



LED'S AND BULBS

THEIR CARE AND FEEDING

Metro-North Meeting
2/15/2020

HISTORY (THE BORING STUFF)

- Bulbs:
 - Incandescent, First Successful -1879 (Carbon Filament)
 - Incandescent -1915 (Tungsten Filaments as We Know Them Today)
- LED's:
 - Infrared -1961
 - Red - 1962
 - Orange, Yellow and Green - 1967
 - Blue – 1972 – 1993
 - White - 1996

BULBS

- “Voltage” device (Ratings like 1.5v, 5v, 12v, 110v)
- The filament is a resistor in a vacuum that glows when heated
- Very inefficient – 95+% of energy is converted to heat, not light
- Some model type bulbs (Miniatronics) have current ratings (i.e. 1.5v, 30mA)
- Ratings are important, especially if used in or near plastic
 - 12v, 50mA bulb creates .6 Watts of power, 95% of which is heat

BULBS - RATINGS

Color	Voltage	mA	Día. (mm)	Hours	Qty	Part #	Price \$
Clear	1.5	30	1.2	1,000	10	18-C03-10	17.95
Clear	1.5	25	1.34	500	10	18-025-10	17.23
Clear	1.5	25	1.34	500	20	18-025-20	31.27
Clear	12	30	1.7	5,000	10	18-712-10	22.63
Clear	12	30	1.7	5,000	20	18-712-20	40.95
Clear	1.5	40	1.7	5,000	10	18-701-10	22.63
Clear	1.5	40	1.7	5,000	20	18-701-20	40.95
Clear	12	50	2.4	10,000	10	18-012-10	16.15
Clear	12	50	2.4	10,000	20	18-012-20	30.19
Clear	14	30	2.4	16,000	10	18-014-10	17.7

BULBS - SIZES



Micro Mini Lamp, Clear, 2.4mm,
16v, 30mA, [10 pcs]



Micro Mini Lamp, Clear, 2.4mm,
16v, 30mA, [20 pcs]



Micro Mini Lamp, Clear, 5.5mm, 6v,
40mA, [10 pcs]



Micro Mini Lamp, Clear, 5.5mm, 6v,
40mA, [20 pcs]

BULBS - CALCULATIONS

- 1.5v bulb, 30mA
- DC – Use diode lighting (each diode drops .7v nominal)
- DCC – 12v nominal on blue wire (could be more)
 - Soundtraxx recommends 560 ohm 1/4 watt resistor
 - Could be too much, depending on decoder voltage and bulb current
 - Voltage drop over a resistor depends on the current
 - Ohm's Law: $V=IR$

LED'S

- “Current” Device (Ratings like 10mA, 20mA)
- Semiconductor material that gives off light when forward current is applied
- Very efficient – 95% of the energy is converted to light instead of heat
- Forward Voltage is important rating to figure resistor value, typically:
 - Red = 1.8v – 2.2v
 - Yellow = 1.9v – 2.3v
 - Green = 3.0v – 3.4v
 - Blue = 3.0v – 3.4v
 - White = 3.0v – 3.4v

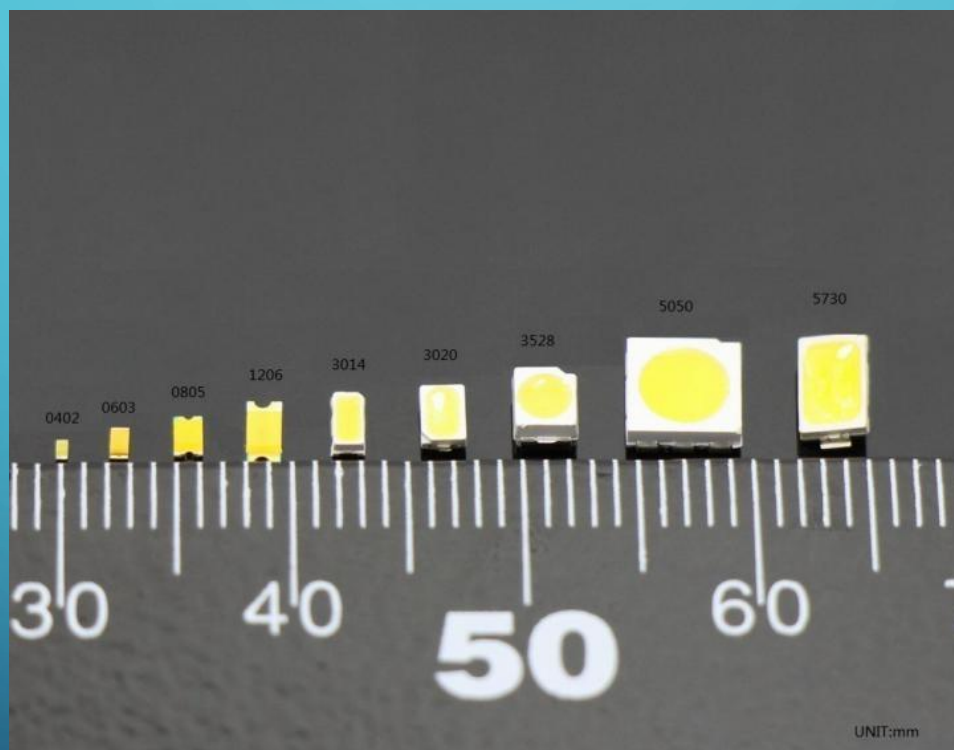
LED'S

- Colors are built in, not dyed like bulbs and permanent.
- Don't need to be colored.
- Color not determined by the plastic, but by the material that makes up the chip
- The efficiency of that material determines the forward voltage

LED'S - SIZES

- T1 (3mm)
- T1 $\frac{3}{4}$ (5mm)
- Surface mount LED's are sized by rectangular dimensions. Common ones are:
 - 1206 .12" x .06" (3.2mm x 1.6mm)
 - 0805 .08" x .05" (2mm x 1.2mm)
 - 0603 .06" x .03" (1.6mm x .8mm)
 - 0402 .04" x .02" (1mm x .5mm)

LED'S - SIZES



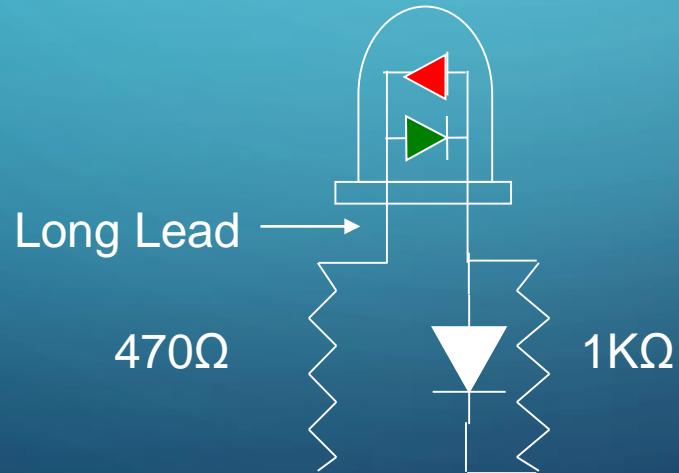
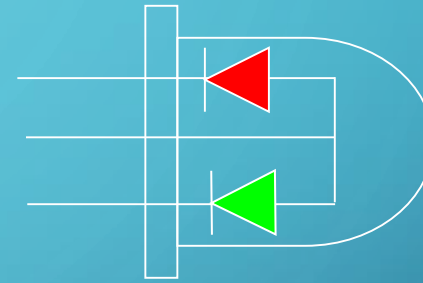
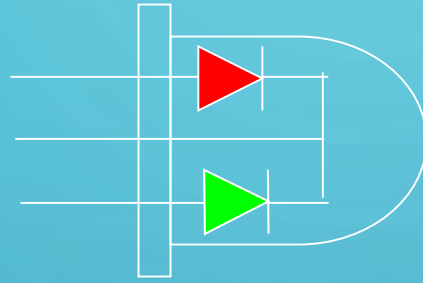
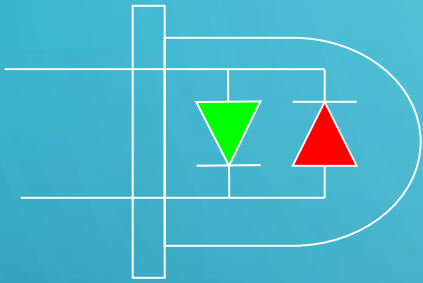
LED'S - CALCULATIONS

- V = Power Supply Voltage (transformer, decoder, etc.)
- V_F = LED Forward Voltage
- I = LED Forward Current
- R = Current Limiting Resistor
- $V - V_F = IR \rightarrow V - V_F / I = R$
- Example for White LED: $12 - 3 = 9 / .010 = 900$ Use $1K\Omega$ min, $2K\Omega$ usually works


BI-COLOR LED'S

- Red / Green commonly used for Model RR use
- 2 lead: Red and Green chips are in reverse parallel (can be yellow on AC)
- 3 lead: Red and Green chips are either cathode to cathode (common -) or anode to anode (common +)
- Because Red is more efficient than Green, a balancing circuit is helpful

BI-COLOR LED'S CONTINUED



DO IT YOURSELF, OR:



Free Shipping on Domestic Orders of \$34 and up

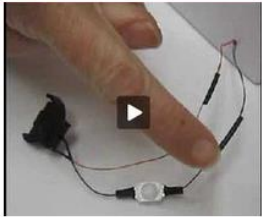
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LED LIGHT FREQUENTLY ASKED QUESTIONS

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The image features a blue gradient background with white circuit-like lines in the corners. The lines consist of straight segments and small circles, resembling a network or data flow diagram. The central text is in a large, white, sans-serif font.

QUESTIONS?