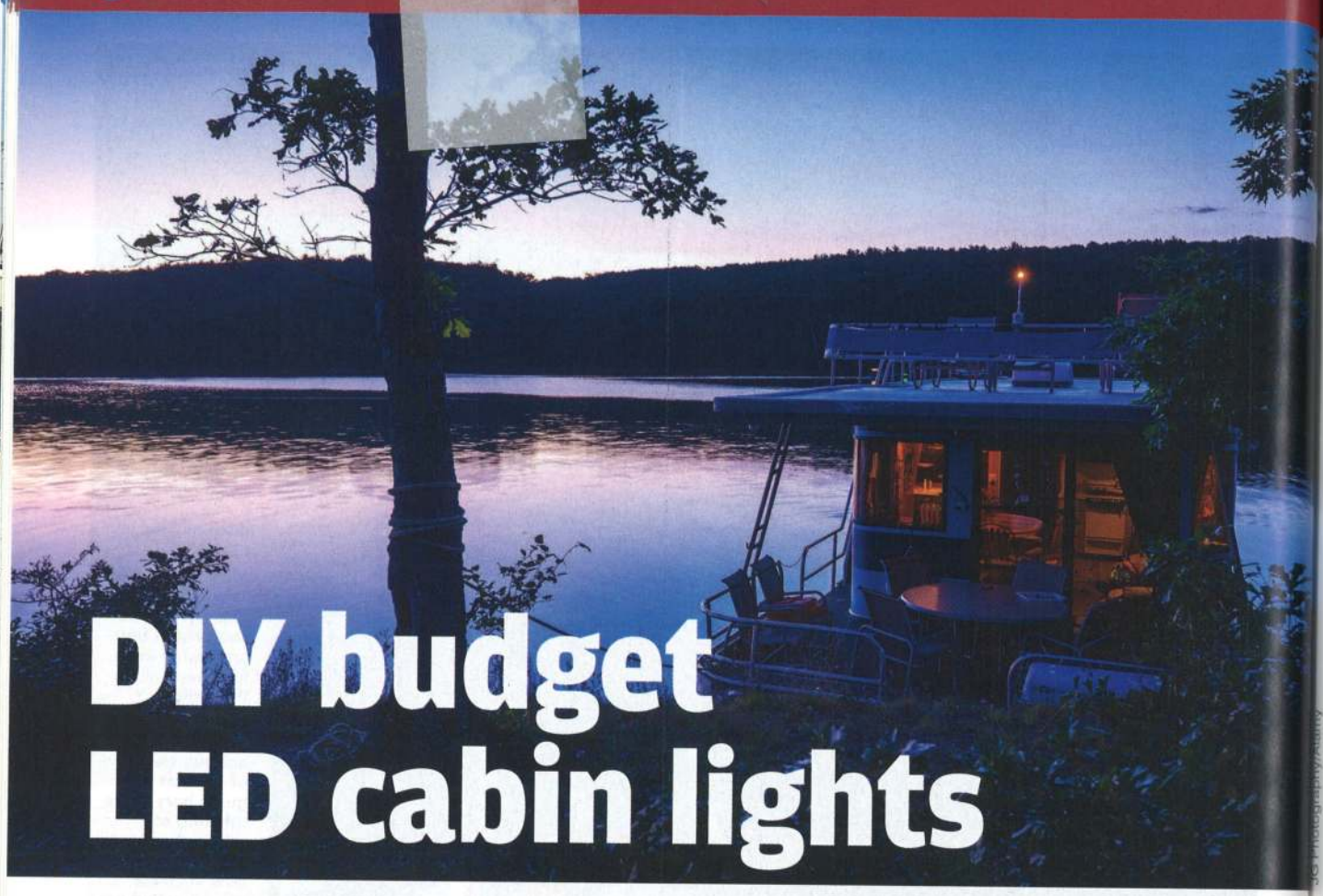


DIY budget LED cabin lights

Zoran Glozinic shows how he fitted budget LED cabin lights

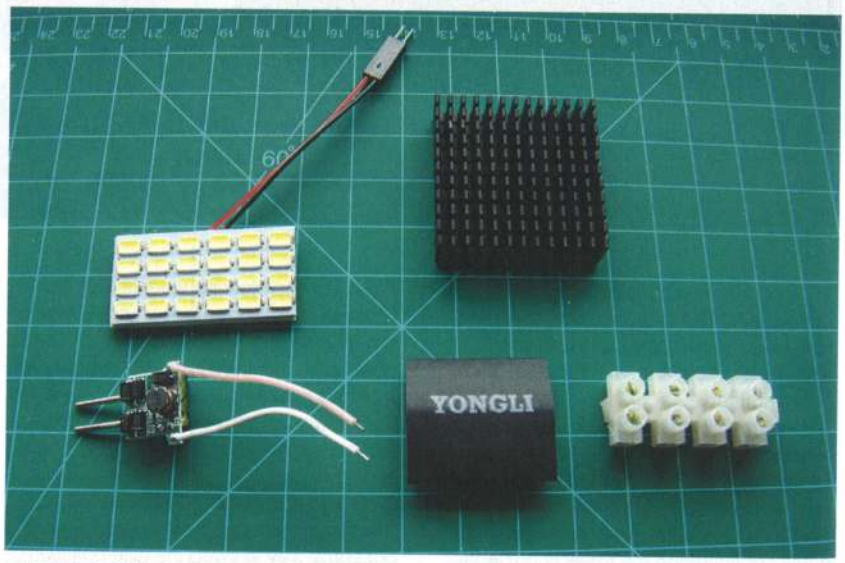
During long Quebec winters, when my small yacht is well tucked up to await the next sailing season, I often amuse myself by keeping busy with various small boat-related projects.

A few winters ago I decided to follow the trend and go 'full LED'.

The first job was to modify the cabin lights: traditional round lights with brass body and halogen bulbs. My yacht has only one battery and I try to avoid unnecessary power drain whenever I can, often relying on my oil-lamp when evenings are not too hot. By replacing halogen bulbs with LED I hoped to further reduce power consumption while aboard.

ABOUT THE AUTHOR

Zoran Glozinic is a retired business professional who has been messing around boats and old cars all his life. He currently lives in Laval, Quebec where he divides his free time between a good old English bilge-keel boat and an 18 year old Saab car.



ABOVE The components required for an LED conversion

INSET LEFT Old style incandescent halogen lamp

DIY LED light installation

Checking some chandlery websites I could see that LED bulbs were readily available for the G4 sockets I had in my cabin lights. However the price of $40 Canadian (these have since come down to $20) for each bulb made me look for more affordable solution.

After some research on ebay I ordered a few different types of LED array lights, some small heat sinks and a bag of assembled LED drivers.

An LED driver is a small electrical device/circuit used to regulate power to one or more LEDs. If LEDs are subjected to higher voltage than designed for, they will overheat and burn out.

The LED arrays I bought were designed to run on 12V and the accompanying documentation stated no requirement to use a LED driver. I tested a few of them by leaving them continuously on for up to 48 hours, using a car battery as the source of 12V power. They didn't burn out, but were running very hot, I couldn't touch them. After connecting the LED driver

between the LED array and the battery, the loss of light output was negligible but they were not getting anywhere near as hot; I could hold my finger on them without getting burned.

I removed the cabin lights and after taking off the lenses, I was able to unscrew the G4 sockets and remove them. I left the original switches in place and crimped a bullet connector to the end of the wire I had to cut. I mounted the LED array directly on the light housing under the lens, using supplied double sided tape. The light housing acts as a heat sink for the LED array. The pins of the LED drivers were connected with 12V power wires using small screw-type terminal connectors. The wires toward the LED array were soldered. I used heat-shrink tubing where needed, and also over the LED driver to isolate it from the brass housing.

In one of the cabin lights I installed two LED arrays. I was concerned about heat dissipation so I used a small heat sink under the arrays – luckily there was enough room under the lens to mount everything. Each of the two LED arrays was connected to a dedicated LED driver, as the drivers I purchased could only handle maximum 3W of power each.

The project was interesting and occupied me for some time. Buying G4-compatible LED bulbs and installing them would have certainly been much faster and easier, but I believe this was a much more satisfying way to upgrade my cabin lights.

TOP TIP

Pay particular attention to polarity (positive/negative): the LED array must be connected properly otherwise the light will not work. The same applies for LED drivers.

Power draw calculations

The typical output of a low-voltage halogen bulb is around 24 lumens per watt. Each of the 10W bulbs I replaced was providing about 240 lumens of light output. I verified the current draw myself: at 12V each 10W bulb was drawing 0.83A from the house battery.

For only one light this is not much, but even a small yacht would most likely have more than one installed in the cabin so battery power drain created by these lights should not be ignored.

- **I used 24 x SMD 5730 LED chips in the arrays to replace my halogen bulbs**
- **The light output of each array was specified as 480 lumens**
- **The power was 2.9W, so theoretically the current draw for one array should be 0.24A.**

Surface mounted Devices (SMDs) are LEDs mounted directly to some kind of surface without using wires. There are many different SMD LED chips – when I worked on this project the most popular were SMD 5630, 5730 and 5050. These chips differ in regard to their characteristics, but for yacht cabin lights, these differences will not be visible in most cases, although the light output could vary.

I tested current draw: the LED arrays were doing a bit better than noted in their specification sheet, drawing only 0.20A each. Most likely the SMD chips used to build these arrays were not up to their spec exactly, probably being less powerful and emitting less light.

I counted three different generations of each type/model of SMD chip, so you can never be exactly sure of their performance regarding light output (lumens) or power draw. Considering low prices when buying directly from suppliers, you can always order a few varieties and do some testing before deciding which to use.

As another benefit, the cost of doing it was minimal – looking at the prices today you can get a small heat sink for less than C$1; 10 x LED drivers for less than C$7 and prices for small LED arrays start at less than C$3.

Another option would be to use LED 12V light strips instead of LED arrays. The strips can be cut to shorter sections and installed in similar type of light housing as described here.

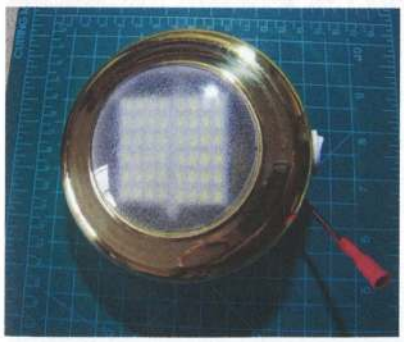
Based on my calculations (see panel, above) the LED cabin lights are using a quarter of the power of the halogen bulbs they replaced, while the amount of light in my cabin has increased.

The only complaint I have is the light colour; I find the LED bulbs emit 'too cool' white light but that is really a question of taste, I guess. Softer white lights are now available, and you can also get red LED bulbs if you want to illuminate your chart table at night.

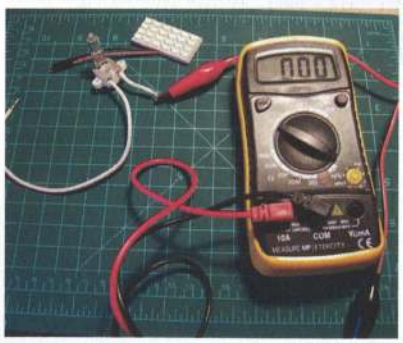
A single LED array fits easily inside the brass light housing

Back side of light housing. The LED driver is hidden inside black heat-shrink tube

Rear view of a double array light. Note the two LED drivers in black heat shrink



Double LED array with lens installed



Checking power draw with a multimeter

A 10W halogen bulb draws 0.83A