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Submission Title: [The LED Interface Considerations for VLC]
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Source: [Dae-Ho Kim, Tae-Gyu Kang, Sang-Kyu Lim, Kwon-Hyung Lee] Company [ETRI]
Address [138 Gajeongno, Yuseong-gu, Daejeon, 305-700, Korea]
Voice:[+82-42-860-5648], FAX: [+82-42-860-5611], E-Mail:[dhkim7256@etri.re.kr]

Re: [vlc_sg]

Abstract: [This document presents LED Interface Considerations for VLC]

Purpose: []

LED Interface Considerations for VLC

Dae-Ho Kim
dhkim7256@etri.re.kr
ETRI

Introduction

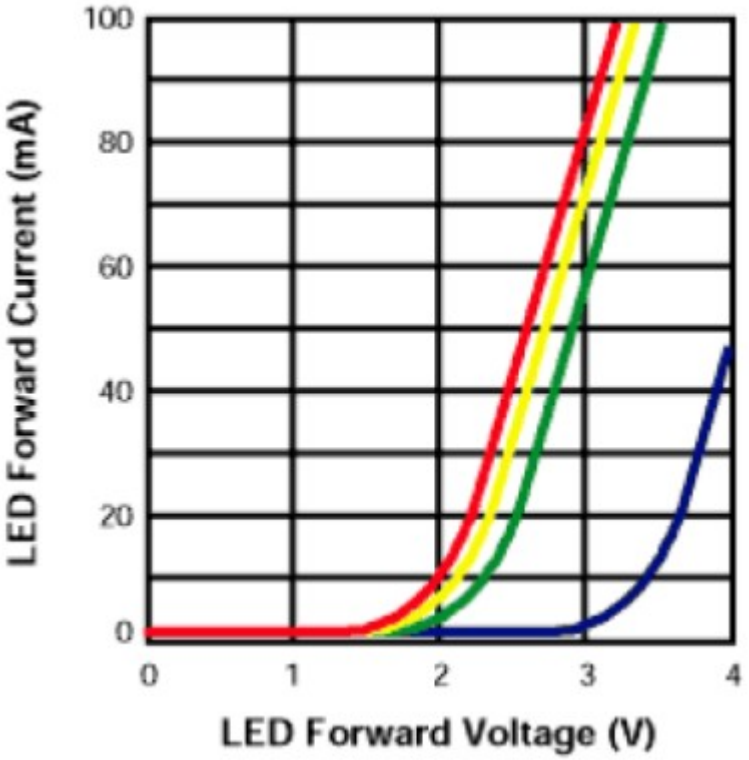
- VLC Applications
  - Lighting and illumination
  - LED signboard
  - Automotive lighting
  - Display backlighting
- Key elements for LED application design
  - Topology : Serial or Parallel
  - Number of LED
  - Type of LED : Current, voltage
  - Temperature of working environment
  - source voltage of system

Why do we need LED driver for VLC?

- To drive LEDs, constant current output power converters are required.
  - Large variety of LED
  - Resister Limiting
  - Linear regulator for Constant current
- Some of LED Driver has a PWM input.
  - For dimming
  - How can we use the PWM input port for VLC?

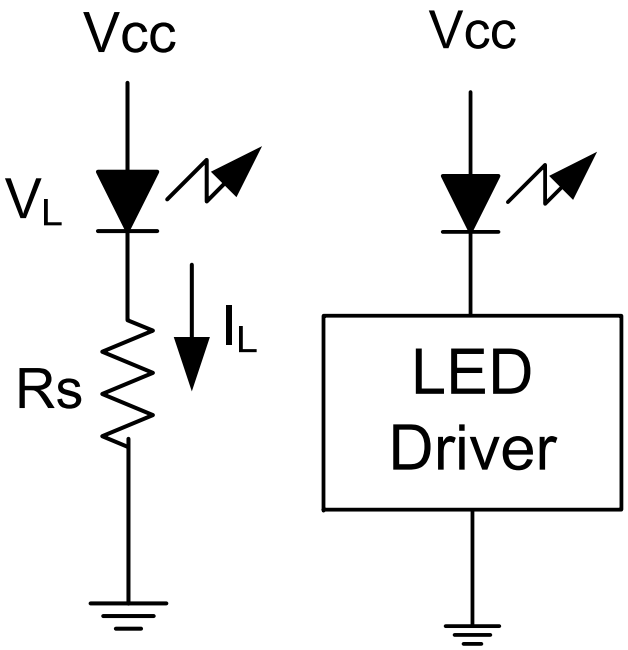
Characteristics of LEDs

- LED's are special diodes that emit light.
- Forward Voltage (V_F) drop across LED
  - Diodes are current driven!



Linear Regulation

- Resister limiting
  - Select $R_s=(V_{cc}-V_L)/I_L$
  - In Automotive system
    - 12V system : 6V~42V
    - 24V system : 12~60V
- IC with Constant current source
  - LED Driver



Type of LED Drivers

- Are configured as
  - Inductorless LED drivers for LEDs in parallel
  - Inductor based LED drivers for LEDs in series.
- Topologies include
  - Boost regulator LED drivers
  - Buck regulator LED drivers
  - Buck-boost LED drivers and more
- For accurate LED current matching

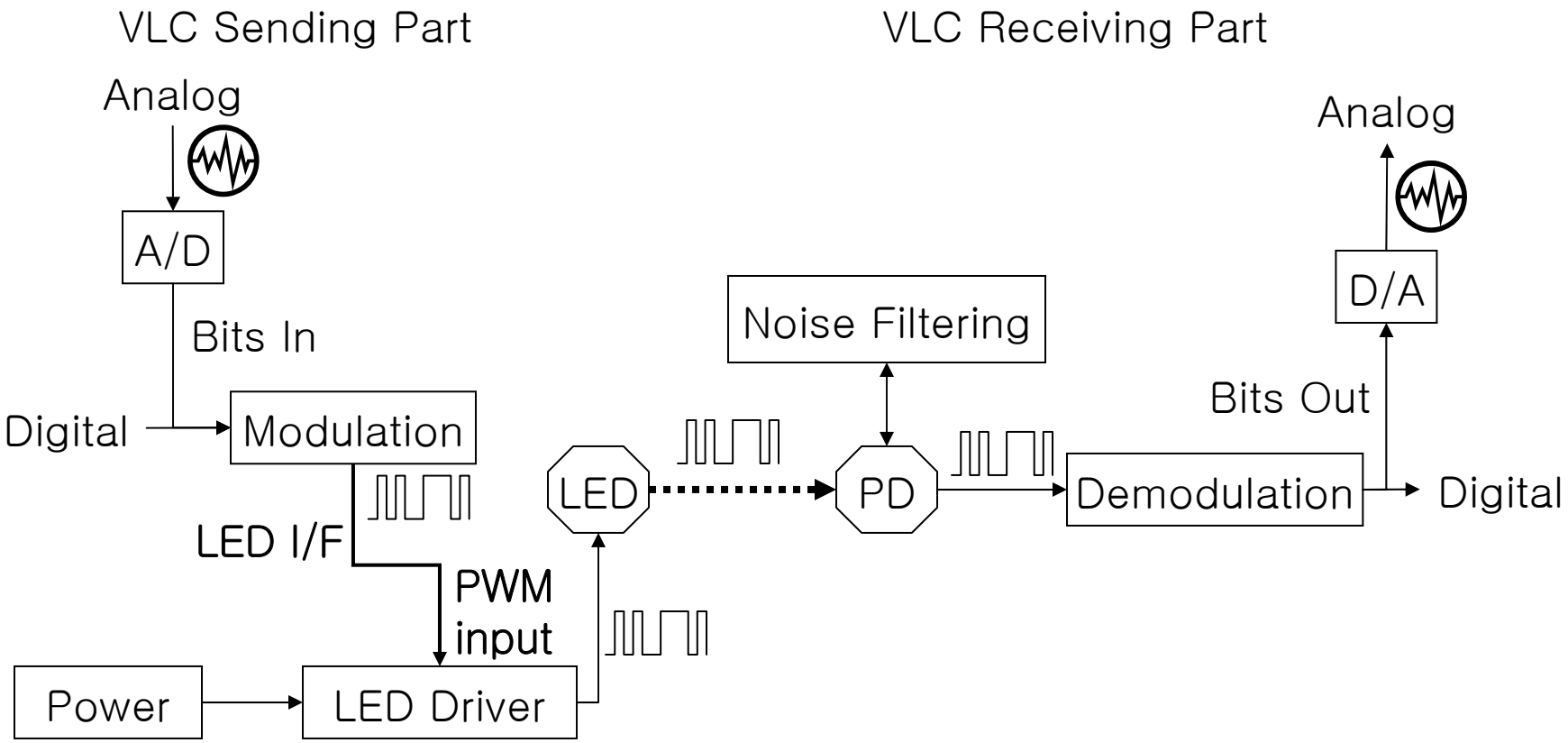
Topology based LED Drivers

- Step-Up (Boost) LED Drivers
  - generate the high voltages required to drive multiple LEDs in series, ensuring current matching betweens the LEDs.
- Step-Down (Buck) LED Drivers
  - are ideal for applications where the input voltage is above the LED voltage, as in many automotive or industrial applications.
- Buck-Boost LED Drivers
  - allow LED bias when the input voltage is either above or below the LED voltage.

Selection of LED Driver

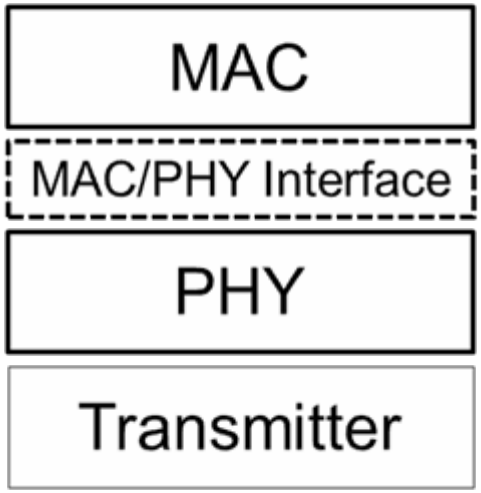
- LED Driver can support a various types of LED
  - 5mm Lamp : I_F = 30mA
  - SuperFlux HB LED: I_F = 70mA
  - Luxeon Power LED: I_F = 350~1000mA
- High speed switching at LED Driver
  - PWM : 1 ~ 30KHz
  - More high speed switching function is required for VLC, if we want to use

VLC Architecture



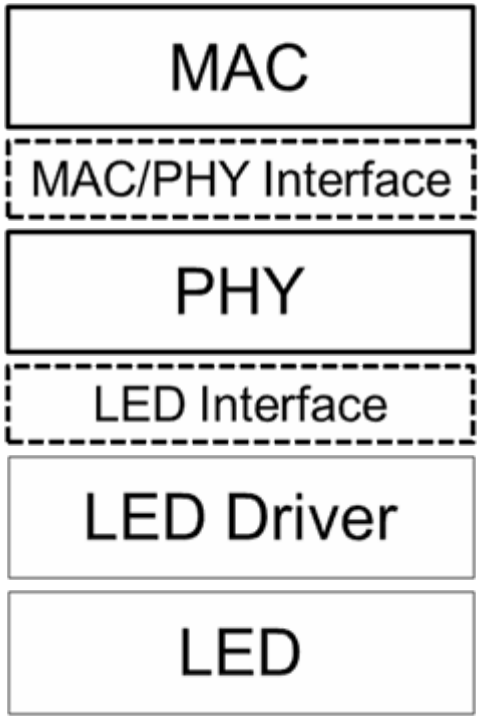
Standard Area before VLC

- Traditional Standard
  - MAC, PHY and MAC/PHY Interface
  - PHY and Transmitter interface is a PHY vender dependent



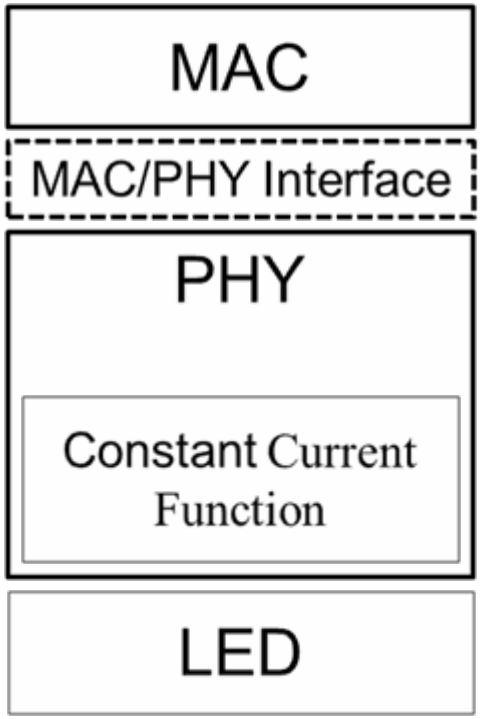
Standard Area for VLC

- For convergence of LED Applications and VLC
  - VLC and Lighting
  - VLC and Automotive
- Especially, High Brightness and High Power LEDs need LED Driver
- Standard is required between PHY and LED driver



Otherwise?

- PHY can drive LED directly?
- Do we have to make the standard of constant current function for LED driving?
- How can do the one standardized PHY chip cover various types of LED?



We need the LED Interface for VLC!

- Large Varity of LED
  - current driven.
  - From several mA to 1000mA
- Standardized PHY
  - Line coding, Modulation, …
- How can we connect LED with PHY?
- LED Driver drives the various type of LEDs and connects with PHY through the standardized LED interface.

Next Step

- MAC/PHY considerations for LED driving
- PD related considerations
- Light interference considerations