

OTHER APPLICATIONS OF LED AND HID LIGHTINGS:

1. Indoor lighting
2. Street lamp
3. Replacing fluorescent tube
4. Replacing halogen spot light
5. Multi-colour illumination
6. LED light bulb
7. LED back light LCD display
8. LED Emergency lighting
9. Hazardous environment LED lighting

Patents filed

2HID:

HID ballast with lamp temperature compensation
– New control method to improve the temperature dependence of the HID lamp and ballast system.
A scheme to dim the HID lamps in automobiles
– A new control and circuit method to provide the dimming control of the front-lighting system using HID lamp.

1LED:

LED head-lamp and tail-lamp for automobiles using classical SMPS topologies with reduced compensation – New method of power driver for the LEDs lamp and reduce the overall cost and improve the performance in efficacy.

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Prof. Eric Cheng is a professor in the Dept. of Electrical Engineering of the Hong Kong Polytechnic University. He is the group leader of Utilization of the Department and Director of Power Electronics Research Center of the University.

His research interests cover all aspects of power electronics, magnetics, machines, EMI and drives. He has published over 200 papers and 7 books. Since he joined the Department in 1997, he has been working on 31 research and development projects as a Principal Investigator with total funding of more than \$35 Million. He also has been Principal Investigator for 4 CERG projects.

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Application of Power Electronics to LED and HID Lighting



LED braking lighting using 7 superbright LEDs



Integrated sphere for lighting measurement



Laboratory testing for lighting

Latest News

The researchers at the Hong Kong Polytechnic University is now developing an LED and HID lamp technology for the high performance lighting systems. It is expecting the new lighting system will benefit the community and the electronics and lighting industry.

The current important development for the centre includes:

- New the LED street lamp – An integrated system for combined solar and wind power system.
- HID ballast system for 2–4 HID lamps – Development of one electronic ballast to many HID for reduction of cost and maintenance.
- Low component count LED power conditioning.
- High power LED development.
- Colour compensation and temperature compensation – Develop a control and circuit method to improve the performance due to ageing and environment.
- Medical lighting – Use the spectrum control for the LED and use them for medical treatment and prevention of certain diseases.

Background

In the past ten years, LEDs has been used for signaling applications. With the rapid growth of the LEDs' technology, LEDs can now be installed as the new lighting systems for vehicle, home and office illumination because of its long service life and low power consumption.

HID lamps are known for their unique ability to produce almost white light and high lumen/watt ratio as compared to halogen lamps. The high efficacy of the HID lamp coupled with power electronic circuits has made the application of the HID lamp in automobiles possible.

Our Development

We have developed the LED power conditioning system for automotive lighting, indoor and outdoor illumination method. The following research and development have been made:

1. HIGH POWER LED AND HID LIGHTING POWER CONDITIONING

2. Thermal management for LED and HID
3. Tri-colour LED power conditioning
4. Matrix lighting using LED for display and advertising
5. LED power conditioning using reduced component approach



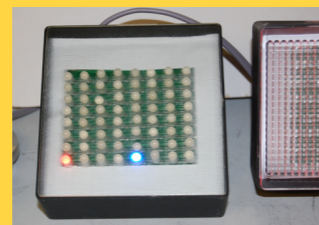
HID front-lighting lamp



LED front lighting using 7 LEDs

6. DEVELOPED OVER 6 CIRCUITS OF SIMPLIFIED POWER CONDITIONING FOR LED

7. Integration of magnetic devices with LED
8. Packaging design for different lighting applications including automotive and consumer electronics
9. Successfully development of brake, reverse and brake lighting system for tail light.
10. Successfully development of desk lamp for office and home use.



Matrix lighting



Matrix tail lamps



HID lamp ballast with thermal managed casing

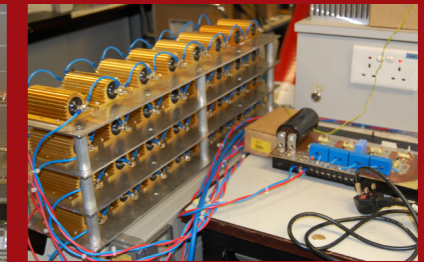


Sample LED lamps

About Power Electronics Research Centre (PERC)



Research Team of the electric vehicle – Power Conversion



Battery loader



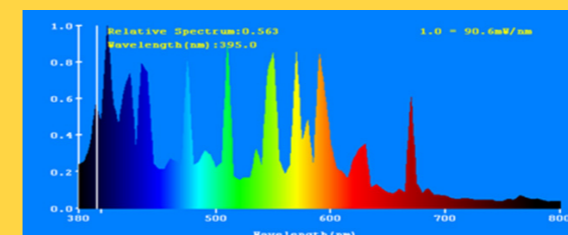
Electric vehicles of Smart and MyCar

The two power electronics groups in the Department of Electrical Engineering (EE) and the Department of Electronic and Information Engineering (EIE) and are well-established research groups. Both groups have an impressive research track record in the areas of power converters design and modelling, power factor correction, chaotic phenomena, motor drives, motor design, energy management, magnetics, electromagnetic compatibility and application of power electronics in power system engineering. In November 2000, the two power electronics groups merged to become the Power Electronics Research Centre. This merger offers significant advantages in staffing and equipment utilisation, as well as in the promotion of large-scale collaborative research work. The Centre has

a wealth of experience in research, testing, evaluation of products and development of new technologies. In addition to conducting research and development work, the Centre provides various services to industry, such as consultancy, testing of utility system components, quality assurance evaluations and professional training. The Centre has a comprehensive range of facilities and equipment. The aims of the center are to provide high level research and development and support local and overseas industrial work. We provide technical training for local engineers who work in the field of power electronics. Regular workshops and conferences are organized by the Centre to foster the exchange of ideas among various research institutions and power electronics manufacturers.

11. DEVELOPMENT OF FRONT-LIGHTING FOR VEHICLE

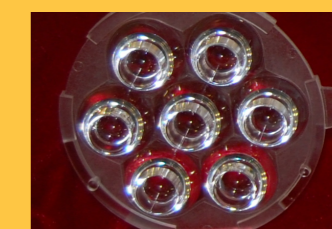
12. Integration of HID and LED lighting system
13. Integration of collimators with LED
14. Dimming Control of HID and LED systems
15. Aging and temperature compensations of HID



Lighting measurement to examine the spectrum

Optics:

We have developed the optical design for the tail and front lighting for the HID and LED lamps. We adopted the freeforming technologies for the design of the reflector and lens. The whole lamp chassis are developed with the total solution for front and tail lamps.



Brake light lens



HID head lamp