PHILIPS

sense and simplicity

LED Drivers
Designed For Control

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Introduction

• LED Drivers & Control:
  – 0-10V dimming
  – Driver characteristics w.r.t. dimming
  – AOC
  – Dali
  – Dynadim
  – AmpDim

• Features
  – Module temperature Protection (MTP)
  – Constant light output (CLO)
  – Over the life (OTL) & Adjustable Start-up time (ADT)
  – Flexible output configuration
  – Diagnostic information
Applications
# LED Driver Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Key Benefits</th>
<th>Key Features</th>
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| Programmable | • All benefits of Dimmable drivers  
• Programmable solution that offers ultimate design flexibility  
• Reduced SKU complexity and simplified logistics management  
• Easily programmable user interface for onsite customization of driver requirements | Intellivolt or dedicated Input Digital Control  
Optional Features:  
(1) Adjustable Output Current (AOC), Rset;  
(2) Module Temperature Protection (MTP), Thermal feedback  
(3) Network-enabled (DALI)  
(4) Mains Dimming, AMP Dim  
(5) Constant Light Output (CLO)  
(6) Over The Life (OTL)  
(7) Adjustable Startup Time (AST)  
(8) Dynadim |
| Dimmable | • All benefits of Fixed drivers  
• Wide variety of dimming interfaces  
• Addresses current and future code requirements for energy efficient buildings  
• Fixture design flexibility with the AOC feature  
• Fan output & module temperature protection | Intellivolt or dedicated Input Dimming Standard (0-10V, Phase cut, Step Dim)  
Option Features:  
(1) Adjustable Output Current (AOC), Rset;  
(2) Module Temperature Protection (MTP), Thermal feedback |
| Fixed | • Cost effective  
• Reliable | Intellivolt or dedicated Input Fixed output current  
Optional Feature:  
(1) Adjustable Output Current (AOC), Rset; |
• Precise adjustment of the dimming curve from 1V-8V and precise current in the dimming leads to enable the use of resistor for dimming.
• Control shut down feature to put driver in sleep mode.
Efficiency

Efficiency vs. Output Power (@ Tcase = 70 C, Maximum LED Load)
Vin = 120, 230 and 277 VAC

- Designed for high efficiency
- Good efficiency over wide output power range
Power Factor

- Designed for best performance
- Good performance over wide power & input voltage range

THD

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Programmable using PC interface via DALI wires
Adjustable Output Current (AOC)

- Adjustable using an external resistor or programmable in increment of 1mA
- Flexibility & SKU reduction for OEM
- Easy light engine upgrades
Flexible Output Configuration

- Due to digital control, output voltage can be adjusted based on current setting.
Module Temperature Protection (MTP)

- Can be used to regulate the temperature of the LED module
- Prevents the damage of LEDs due to misapplication or when LED modules is not mounted properly on the heatsink
- On non-programmable driver have a set profile
- On programmable driver, the levels can be adjusted within a certain range
Programmable drivers - Dimming options:

• Driver can be programmed to function as one of following dimming options.

- 0-10V
- DALI
- DYNADIM
- AMPDIM
- NO DIM.
Dimming option: (0-10V)

Driver offers additional flexibility to set minimum dim level. Hence easily compatible with motion sensor or presence detectors.
Dimming options: Dynadim

Learning mode

Intelligent & self learning
No need for external devices or wires
Five steps of light level & timing can be programmed.
3-day learning period before dimming profile is executed
Driver learns “ON-time” of LED system and then calculates a virtual clock.
New drivers can be programmed with a time based profile (no learning period)
**DALI: Digital Addressable Lighting Interface**

**Use of DALI**
- Two way digital communication
- Set digital dim level (0-254)
- Define groups and set scenes
- Individual address drivers - turn ON/OFF
- Query driver/LED status - ON/OFF, failures, short circuit, open circuit

1) Indoor highbay applications / Dynalite
2) Networked/wireless RF Starsense
Dimming options: AmpDim

- Dim by reducing input mains amplitude.
- Designed to support Philips Amplight Systems
Constant Light Output (CLO)

- Can be used to regulate the driver current to maintain constant light levels over life
- CLO curve can be generated using LED life degradation curve as reference
- Limited to 16 segments
- Output current can be increased to 120% of setting as along as the max current is below driver max current.
OVER THE LIFE (OTL)

– Feature used to alert the end user that the module reached its predicted lifetime

– Once triggered the driver will flash the LEDs for 2.5sec every time it is turned on

– After 2.5sec the driver will return to normal operation

– The trigger point is programmable and uses the same lifetime counter as CLO
ADJUSTABLE STARTUP TIME (AST)

- LEDs turn on instantly, in some cases this is undesirable
- This feature can be used to turn on the LEDs at a gradual rate to avoid such situations
- Can be programmed between 1000ms (default) to 30000ms in 1ms increments
Diagnostic Information

- Allows detection of fault conditions. Helps troubleshooting in field installations and detect misapplication.

- System health over life like operating hours, module temperature and energy consumption can be monitored remotely via telemangement system.
Summary

• LED Drivers are designed to operate at a very wide power range providing optimal performance.

• LED Drivers can interface with various control means and provide substantial energy saving with LED Lighting.