Lighting technology development and trend

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Global Efficient Lighting Centre
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UNEP Collaborating Centre for Energy Efficient Lighting

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Lighting technology status

Lighting development

Incandescent lamp **Gas discharged lamp** **CFL** **LED lamp**

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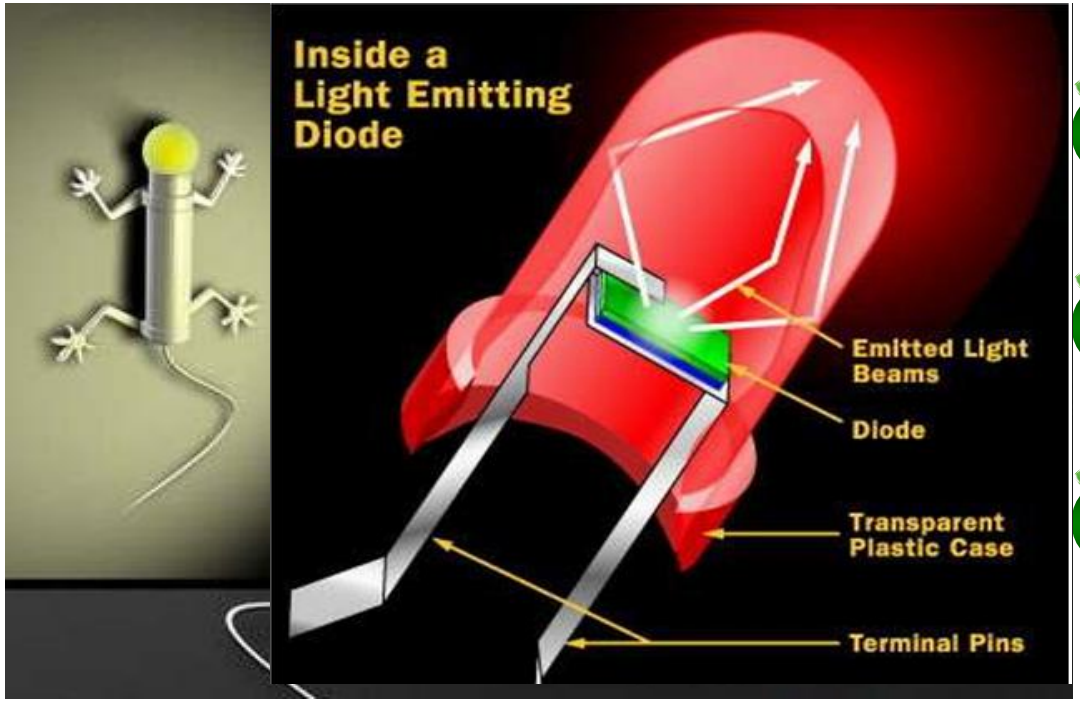
Lighting technology status

Market demands

Lighting technology status

LED



- **Energy Conservation**
- **Long Lifetime**
- **Small Size**
- **High Luminous Efficacy**

Commonly used LED lighting products

LED panel
LED reflector
LED downlight

LED tunnel lighting
LED street lighting

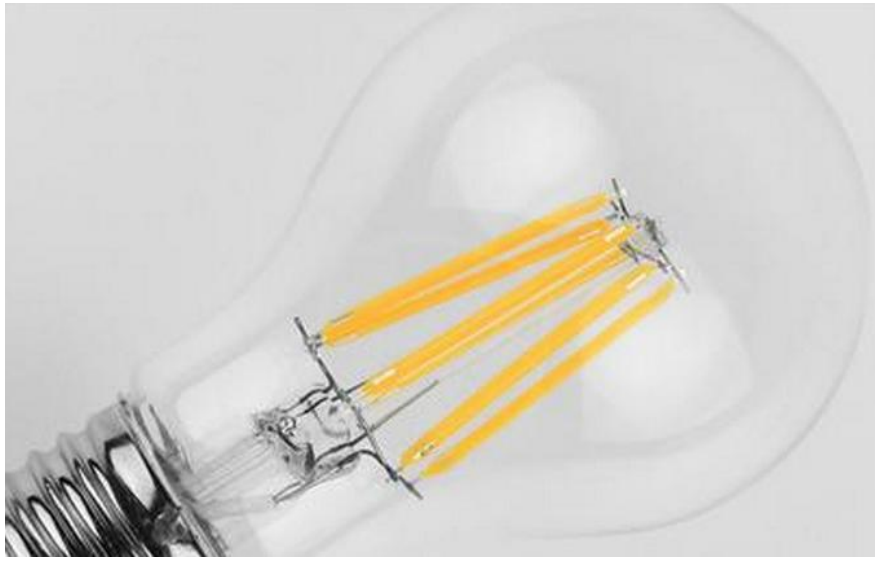
Commonly used LED lighting products

LED bulb

LED tube

LED filament bulb

incandescent lamp



Imitation of incandescent lamp

LED lamp Classification – by luminous flux

Classification Self-ballast LED lamp
150 lm
250 lm
500 lm
800 lm
1000 lm
1500 lm
2000 lm
3000 lm

- **IEC 62612 Ed.1 CDV**
- **GB/T 31112 2014**

LED lamp Classification– different heat sink materials

Plastic

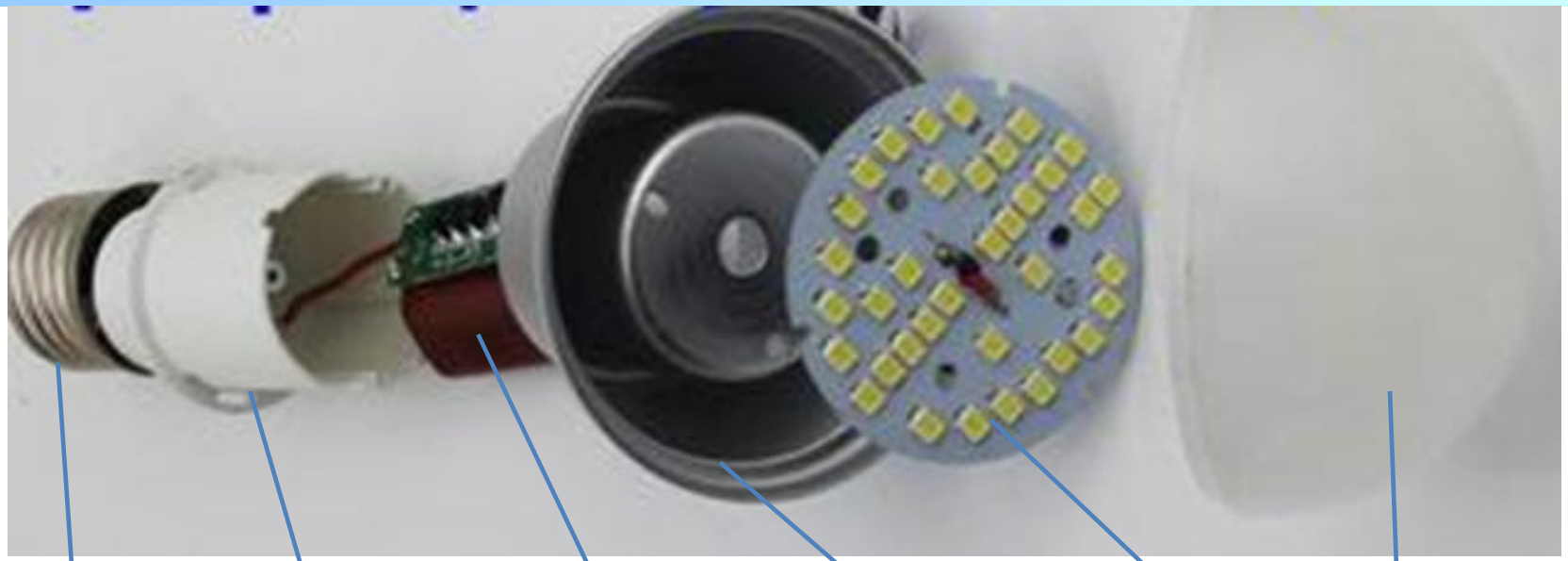
Aluminum

Ceramic

LED lamp Classification-- different lamp bases

GU10

LED lamp structure



Lamp base

lampstand

driver

Heat sink

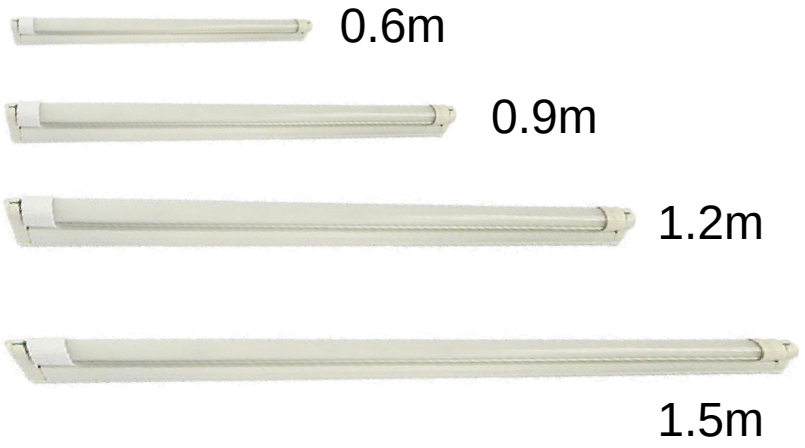
LED chip

cover

Lighting technology status

LED tube classification-- different sizes

Size	T5	T8	T9	T10
Tube length	0.6m	0.9m	1.2m	1.5m



LED tube structure

Driver

Lamp panel

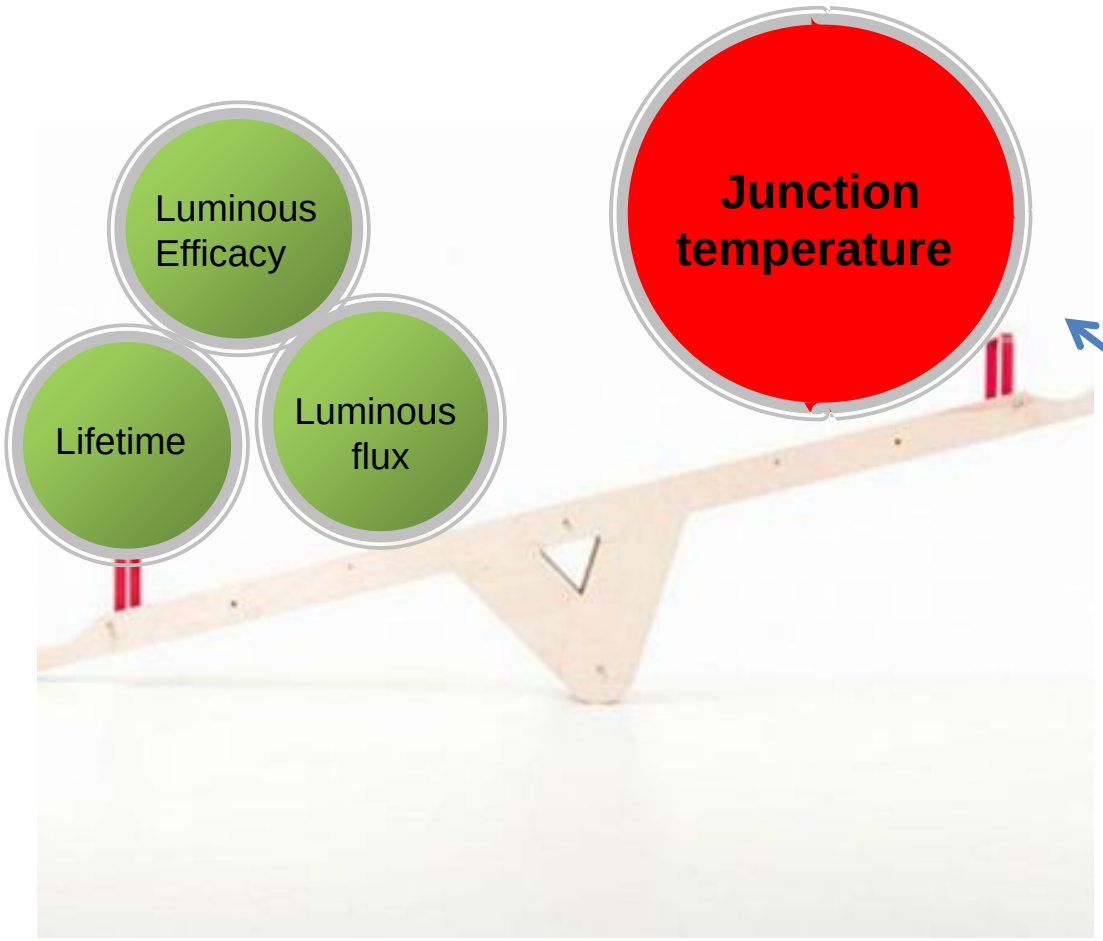
Heat sink (Aluminum)

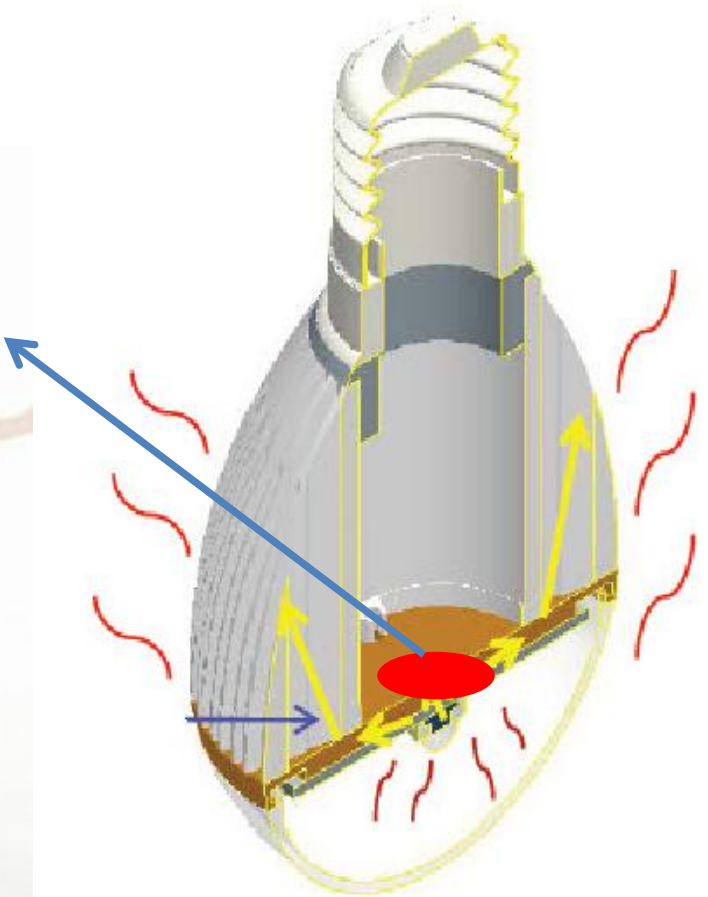
Lamp base

Luminous efficacy comparison

	Luminous Efficacy
Incandescent lamp	≈15 lm/W
CFL	≈65 lm/W
LED bulb	≈70-75 lm/W
LED tube	≈90-100 lm/W

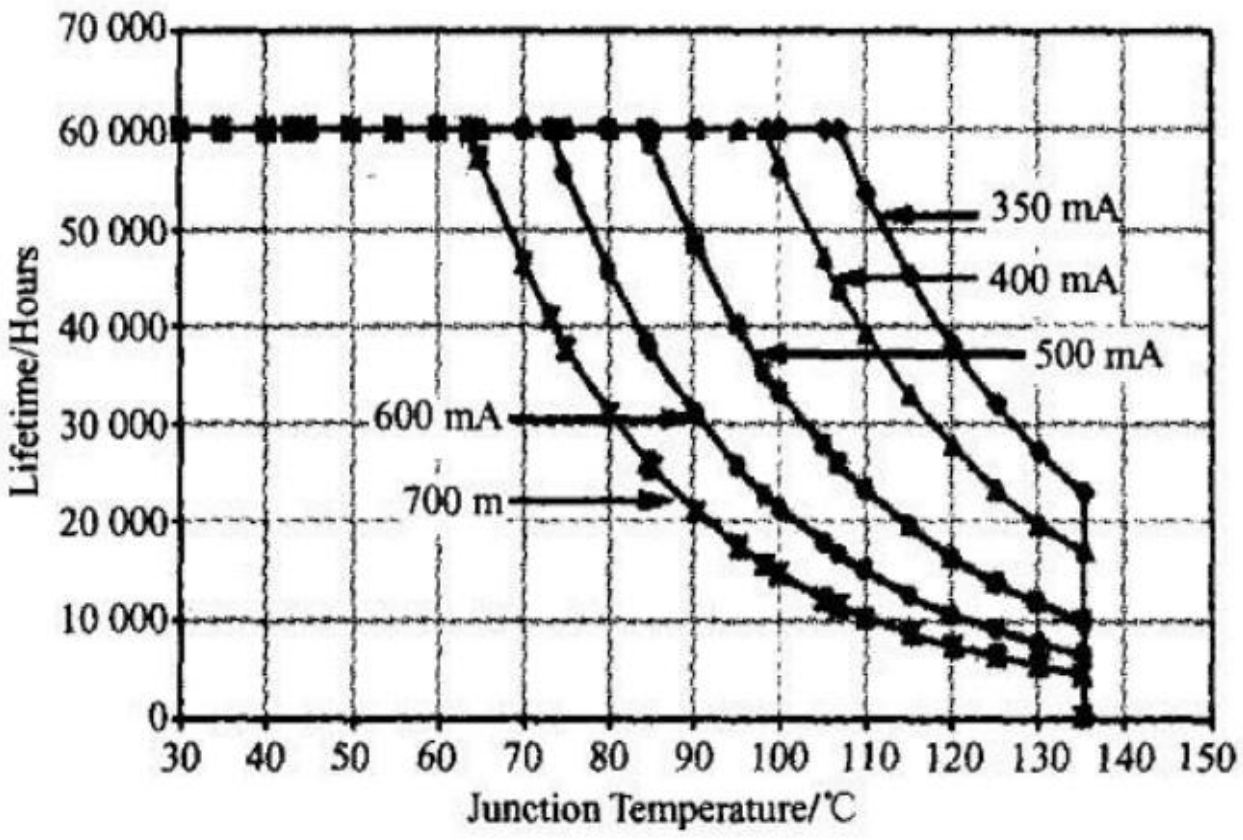
The main issue of LED lighting technology





LED technical bottleneck---heat radiation

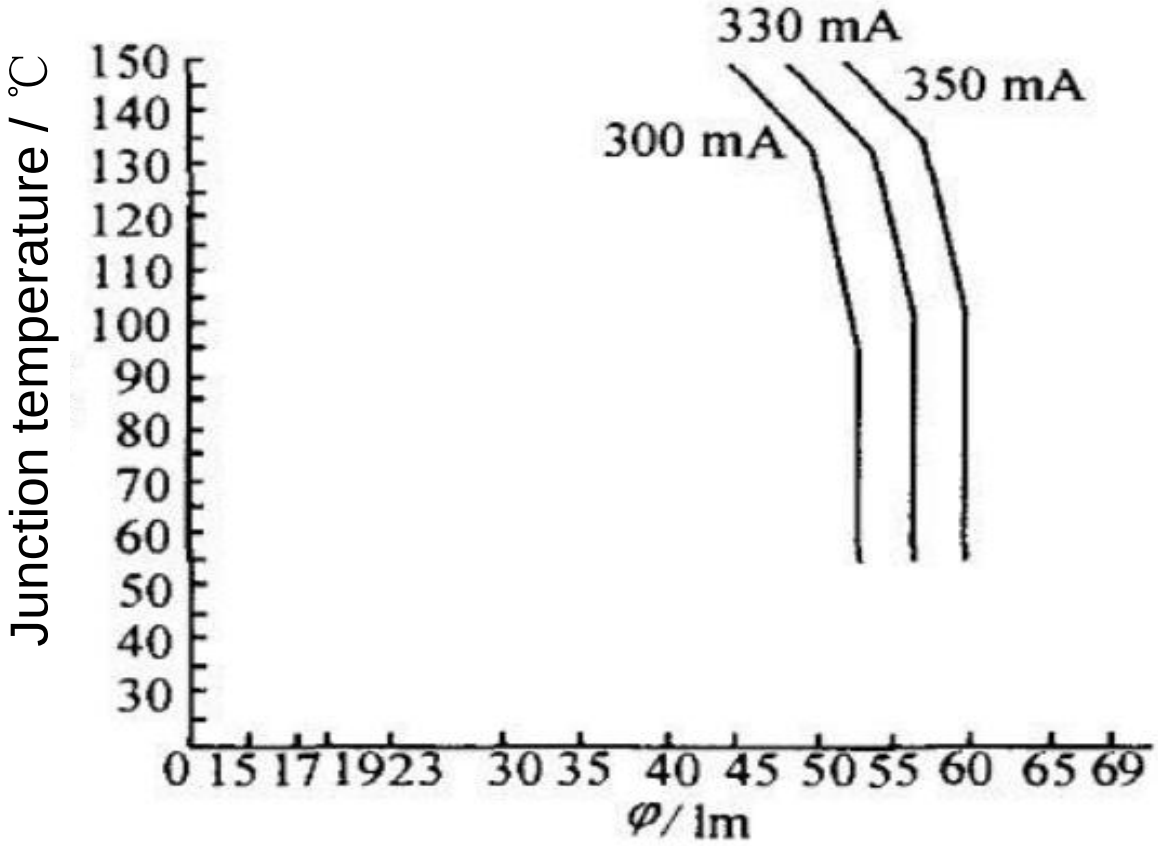
Lifetime



Dr. Tang Dawei,The status and development trend of LED heat radiation technology,2012

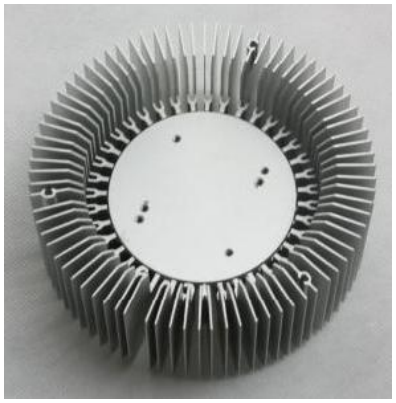
LED technical bottleneck---heat radiation

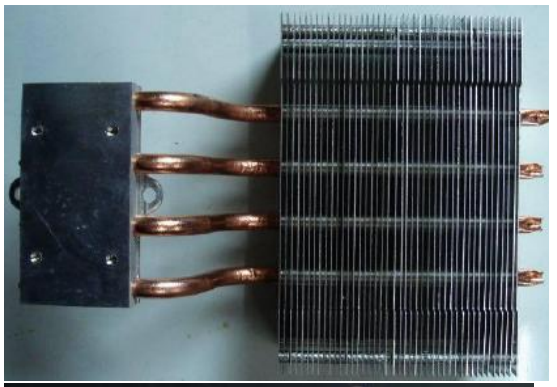
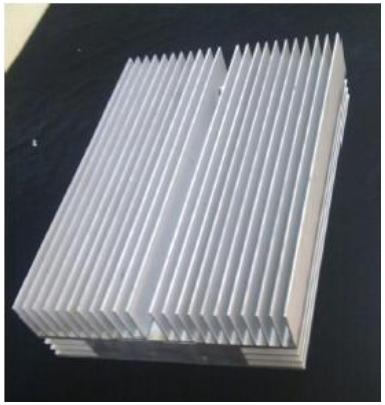
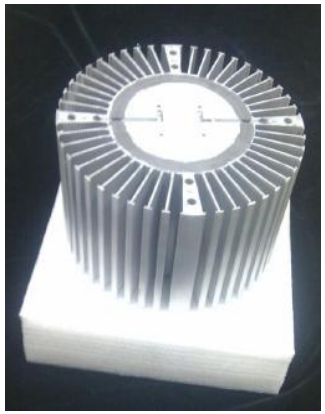
Luminous flux

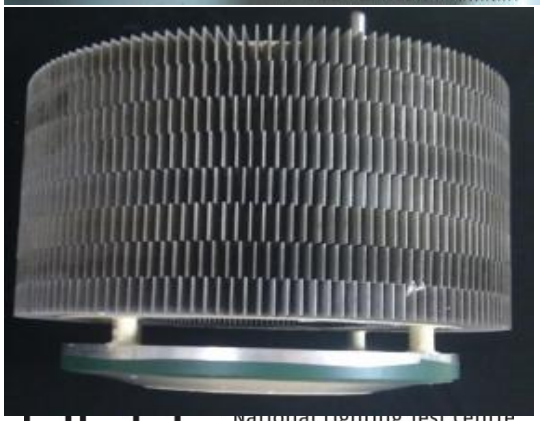


Dr. Tang Dawei,The status and development trend of LED heat radiation technology,2012

Typical heat radiation technologies: examples



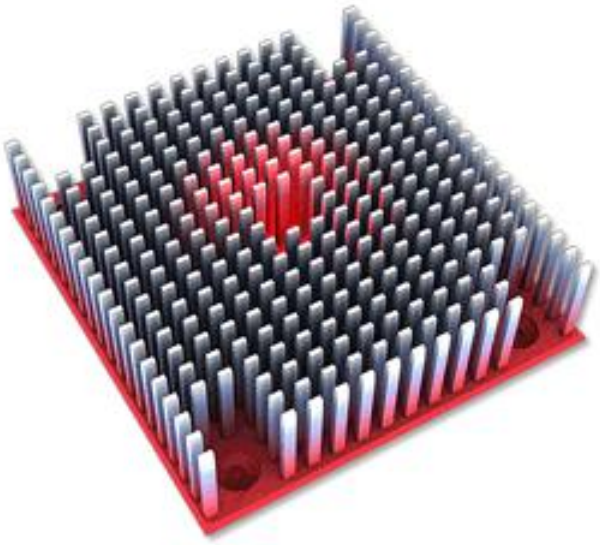


New LED heat radiation technologies

Electro Hydro Dynamic

Polycrystalline diamond composite

Infrared radiation coatings



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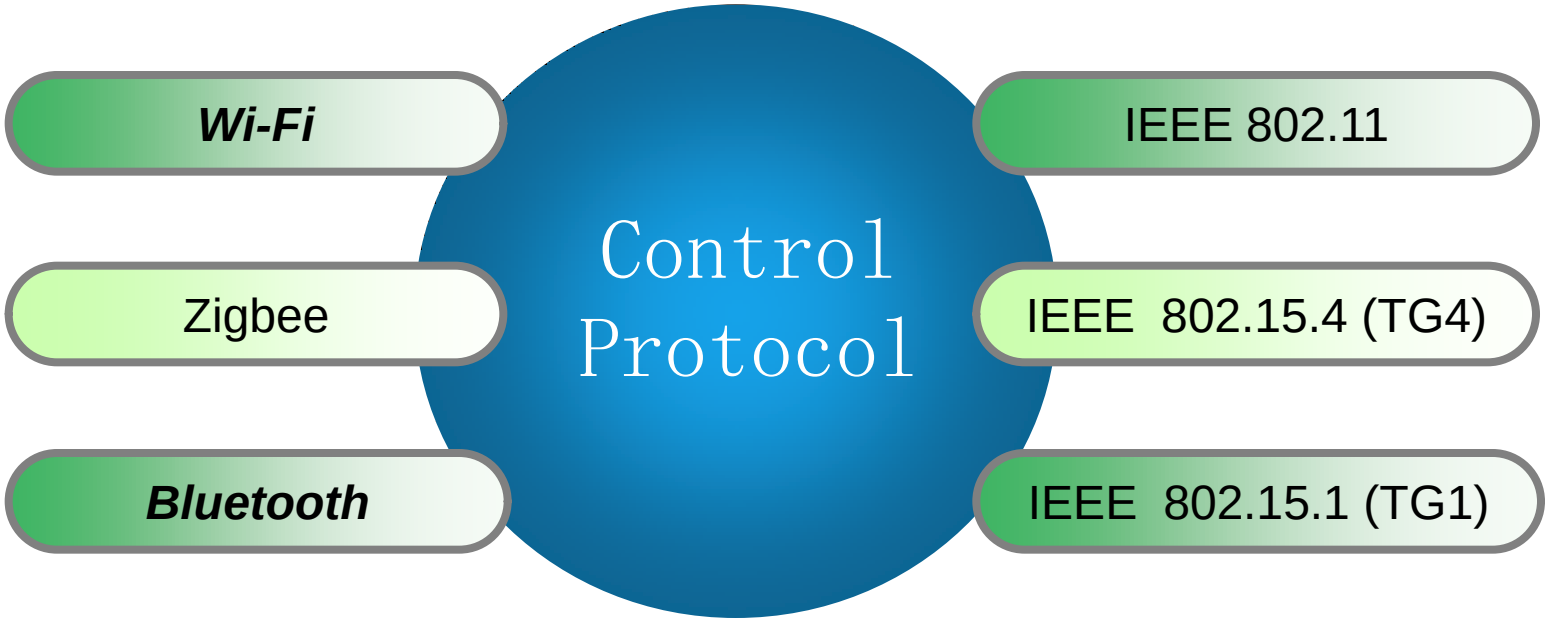
Intelligent control in lighting

st Centre

What is control protocol ?



Intelligent control in lighting

Wi-Fi

Intelligent control in lighting

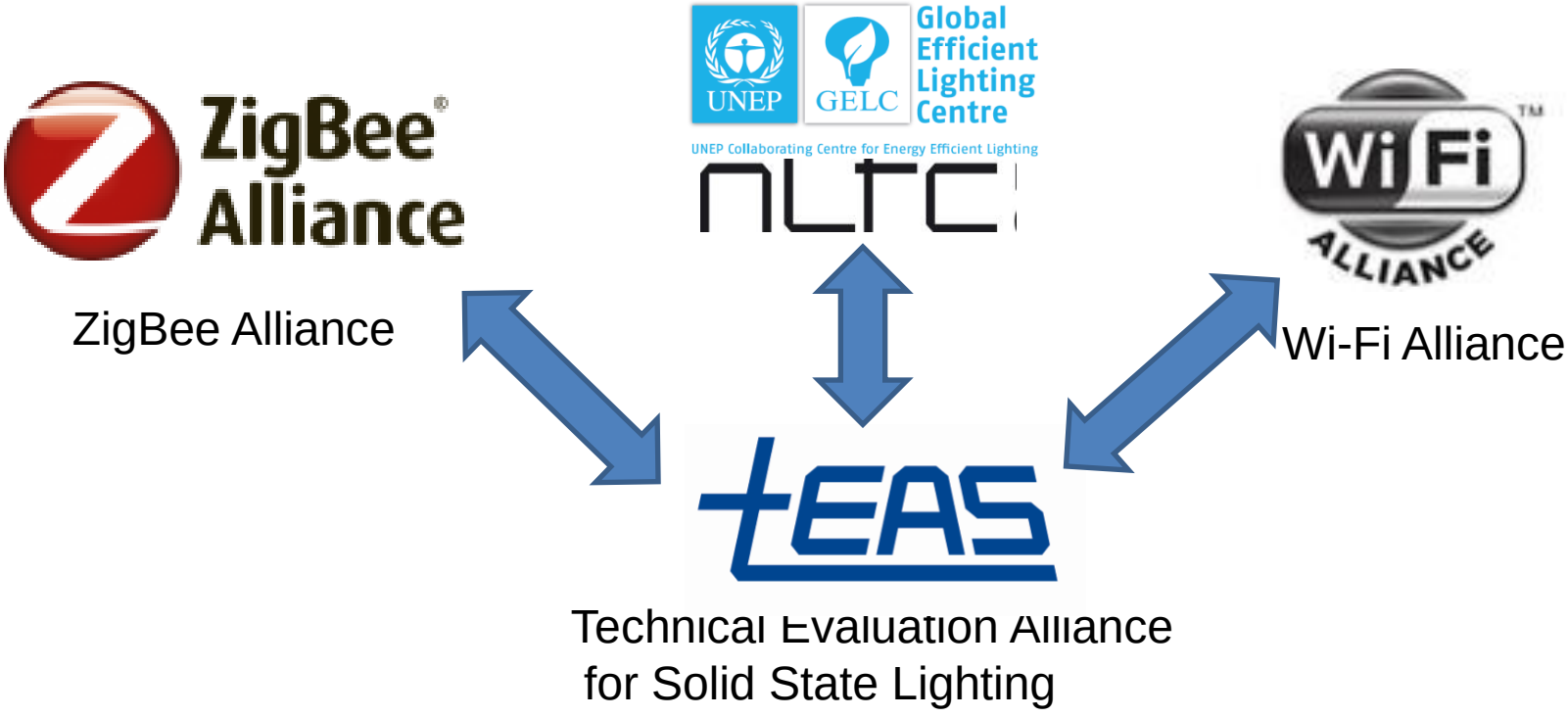
Zigbee

Intelligent control in lighting

Bluetooth

Intelligent control in lighting

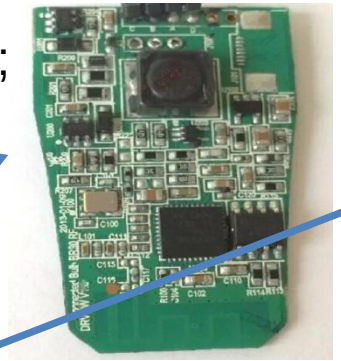
Cooperation

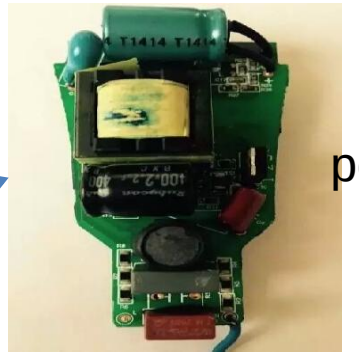


Intelligent control protocol in LED lighting

Intelligent control protocol in LED lighting

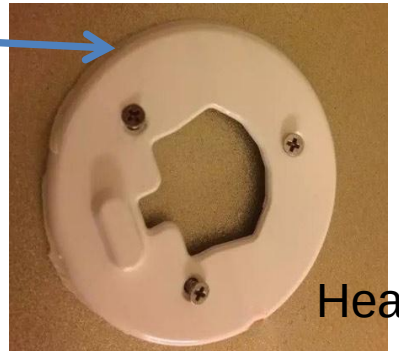
motherboard;
zigbee2530





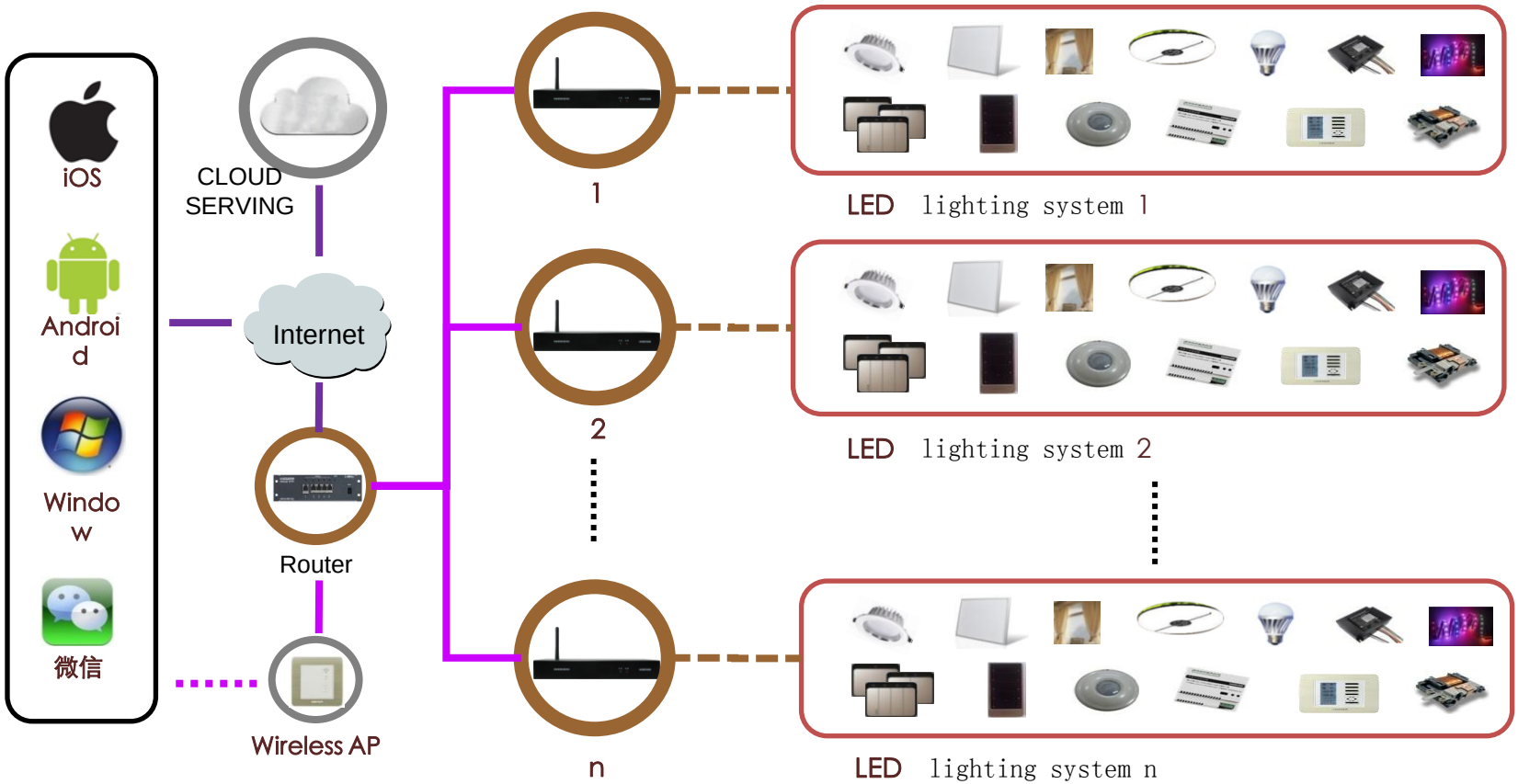
power

LED chip



Heat sink

The trend --- Lighting system



The development trend of lighting in future

The trend --- Human centric

The development trend of lighting in future

The trend --- Human centric

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National Lighting Test Centre China

The development trend of lighting in future

The trend --- Human centric

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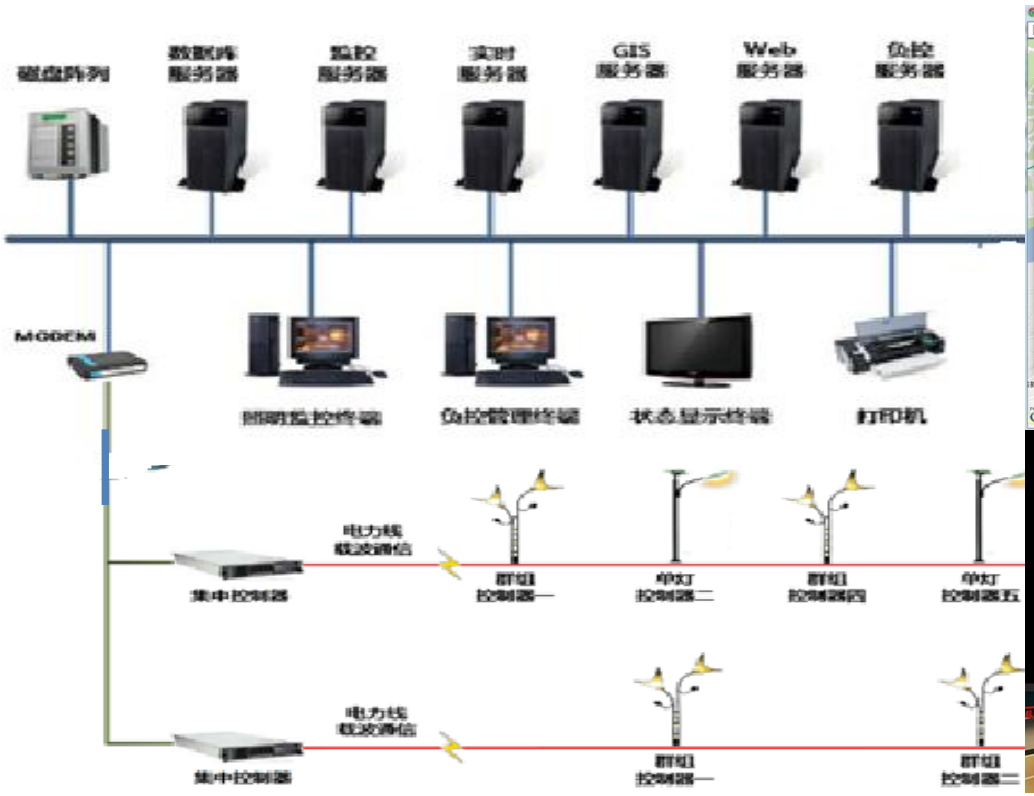
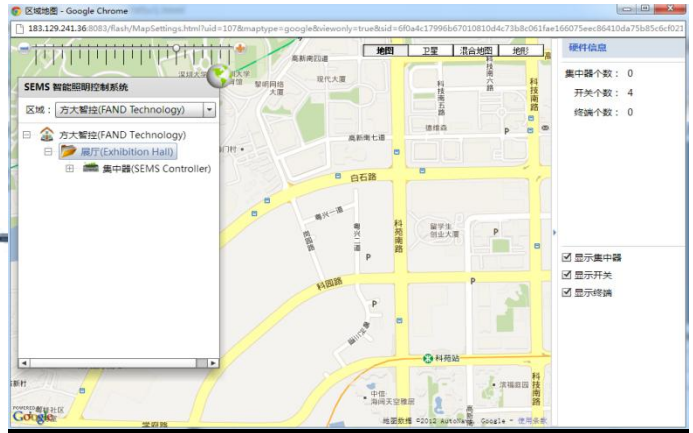
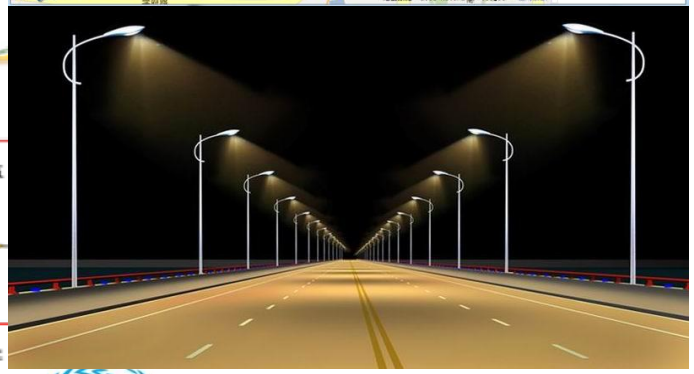
The development trend of lighting in future

The trend --- Human centric







The development trend of lighting in future

Non-visual Lighting

Agriculture lighting

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