ETRI

Production-ready LED lighting of various colors

LED lighting control technology for the adjustment of color temperature and RGB color

Contact: Heejin Choi
Email: hjchoi2@etri.re.kr
Phone: +82. 42. 860. 4946

TECHNOLOGY BRIEF

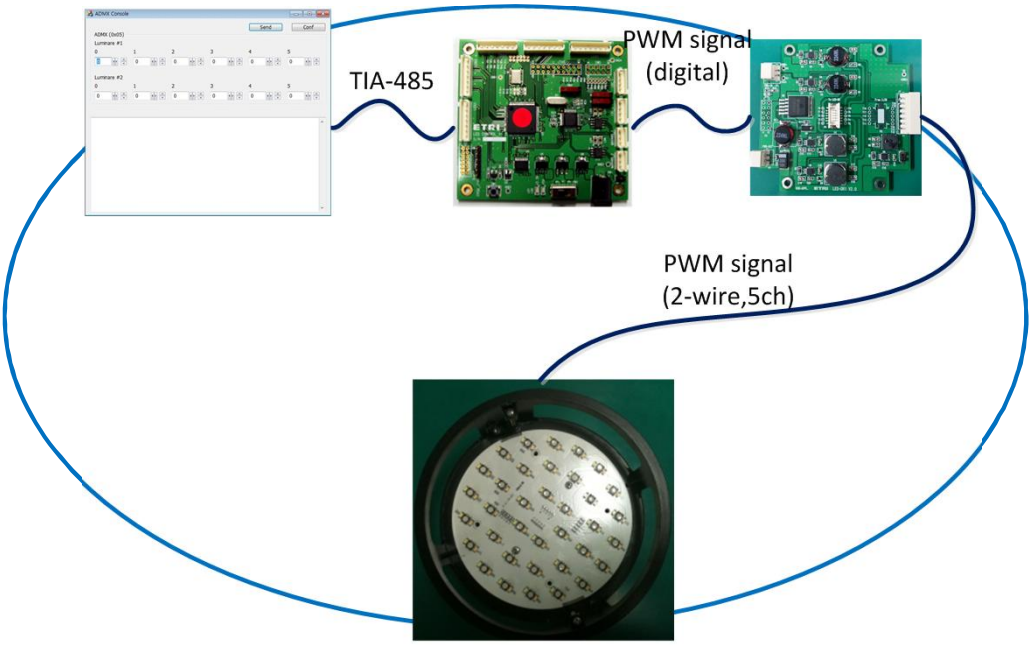
LED lighting control technology for the adjustment of color temperature and RGB color

▣ Technology Overview

Lighting Control technology to give LED lightings more variety of color temperature by inserting RGB LED on top of white LED

- By using two or more LEDs with varying color temperature, it becomes possible to present LED lightings with more variety of color temperature.
- It enables to make artificial light that resembles sunlight, hence applicable at homes, classrooms, department stores, underground facilities, complex facilities, large buildings.

▣ Technology Structure Map



☐ **Keywords** | LED Light, Color Temperature, RGB(Red Green Blue)

☐ **TRL** 5

Technology Category Code		
Sector	Sub Sector	Industry
Smart Service	Smart Media	Emotional Media

TECHNOLOGY BRIEF

LED lighting control technology for the adjustment of color temperature and RGB color

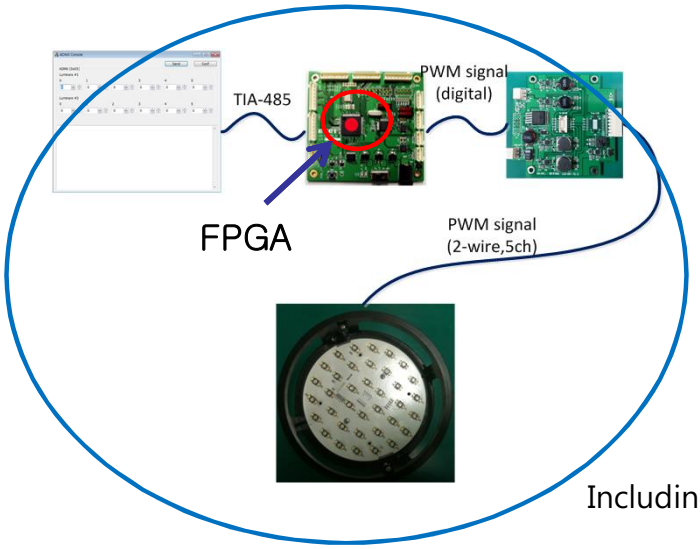
▣ Technology Description

▶ LED lighting control technology through which users can control color temperature and color by using white LED and RGB LED that are different in color temperature

- A system comprised of User Interface for color temperature control, PWM signal generator, LED Driving, LED downlight lighting
- By altering PWM signal value to each LED in User interface, users can measure color digits and color temperature of LED lighting

▶ Features and Advantages

- LED lighting control data generation technology based on User Interface
- LED control data transmission technology based on DMX-512A
- Color temperature control technology using 2 white LEDs with different color temperature
- Technology to produce High definition PWM(Pulse Width Modulation) signal based on FPGA
- Circuit and lighting designing technology with white and RGB LEDs
- In lightings with white and RGB LEDs, developing time can be economized by resolving method to control color temperature and color by PWM signal



Including VHDL source to run FPGA

▣ Application Fields

- Providing artificial light that resembles sunlight at houses, classrooms, department stores, underground facilities, complex facilities, large buildings.

▣ Outstanding Features

By using DMX-512, which is an enhanced version of DMX-512 effective lighting data transmission is available

More delicate control of color temperature available by heightening definition of PWM based on FPGA

- This technology has an ability to control color temperature as delicately as 2^{12} levels

▶ Features

- LED lighting is a new form of lighting which can replace white lightings as incandescent, halogen, florescent lighting
- Given that LED lighting was not open to alteration of color itself for it is usually fixed because of single type of LED has been used -> Adding RGB LED to make LED lighting with various color temperature

▶ Technology Elements

- LED lighting control circuit design technology
- PWM generation FPGA design technology
- LED lighting Driving Circuit design technology
- LED downlight circuit design technology
- User interface design technology for LED controlling

▣ IPR Status

▶ Korea: 2 applied Global: 3 registered

No.	국가	출원번호(출원일)	상태	명칭
1	USA	9119267 (2015-08-25)	Registered	Apparatus and method for controlling fault in lighting network
2	USA	8737731 (2014-05-27)	Registered	Method and apparatus for correcting light
3	USA	8941333 (2015-01-27)	Registered	Lighting control method and device

▣ Technology Trend

Technology evolved from singular LED lighting with simple On-Off function to controllable LED lighting using MCU(Microcontroller Unit)
High-Quality LED lightings are being actively developed due to possibility of various composition and control of LED lightings

☐ Korea

- Many are on market as products in a form of LED stand lighting
- Many technology to control singular independent lighting is being developed rather than in a viewpoint of network of lightings

☐ Global

- Philips has produced LED stand lighting for improvements in learning capacities by controlling color temperature
- LED lightings with color temperature control function are developed so as to control a portion of entire lighting system

▣ Market Trend

Existing Lightings have only On-Off functions or a low capacity function of lightness control and LED lightings with control function of color temperature is applied partially and limitedly

- Future lighting industry is expected to develop into producing more multi-functional, and Human-oriented products with light more emotionally coping with humans

☐ Market Leaders

▶ **Philips**

☐ Technology Demand

Application	Color Temperature Control LED lighting that adjusts itself to surrounding changes
Industry	Houses(Dining Table, Study, etc), Department stores, complex facilities, schools

▣ Scope of Technology Transfer

▪ Contents and Range of Technology Transfer

▶ Contents of Technology Transfer

- LED control technology with color temperature control function
  - LED lighting control circuit design technology
  - User Interface design technology for LED lighting Control

- LED lighting control technology to adjust color temperature and RGB color
  - LED lighting control circuit design technology
  - LED lighting Driving circuit design technology
  - LED downlight circuit design technology
  - User Interface for LED control design technology

- LED lighting control technology to adjust color temperature and RGB color(Including VHDL source to run FPGA)
  - LED lighting control circuit design technology
  - PWM generation FPGA design technology
  - LED lighting Driving circuit design technology
  - LED downlight circuit design technology
  - User Interface for LED control design technology

▶ Range of Technology Transfer

▣ Applications and Effects

▶ Expected product through application

- Color temperature controllable LED lighting responding to changes in surroundings in schools, department stores, complex facilities
- LED Table at home
- LED stand for educational use at home, schools, offices

▶ Expected Effects

- It enables delicate adjustments of color temperature by adjusting lightness of LED lightings, and the arise of Emotion-Friendly lighting products, which will bring about bigger market and bigger demands