



Lead-Free: Yes (HASL Lead-Free finish)

- Forward Voltage: 1.70V - 2.30V (typically ~2.0V)
- Forward Current: 20mA (recommended), 25mA maximum continuous
- Peak Forward Current: 60mA (duty 1/10 @ 1kHz)
- Power Dissipation: 60mW per LED

- Luminous Intensity: 90-180 mcd per LED
- Viewing Angle: 120°

Total Board Specifications:

- Operating Voltage: 2.4V - 3.6V (for both LEDs in parallel with resistors)
- Total Current Draw: 40mA (20mA per LED)
- Total Power Consumption: ~120mW at 3V
- Reverse Voltage: 5V maximum per LED

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## PHYSICAL SPECIFICATIONS

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PCB Shape: Ghost silhouette

PCB Color: White solder mask

PCB Thickness: Standard thickness suitable for textile applications

LED Package: 0603 SMD (1.6mm x 0.8mm x 0.6mm height per LED)

LED Position: Two LEDs positioned as "eyes" in ghost head

Connection Type: Sewable pads with large holes, Alligator Clips, Conductive tape

Operating Temperature: -40°C to +85°C

Storage Temperature: -40°C to +90°C

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## PHYSICAL SPECIFICATIONS

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RoHS Compliance: Yes (Restriction of Hazardous Substances Directive)

Lead-Free: Yes - HASL Lead-Free finish and lead-free solder

Pb-Free: Yes (component and assembly)

CE Marking: Yes (European Conformity)

Safe for Educational Use: Yes - meets safety standards for classroom use

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## PINOUT & CONNECTIONS

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Connection Configuration:

[+] Positive: Connect to positive terminal of power source

[-] Negative: Connect to negative terminal (ground) of power source

## POWER SUPPLY REQUIREMENTS

Recommended Supply Voltage: 3.0V (optimal for amber LEDs)

Minimum Supply Voltage: 2.4V (LEDs may be dim)

Maximum Supply Voltage: 3.6V (do not exceed)

Current Requirements:

- Per LED: 20mA (recommended operating current)
- Total Board: 40mA (both LEDs)
- Power Consumption: 120mW at 3V ( $3V \times 40mA$ )

Recommended Power Sources:

- CR2032 Coin Cell Battery (3V) - 5.6 hours continuous
- Teknikio Battery Board with CR2032
- 2×AA Batteries (3V total)
- 3V regulated power supply

Battery Life Calculations:

Power Source | Capacity | Estimated Runtime

CR2032 | 225mAh | 5.6 hours continuous

2×AA (Alkaline) | 2500mAh | 62.5 hours continuous

4×AA (6V with regulation) | 2500mAh | 62.5 hours

## INSTALLATION GUIDELINES

Sewable Connection:

1. Use conductive thread for e-textile projects
2. Recommended thread: Stainless steel conductive thread
3. Make secure knots at sewable connection pads
4. Test continuity before final installation
5. Keep positive and negative connections separated
6. Plan for easy access if battery replacement needed

Soldering Connection:

1. Use lead-free solder (SAC305 recommended) or standard 60/40 solder
2. Keep soldering time minimal to prevent heat damage to 0603 LEDs
3. Use flux for clean connections on small pads
4. Test LED function immediately after soldering
5. PCB is manufactured with HASL lead-free finish
6. Use fine-tip soldering iron for precision work

Project Integration:

1. Position ghost for optimal visual effect

2. Consider light diffusion through fabric
3. Plan mounting to prevent PCB flexing
4. Protect connections from mechanical stress
5. Test functionality before final assembly

## **DESIGN CONSIDERATIONS**

### Visual Design:

- Two amber LED eyes create authentic spooky effect
- White PCB body provides good contrast with amber LEDs
- Small size suitable for subtle effects or multiple units
- Ghost shape is recognizable and friendly

### Power Management:

- 40mA total draw is moderate for battery-powered projects
- Consider PWM dimming for battery conservation
- Use on/off switch for manual control
- Plan for duty cycle in animated projects

### Thermal Management:

- 0603 LEDs generate minimal heat at 20mA
- Good thermal dissipation through PCB
- No special cooling requirements
- Suitable for enclosed projects

### Mechanical Considerations:

- Lightweight design suitable for fabric attachment
- Small form factor for multiple ghost effects
- PCB thickness compatible with flexible projects
- LED placement protected by PCB design

## **APPLICATIONS**

### Educational Projects:

- Introduction to LED circuits
- Halloween science projects
- STEM education activities
- Paper circuit tutorials
- Basic electronics learning

### Wearable Technology:

- Halloween costumes and accessories
- Spooky themed clothing
- Interactive fashion projects
- Children's light-up accessories
- Night safety gear with fun theme

#### Art & Craft Projects:

- Halloween decorations
- Spooky greeting cards
- Interactive art installations
- Haunted house effects
- Children's craft projects
- Year-round themed projects

#### Entertainment & Events:

- Theatrical props
- Party decorations
- Interactive games
- Horror-themed projects
- Atmospheric lighting

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### **TROUBLESHOOTING**

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#### LEDs Not Lighting:

1. Check power supply voltage (should be 2.4V-3.6V)
2. Verify correct polarity (+ to +, - to -)
3. Test with multimeter for continuity
4. Check battery charge level
5. Verify current limiting resistors are functional

#### Dim LED Output:

1. Check supply voltage - may be too low
2. Verify adequate current supply (40mA minimum)
3. Test battery condition
4. Check for high resistance connections
5. Clean connection points

#### One LED Not Working:

1. Check individual LED with direct power test
2. Verify connections to that specific LED
3. Test for damaged LED or current limiting resistor
4. Check for cold solder joints on 0603 components

#### Intermittent Operation:

1. Check for loose sewable connections
2. Verify solder joint integrity on small components
3. Test for mechanical stress on PCB
4. Check battery contact stability

#### LEDs Too Bright/Harsh:

1. Consider diffusion material over LEDs

2. Reduce supply voltage slightly (within safe range)
3. Use PWM dimming control
4. Position ghost for indirect lighting effect

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## **SAFETY INFORMATION**

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Electrical Safety:

- Do not exceed 3.6V supply voltage
- Observe correct polarity during installation
- Use appropriate current limiting
- Avoid short circuits
- Disconnect power when not in use

Mechanical Safety:

- Handle PCB carefully to avoid component damage
- Avoid bending of PCB
- Keep small components away from children under 3
- Secure connections to prevent shorts

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## **STORAGE & HANDLING**

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Storage Conditions:

- Temperature: -20°C to +70°C
- Humidity: < 85% RH
- Avoid direct sunlight
- Store in anti-static packaging
- Keep connection pads clean and dry

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