



# Lights and Sounds for Your Layout

by Brent Ciccone

# Simulating Life on Your Layout

We have trains that move, but the rest of the layout is dead!

Use lights and sound to simulate activity.

Solid state methods, no moving parts.

# Lets start simple with Lighting

## Building Lighting

- Simple - stick a building over top of a light

  - Not very realistic, but it works

- Better - Block off the building interior and light rooms individually

- Even better, Animate the lighting by having individual lights go on and off to indicate some life

- ❑ Lights - LED's only  
*Don't even think about using mini bulbs!*

- ❑ Many varieties of LED's

- ❑ 5 mm

- ❑ 3 mm

- ❑ 1.8 mm

- ❑ SMD's (Surface Mount Device)

- ❑ 402 0.04" X 0.02"

- ❑ 603 0.06" X 0.03"

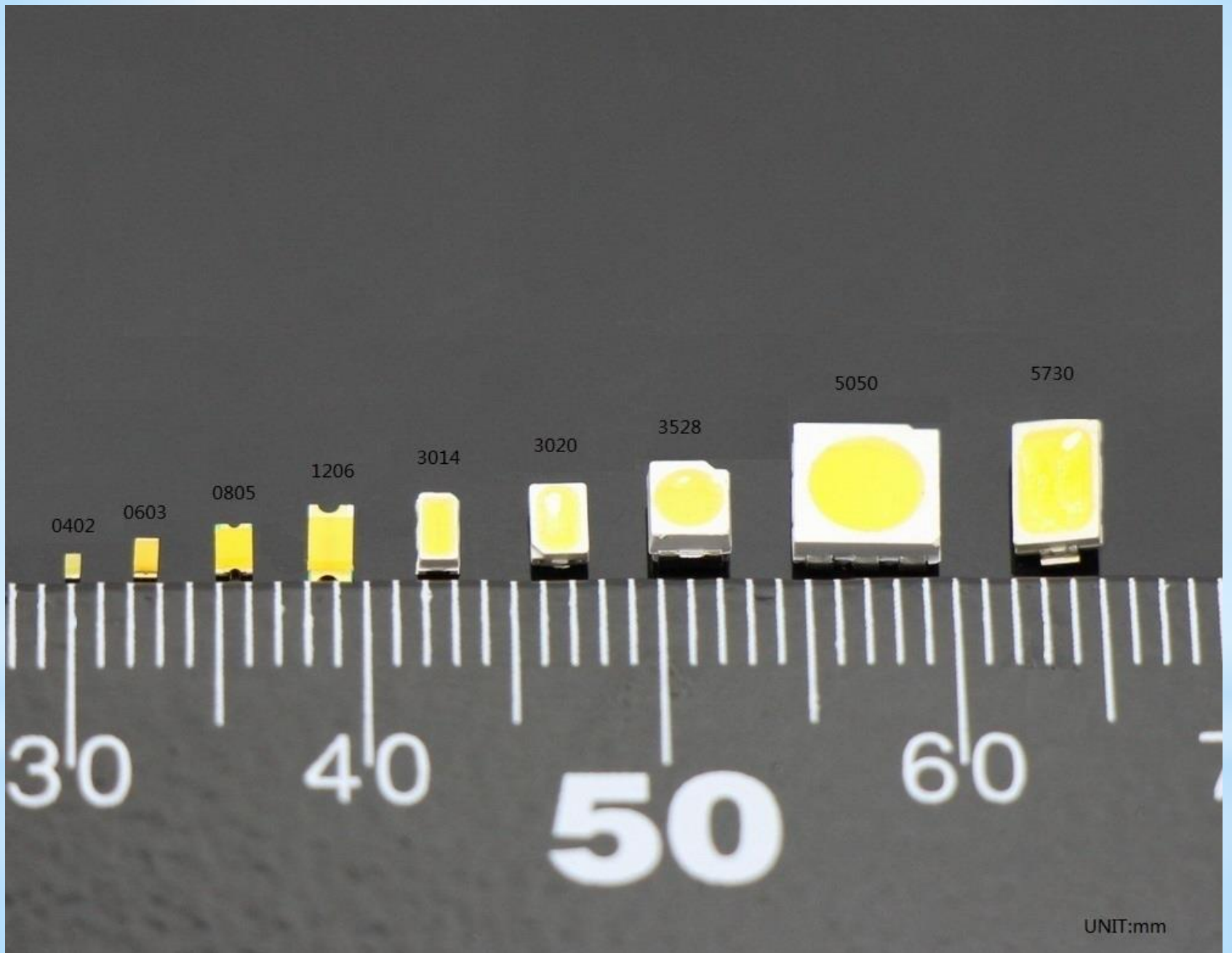
- ❑ 3528 3.5 mm X 2.8mm

- ❑ 5050 5 mm X 5mm

- ❑ LED Strip Lights

- ❑ Cut every 3 leds, resistors already in place

- ❑ **Always need a current limiting resistor!**



UNIT:mm

# Buy or Build?

- 5 and 3 mm Leds are separate pieces
- SMD Leds come in tape trays, Wire them with magnet wire
- Buy SMD LEDs fully wired and with resistors/rectifiers (Evans Design)
- Buy SMD LEDs wired, no resistors (China)
  - Two types of wire, regular insulated wires or magnet wire
- Led Strips - cut into groups of 3

## Where to buy?

- B&E Electronics
- Active Electronics
- Digi-Key
- Ngineering
- LED Baron
- Evans Design - GLX Scale Models in Ontario
- Other Model Railway suppliers
- from China - Ebay, Alibaba and others

# Power Supply

- 9 volt battery
  - Accessary power bus
  - Steal power from DCC bus - rectifier and regulator
  - Wall Wart
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- Think about how you are going to turn the lights on or off, central power switch is ideal. Power bars can work great



# Lighting Issues with Buildings

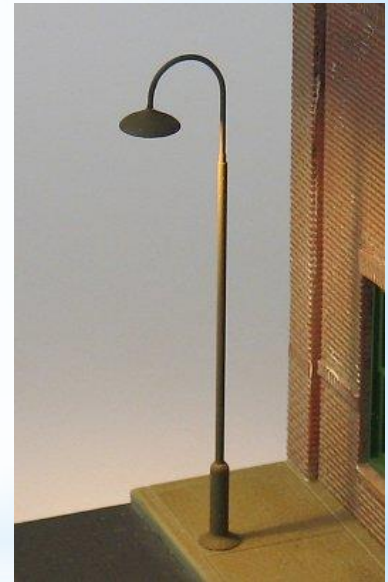
- Make sure the building is light proof!
  - Seal the corners - bead of glue works
  - Paint the interior
- Windows - Now we can see inside!
  - Partition the building
  - Box in windows and light individually
  - Curtains
    - Commercial ones
    - Bits of paper
    - Aluminum foil - painted

# Building Interiors

- Background Buildings may not need anything
- Middle ground Buildings - Fake it!
  - Frosted glass - sand the back
  - Collect packaging, candy wrappers!
  - Curtains
  - Bits of paper
- Foreground Buildings require some details
  - Fake part of it, detail others
  - Photographs as interior
  - Silhouettes

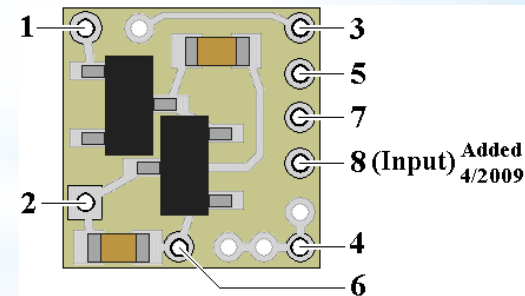
# Building Exteriors

- Exterior Lights
- Street Lights
- Traffic Lights
- Vehicle Lights
  - Buy or build yourself with 402 LEDs
- Flashing Lights - Police cars, fire trucks
  - Buy blinking LEDs or flash circuits
- Fire pits, Welders, Lighthouse



# Animating Lights

- ❑ LED's that flash or flicker - nothing else needed
- ❑ Buy a circuit- Nginengineering and others sell dedicated circuits for flashing lights and other effects
- ❑ Nginengineering has a building animation circuit that turns lights on and off at random.
- ❑ Build your own circuit (555 timer circuits)
- ❑ Programmable controllers, various types
- ❑ Arduino
  - ❑ More details later!



# Sounds

Background or Ambient Sounds

Specific Sounds

# Background Sounds

- Create the ambiance of your location, forest, city harbour, waterfalls
- Sets the mood and character of a place, but it is very important to keep the sound very soft, should be almost inaudible
- Concept of the “call out” sound, the occasional louder sounds that brings the listener awareness to the soundtrack. Bird call, dog barking, car sound, voices
- Fantasonics is a good source
- Nature CD's

# Specific or Direct Sounds

- ❑ Short duration sounds, louder than the background
- ❑ Industry sounds, sawmill, factory, cattle
- ❑ Animal sounds, dogs, birds, people
- ❑ Buy ready made or build your own.
- ❑ Sources like [Freesound.org](http://Freesound.org) or [Audio Micro](http://AudioMicro.com)
- ❑ Use an Audio Editor, Audacity is free

# PlayBack Devices

- ❑ CD players, mp3 players
  - ❑ Difficult to control, usually use button presses
- ❑ Dedicated playback device - PRICOM Dream Player
  - ❑ Plays multiple tracks
  - ❑ Triggers for each track
  - ❑ Outputs can drive lights
- ❑ Sparkfun Wav Trigger
- ❑ DFPlayer



# Speakers

- ❑ Computer speakers - amplified
  - ❑ Look for used ones
  - ❑ Dismantle the case
- ❑ Portable mp3 speakers
  - ❑ Used or dollar store
  - ❑ Might have to dismantle the case
  - ❑ Usually need 5 volts
- ❑ Hide them in the scenery is best
  - ❑ Underneath or above, but not as good as in the scenery
  - ❑ Hide behind, not inside buildings, use trees rocks to hide
  - ❑ Bounce sound off the backdrop
  - ❑ Experimenting is required

# Triggers

- Consider how you want to trigger the sound to play
- Big Red Button
- PIR sensor
- DCC control
- Timed
- Clock control for time of day effects
- Automatic for background sounds
- Voice Control?

# Home Layout or Show?

Volume of Sounds

Frequency of Actions

Annoying?

# Putting it all together

- ❑ Computer control

- ❑ Arduino

  - ❑ What is it?

  - ❑ What can it do?

# Arduino

- ❑ Designed for artists and as a teaching aid
- ❑ Multiple Inputs and Outputs
- ❑ Programs are called “Sketches”, a variation of the C language
- ❑ “Shields” are boards that stack on top of the Arduino that add functions, for example Ethernet connection, WIFI, Bluetooth, motor control
- ❑ Chances are that someone has already written a “sketch” that does what you want and is available for download.

# Arduino

- Purchase a Learning Kit
- Buy one good board, get the rest from China
- Pro Mini can be had for around \$3 each
- Get the 5V 16 mHz boards
- Limited to 40 mAmps per pin and 150 mAmps total
- Use transistor to drive larger loads, like the LED strip lights
- Motor shield for running motors
- Relays for larger loads
- 18 pins on the Pro Mini, 8 of those are analog, 6 have PWM

# Arduino Software

- Free download the Arduino IDE from [Arduino.cc](http://Arduino.cc)
- Download the NMRA DCC library, includes many of Geoff Bunza's examples
- Internet search will turn up lots of "Sketches" that do all sorts of things!
- Take one of the examples and modify it to suit your needs.

## Resource Links

Geoff Bunza in Model Rail Hobbies Magazine

Laurie Mclean

Harry's TV by Geoff Bunza