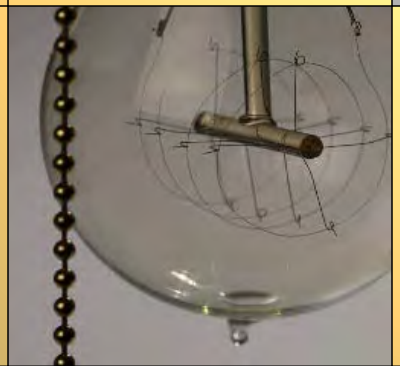


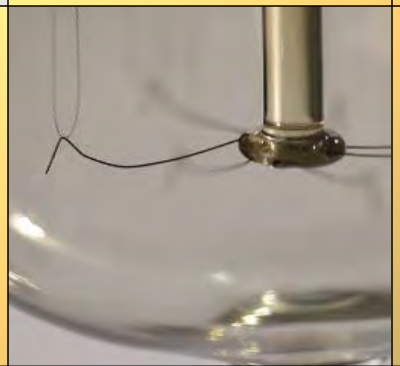
Lighting

Your Layout

With



LED



Tape

Overview

What is LED Tape Lighting?

A continuous strip of surface mount device (SMD) light emitting diode (LED) semiconductor devices, wired in parallel, with integral current limiting resistors, affixed to a plastic tape substrate with self-adhesive backing.

Overview

What is LED Tape Lighting?

Operates on low voltage, typically 12 volts DC (polarized + / -) from a power supply.

Originally developed for under-counter kitchen lighting and architectural effects.

There's a waterproof kind – not needed and has disadvantages for layouts

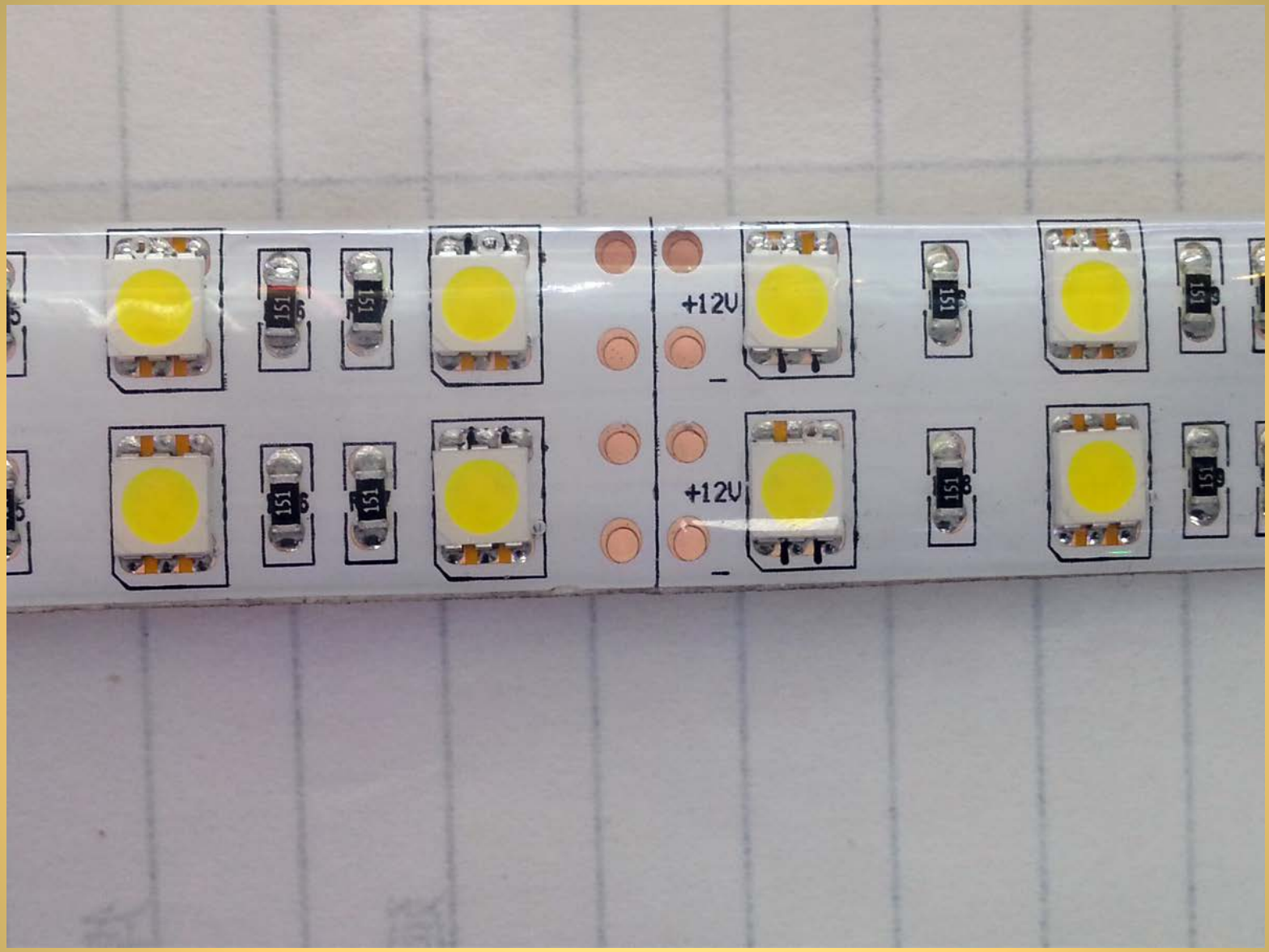
Typical LED lighting kit

Overview

What is LED Tape Lighting?

Typically supplied in 5-meter (16.4 foot) rolls. Can be cut shorter.

Dimmable, subject to emission of significant electro-magnetic interference (EMI)



Closeup of type 5050 LED tape

Overview

What is LED Tape Lighting?

At the layout surface, and more than 1” away from the tape, no perceivable heat emission. “Cool light”

BUT LEDs and tape can get hot (150°) and must be affixed to mounting materials that can withstand this.

Overview

What is LED Tape Lighting?

Available in white and colors, and multi-colors, and different backs

Overview

Variables to Consider

1. Light output
2. LED unit size
3. Color temperature
4. Power consumption
5. Light dissipation or coverage

Light Output

~~Don't think watts~~

Think lumens

Light output in lumens is affected by LED unit size, power consumption and number per roll.

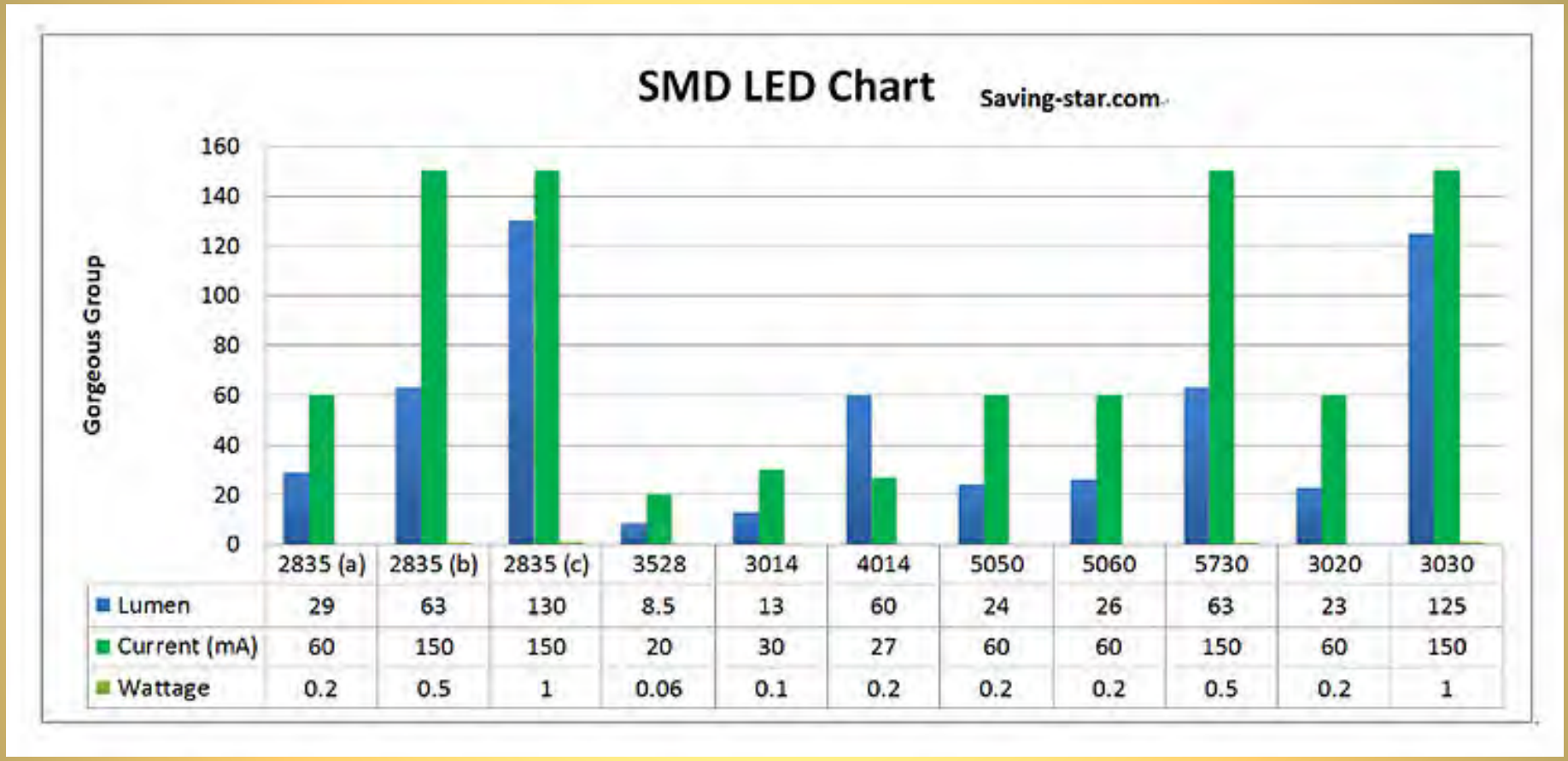
Wattage (power consumption) is still important for power supply planning.

Light Output

Comparison to Conventional Light Bulbs

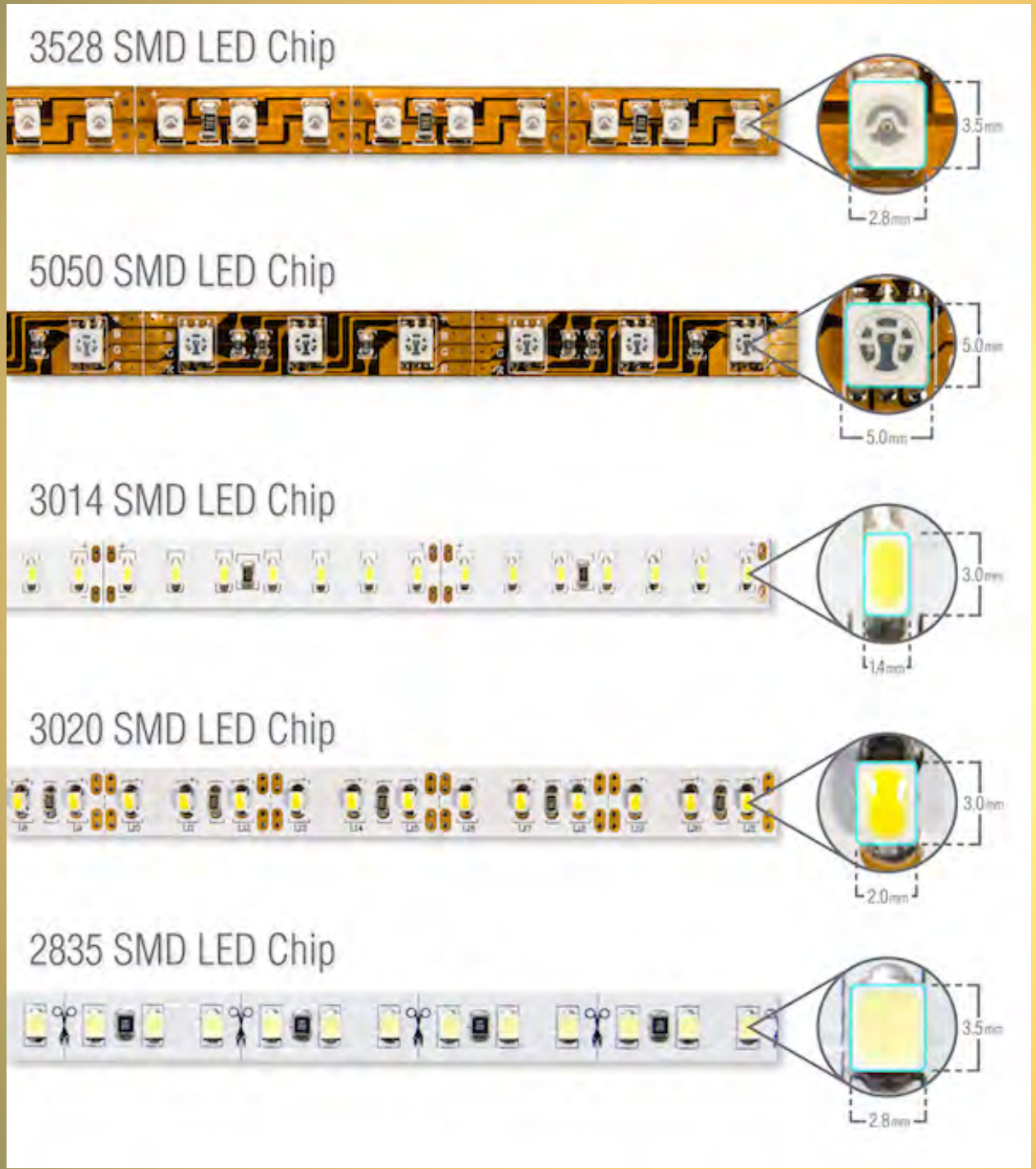
Watts	Lumens
15	100
25	250
40	450
60	800
75	1,100
100	1,600
150	2,600

Light Output



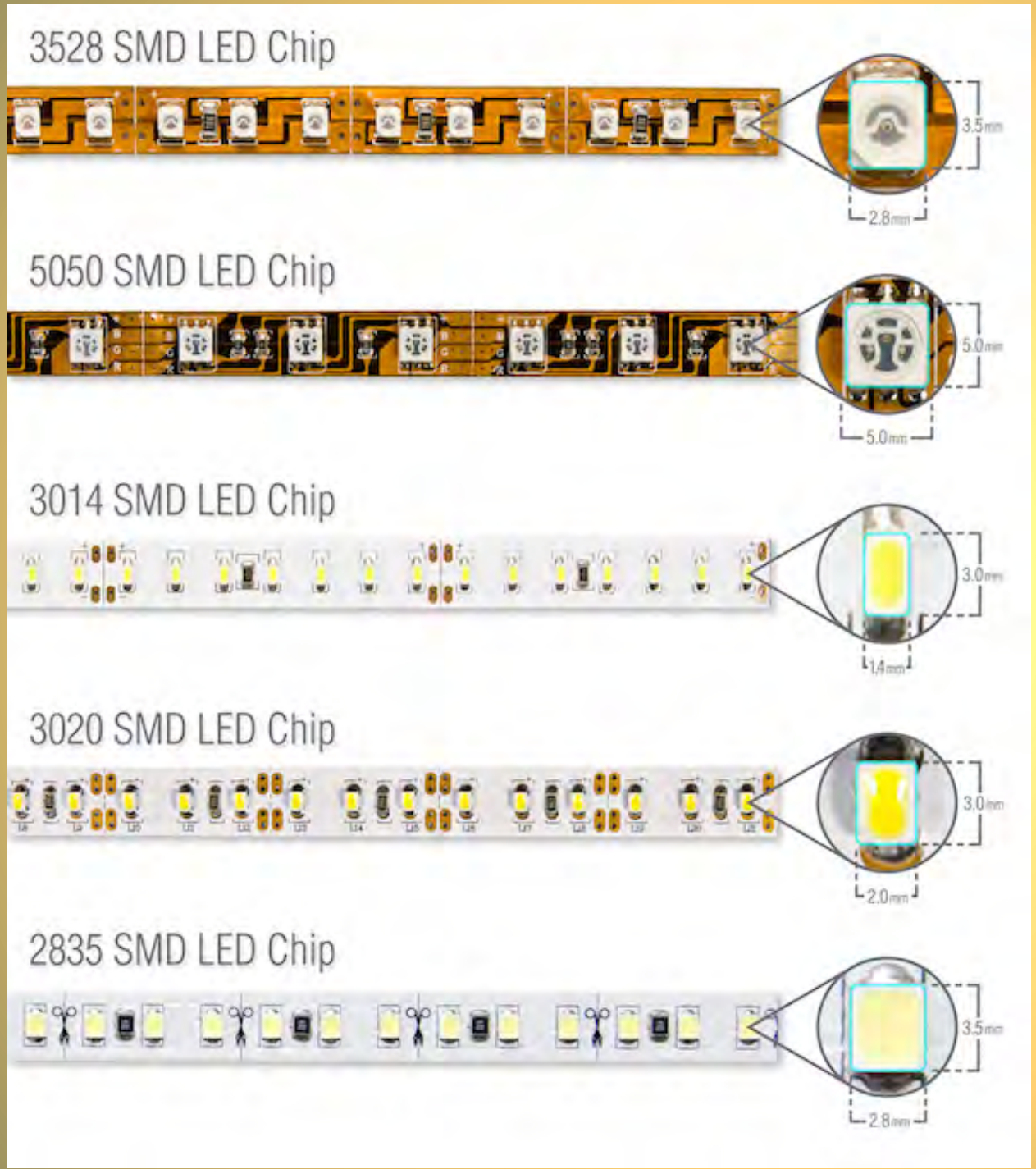
	2835 (a)	2835 (b)	2835 (c)	3528	3014	4014	5050	5060	5730	3020	3030
Lumen	29	63	130	8.5	13	60	24	26	63	23	125
Current (mA)	60	150	150	20	30	27	60	60	150	60	150
Wattage	0.2	0.5	1	0.06	0.1	0.2	0.2	0.2	0.5	0.2	1

Lumen = per individual SMD LED unit
(Often 300 per roll, but not always)
http://www.saving-star.com/smd-led-comparison/



LED Unit Size

(Numbers indicate LED package dimensions, HxW in 0.1mm)



LED Unit Size

Package size does not inherently indicate light output. Need to know lumens per watt.

LED Unit Size

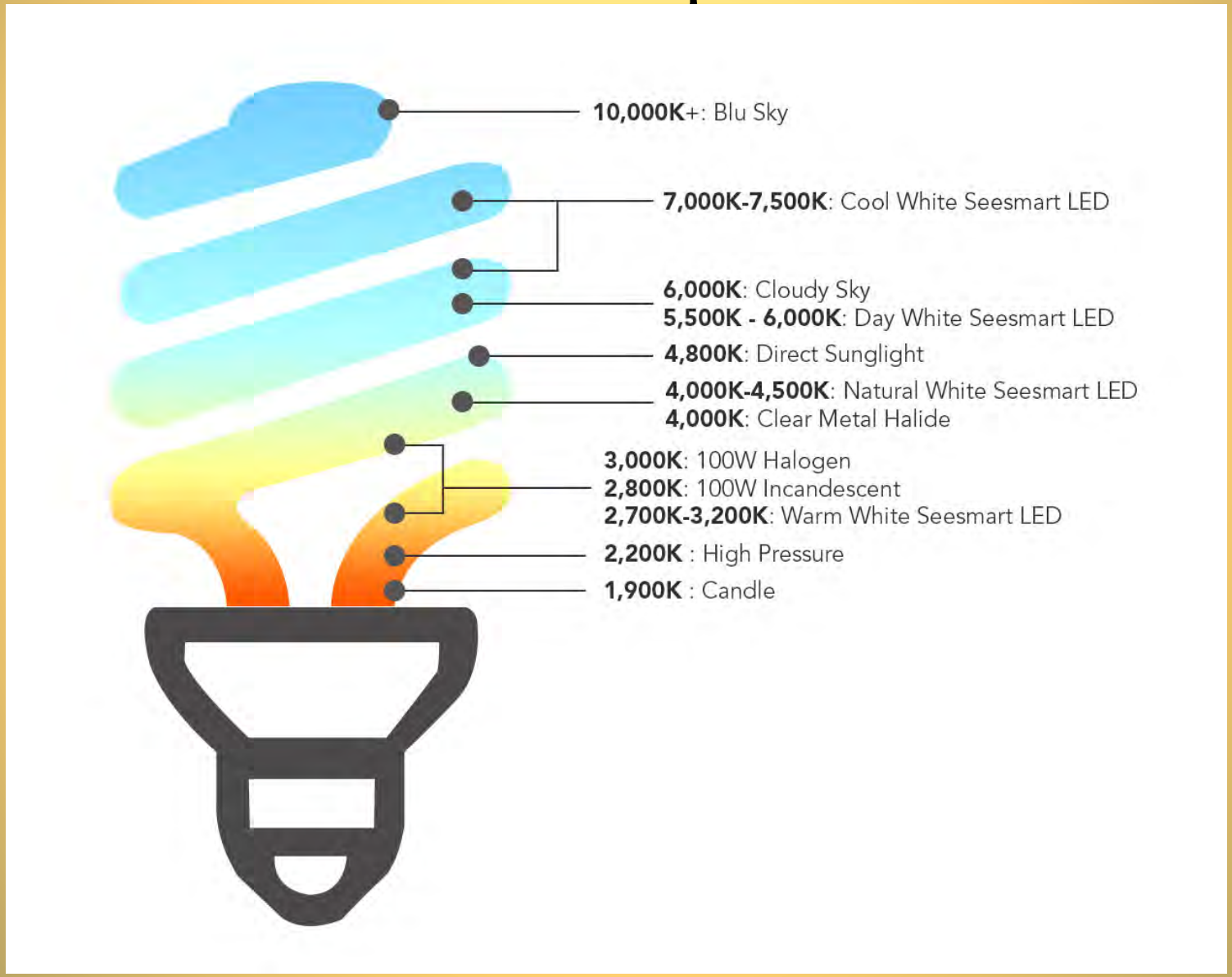
LEDMO 2835 600LEDs Warm White LED Strip, 16.4Ft DC12V Non-waterproof 15LM/LEDs 3000K, 3 times brightness than SMD3528 LED, LED Ribbon, LED Light Strip, LED Strip Light - $10.90 Free Shipping for Prime Members

Specifications

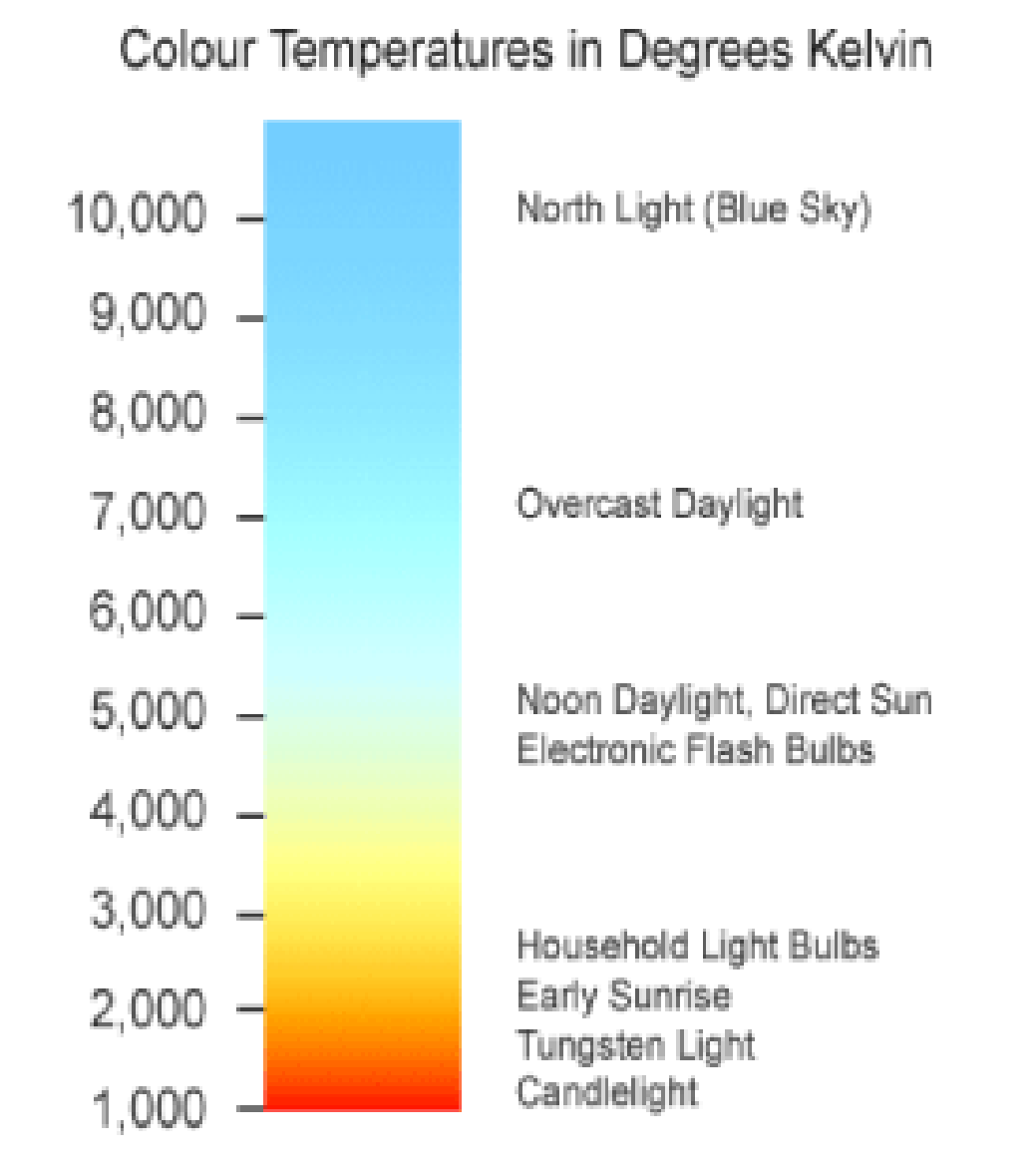
*** LED Type: High Quality SMD2835 LED Light StripTop LED, 3 times brightness than SMD3528 LEDs**
*** Quantity of LED: 600 LEDs**
*** Input Voltage: DC12V**
*** Light Color: Warm White (2800-3000K)**
*** Light Output (lumen): 15LM/LED**
*** Length: 16.4Ft (5m)**

3X brighter than 3528, which would be 8.5 x 3, or about 26 lumens. Same as the 2835: 26 lumens and 0.2 watts. 600 LEDs, so doing the math ...
26 lumens x 600 = 15,600 lumens - divide by 16.4 ft gives 950 lumens per foot
0.2 watts x 600 = 120 watts - divide by 16.4 ft gives 7.4 watts per foot
950 lumens per foot is 65+ watts of incandescent light equivalent per foot. For 6’ module sections that's 390+ watts of light, which is pretty bright.

Color Temperature



Color Temperature



Some modelers have reported success using one Warm White strip and one Cool White strip mounted in parallel and connected to separate power supplies to permit separate dimming.

Or one Warm White and one Blue strip to permit night effects and blending.

Power Consumption

The power source needed depends on the length that you cut the LED strip. Let's use the prior example:

- Each foot uses 7.4 watts.
- Let’s assume a 16-foot section of layout
- 7.4 x 16 = 118.4 watts for that 16 feet
- Add 20% more room in the power supply so take the wattage, and divide by .8 to get the power supply needed: 118.4 / .8 = 148 watt power supply or a 12-amp supply @ 12 VDC

Power Consumption

- There are 12VDC 30-amp supplies available on Amazon for about $20
- Typical power supplies included in lighting kits are 5 Amps. Old PC supplies sometimes usable (Dell) if not 5VDC
- For large layouts the number, space required and heat dissipation of power supply “bricks” adds up fast
- Number of 120 VAC circuits and their current rating must be considered

Mounting at the Layout

Self-adhesive backing intended for low-porosity substrates such as metal, laminate, or dense wood. Think cabinets.

The substrate must have heat dissipation capability.

Mounting at the Layout

PVC pipe will fail
Wood strips, molding, dowel
Aluminum angle
Drywall cap strips (plastic or metal)
Metal flashing over wood

Demo module uses unfinished Masonite strips, held with pan head screws. Lets you install/wire at the bench. Strips removable.

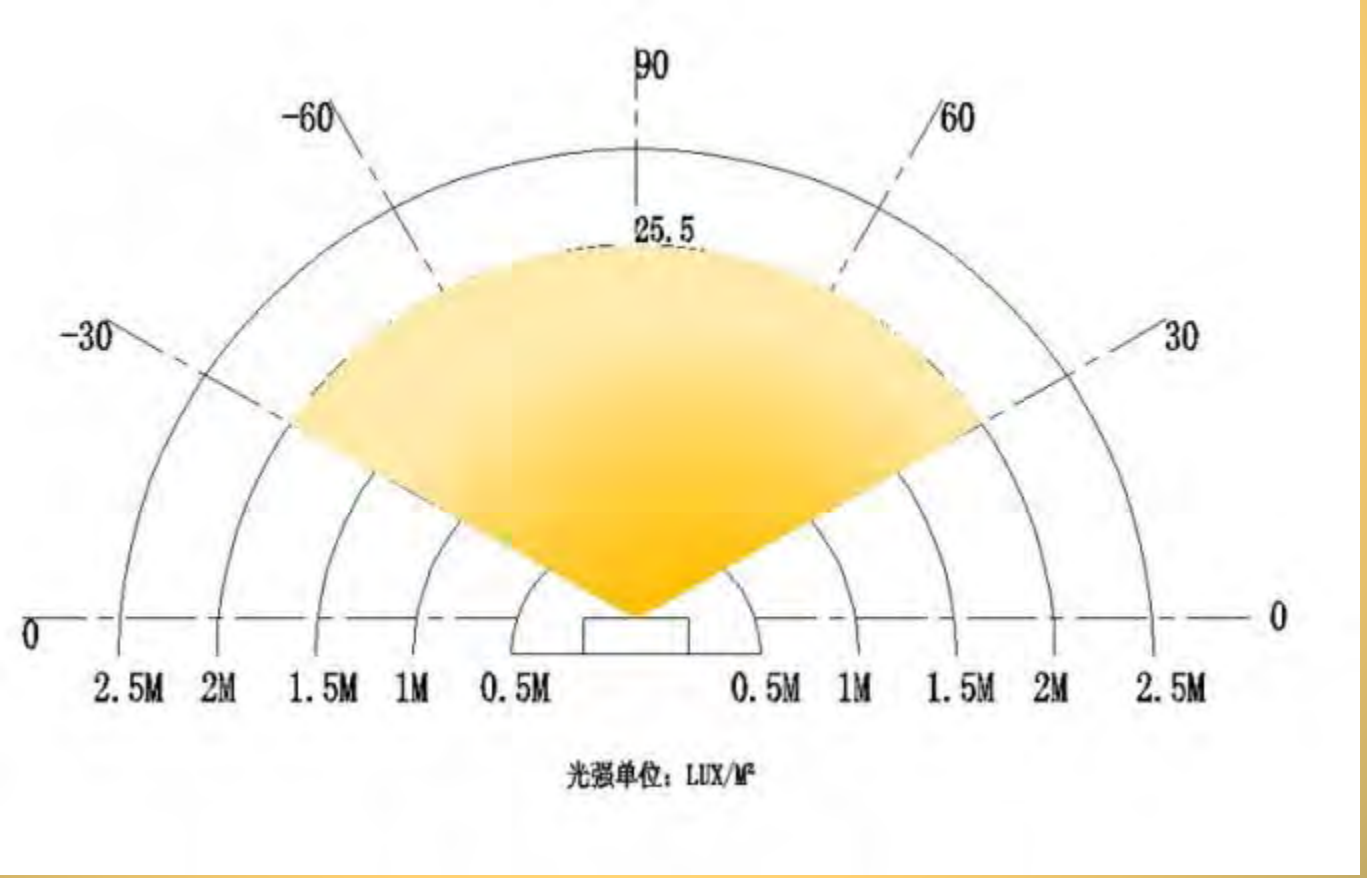
Mounting at the Layout

Rely only on self-adhesive? Some add duct tape, electrical tape, silicone adhesive, Gorilla glue

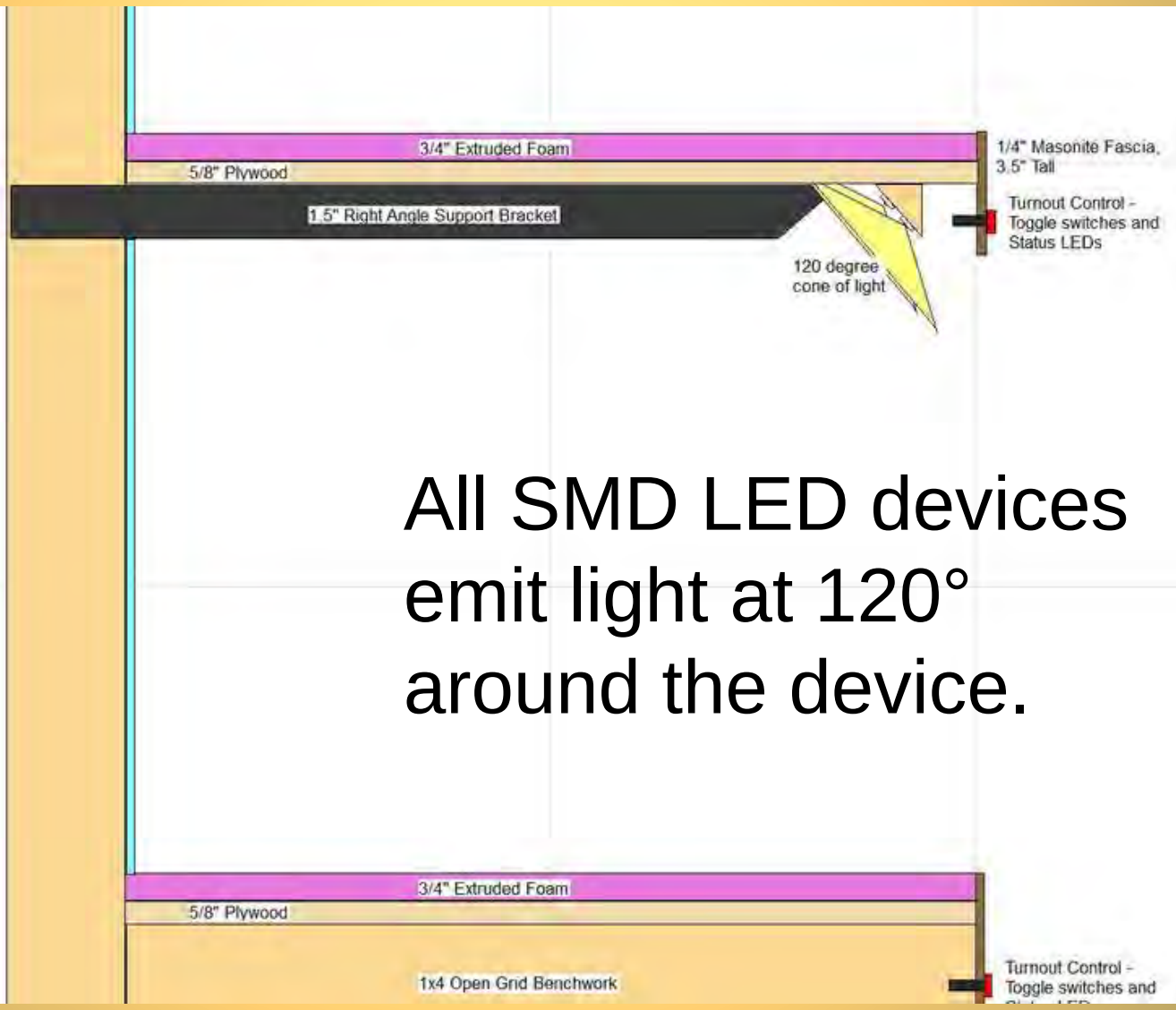
If you use the adhesive, replacement may require soldering upside down. Plastic clips/brackets/hold-downs?

Beam Angle Affects Mounting

All SMD LED devices emit light at 120° around the device.



Beam Angle Affects Mounting



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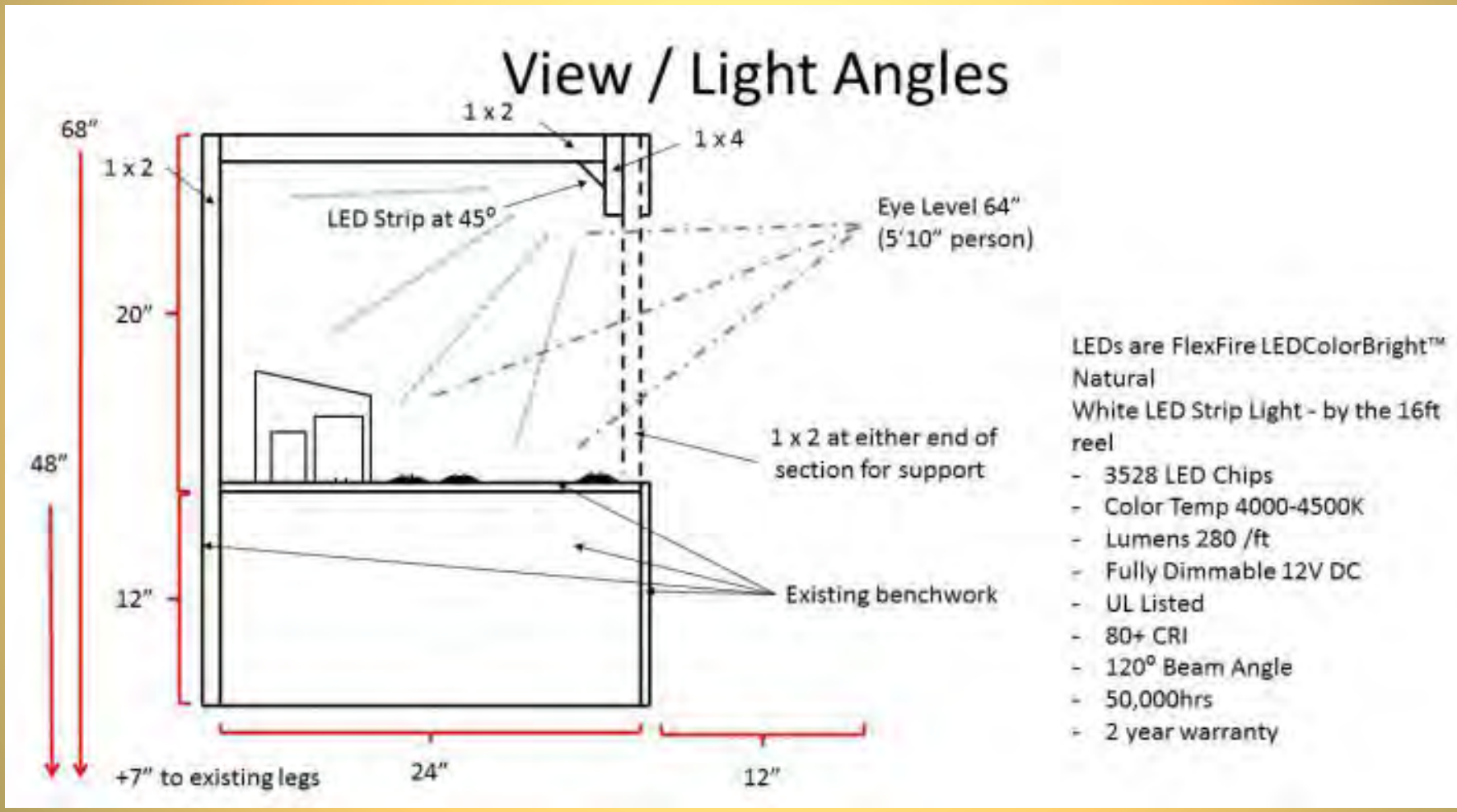
Beam Angle Affects Mounting

Source: Rick Wade on MRH

Beam Angle Affects Mounting

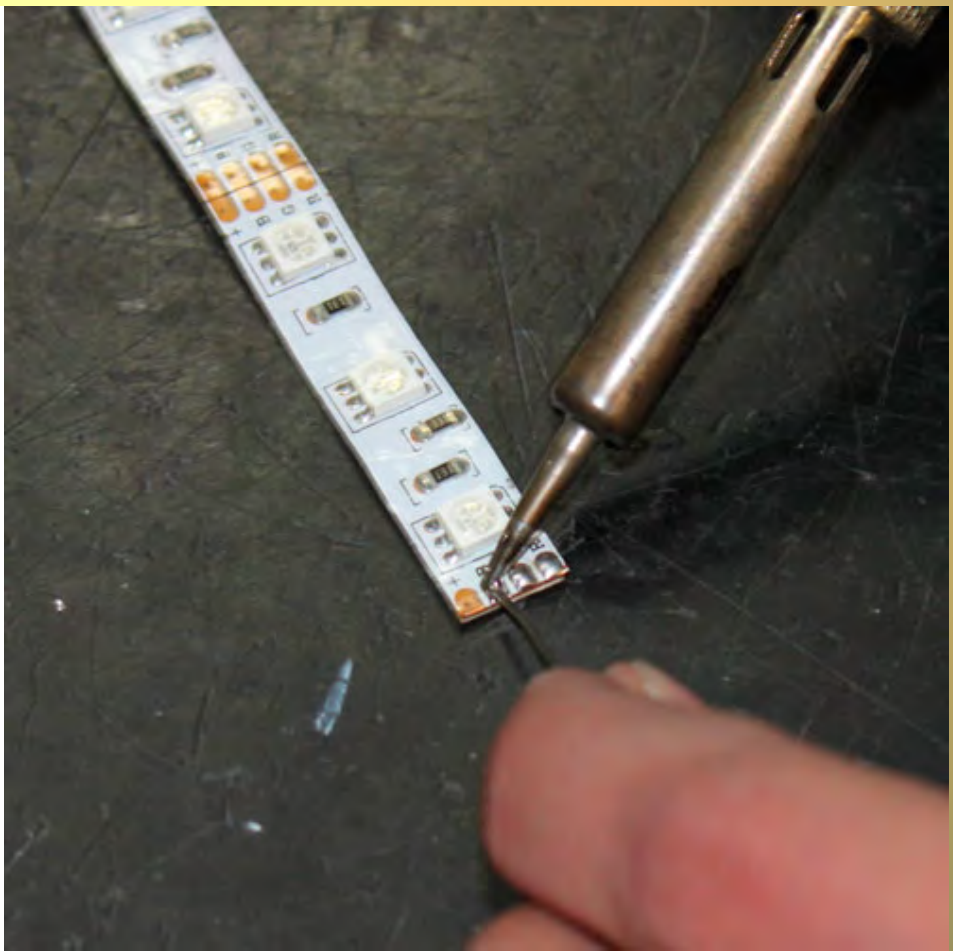


Multi-level Mounting Example

Mounting LED tape more than 24” above the layout surface may result in insufficient brightness at the layout surface. 3’ is definitely too high

Wiring to Power

Some rolls come with prewired mini coax connector, others pigtail wires, others nothing.



Wiring to Power

Do you need a power supply bus?
To power multiple strips arranged end to end, yes. Over a 5m strip, considerable voltage loss occurs.

Due to the high current carried, use 14-gauge bus.

Strips do not need to be electrically or mechanically joined together, just to the supply bus.

Dimming

Dimmers operate by switching LEDs on and off at extremely high rates using variable width pulses; result is EMI that can affect local use of digital TV and some radios.

No reports of problems with DCC radio throttles.

You may hear humming from power bricks.

Buying

Amazon
eBay
Big box stores
Home Depot/Lowe's (5X to 8X markup)

All strips are made in China. Lowest prices ($9-$10 per 5m roll) online, but be prepared to wait a month.

LED strip lighting "for the average Joe"

Fri, 2017-03-10 11:27 — joef Layout design Personal journal (editorial or commentary)
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As I'm planning out my new Siskiyou Line 2, one of the great modern tech developments that I want to use is LED strip lighting.

Here's how I've been conducting my research and how I evaluate the various LED strip product offerings. More details to follow ...

For further reading

http://model-railroad-hobbyist.com/node/29429

Thank you

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