Hi-lume® LED Driver Webinar

This webinar will cover:

- LED basics
- LED control options and the definition of dimming
- New – Hi-lume LED driver

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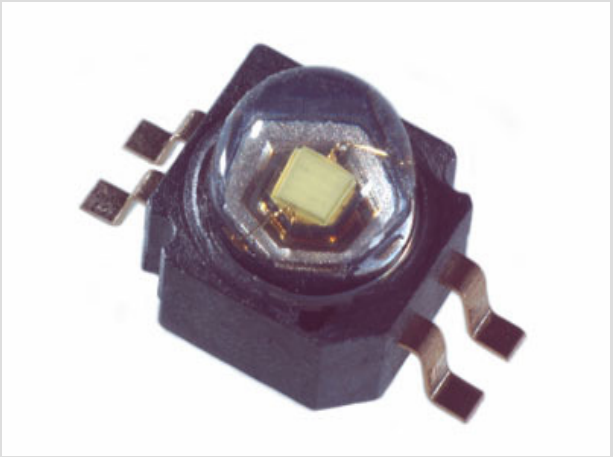
LED Basics

- LED Technology
- Lack of Standardization
- Luminaires

LED Technology

- An LED, Light Emitting Diode, is a semiconductor device designed to create a specific wavelength of light



- There is no “white” wavelength. White light must be created.

LED Technology

LED Benefits:

- Reduced Maintenance
- Immediate light output
- No UV / IR Radiation
- Lower Energy Costs
- New Applications
- No Mercury

LED Challenges:

- Color consistency
- Thermal management
- Fixture photometrics
- System compatibility

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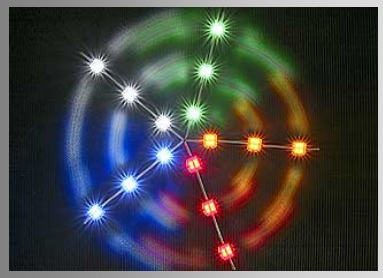
Applications

White LEDs

- General illumination
- Task lighting
- Landscape/ outdoor

Monochromatic LEDs (Red, Green, Blue, etc.)

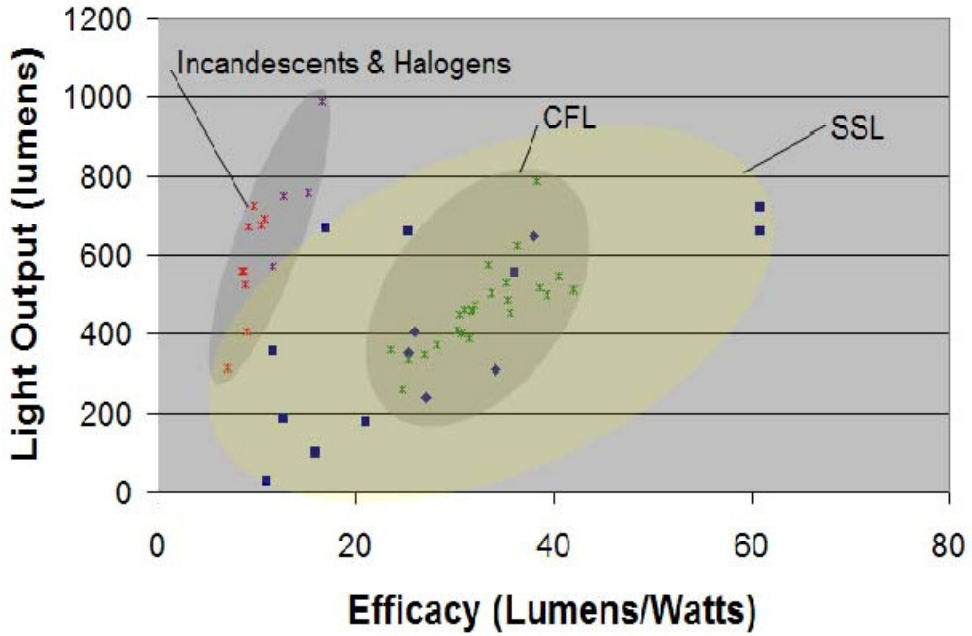
- Signage
- Traffic lights
- Multi-colored lighting effects
- Video screens
- Billboards



Lack of Standardization

LED technology is now comparable to incandescent, halogen, and fluorescent lights.

Figure 2. Downlight Comparison:
Luminaire Output vs Efficacy for Different Sources



- SSL Downlight Fixtures and Retrofits, 3-40W
- SSL R30 Replacement Lamps, 9-17W
- Downlights with Incandescent BR and A-lamps, 45-75W
- Downlights with Halogen PAR38 (FL and IR) Lamps, 50-60W
- Downlights with CFLs (spiral, pin, & reflector), 9-21W

--Values for SSL downlight products are from CALiPER testing.
--Values for CFL and incandescents are assembled from CALiPER testing, earlier photometric testing and product catalogs.
--Fixture efficiencies are applied to replacement lamp values (factor depends on lamp type).

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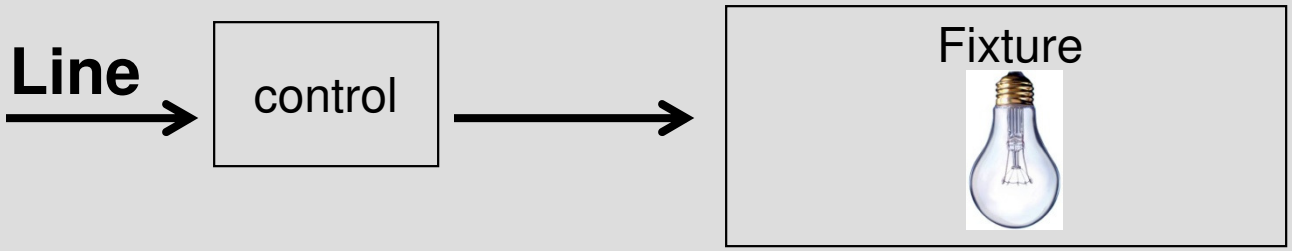
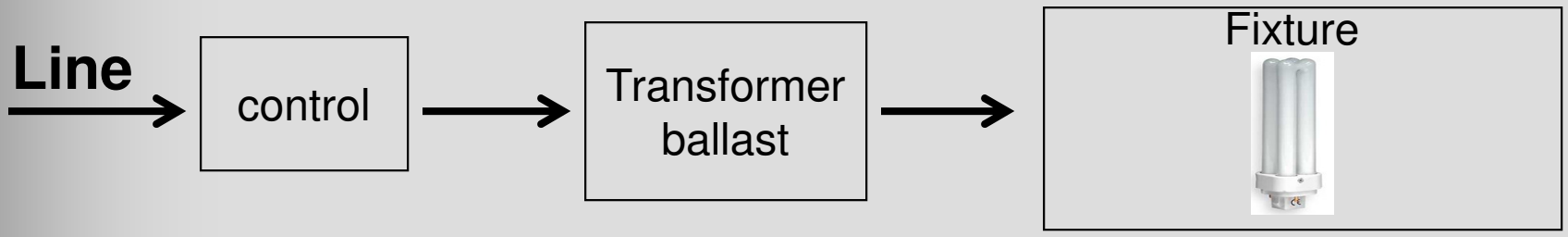
Lack of Standardization

Incandescent Lighting



Fluorescent/ELV Lighting



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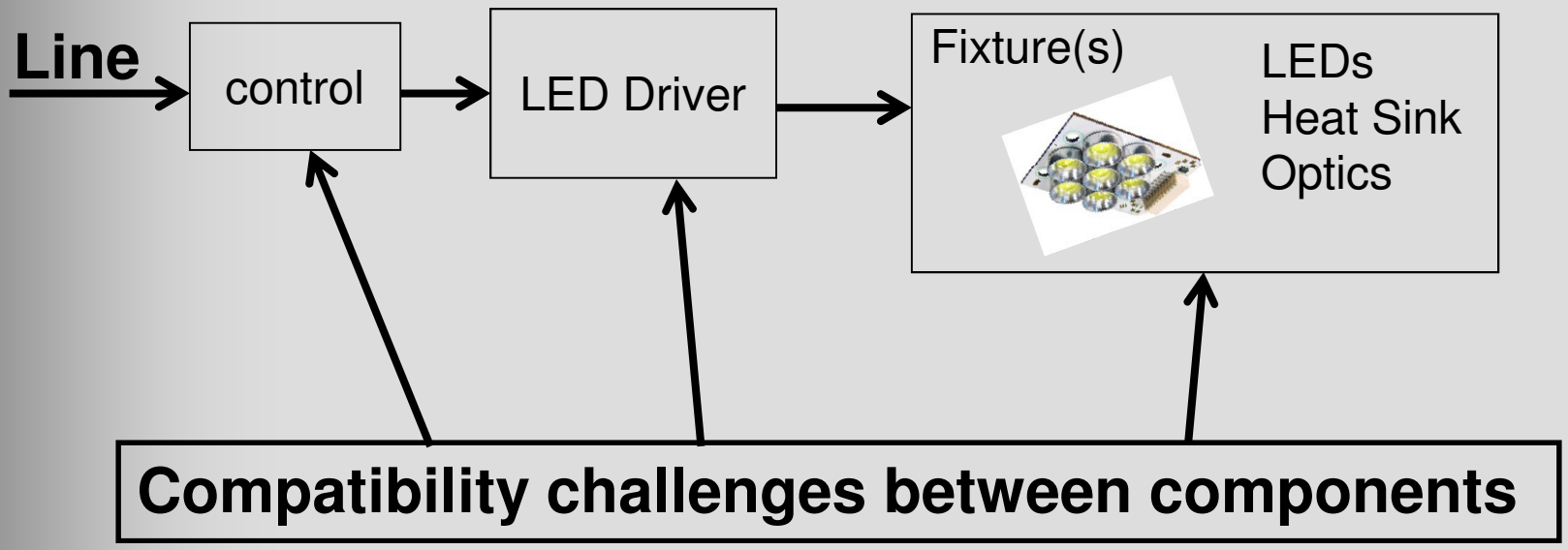
Lack of Standardization



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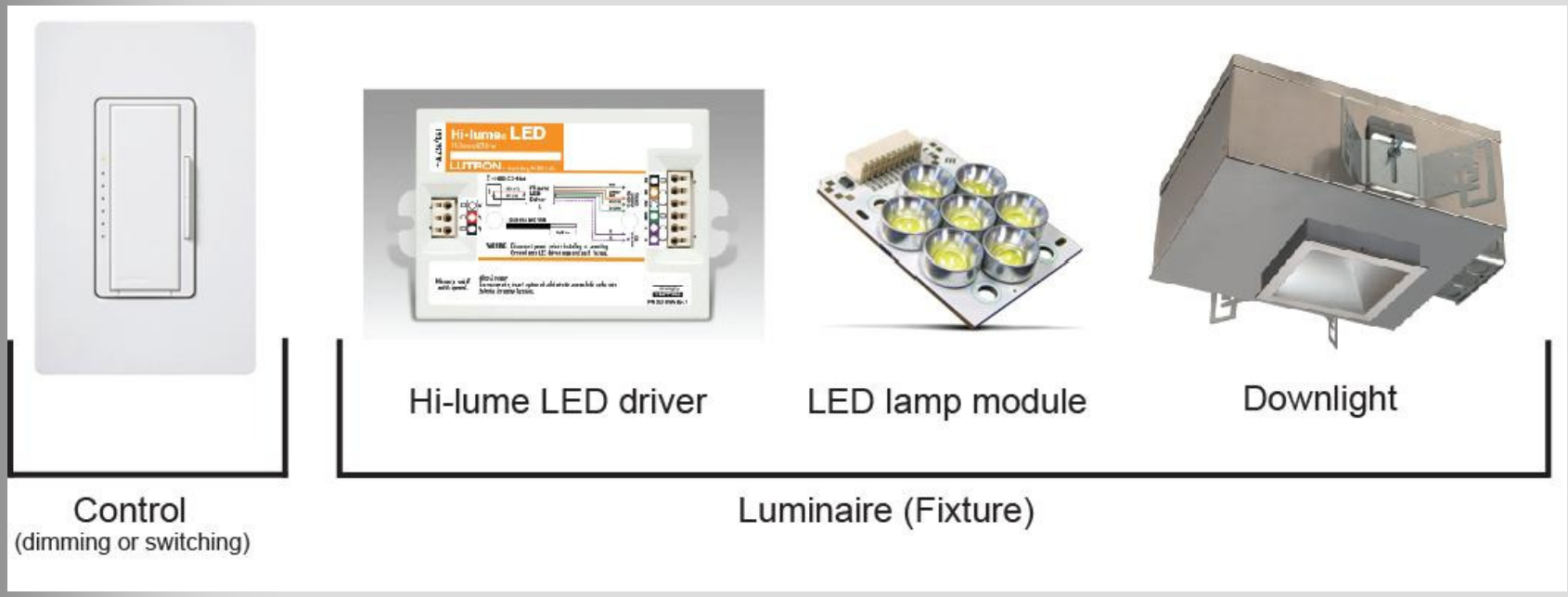
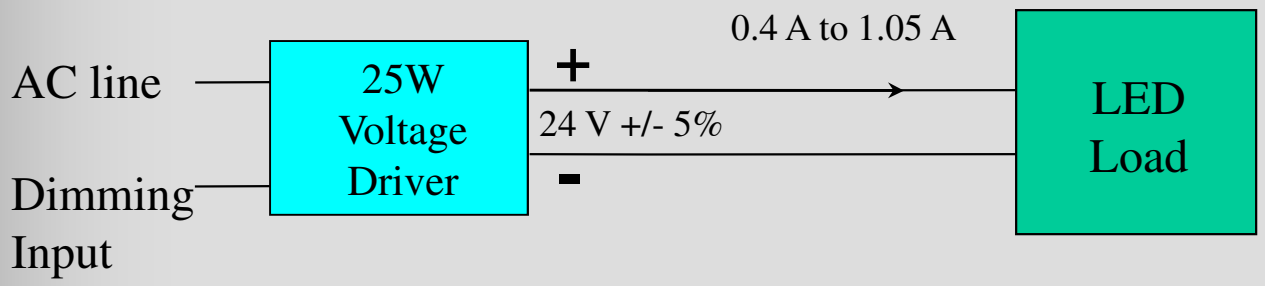
Luminaire Example

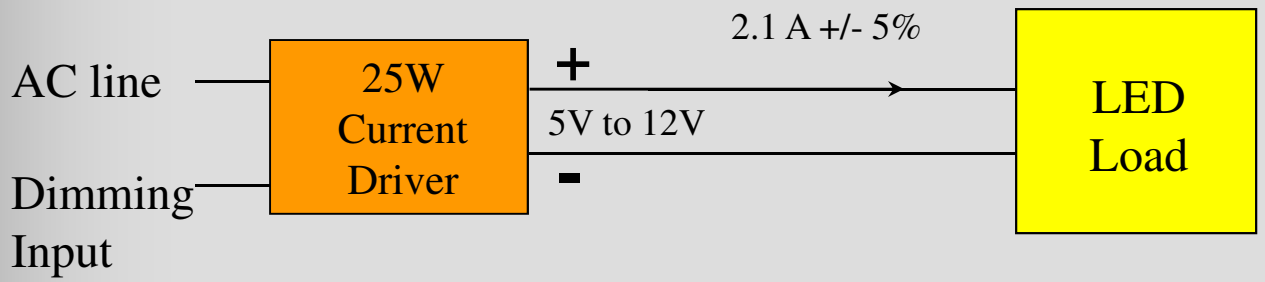


Luminaires: Driver Types

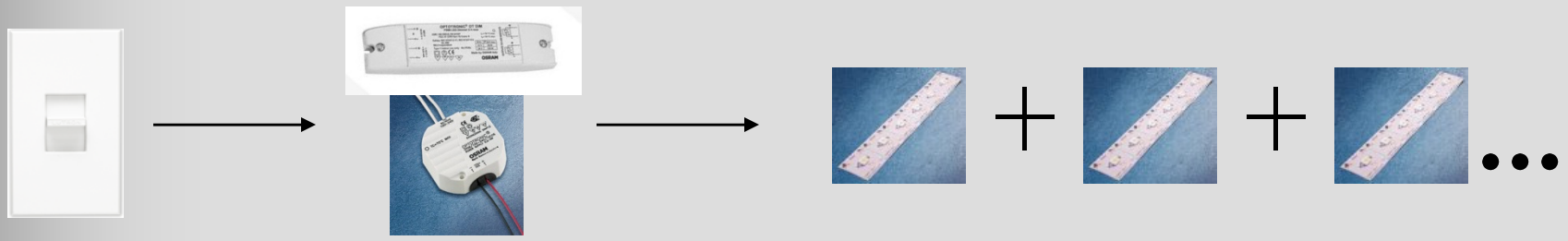
Constant Voltage Output Example



Constant Current Output Example

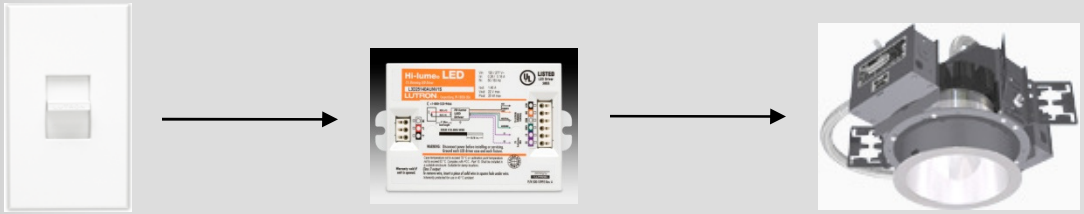


Luminaires: Constant Voltage Drivers



- The LED light engine requires constant voltage instead of constant current
- User needs flexibility in number of luminaires or length of cove controlled by one power supply
- Typical Applications: accent, display, cove

Luminaires: Constant Current Driver

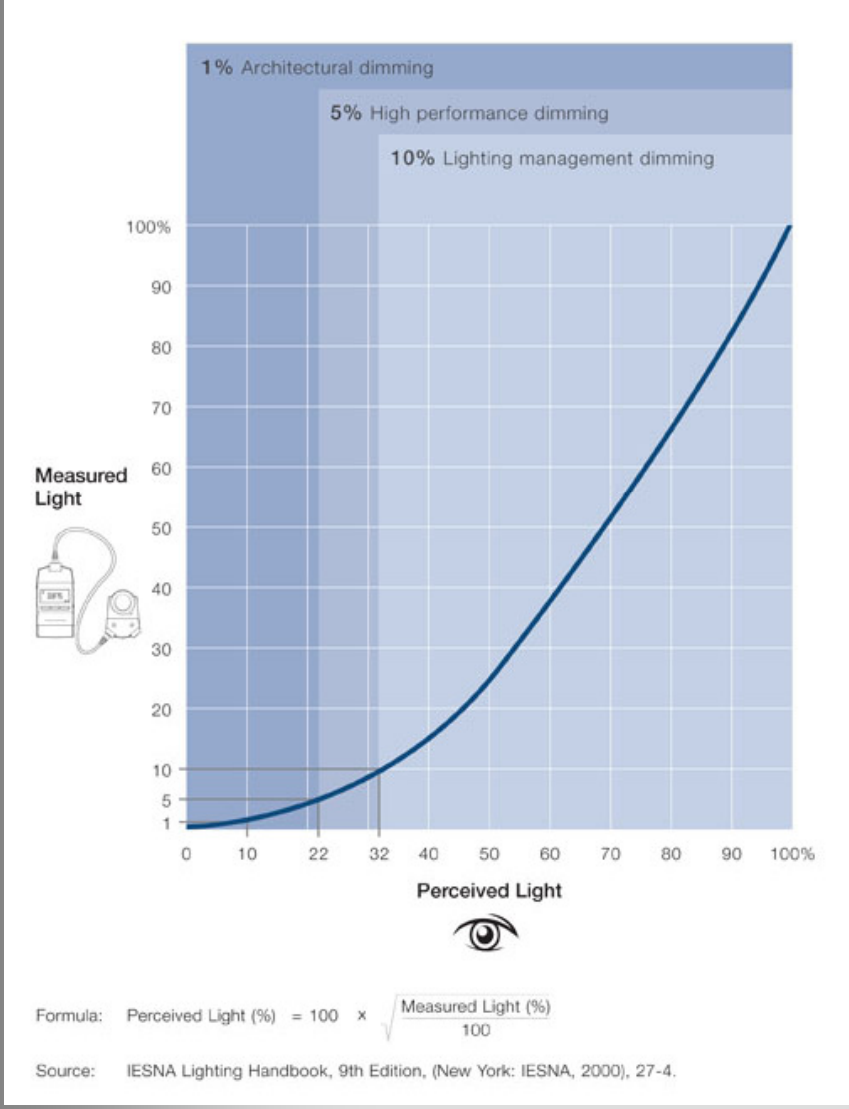


- The LED light engine requires a constant current instead of a constant voltage
- User wants higher efficiency
- Typical Applications: downlight, streetlight, wall wash

LED Control

- Types of control
  - Power line control
  - 3-wire control
  - Low voltage control
- For more information on control compatibility, see Application Note 138

Definition of Dimming



- The expectation of dimming needs to be defined with:
  - The entire supply chain
  - Design community
  - End-user
- Dimming is **not** 20% low end (~47% perceived)

Power Line Control

Types

Leading Edge

- Incandescent
- Magnetic low voltage transformers

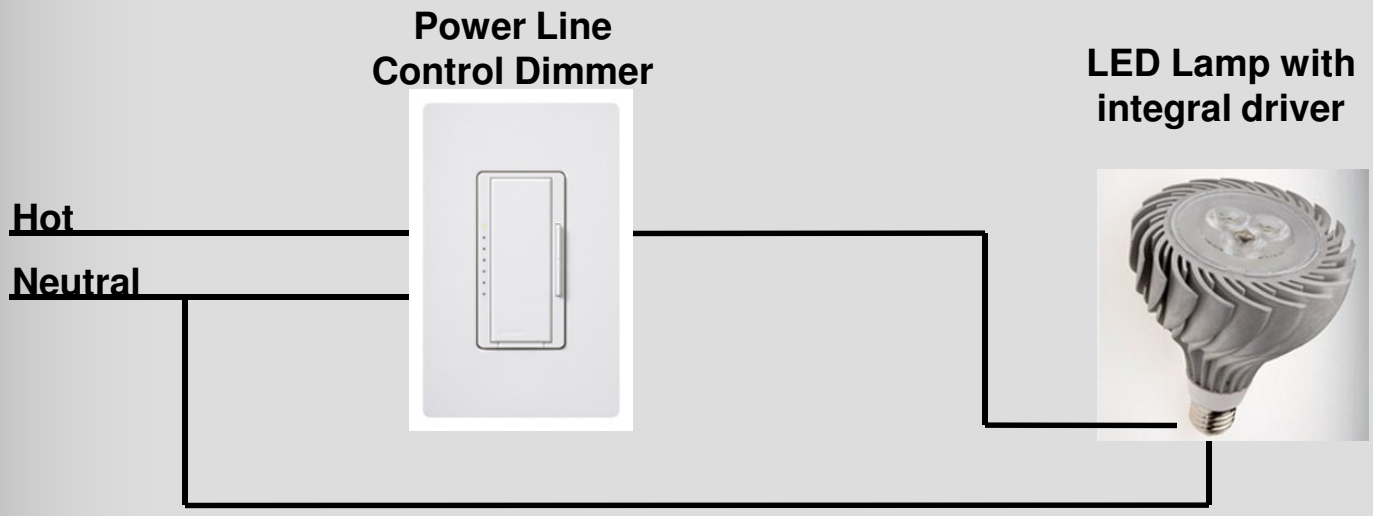
Trailing Edge

- Electronic low voltage transformers

Typical performance today:

- **Dimming to** 20% low end
- Examples: Cree/LLF, Halo, Permlight

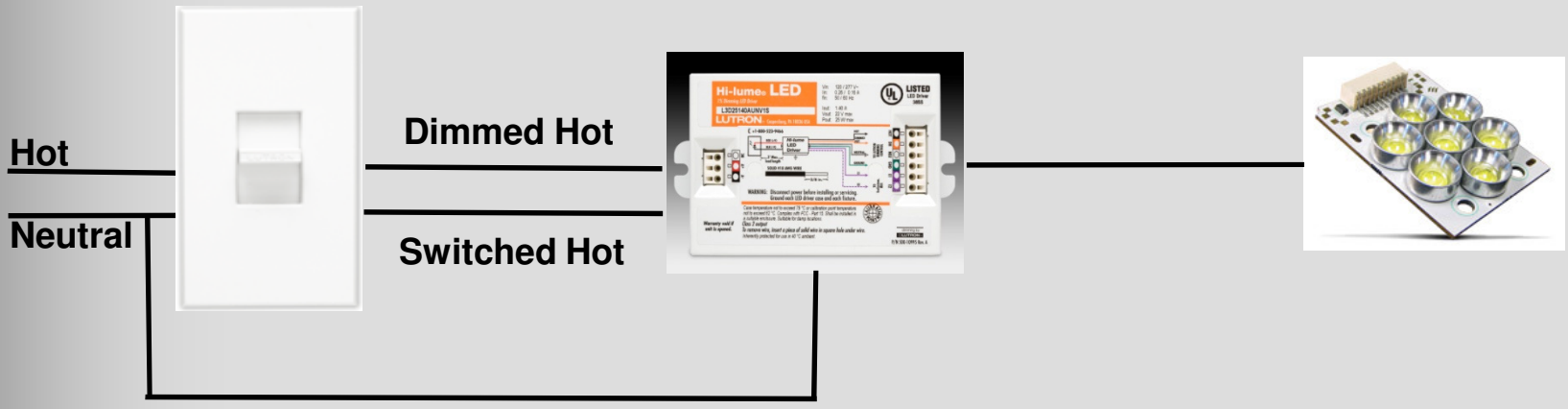
Line Voltage Control



- Typically used to control an LED lamp with a built-in driver
- Incandescent dimmers generally do not work well with LEDs
- Trailing edge dimmers tend to have better performance, but they require a neutral wire connection

3-Wire Control

- 3-wire control for both small and large scale systems
- Uses established wiring protocol for fluorescent controls
- Separate control and power feed eliminates interference and allows for more precise control



Low Voltage Control

Analog

- 0 -10V

Digital

- Digital Multiplex (DMX-512)

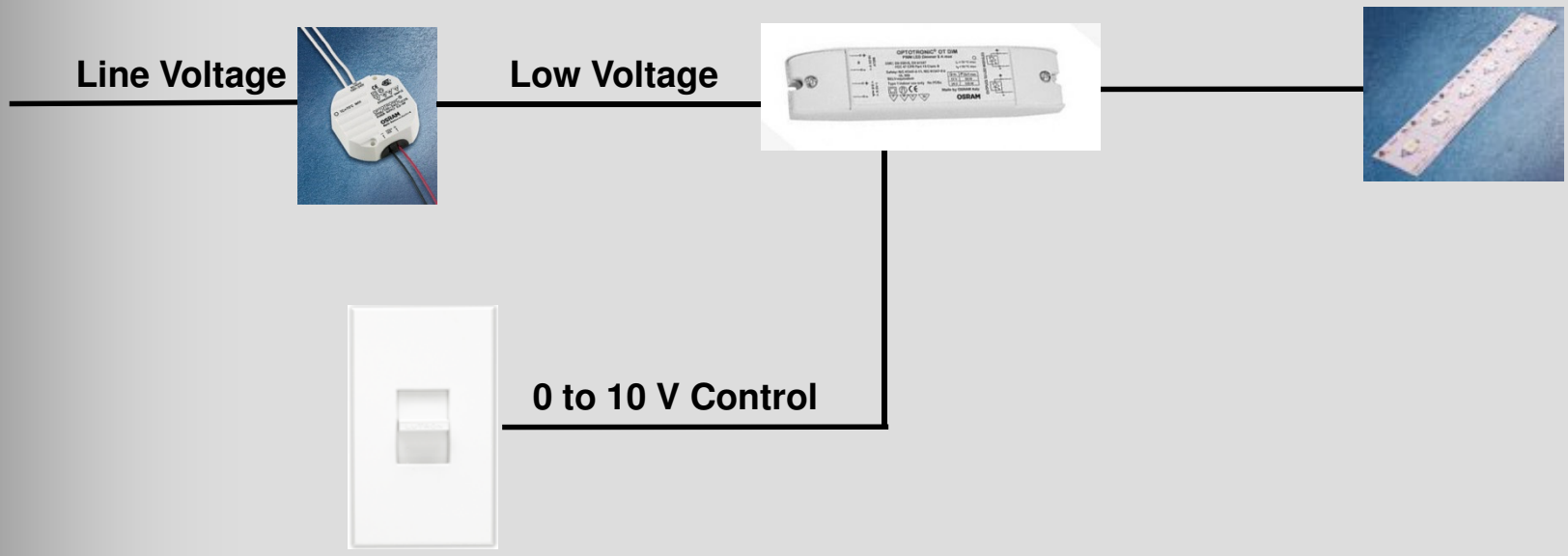
- DALI (EcoSystem)

Other

Low Voltage Control

0-10 Volt Control

- Two control methods: current sink (IEC 60929) and current source
- Application Note #138 details Lutron control options for each method



Low Voltage Control

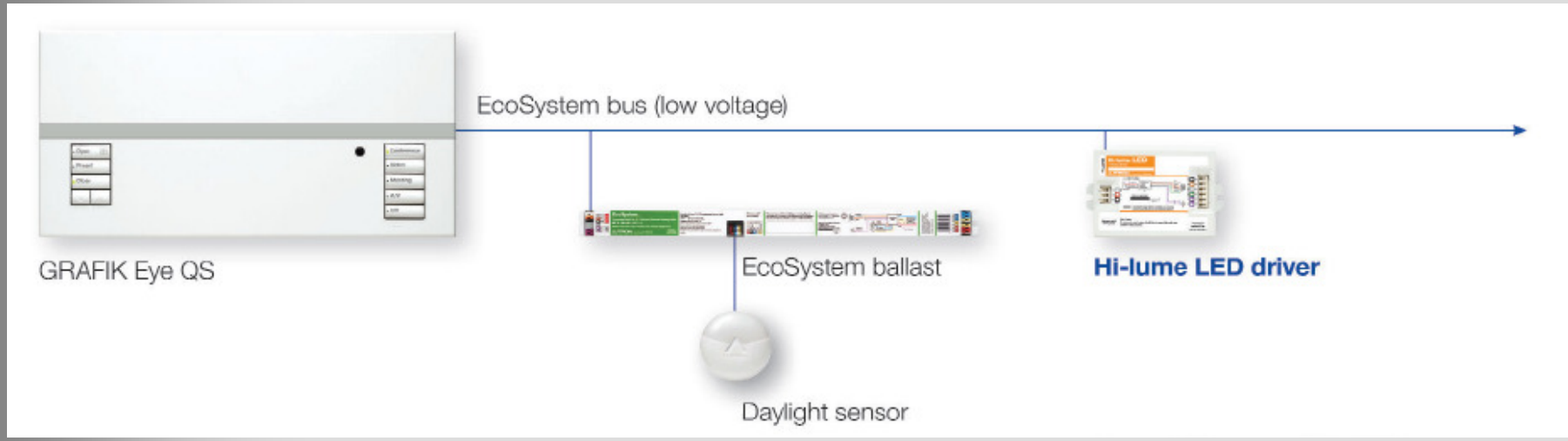
Digital Multiplex (DMX)

- Protocol used primarily for mixing colors and varying color intensity
- Multiple channels required
- Applications: Theatrical

Low Voltage Control

DALI (EcoSystem)

- Developed as a fluorescent ballast communication standard
- Allows for individual addressing of fixtures
- Uses digital signals to send control information to the LED drivers



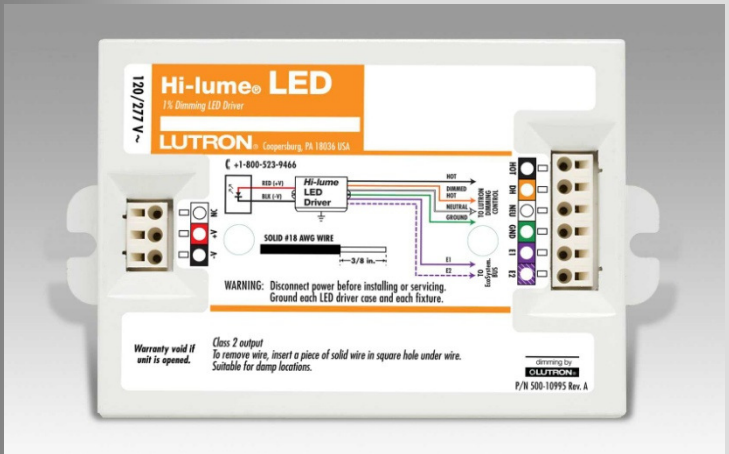
For More Control Information

- For more control information:
  - Go to www.lutron.com/LED
  - E-mail HilumeLED@lutron.com
- A complete matrix of Lutron LED compatible products will be posted by the end of March at www.lutron.com/LED

Hi-lume LED Driver

- Features
- Performance
- Quality
- Control Compatibility
- Applications

Features

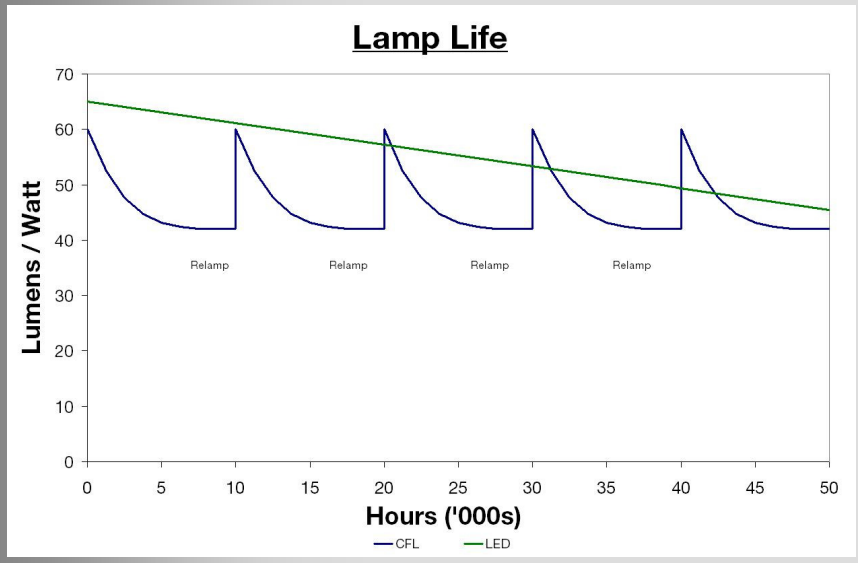


- Constant Current Driver
- Universal voltage (120V or 277V)
- 2.1 Amps or 1.4 Amps
- 25W maximum driver rating

Performance

- Customized light levels and energy savings through smooth and continuous **high performance dimming** from 100% to 1%
- Immediate light output: no warm up time necessary
- Thermal Foldback: Intelligently detects and responds to excessive temperatures and automatically reduces power and light output to preserve driver life

Quality



- Service free lifetime of at least 50,000 hours
- 100% performance tested and qualified with light engines and fixtures
- 24/7 technical support

Control Compatibility

Seamlessly integrates with a wide variety of control options, including:

EcoSystem/Digital

- EcoSystem

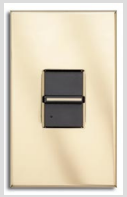
- GRAFIK Eye QS w/EcoSystem

- Quantum

3-Wire

- Vierti

- NovaT*



- Maestro

Applications

Downlights used in

- Offices
- Hotels
- Restaurants
- Meeting Rooms
- Corridors

Go-to-Market Strategy

- Fixture Qualification Program
- Approved Fixtures
- How to get approved

Fixture Qualification Program

- Lutron is testing and qualifying specific fixtures with the Hi-lume LED driver
- If compatibility is determined, the specific fixtures will be posted on www.lutron.com/hilumeled/fixtures and will be sold with the Hi-lume LED driver
- Lutron can send engineering samples to fixture manufacturers for testing

Approved Fixtures

Currently, the Hi-lume LED driver has these approved fixtures:

- **PMC Oceanstate:**
  Downlights: 6LE-800, 6LE-PO

- **Edison Price:**
  Downlights: DL/4-950-DM, DL/5-950-DM
  Wall washers: WL/4-950-DM, WL/5-950-DM

- **Omega:**
  Downlights: Revelation_OM4LED, Revelation_OM6LED

- **Amerlux:**
  Downlight: coming soon

How to get Approved

If you have an OEM that would like to qualify a fixture, please contact:

- E-mail hilumeLED@lutron.com

Questions?