

**ETI** (Elec-tech International Co.,Ltd)

# LED Package BU Introduction



# CONTENS

**01**

**ETI LED Package BU**

**02**

**ETI LED Application**

**03**

**ETI Advantage**

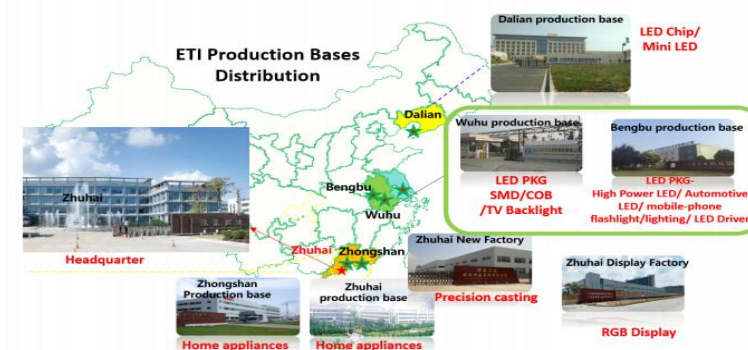
# ETI LED Package BU Introduction

## Part 1

# ETI Group Profile (Who is ETI)

ELEC-TECH INTERNATIONALCO., LTD.(ETI) was established in May 1996, mainly engaged in the design, production and sales of LED and intelligent home appliances . ETI was listed on the Shenzhen Stock & Exchange Market in 2004 under the stock code 002005. It was one of the first batches of eight enterprises listed on the Small and Medium-Sized Enterprises Board.

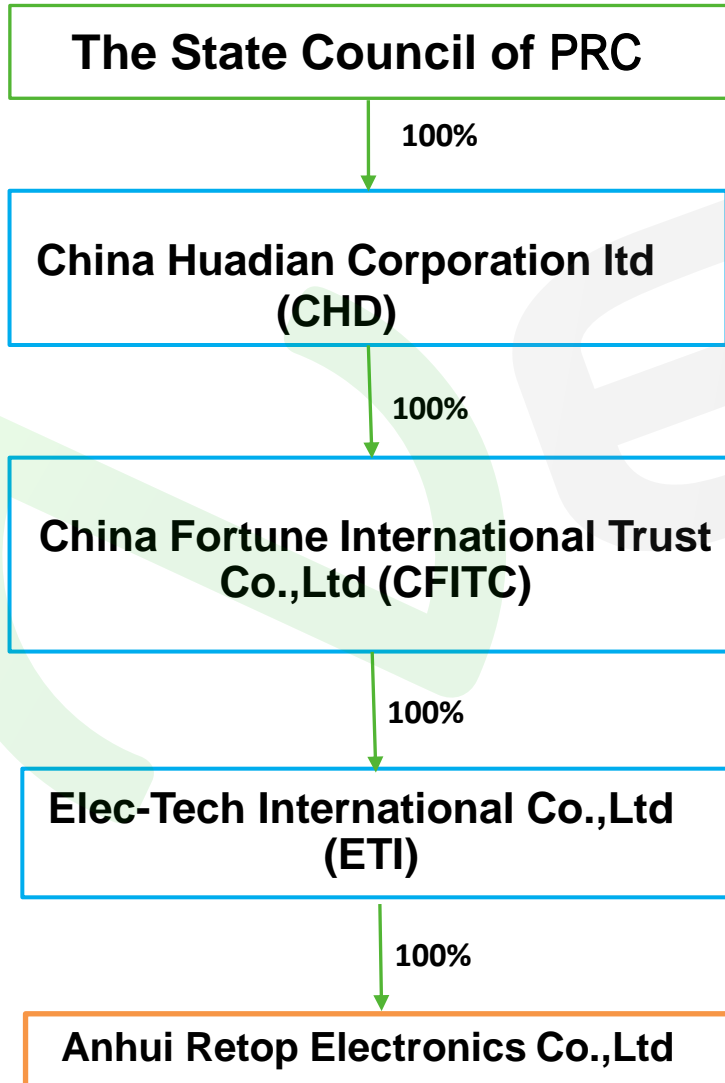
Elec-Tech is now operating 30 wholly-owned and holding companies with over 20,000 staff. The group has seven R&D and production bases respectively in Zhuhai, Wuhu, Zhongshan, Shenzhen, Dalian, Yangzhou and Bengbu. ETI group has two listed companies (ETI, stock code 002005 in Shenzhen and NVC, stock code 0222 in Hongkong. Total assets of the group exceed 8 billion CNY, have NVC, Whirlpool, Electrolux and AEG brands for LED lighting, over 1200 patents and intellectual property. ETI' s biggest shareholder is CHINA HUADIAN CORPORATION LTD. CHD total revenue is \$35 billion (2018), It was ranked 397th on Fortune Global 500 In 2018.



LED Factory video: <https://youtu.be/5n2Mr9pJD9U>

ETI (Elec-Tech) Company Video: [https://youtu.be/8vdJMUN\\_ZxI](https://youtu.be/8vdJMUN_ZxI)

## Major Shareholders Background



CHD is one of the five state-owned sole proprietorship power generation corporations organized at the end of 2002 according to national reform for electricity system. Its major business includes power generation, heat production and supply, development of primary energy related with electricity such as coal and relevant technical service. It has grown from a electric power generator to a comprehensive energy group with rising position in the industry. The corporation was also listed among the FORTUNE GLOBAL 500 for the tenth year in a row with ranking rising by 18 places(to No.352) from the previous year.



China Fortune International Trust Co., Ltd is a trust company under China Huadian Co., Ltd. The Company offers capital trusts, movable property trusts, real estate trusts, marketable securities trusts, property rights trusts, mergers and acquisitions, project financing, and other services.

# Milestones

**1996** Founded,  
start from home  
appliance business

- ✓ 1997 Became major bread maker in North America market.
- ✓ 1999 The biggest bread machine OEM/ODM factory, have a 50% worldwide market share.
- ✓ 2001 Shareholding reform
- ✓ 2004 Acquire ACA(North America Appliances)
- ✓ 2004 listed on the Shenzhen Stock & Exchange

**2009**  
Enter into  
LED industry

- ✓ 2009 Acquired the LED Assets Of EpiValley Co.,Ltd, Shenzhen Retop Display Co.,Ltd, Enter Into LED Industry.
- ✓ 2009 Built wafer/EPI, LED chip Production bases in Wuhu/Yangzhou/Dalian/Bengbu city.
- ✓ 2011 Got AEG、Whirlpool brand authorized for LED lighting.
- ✓ 2013 Launched NVCETI brand for LED lighting.
- ✓ 2013 Launched NLW(northern lights white) world-class flip-chip , won a golden award of semicon china.

**2012**  
Acquire NVC

- ✓ 2014 Launched NVC lighting and ETI smart home O2O e-commercial platform
- ✓ 2014 Launched "Sirius" Flip-chip, "Northern light" CSP flip-chip.
- ✓ 2015 CSP for direct type TV backlight application.
- ✓ 2015 Got AEO certification from customs.

**2016**  
Solid growth

- ✓ 2016 China 500 most valuable companies.
- ✓ 2017 Guangdong intelligent manufacturing Award
- ✓ 2018 Informatization and digital transformation
- ✓ 2019 Advanced manufacturing Award

**2021**  
Change &  
innovation

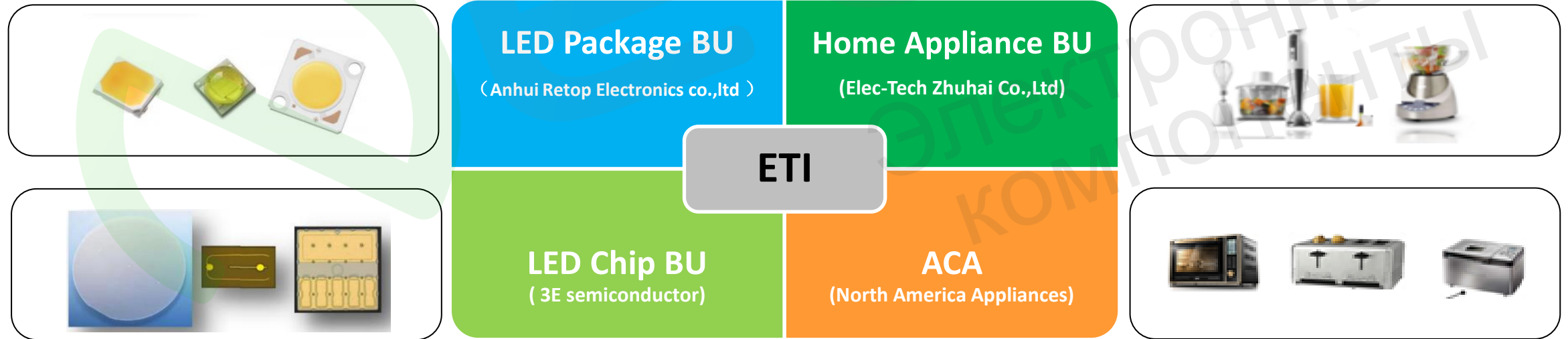
- ✓ 2021 CHD is became the major shareholders.
- ✓ 2021 LED Package BU released development roadmap next 5 years
- ✓ Compound Semiconductor Research

# ETI LED Package BU Introduction (About Retop)

Anhui Retop Electronics Co.,Ltd is a professional LED packaging products supplier.

as a wholly owned subsidiary of Elec-Tech International Co.,Ltd,

We offer LED Chip, LED Package, LED module, LED components and lighting Solutions to the market. Our main business include : Automotive lighting, TV Backlight, Mobile flash light, Commercial lighting. The factory located in Wuhu production base with area 21000m<sup>2</sup> and Bengbu production base with 90,000m<sup>2</sup>.



**ETI LED Package BU = Anhui Retop Electronics Co.,Ltd**



# ETI LED Package BU Introduction (Anhui Retop Electronics Co.,Ltd)



**Wuhu production base**  
total area 210,000m<sup>2</sup>



**Bengbu production base**  
total area 280,000m<sup>2</sup>

## LED ( with wire bonding)



**PLCC/SMD/EMC LEDs**

## Flip-chip LED (no wire bonding)

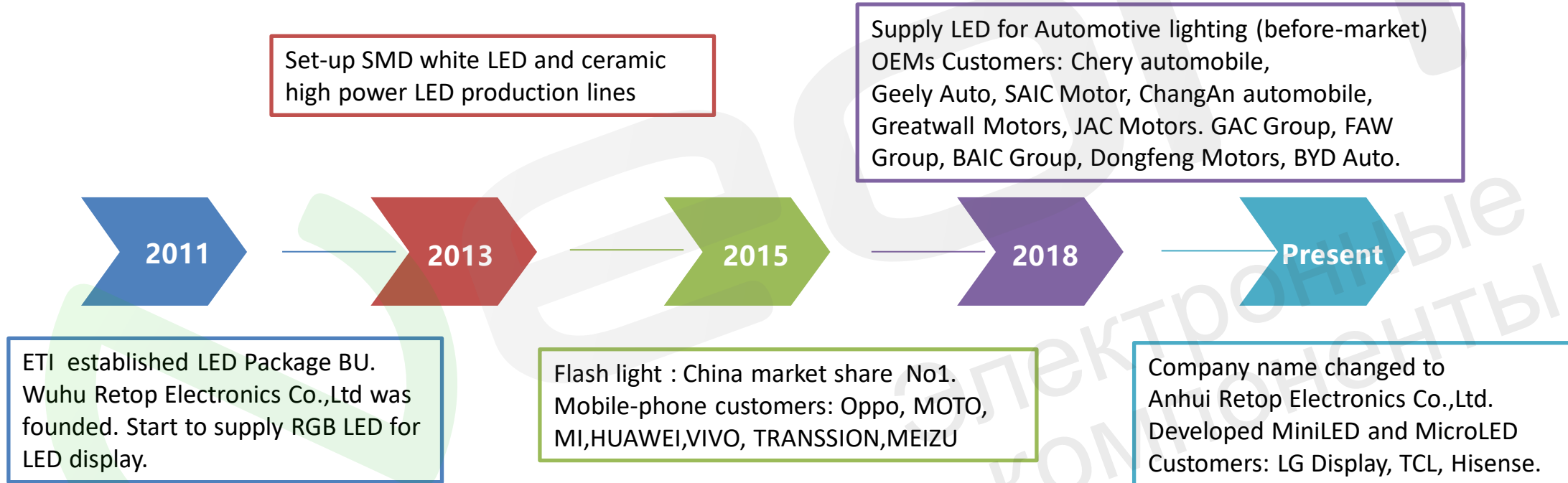


**Ceramic high power LEDs**



# ETI LED Package BU Introduction (Anhui Retop Electronics Co.,Ltd)

## Retop Co.,Ltd Development Timeline



# ETI LED Package BU Introduction (Anhui Retop Electronics Co.,Ltd)

One of the biggest class 1000 cleanroom and semiconductor-grade workshop in CHINA



## Cleanroom Level Classification

ISO 14644-1 and ISO 14698

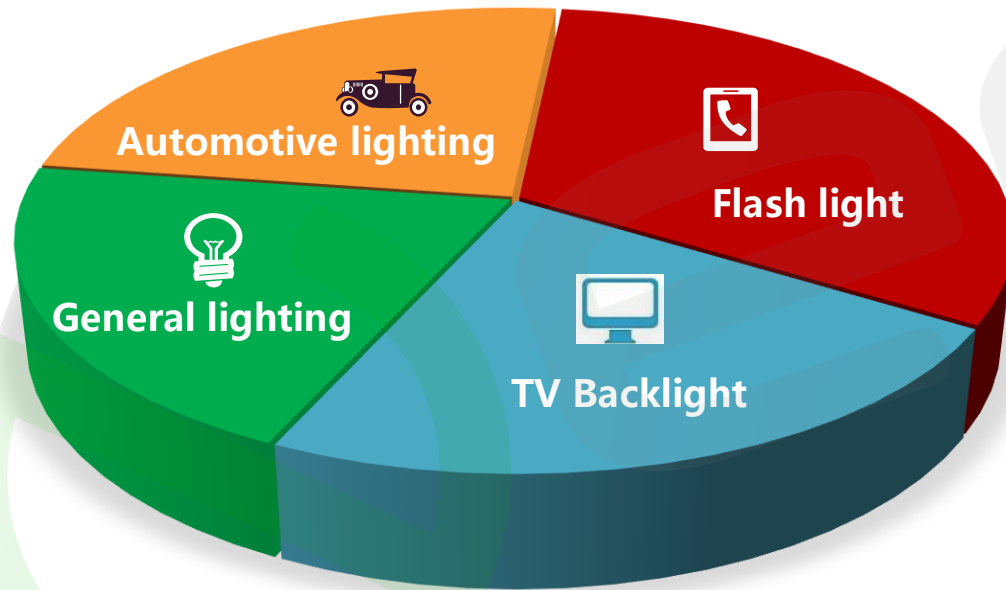
Class	Class limit "not to exceed" particles per cubic meters for particles sizes shown						FED STD 209E equivalent
	$\geq 0.1 \mu\text{m}$	$\geq 0.2 \mu\text{m}$	$\geq 0.3 \mu\text{m}$	$\geq 0.5 \mu\text{m}$	$\geq 1 \mu\text{m}$	$\geq 5 \mu\text{m}$	
ISO 1	10 <sup>b</sup>	d	d	d	d	e	
ISO 2	100	24 <sup>b</sup>	10 <sup>b</sup>	d	d	e	
ISO 3	1,000	237	102	35 <sup>b</sup>	d	e	Class 1
ISO 4	10,000	2,370	1,020	352	83 <sup>b</sup>	e	Class 10
ISO 5	100,000	23,700	10,200	3,520	832	def	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7	c	c	c	352,000	83,200	2,930	Class 10,000
ISO 8	c	c	c	3,520,000	832,000	29,300	Class 100,000
ISO 9	c	c	c	35,200,000	8,320,000	293,000	Room air

ETI level

Average level

# ETI LED Package BU Introduction (Anhui Retop Electronics Co.,Ltd)

## Product segment



**SMD LEDs:**  
500KK pcs/M

**Ceramic LEDs:**  
75KK pcs/M

Capacity	2020	2021	2022	2023
PLCC SMD LEDs(Qty/Month)	250KK	350KK	500KK	600KK
Ceramic High Power LEDs (Qty/Month)	15KK	25KK	75KK	125KK

# ETI LED Application | Part 2

# ETI LED Application (product segment)

Flash light



TV Backlight



Automotive lighting



Commercial lighting





# Flash light customers



## Classic cases:

Mobile phone customers : OPPO、HUAWEI/HONOR、TRANSSION、MOTO、NOKIA.

ODM solution customers : WINGTECH 、LONGCHEER 、CHINO-E



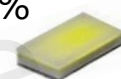
# Flash light successful cases



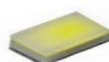
Brand: MEIZU 7series (Joint development)  
Application: Rear dual-color flash light  
LED Part: NLW1209AV/1016AV  
LEDs qty: 8pcs



Brand: TRANSSION(Africa)  
Application: Rear/front flash light  
LED Part: NLW2016AY/2016C05  
ETI share: account for 80%-90%



Brand: HUAWEI/HONOR  
Application: Rear/front flash light  
LED Part: NLW2016AY/2016C10  
LEDs qty: 2pcs



Brand: OPPO R series  
Application: Rear flash light  
LED Part: NLW2016AY  
LEDs qty: 2pcs



Brand: TCL full series  
Application: Rear/front flash light  
LED Part: NLW2016AY/CSP1313  
LEDs qty: 6个



Brand: MOTO V series  
Application: Rear/front flash light  
LED Part: NLW1016/2016  
LEDs qty: 3pcs



ETI flash light LED apply to various brands mobile phone

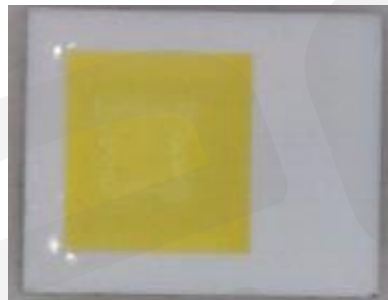
# ETI Flash light LED features

Exxx company CH09



Conventional 2016LED,  
epoxy molding

ETI-NLW2016AY5B



ETI Q-flash  
Feature: high center  
luminance

ETI-NLW2016AY2C



Partial phosphor coating  
and molding technology.  
Feature: good uniformity

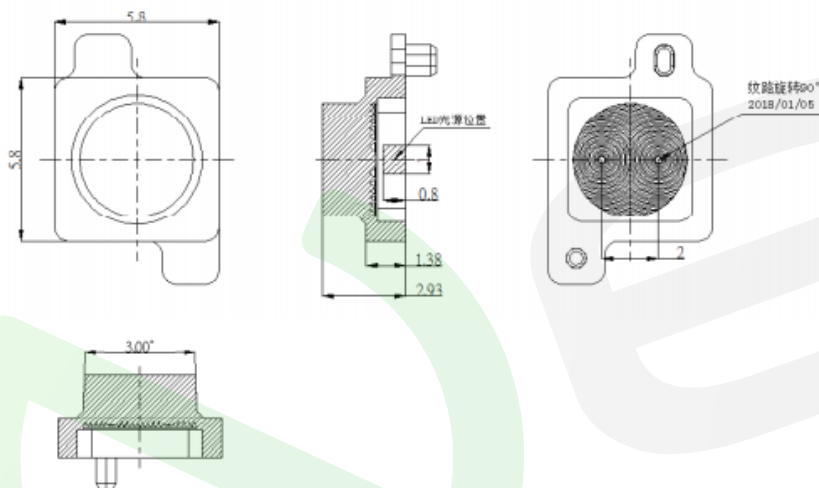
Part No	Center luminance (lx)	Luminance uniformity	CCT difference (K)
E company CH09	105.7	37.8%	159
NLW2016AY5B	<b>111.5</b>	37.5%	102
NLW2016AY2C	100.3	<b>40.6%</b>	131

Flash light optical requirement: High luminance/high CCT uniformity

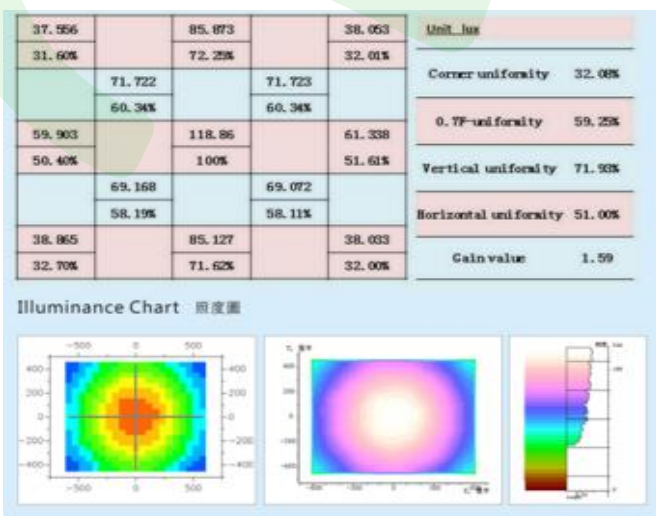
# ETI Technical support for Flash light

## ◆ Optical simulation

Optical simulation according to LED and Lens Ray File.



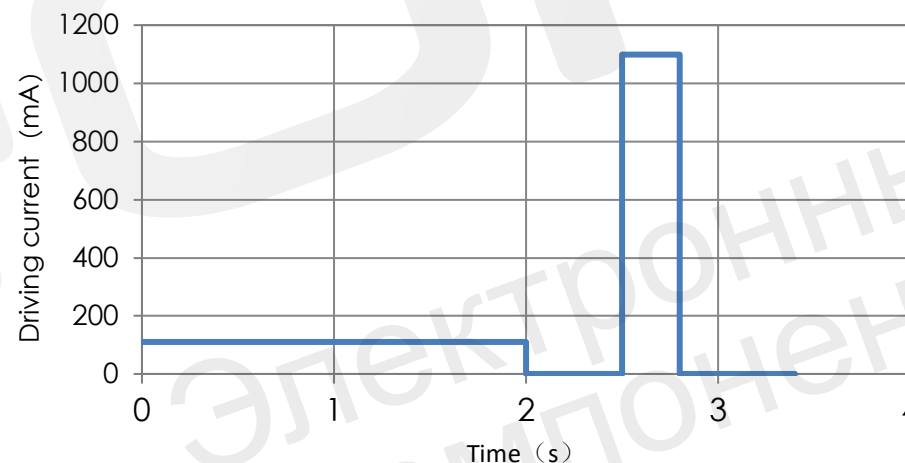
LED+LENS Optical simulation report



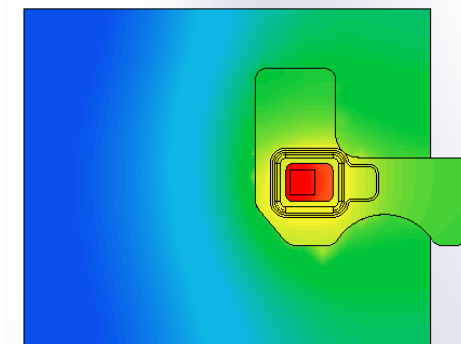
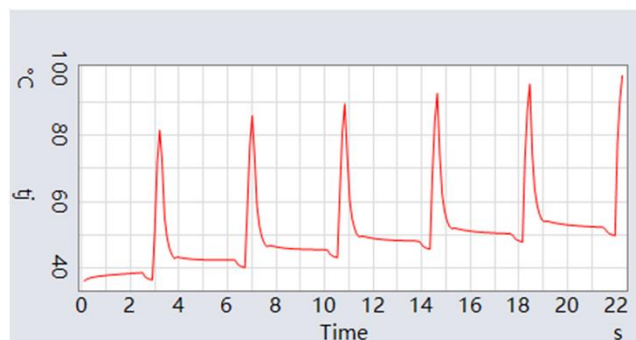
## ◆ Thermal simulation

Flash light under different current driving/applications (FPC/FR4/PCB) simulation

Pulse driving vs time



Project thermal simulation report



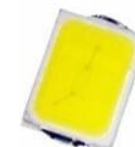
# Flash light successful cases

客户名称	项目日期	项目名称	终端机型	ETI选型	项目量
OPPO	2019.04.17	FA029	OPPO (A11X)	NLW2016AY5B	项目总量: 20KK
	2020.02.24	DD319	OPPO (外销项目)	NLW2016AY5B-B5060V23NAB	项目总量: 5KK
	2020.04.18	DD352	OPPO (跑量项目)	NLW2016AY5B-B5060V23NAB	项目总量: 30KK
	2020.05.11	FA237	OPPO	NLW2016AY5B-B5060V23NAB	项目总量: 5KK
	2020.10.15	AA001	OPPO	NLW2016AY2C-B5060V23NBC-FO1	项目总量: 5KK
	2020.11.02	AA306	OPPO	NLW2016AY2C-B5060V23NBC-FO1	项目总量: 10KK
	2021.05	PAKE-B	OPPO	NLW2016AY2C-B5060V23NBC-FO1	项目总量: 9KK
闻泰	2018.Q4	WT-88940中标	联想	NLW2016AY3-B5258V23N9A-WTLX	项目总量: 4KK
	2018.Q4	WT-89571中标	NOKIA	NLW2016AY3-B5060V23N9A	项目总量: 3KK
	2018.Q4	WT-80129中标	移动	NLW1016AV2-B5060V24N8A	项目总量: 8KK
	2018.Q4	WT-98607 (summer)	OPPO	NLW2016AY4-H4148V23N9B	项目总量: 10KK
	2019.Q1	WT-91007	华为	NLW2016AY5-B5257V23NAC	项目总量: 10KK
	2019.Q1	闻泰T89629与T89626	诺基亚	NLW2016AY3-B5060V23N9A-WT	项目总量: 10KK
	2019.Q1	闻泰0112 (S98860)	联想	NLW2016AY3-B5258V23N9A-WTLE	项目总量: 10KK
	2019.Q1	闻泰0124 (M88691)		NLW2016AY3-B5060V23N89	项目总量: 10KK
	2019.4.18	闻泰P98328 M8	联想	NLW2016AY5C-B5258V23N9B-WT	项目总量: 3KK
	2019.06.03	S88718-Sofia	联想	NLW2016AY5C-B5258V23NAB-WT	项目总量: 800K
	2019.06.21	S98860/S98870	联想	NLW2016AY3-B5258V23N9A-02-WT	项目总量: 1-1.5KK
	2019.07.19	S88718项目	项目一	NLW2016AY5D-B5258V23NAB-A	项目总量: 1KK
	2020.06.24		LG (FH10)	NLW2016AY4-B5258V23N9B	项目总量: 1-1.5KK
	2020.07.03	K10	小米	NLW2016AY5C-B5258V23NAB-WT	项目总量: 1-1.5KK
	2020.09.24	T99652/99653	诺基亚	NLW2016AY3-B5258V23N9A-WTLE	项目总量: 6.5-11.5KK
	2020.10.09		假闪	WR-2016C10-80C3-R A2	项目总量: 1-1.5KK
	2020.10.23	M10 P98928	联想平板	NLW2016AY3-B5258V23N9A-WTLE	项目总量: 5-10KK
	2020.11	印度Airtel19545	印度	WR-2016C10-80C3-R	项目总量: 10KK
	2020.11	印度Airtel19545	印度	WR-2016C15-80C3-R	项目总量: 10kk
	2021.1	印度T18546	印度	WR-2016C15-80C3-R	项目总量: 2-3KK
	2021.1	印度T18546	印度	WR-2016C10-80C3-R	项目总量: 按实际评估
	2021/2/1	S96767 (EIIIS)	联想	NLW2016AY4-B5258V23N9B	项目总量: 按实际评估
	2021/3/1	S96763 (派斯)	联想	NLW2016AY4E-B5258V23NBC	项目总量: 按实际评估
	2021/4/1	S98421	北美	NLW2016AY4E-B5258V23NBC	项目总量: 按实际评估
	2021/2/1		印度	NLW2016AY5C-B5258V23NAB-WT	项目总量: 2KK
	2021/4/12	S98117 (矩欣)	北美	NLW2016AY4E-B5258V23NBC	项目总量: 5KK
	2021/4/12	P88502	联想手机	NLW2016AY4-B5258V23N9B	项目总量: 按实际评估
	2021/6/1	K82172	魅族	NLW2016AY5C-B5258V23NAB-WT	项目总量: 按实际评估

客户名称	项目日期	项目名称	终端机型	ETI选型	项目量
传音	2020年	传音E代手机	传音HOT10	NLW2013AD2-H4554V13N23-KN0	项目总量: 按实际评估
	2021年	传音F代手机		NLW1016AV3-B4651V24NAB-YN0	项目总量: 按实际评估
	2021年	传音F代手机		NLW2013AD3-B4651V34NAB-YR0	项目总量: 按实际评估
	2021.06	LE6		NLW1016AV3-B4651V24NAB-YN0	项目总量: 1-1.5KK/月
	2021.06	LE8-5G		NLW1016AV3-B4651V24NAB-YN0	项目总量: 100K
	2021.06	KG5		NLW1016AV3-B4651V24NAB-YN0	项目总量: 700-800K/月
龙旗			华为pad	NLW2016AY5E	项目总量: 按实际评估
	2021.06	M330	MOTO	NLW2016AY2C-B5257V23NAB	项目总量: 6KK
	2021.06	M320	MOTO	NLW2016AY3C-B5257V23NBC	项目总量: 按实际评估
中诺	2021.06	M322	MOTO		项目总量: 按实际评估
	2020.09		诺基亚	NLW2016AY2-B5257V23N9A-EO1	项目总量: 2-3KK
	2020.10.20	S6301	MOTO	NLW2016AY7D-B5060V23NAB-AN2	项目总量: 3-5KK

## Projects list from 2019 to 2021/Q2

ETI is only Chinese supplier  
who can supply both PLCC and  
ceramic LED for flash light





# OEMs and Automotive lighting customers



## Classic cases:

OEMs customers/ China top 4 car makers: Greatwall, Chery, Geely, BYD.

Automotive lightings customers: Changzhou Xingyu automotive lighting systems co ltd, Mind Electronic Appliances Co.,Ltd.

**ETI is the first automotive LED company approved by OEMS (Chery auto & Greatwall motors)**

# ETI Automotive LED Applications














# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
CHERY Automobile – JETOUR X70	DRL/Position light	3433C05		
	Backup light	3528C02		
	Rear turn light	3528C02		
	Rear stop light	3433C05		
	Rear stop light	3528C02		
CHERY Automobile – JETOUR X70 (2020)	Rear turn light + Rear stop light	3537C05		
	Front turn light	3030C05		
	DRL/Position light	3030C07		

# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
CHERY QQ	Stop light	2835A05		
	DRL	3433C05		
CHERY SUV	Stop light	3528C02		
CHERY Automobile – JETOUR X95	Turn light	2835A02		
CHERY Automobile – JETOUR X95	Stop light	3528C02		

# ETI Automotive LED successful cases 2019/Q4~2021/Q2




OEM	Application	LED Part No	Vehicle	LED Package Picture
CHERY Automobile-Tiggo8	DRL/Position light	3433C05		
	Stop light	3030C09		
CHERY Automobile -T18	Turn light	3030C05		
CHERY Automobile-M13FL	Rear Position light	3528C02		
CHERY Automobile-T1E	Stop light	3030C09		
CHERY Automobile-ARRIZO	Position light	3528C02		
	Stop light	3433C05		
	Turn light	3030C05		
	DRL/Position light	3030C07		

# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
Great Wall Motors - Ora	DRL	2720M05		
	Turn light	2720M05		
Great Wall Motors - WEY / Tank SUV	Luggage boot light	3528C02		
Geely FE-5	button light	2214		
GM-A13/H73	Reading light	2835A02		
Wuling Motors	Reading light	2214		



# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
Baic Foton Motor IX5/IX7	Turn light	2835A05		
CAG Motor A30	Turn light	2835A05		
Soueast Motor	Tail light	3528C02		
FAW Auto – JIEFANG truck	LOGO light	3528AB6		
	LOGO light	3528A02		
FAW Auto – JIEFANG truck JAP	DRL/Turn light	3537C05		

# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
JAC Motor	CHMSL	2835A05		
	CHMSL	2835A05		
JAC Motor	LOGO light	2525		
Zotye Auto-X5	DRL	3535		
BYD E-vehicle	Stop light	3528C02		
Haval SUV	Interior light	3528AB6		



# ETI Automotive LED successful cases 2019/Q4~2021/Q2

OEM	Application	LED Part No	Vehicle	LED Package Picture
Dongfeng Motor	Projection light	3535		
Brilliance Auto X7	Stop light	3528C02		
Brilliance Auto T30	CHMSL	3528C02		
Weicai Motor S201	Fog light	2016AV5		
Geely	Turn light	3030		

# Niche Product: Headlight retrofit (After-market)

## LED Headlight: H4/H7/H11 Series



Item	Halogen lamp (original part)	HID (original part)	ETI LED ( retrofit)
Lumen	1000LM	2800LM	3500LM+
Lumen Efficiency	20LM/W	70LM/W	100LM/W+
Power	55-60W	40-45W	38W+
CCT	3000K	4200-6000K	6000K+

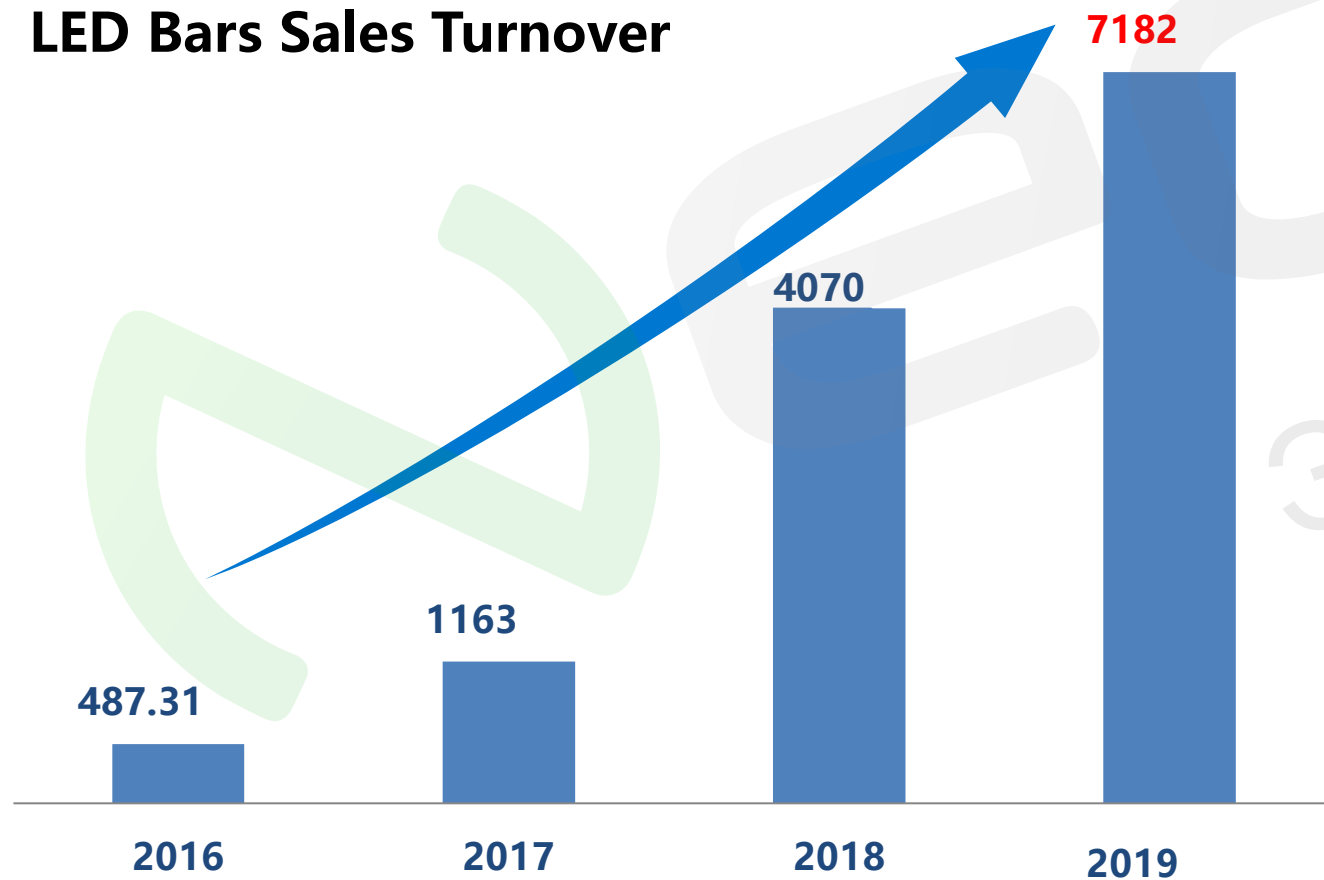
ETI-NLW 7535CV3/CV1



ETI supply LED to top five automotive lighting (after-market) customers.  
2019 Headlight aftermarket: 350Kpcs pair headlights/years.  
supply market: China / EU / North America.  
ETI supply share : Account for 55-60% of total qty.

# TV Backlight Customers

LED Bars Sales Turnover



PANDA  
熊猫

VESTEL

CHANGHONG 长虹

Haier



BOE

TCL

Hisense

TV Customers: Vestel/Haier/Hisense

# TV Backlight successful cases

客户名称	侧入式/直下式	电视尺寸	光源形式	透镜搭配	灯条阵列	LED光源颗数
Vestel	侧入式	22"ELED BAR	PCT4014	N/A	42*1	42
		24"ELED BAR	PCT4014	N/A	40*1	40
		28"ELED BAR	PCT4014	N/A	52*1	52
		32"ELED BAR	PCT4014	N/A	64*1	64
		43" Slim ELED	EMC4014	N/A	84*2	168
		49" Slim ELED	EMC4014	N/A	98*2	196
		55" Slim ELED	EMC4014	N/A	108*2	216
		65" Slim ELED	EMC4014	N/A	144*2	288
	直下式 OD40mm	24"DLED BAR	PCT3528	top emitting	2*5	10
		32"DLED BAR	PCT3528	top emitting	2*11	22
		39"DLED BAR	FC3030	top emitting	989	26
		39.5"DLED BAR	FC3030	top emitting	878	23
		40"DLED BAR	FC3030	top emitting	3*9	27
		43"DLED BAR	FC3030	top emitting	4*7	28
		43"DLED BAR	FC3030	top emitting	8998	34
		48"DLED BAR	FC3030	top emitting	6*5	30
		49"DLED BAR	FC3030	top emitting	6*7	42
		55"DLED BAR	FC3030	top emitting	4*7+3*8	52
	直下式 OD30mm	65"DLED BAR	FC3030	top emitting	10*7+1*8	78
		65"DLED BAR	FC3030	top emitting	6*8+4*9+1*10	94
		75"DLED BAR	FC3030	top emitting	12*9+1*8	116
	直下式 OD25mm	43"DLED	FC3030	top emitting	4*9	36
		50"DLED	FC3030	top emitting	6*8	48
		55"DLED	FC3030	top emitting	6*9	54
	直下式 OD40mm	32"DLED	LC3030	top emitting	2*6	12
		39"DLED	LC3030	top emitting	3*8	24
		40"DLED	FC3030	top emitting	2*11	22
		43"FHD	LC3030	top emitting	3*7	21
		43"UHD	LC3030	top emitting	10+11+10	31
		50"UHD	LC3030	top emitting	3*12	36
		55"UHD	LC3030	top emitting	2*11+2*12	46
	直下式 OD30mm	65"UHD	LC3030	top emitting	13*5	65
		70"UHD	LC3030	top emitting	2*6+2*7+2*8	84
	直下式 OD20mm	43"DLED	LC3030	side emitting	4*8	32
		50"DLED	LC3030	side emitting	4*9	36
		55"DLED	LC3030	side emitting	3*10+2*9	48
	直下式 OD20mm	43"UHD	LC3030	top emitting	6*11	66
		50"UHD	LC3030	top emitting	7*12	84
		55"UHD	LC3030	top emitting	8*14	112
		65"UHD	LC3030	top emitting	9*16	144

客户名称	侧入式/直下式	电视尺寸	光源形式	透镜搭配	灯条阵列	LED光源颗数
海尔国际	直下式 OD35	32"DLED	LC3030	top emitting	2*6	12
		38.5"DLED	LC3030	top emitting	3*7	21
		43"DLED	LC3030	top emitting	3*8	24
		58"DLED	LC3030	top emitting	5*10	50
	直下式 OD22	50"DLED	LC3030	side emitting	4*9	36
		55"DLED	LC3030	side emitting	5*9	45
		65"DLED	LC3030	side emitting	6*12	72
青岛海尔	直下式 OD22	50"DLED	LC3030	side emitting	4*12	48
		55"DLED	LC3030	side emitting	5*11	55
		65"DLED	LC3030	side emitting	7*10	70
		70"DLED	LC3030	side emitting	12*7	84
		75"DLED	LC3030	side emitting	14*8	112
中电熊猫	直下式 OD35	38.5"DLED(长虹)	LC3030	top emitting	3*7	21
		38.5"DLED(传音)	LC3030	top emitting	3*6	18

客户名称	侧入式/直下式	电视尺寸	光源形式	透镜搭配	灯条阵列	LED光源颗数
LG	MiniLED BLU	12.9"Pad	12*9mil	N/A	6912*1	6912
				N/A	9072*1	9072
				N/A	10384*1	10384
		N/A		4032*2	8064	
		N/A		7168*1	7168	
		N/A		3024*4	12096	
Hisense		65"TV		Glue	2880*16	46080
TCL		75"TV		Glue	5760*10	57600
		75"TV		Glue	4320*10	43200

Projects list from 2019 to 2021/Q2

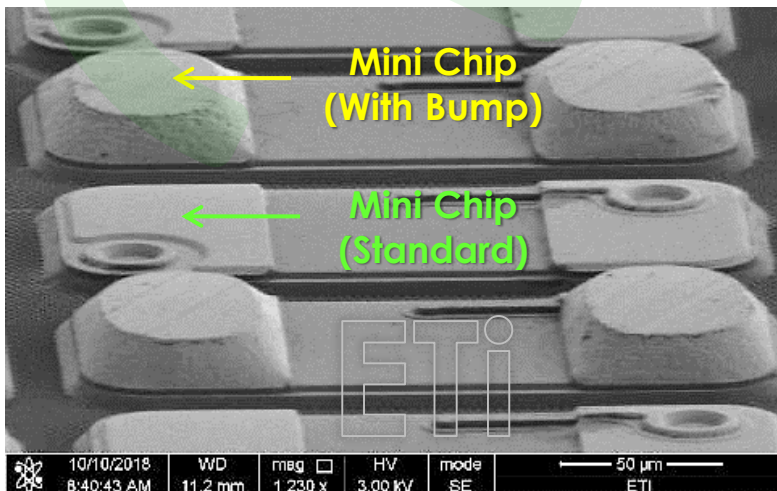
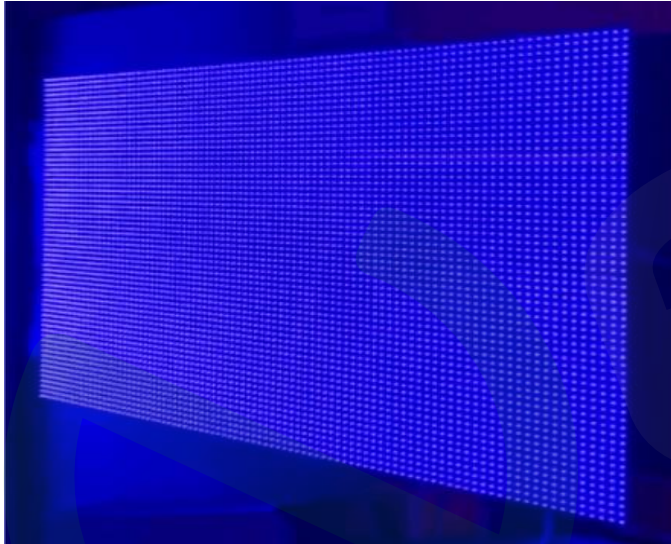
Direct type /Side type light bar solutions,

POB/COB Mini LED solutions for TV Backlight.



# MiniLED TV Backlight ( ETI MiniLED Application Case)

## QLED TV Brand-TCL



### 8K QLED with Mini LED Light Engine

- Display Type: LCD + Mini LED BLU
- LCD Size: 75 inches
- LCD Resolution: 7680x4320
- Peak Brightness: 1200 cd/㎡
- Contrast Ratio: 1000000:1
- Color Gamut: DCI-P3 Coverage: 99%
- Backlight: Mini LED
- Backlight Zones: 7200

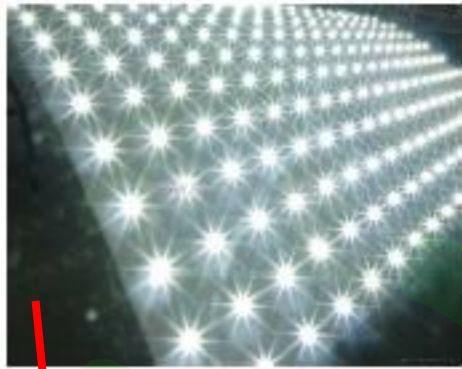


## TCL MiniLED TV at IFA Berlin Show in 2019

Choose ETI **QLED+MiniLED** Backlight solution  
8K ultra UHD 75" TV, peak illuminance 1200  
cd/m<sup>2</sup>, block 7200, super contrast 1000000:1

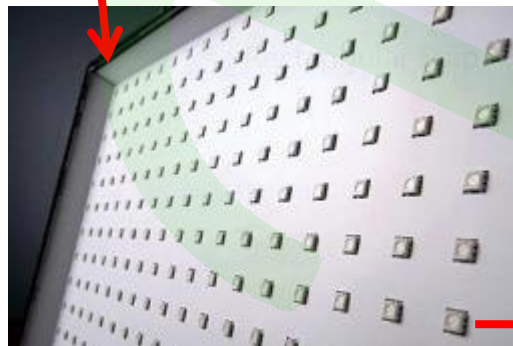
# MinLED TV Backlight (ETI MiniLED Solution)

## Direct Lit BLU (SMD)



Array of White LED

Chip on Board

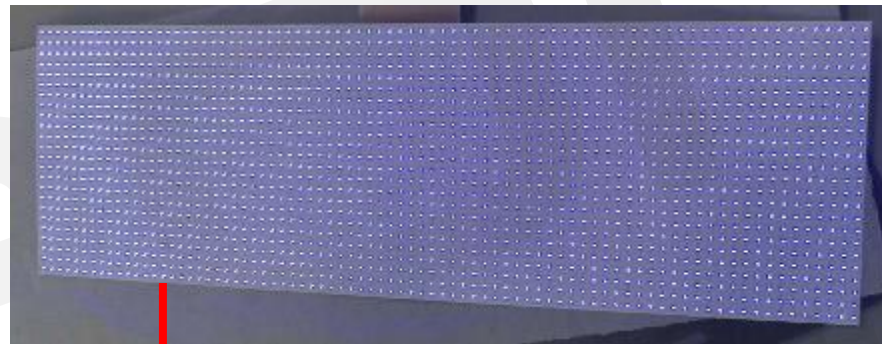


3030 Package (White)

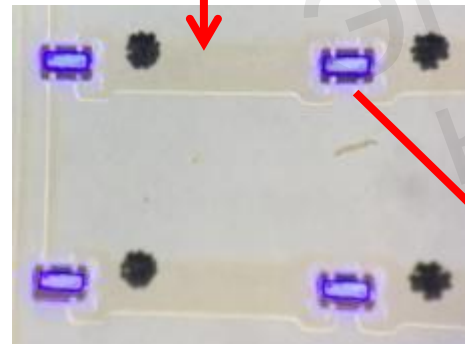


- Limit local dimming
- Thick backlight module thickness

## Mini LED BLU (COB)



Dense Array of Blue LED



Mini LED Flip Chip (Blue)



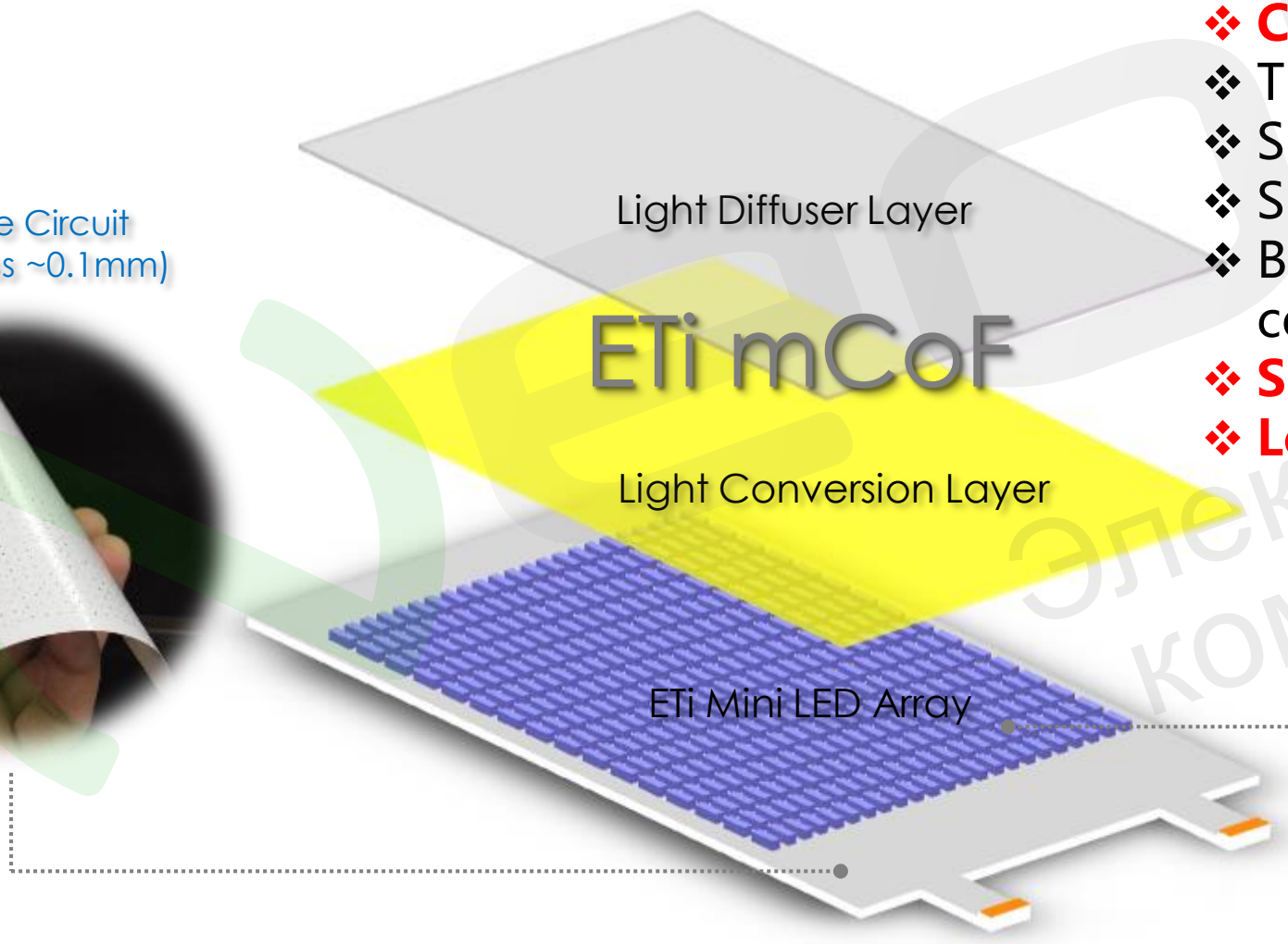
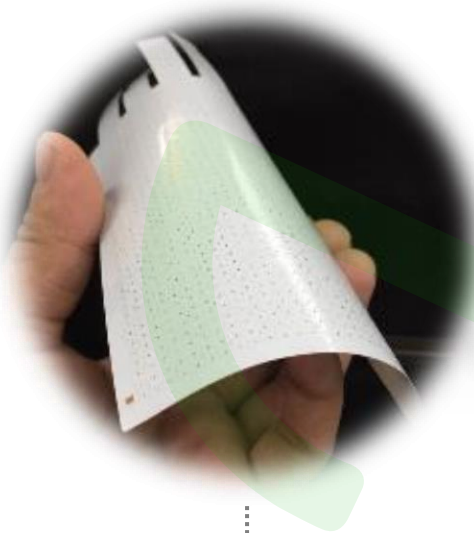
- Local dimming(High Dynamic Range)
- Thin backlight module thickness
- Supper slim

- ❖ Miniaturization trend in LED industry
- ❖ MiniLED technology gives LCD panels a chance to stay in the race against OLED for high end applications especially in the advanced TV market.



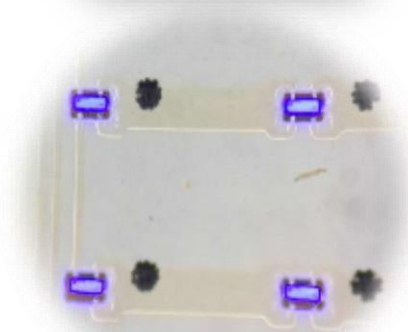
# MiniLED TV Backlight(ETi MiniLED Solution)

Flexible Circuit  
(Thickness ~0.1mm)

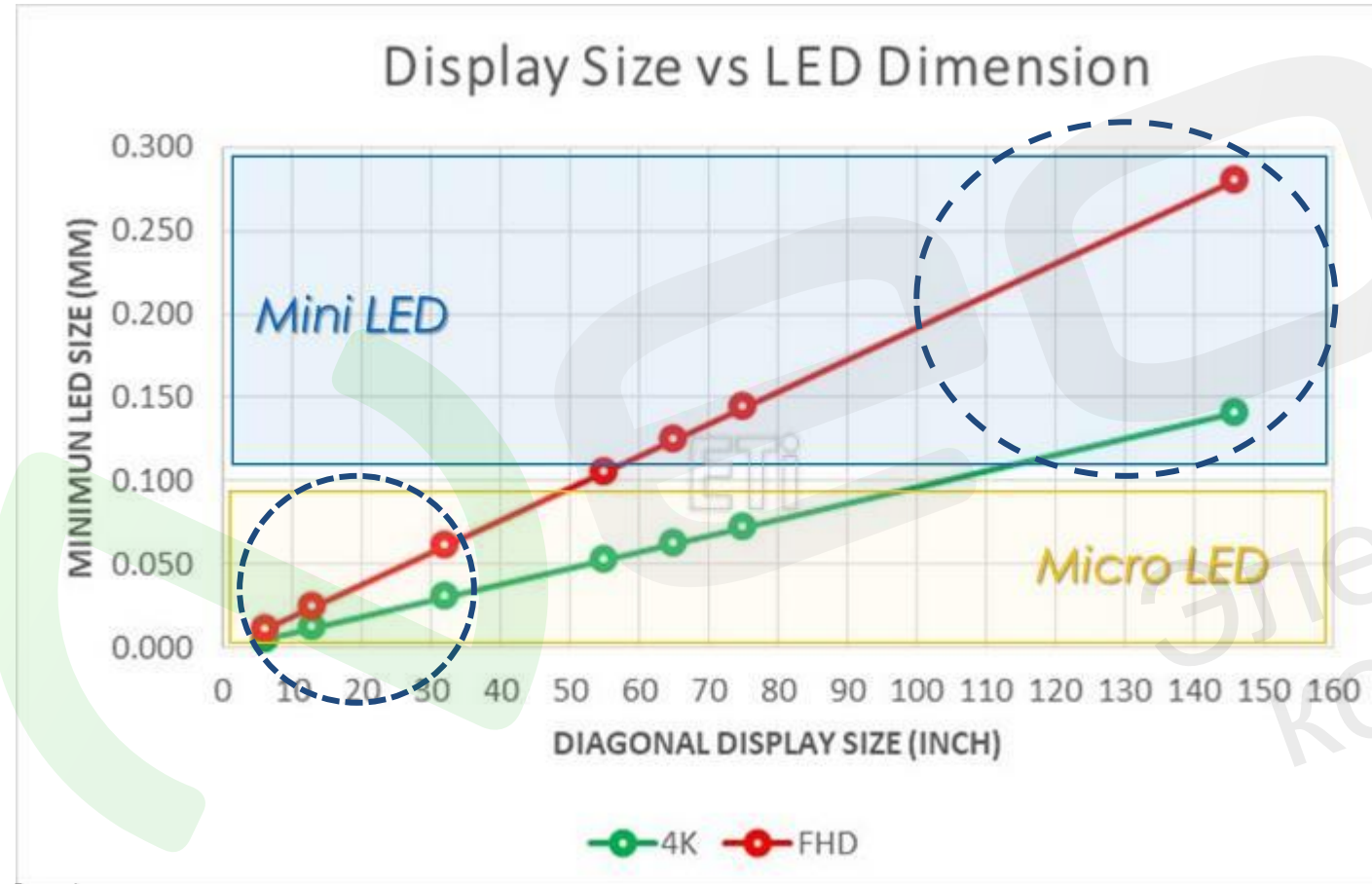


- ❖ **Chip on Board(COB) package tech.**
- ❖ Thousands Mini LED array
- ❖ Substrate : FPC、High Tg FR4、 BT
- ❖ Substrate thickness: 0.1~0.4T
- ❖ Backlight module integrate light conversion layer and diffuser layer
- ❖ **Supper slim backlight module**
- ❖ **Local dimming**

ETi 0.04mm<sup>2</sup> Flip LED



# MicroLED Next-Gen Display (ETi MicroLED R&D)



## ETi Solution:

- ❖ **Application:** <30inch Mini or Micro Size Display
- ❖ **Driving:** Active Matrix
- ❖ **Chip:** Micro LED (Vertical Chip)
- ❖ **Transfer solution:** Wafer Level to Transistor Backplane
- ❖ **Bonding solution:** Eutectic Bonding

## ETi Solution:

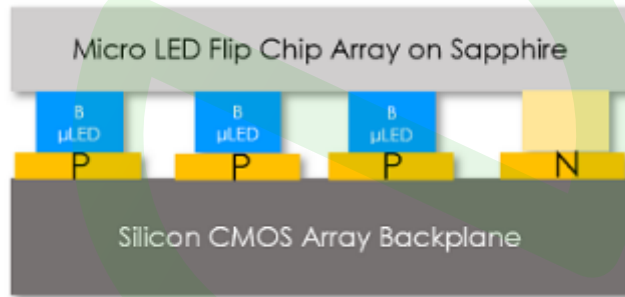
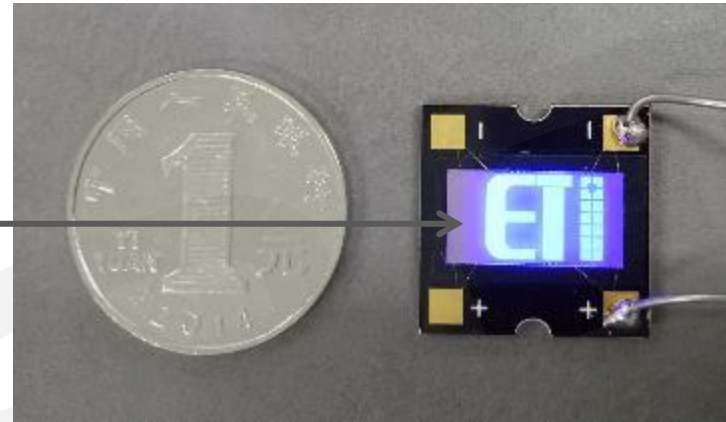
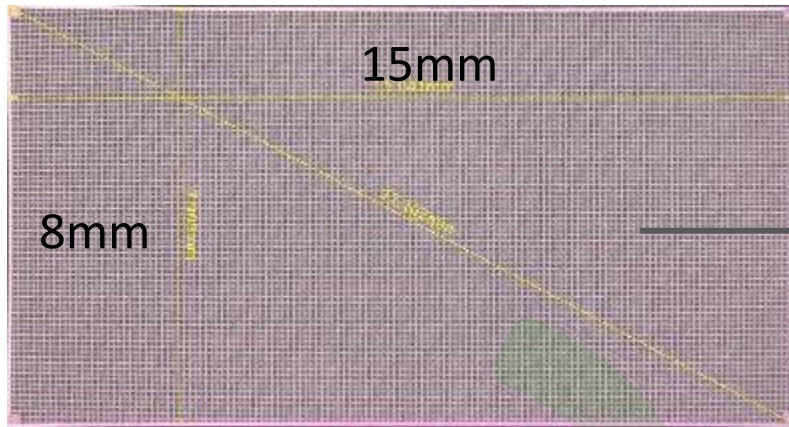
- ❖ **Application:** >100inch Large size display
- ❖ **Driving:** Passive Matrix
- ❖ **Chip:** Mini LED (Flip Chip)
- ❖ **Transfer solution:** Pick & Place
- ❖ **Bonding solution:** SnAgCu Solder Reflow

## ❖ ETi R&D Focus on:

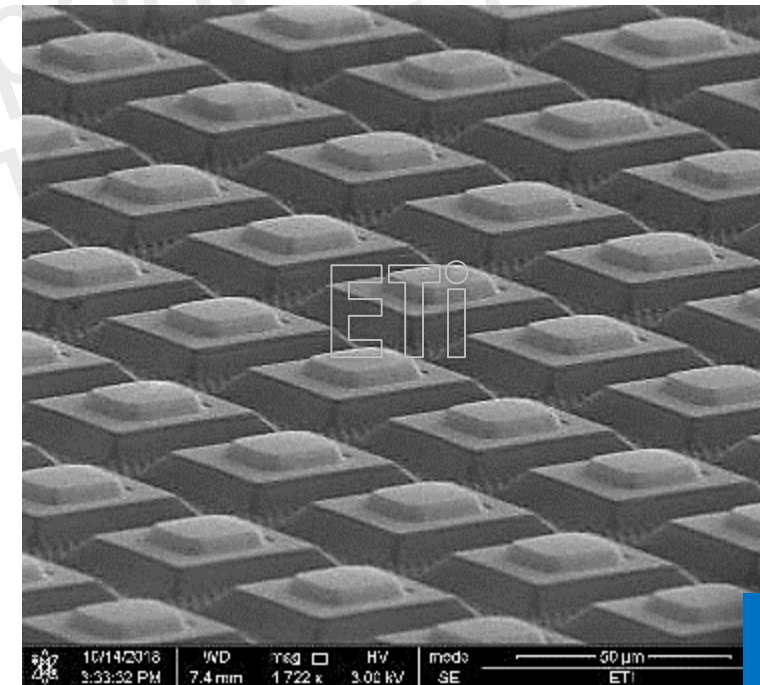
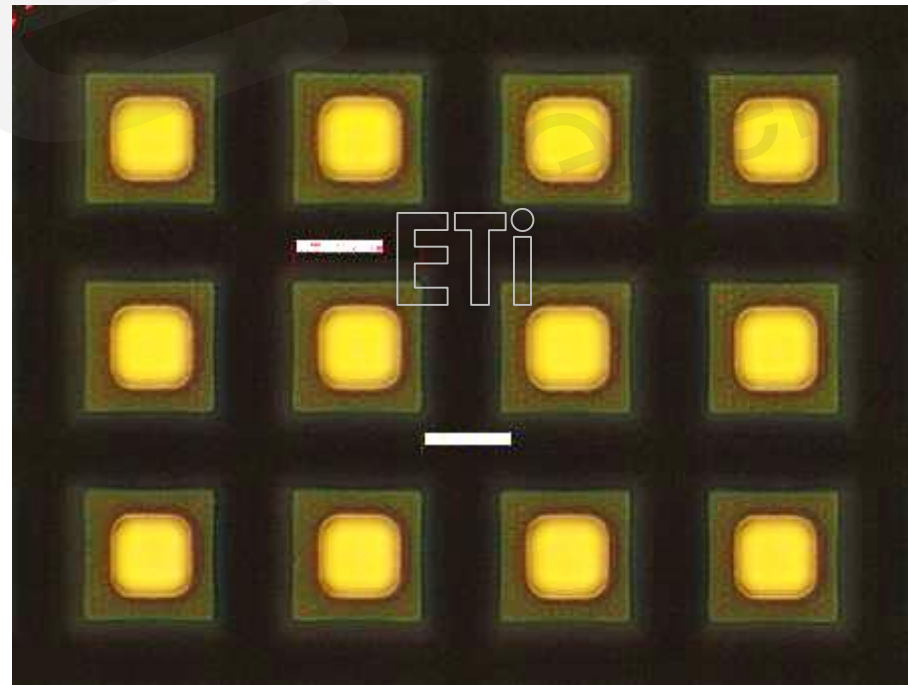
- ① > 100寸 Mini LED Display
- ② < 30寸 Micro LED Display



# MicroLED Next-Gen Display (ETI MicroLED R&D)



- ❑ Micro LED Display Size: 0.67 inch
- ❑ Application: AR, Projector
- ❑ Monochrome
- ❑ Micro LED Size:  $< 30\mu\text{m} \times 30\mu\text{m}$
- ❑ Pixel Pitch:  $60\mu\text{m}$
- ❑ Resolution:  $250 \times 133$
- ❑ PPI:  $\sim 400$



# Commercial lighting、Outdoor lighting Customers

- High-end Commercial lighting

High power Outdoor lighting

- Overseas customers

- AEG, Whirlpool, PHILIPS.

- Domestic customers

NVC Lighting, INESA, Midea.

PHILIPS



美的 Midea

INESA

上海飞乐音响股份有限公司  
SHANGHAI FEILO ACOUSTICS CO.,LTD



AEG

simon



SENGLED 生迪

Electrolux



signify



# Outdoor lighting successful case

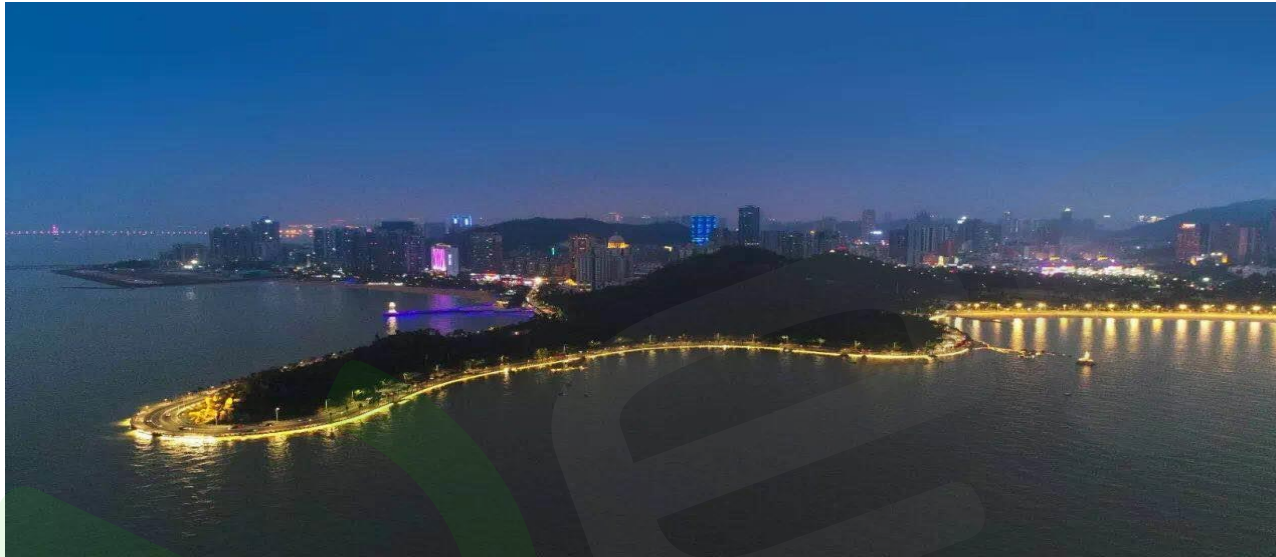


2019 **Shanghai Airport upgrade project.**  
2000W High-pole light,  
Customer: **INESA**  
light source: ETI High power LED





# Outdoor Landscape lighting successful case



2019-2020  
**Zhuhai city** landscape  
lighting project.  
Customer: **NVC Lighting**  
Light source:  
ETI high power RGB LED



# Commercial lighting successful case



Sichuan International Airport  
(Panda)

2020-2021

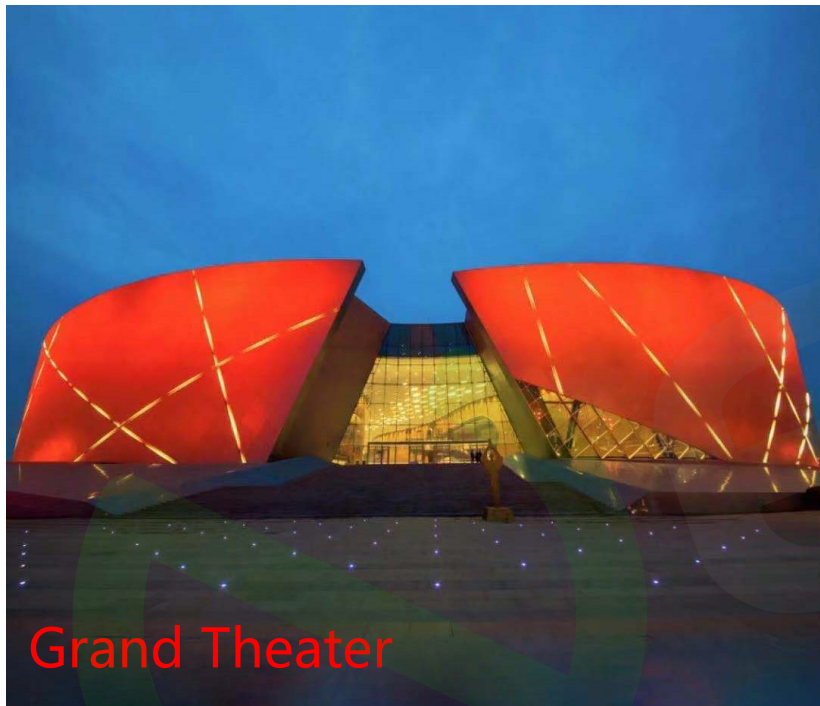
Sichuan International Airport  
Customer: **NVC Lighting**

No.2 Building Office/Meeting/Restaurant area  
LED panel light/High power downlight.  
Light source: ETI SMD LED





# Commercial lighting successful case



Grand Theater

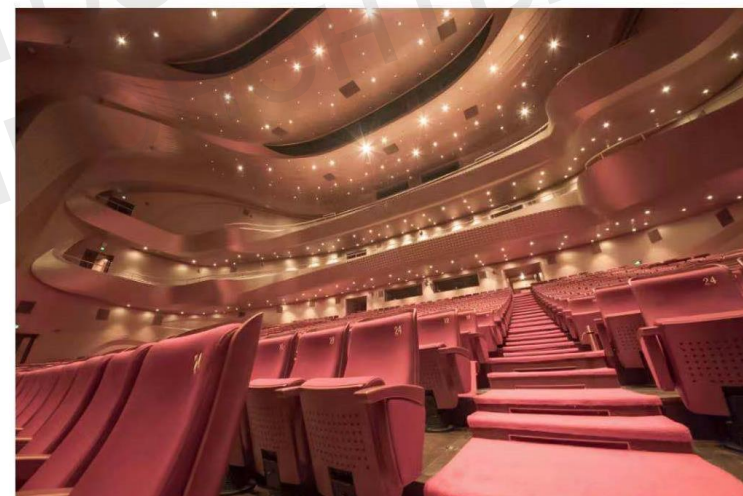
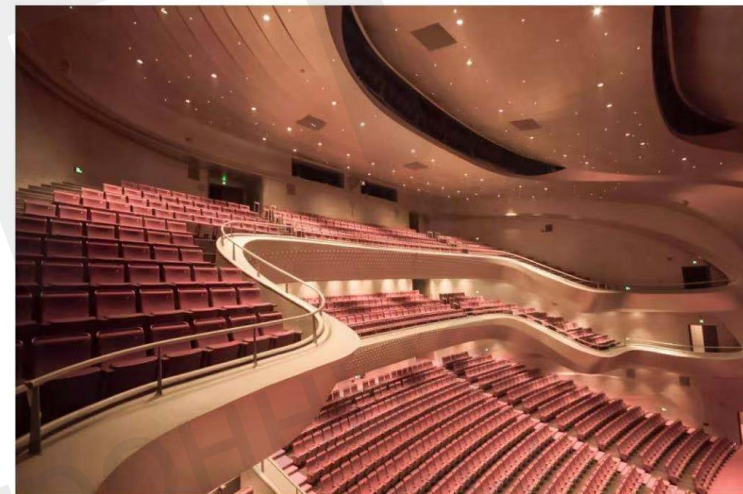
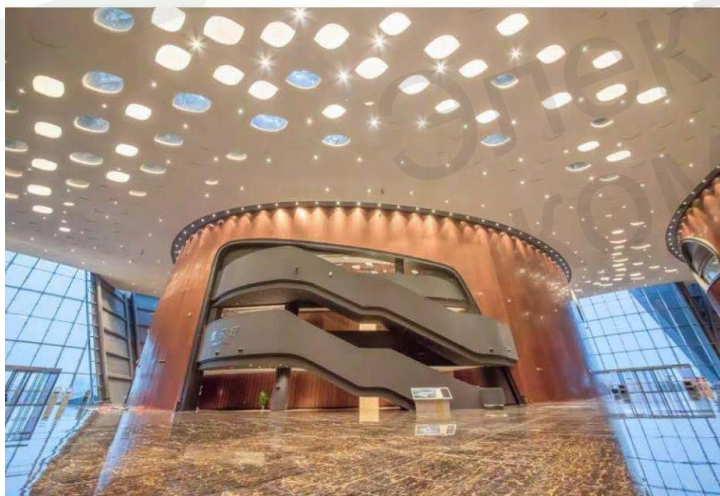
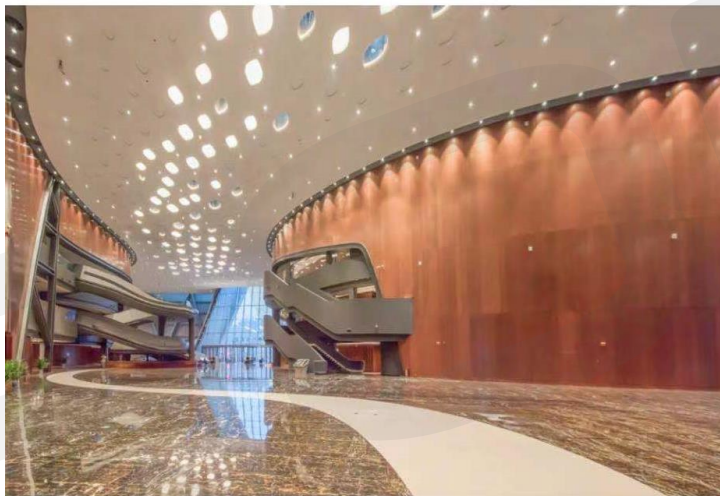
2020-2021

**Zhengzhou** Grand Theater  
lighting project

Customer: **NVC lighting**

Grille spotlight/Floodlight for lobby and drama theater.

Light source: ETI COB/SMD LED.





# Street light successful cases

## Overseas & domestic projects



Street light-Dalian China 2016



Street light-Shenzhen China 2016



Street light- Malaysia 2016



Street light-Spain 2015



High-pole lamp-Spain 2015



Street light-Foshan China 2015



Street light-Guangzhou China 2014



Street light-UK 2014



Street light-Hangzhou China 2014

**ETI Advantage**



**Part 3**



# ETI Advantages

## Choose ETI LED 8 Reasons:

•**High reliability:** ALN Ceramic substrate + Flip Chip, good reliability in electric、thermal、mechanical.

•**Uniform light distribution:** Strict raw material selection criterion for Phosphors powder 、epoxy, ETI special phosphors powder coating technology, Which ensure light distribution is uniform.

•**High performance:** Based on ETI strong Flip-chip and advanced LED Package technology.

•**Certifications:** ISO9001/ISO14001,IATF16949,ELV

•**Patent:** 81 EPI wafer and chip patents.

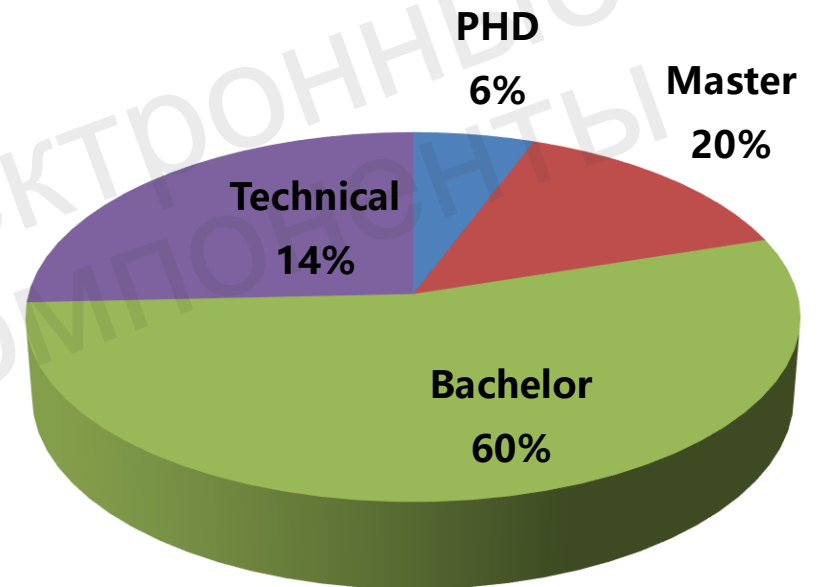
•**Strong R&D :** Provide optical 、failure analysis 、customized solution technical support.

• **Good pre-sale and after-sale service:** professional sales, product, FAE teams, fast respond

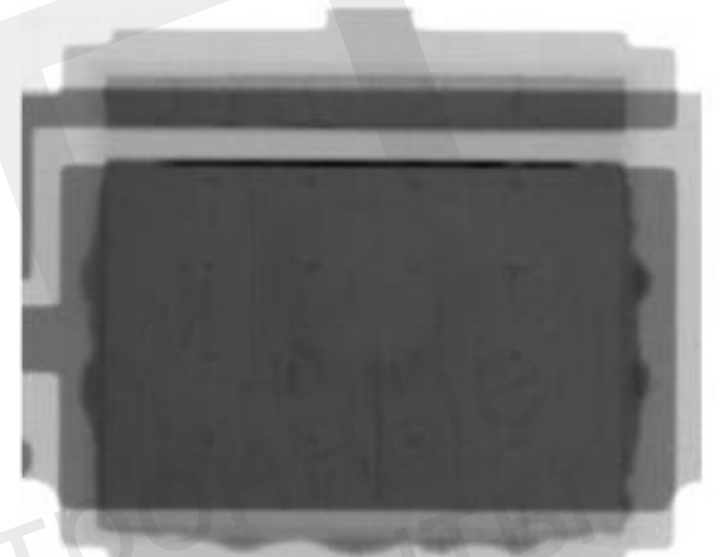
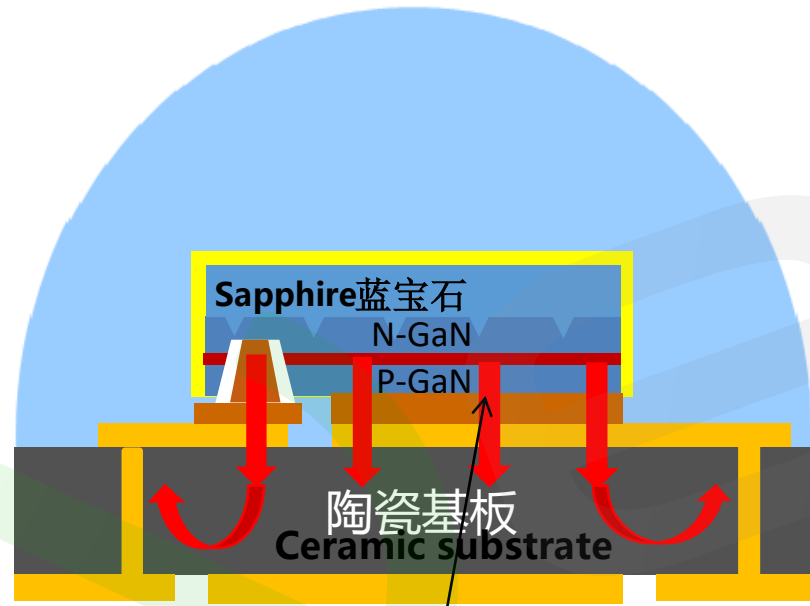
• **Fast delivery:** Huge production capacity.

Strong R&D Team、 advanced automated production equipment , professional sales、 product、 FEA teams, and fast delivery.

## R&D Team



# ETI advanced chip and solder technology



Thermal resistance  $R_{th_{js}}$   
 $= (T_j \text{ Junction temperature} - T_s \text{ Solder temperature}) / \text{Power}$

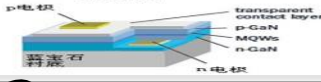
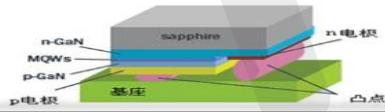


- ETI R&D
- ETI have advantage technology on both Chip and Package

Advantages & benefits:

- gold-tin eutectic bonding
- Fluxless soldering, no potential quality risk
- Zero void rate
- Heat transfer area 80-90%
- Lowest thermal-resistance ( $\sim 1.5\text{K/W}$ )

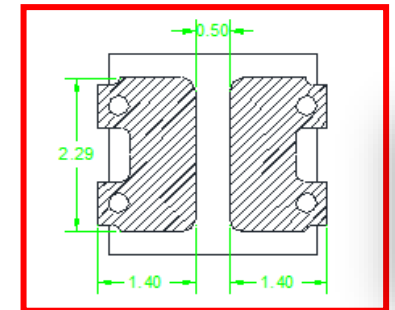
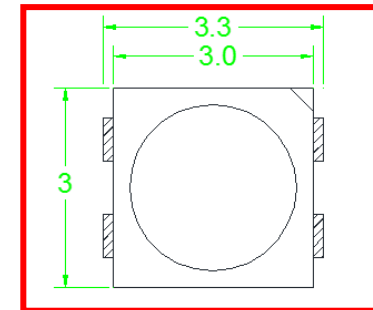
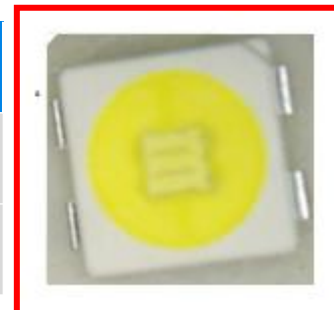
No bonding wire/ball & Fluxless soldering  
to improve heat dissipation and reliability performance

# ETI Flip-chip LED in Backlight application

	Lateral Chip		Flip Chip	
Chip Type				
Bonding				
PKG	3528PCT	3030EMC LC	3030EMC FC	1616 Ceramic
Lumen	100@300mA, 3V Max to 400mA	200@600mA, 3V Max to 700mA	210@600mA, 3V Max to 800mA	270@800mA, 3V Max to 1000mA
Thermal	Sapphire at the bottom of the chip and DB with glue, PKG Rth $\approx 20^{\circ}\text{C/W}$		Metal PAD bonding with Solder or Eutectic, PKG Rth $< 5^{\circ}\text{C/W}$	
Reliability	Wire connection should avoid outside force Ag plating has S problem		No wire connection, high reliability	
Application	Mature technology, low price choice		High reliability choice	

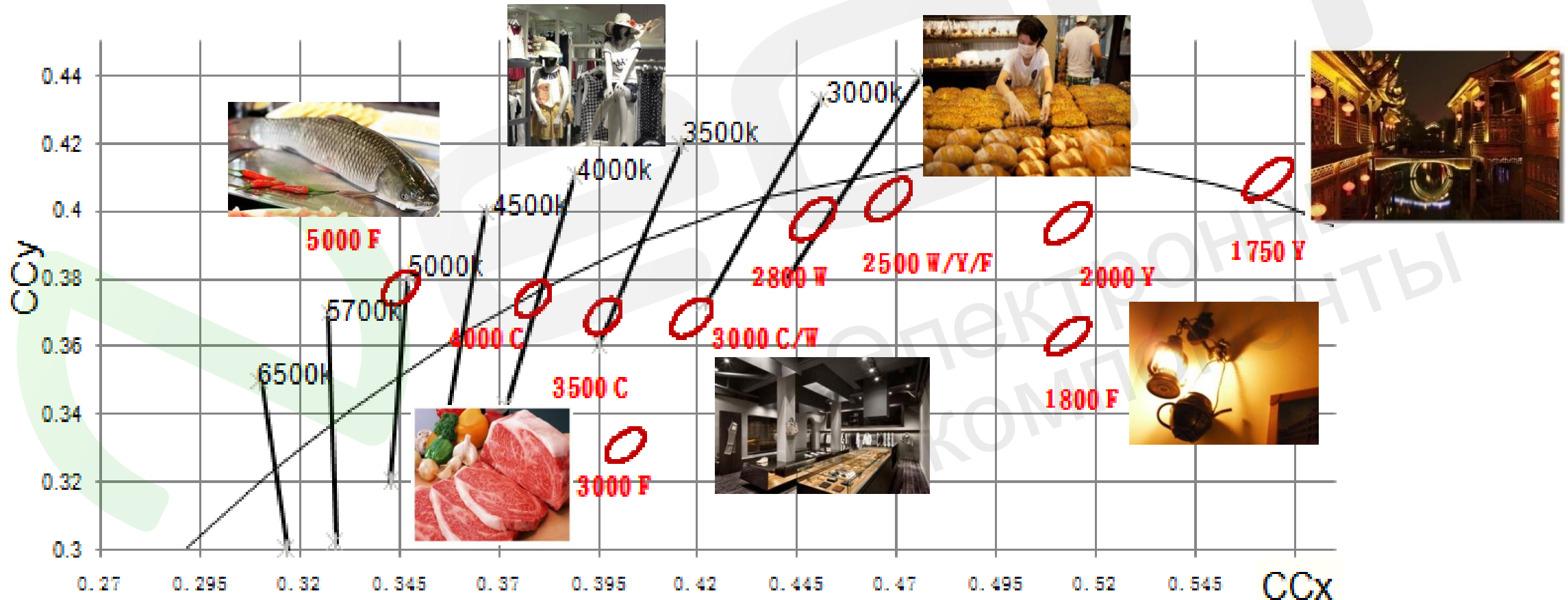
## ➤ Flip chip in EMC3030

Chip size	IF	Lm (typ)	VF (typ)	Lm/w	CIE-x	CIE-y
35*35mil	600mA	200 - (210) - 220	2.8-(3.0)-3.2	115	0.270	0.240
43*43mil	800mA	250 - (260) - 270	2.85-(3.05)-3.25	105	0.270	0.240



# ETI advanced phosphorus technology in Color mixing

ETI have rich experience for phosphorus convert colors



ETI have lot of experience in special color point from CCT1750-5000K for various applications, and its different from the current solutions in the Black Body Line

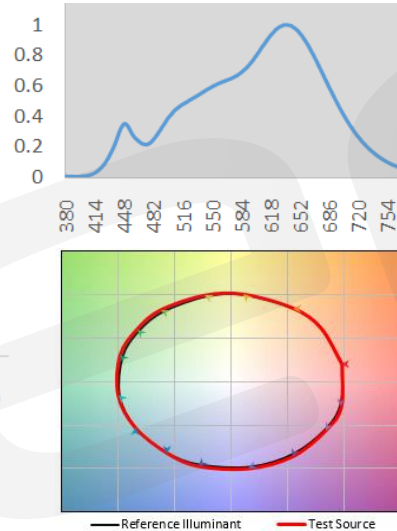
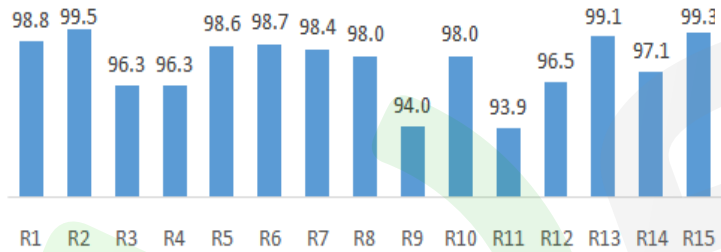


# ETI advanced phosphorus technology in CCT/CRI

## ETI full spectrum phosphorus solutions for different CCT

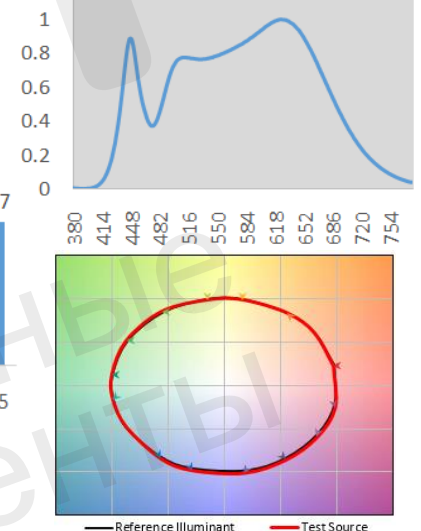
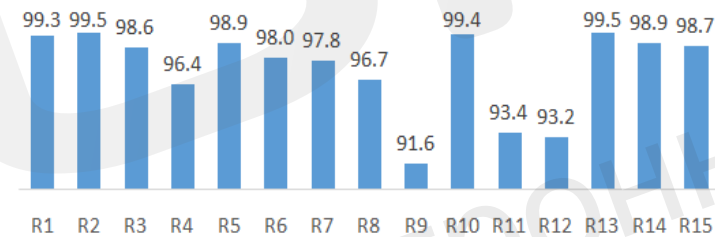
### ■ 3000K :

Ra 98.1/Rf 96/Rg 102



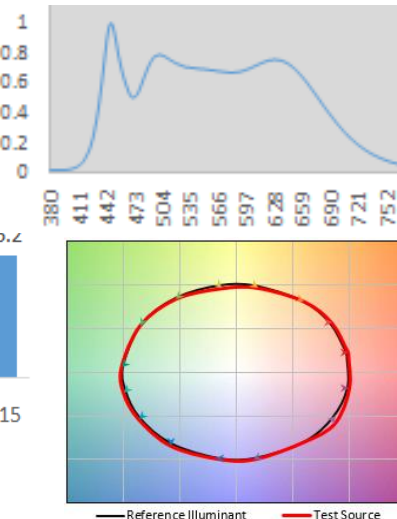
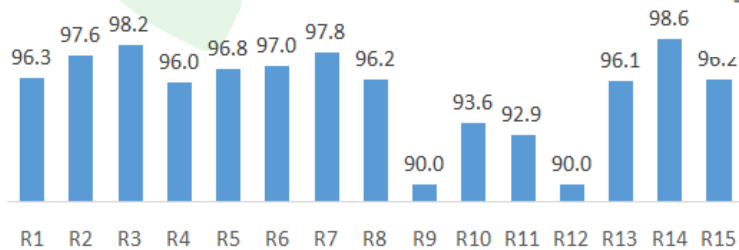
### ■ 4000K :

Ra 98.1/Rf 96/Rg 102



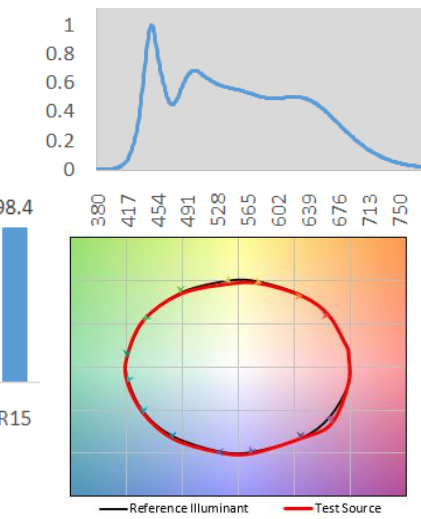
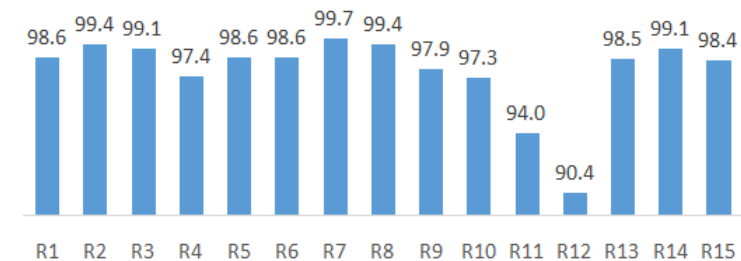
### ■ 5000K :

Ra 97/Rf 95/Rg 102



### ■ 6500K :

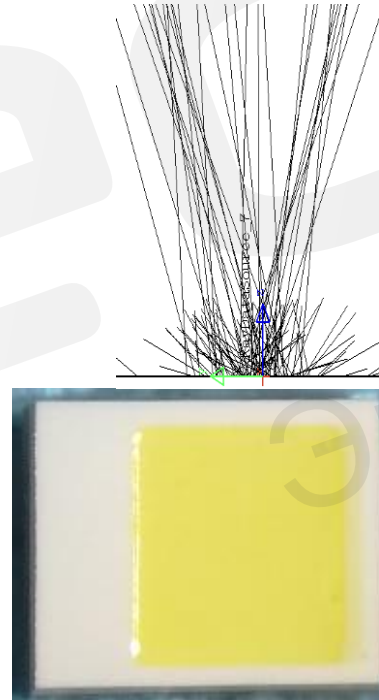
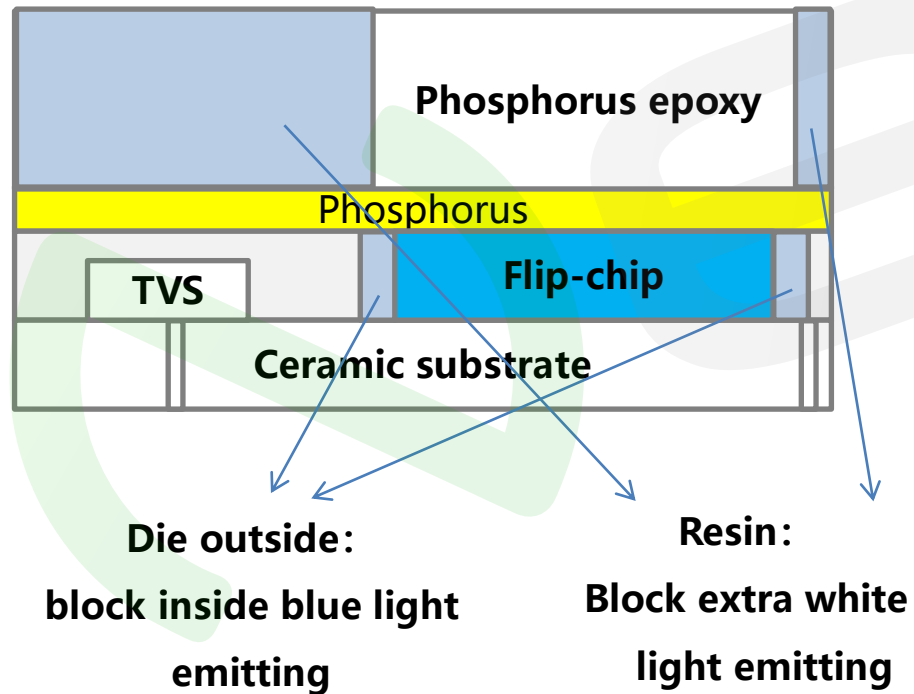
Ra 98.9/Rf 95/Rg 101



# ETI advanced phosphorus epoxy coating technology in CSP

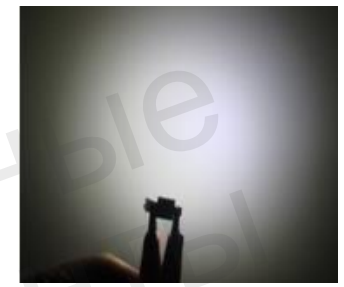
## ETI special phosphorus coating technology in CSP package

### ■ ETI Sun-egg technology in CSP package



Conventional

ETI Sun-egg

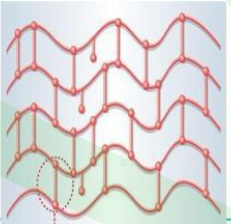
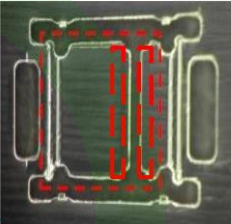
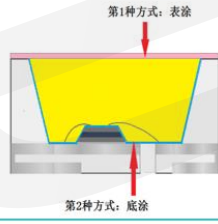
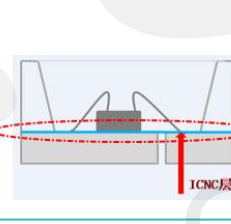


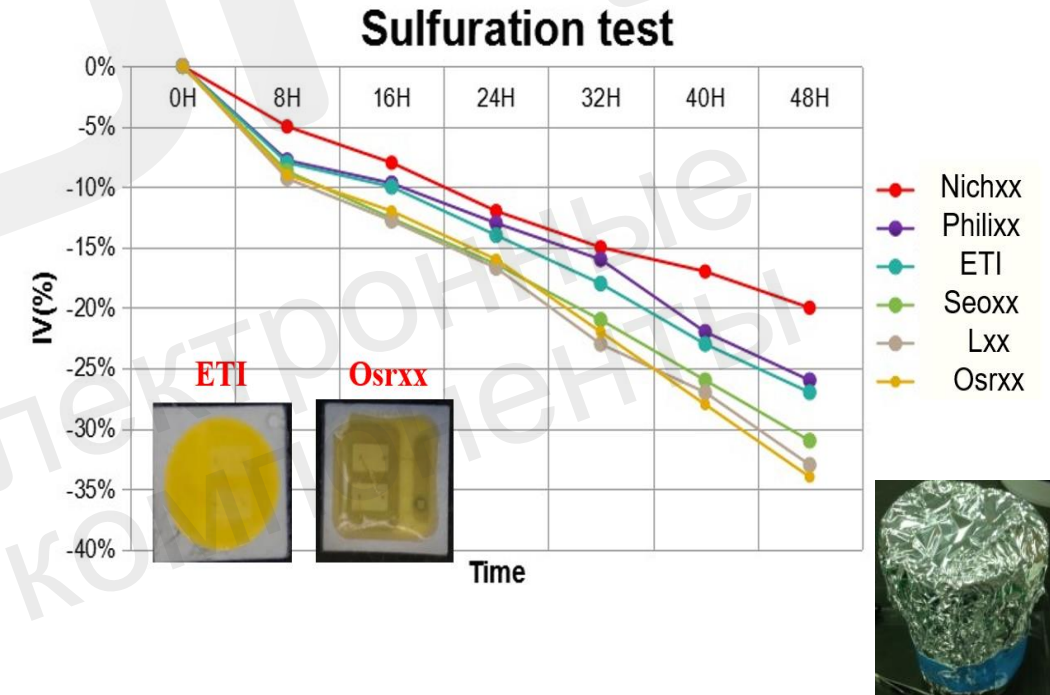
■ ETI Sun-egg technology in CSP package: reduce yellow light spot and narrow beam angle, Improve visual effect and illuminance after match with secondary optical lens.

# ETI advanced anti-sulfuration technology in leadframe

## ETI upgrade anti-sulfur technology in PLCC LED




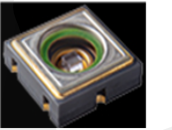

ETI choose Inorganic CNC(cellulose nanocrystals) technology  
ETI choose Inorganic composite nano-materials coating technology.

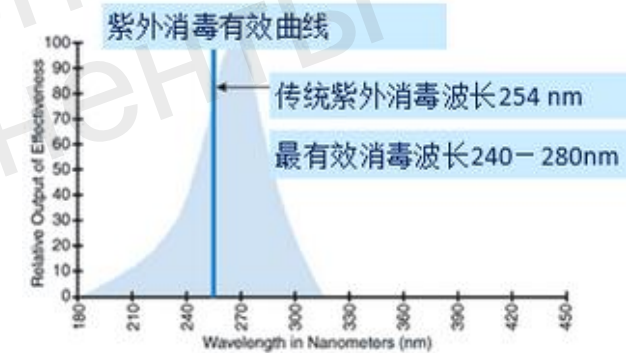
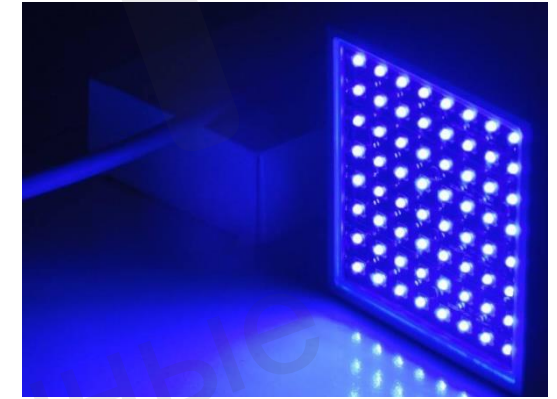
Method	Step 1 High hardness glue	Step 2 Lead frame structure	Step 3-1 Oxide layer	Step 3-2 ICNC tech
	Increase linking density	Increase metal contact area	Surface protection	Organic layer coating
Picture				
Anti-Sulphuration	+++	++	++++	+++++
High temperature lifetime test	++	+++	+++	+++++



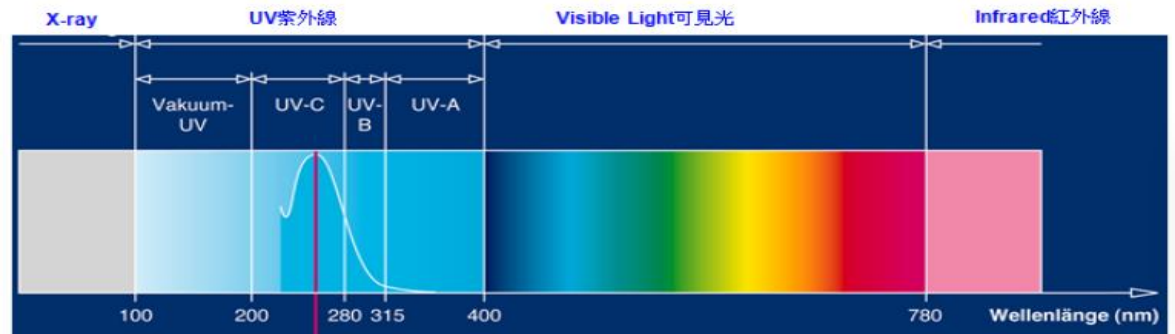
- PLCC LED Pkg in outdoor landscape lighting application , ETI LED choose ICNC coating technology, less than 25% luminous flux loss after 4Hours sulphuration test

# Invisible light research (UV Sterilization-UVC)

Company	SXXX	LX	RXX	NichXX	ETI
LED Pkg	3535Ceramic, 1.2mm	3535Ceramic, 1.4mm	3535Ceramic, 1.6mm	6868Ceramic, 2.1mm	3535Ceramic, 2.4mm
Lens	No	No	No	No	Yes
Picture					
Description	gold plating leadframe	silver plating	ceramic gold plating leadframe	gold plating leadframe	ceramic gold plating leadframe
	Flip-chip	Flip-chip	Flip-chip+UVA	Flip-chip	Flip-chip
	Zener diode	Zener diode	Zener diode	Zener diode	Zener diode
Wavelength(nm)	270-275-280	265-278-285	265-275-285	265-280-285	265-275-285
Current(mA)	20	20	30	350	40
Power(mW)	1.5-1.8-2.3	1.5-2.0-3-3.5	2004/5/6	45.7-54.4-67.6	2005/6/7
Angle(deg.)	120	125	140	120	125
Voltage(V)	5.8-6.0-6.2-6.4	5.3-5.7-6.25-6.75	6-6.5-7	4.8-5.2-5.6	5.8-6.0-6.4
Max. Current(mA)	30	30	60	500	100

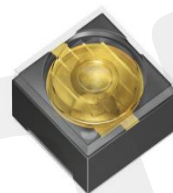
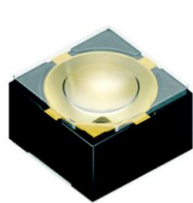


CMH (ceramic metal hard glass)  
Inorganic package technology,  
ETI UVC photoelectric conversion  
efficiency 3.6%.



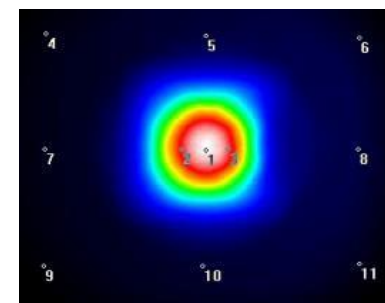
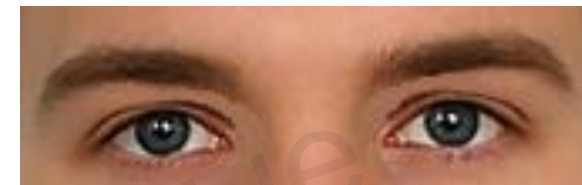


# Invisible light research (IR iris recognition)



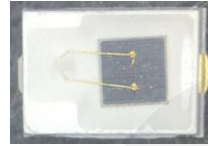
Item	Osrxx	Evexxx	Lextxx	ETI
Part	SHF4780S	NIR-C19M-A2	PM88 M02	WR-3535A30-XXRF
Size(mm)	3.5*3.5*2.4	3.5*3.5*2.3	3.5*3.5*2.4	3.5*3.5*1.6
Radiant flux(mw)	660	670	680	650
Intensity(mw/sr)	2900	2700	2700	2900
$\lambda p$ (nm)	810	810	810	810
VF(v)	3.3	3.3	3.3	3.3
IF(A)	1	1	1	1
Tilt Angle	—	—	—	—
Half Angle	10°	20°	25°	10°

**LED no title angle  
match Lens**



ETI IR LED have great image quality when match with CMOS sensor under 810nm wavelength

# Invisible light research (IR face recognition)



**LED match DOE emitting  
120° wide angle recognition**

Item	Osrxxx	ETI
Part	SFH 4770S	WR-2820A20-XXRF
Size(mm)	2.8*2.0*0.6	2.8*2.0*0.6
Radiant flux(mw)	1200	1100
Intensity(mw/sr)	375	370
$\lambda p$ (nm)	850	850&940
VF(v)	3.3	3.2
IF(A)	1	1
Tilt Angle	—	—
Half Angle	60°	60°

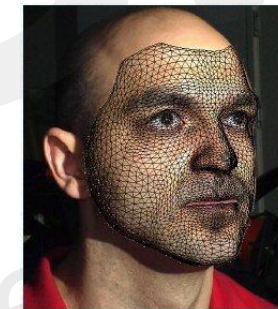


image & model projection



optimised model



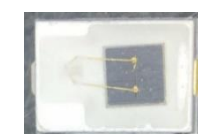
texture map



CMOS

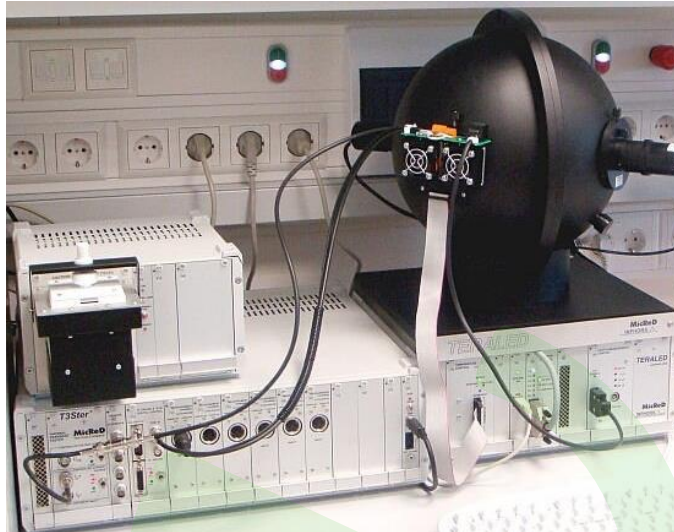


IR LED



ETI wide angle face recognition IR LED , its have good emitting uniformity and high intensity able to create great images.

# Optical Test Equipment and Laboratory



**T3ster (thermal resistance measurement)**



**SIG-400 Near-field tester**

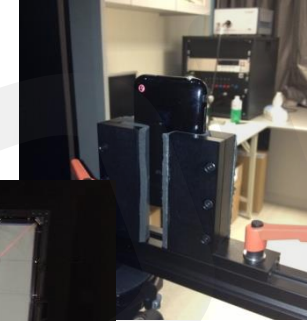


**NanoSEM 450**

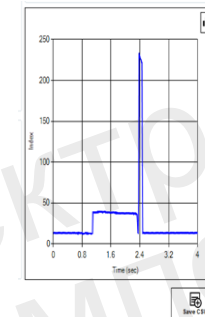
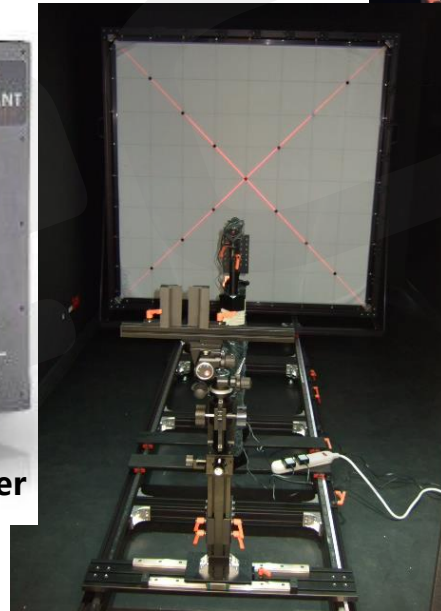


**OM microscope (1800X)**

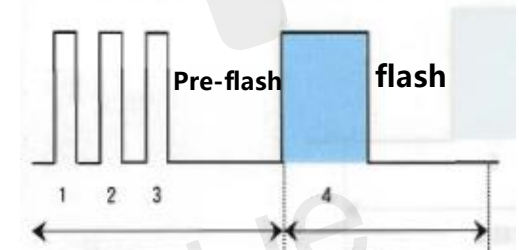
**Laser visual positioning**



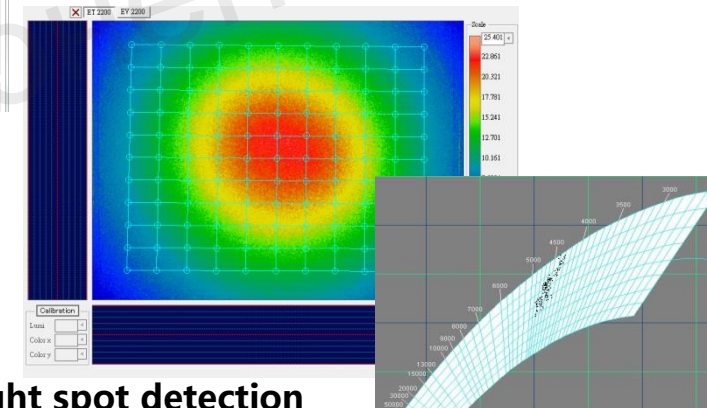
**Color analyzer**



**Flashlight for mobile phone camera**

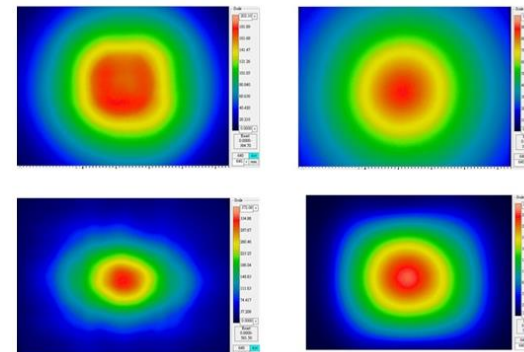


**Center illuminance, illuminance, chromaticity CCT analysis**



**Light spot detection**

**LED+LENS optical design**

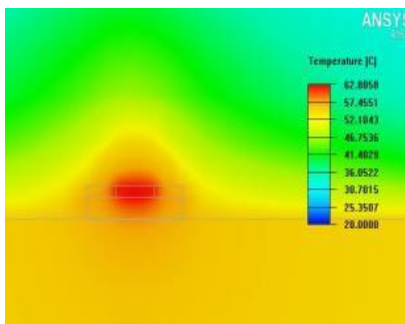
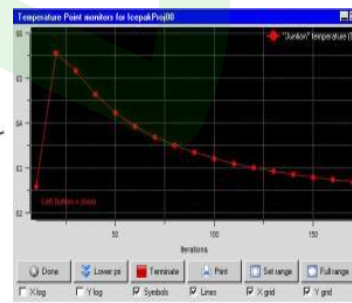
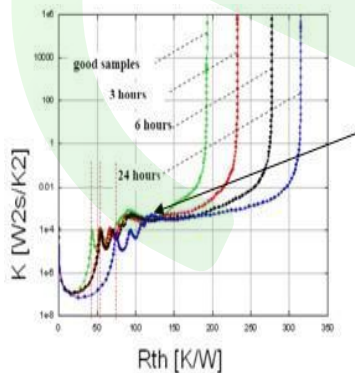
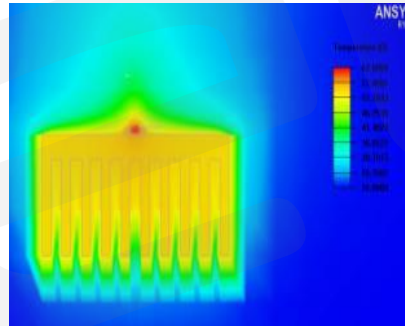
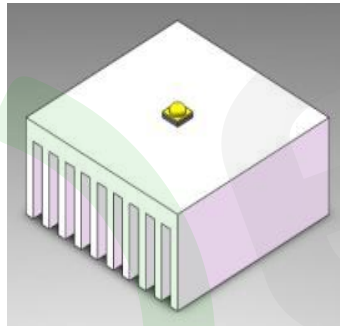




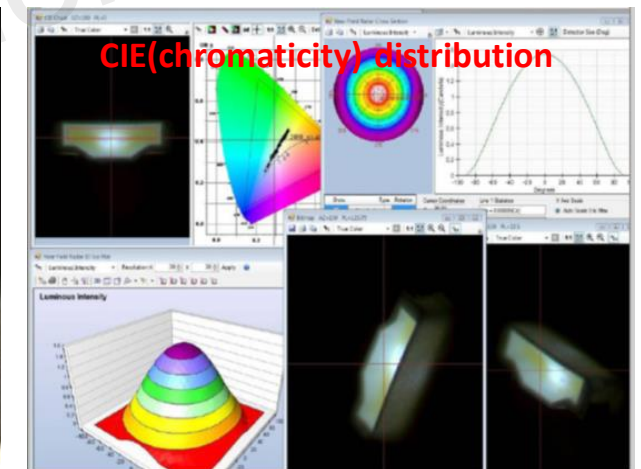
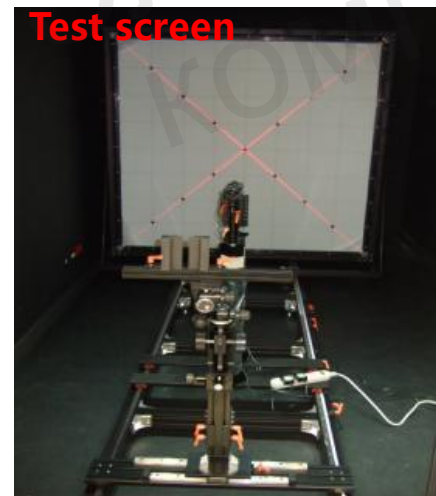
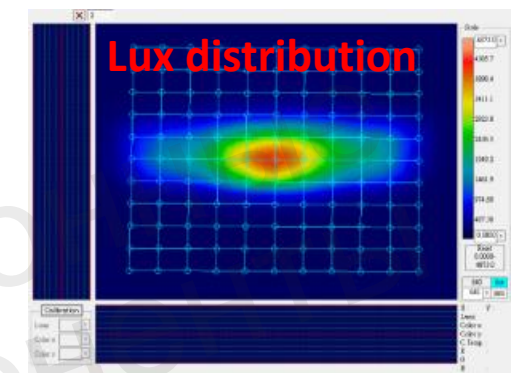
# Optical Test Equipment and Laboratory

ETI equipped with thermal resistance , temperature junction test machines, and professional optical design teams which can provide  $R_{thj}$  &  $T_j$  test service , also support thermal simulation and design based on customer's 3D automotive lighting mockup.

## ■ T3 STER thermal resistance tester and thermal simulation



## ■ Ray file and optical analysis



# Reliability Test and Failure Analysis

ETI equipped with professional Lab and facilities which can provide timely & accurate failure analysis report for customers.



High temp aging

High temp & humid aging

Switching test

Pulse experiment

Vibration test

X-ray Inspection

Thermal shock

Thermocycling

Reflow solder

ESD test

Mechanical stress test

SEM scanning



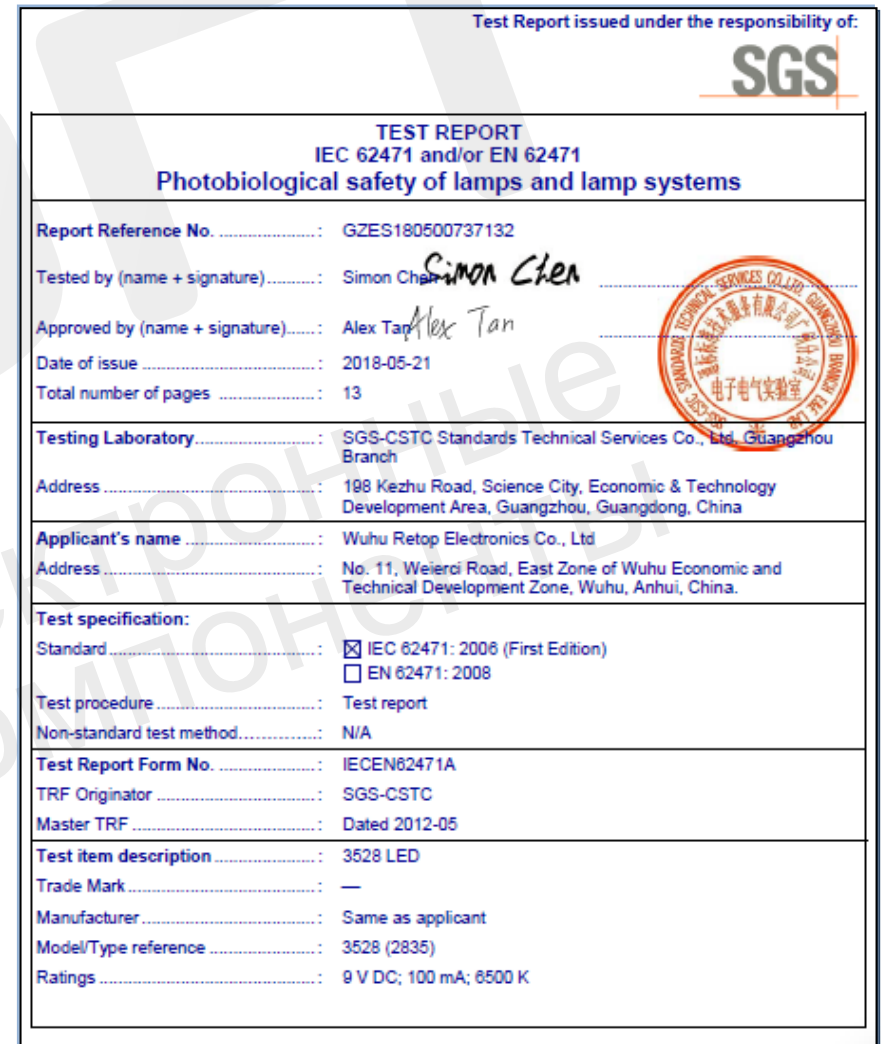
# Certifications



ISO9001  
ISO14001






TUV Automotive quality  
Management system



SGS Photobiological report  
ELV (Hazardous material  
process management system)

# Certifications






**IESNA LM-80-2008**  
MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

**MEASUREMENT AND TEST REPORT**  
For

**Wuhu Retop Electronics Co., Ltd**  
No.11, Wei Erci Rd., East Zone of Wuhu Economic and Technical Development Zone, Wuhu City, Anhui Province

**Model: WR-3528A02**

<b>Report Type:</b> 9000 Hours Test Report		<b>Product Type:</b> LED Package	
<b>Test Engineer:</b>	Daniel Duan		
<b>Report Number:</b>	R2SH141221050-10-9000		
<b>Test Date:</b>	2014-12-17 to 2015-12-13		
<b>Report Date:</b>	2015-12-29		
<b>Reviewed By:</b>	Jeanne Han /EE Manager		
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan) Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China Tel: +86-0769-86858888 Fax: +86-0769-86858588		

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).  
This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.




## 证书

TÜV SÜD 管理服务有限公司  
认证部  
兹证明

**芜湖锐拓电子有限公司**  
中国安徽省芜湖市经济技术开发区东区纬二次路11号  
邮政编码: 241000

在以下适用范围  
建立和实施了质量管理体系

汽车用LED产品的设计和制造  
(含8.3章节产品设计和开发)。

通过审核,  
证明该体系满足

**IATF 16949**  
第一版2016年10月01日

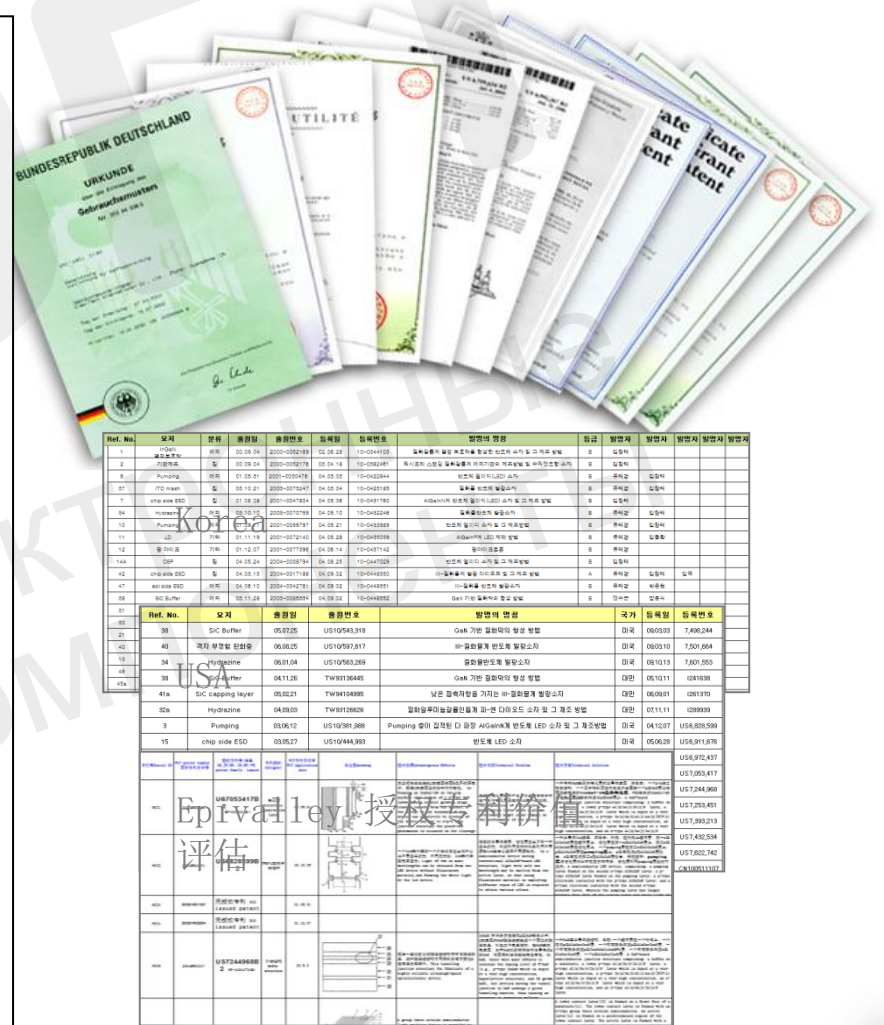
的要求。

颁发日期: 2018年04月09日  
有效期: 2021年04月08日  
证书注册号: 12 111 53493 TMS  
IATF证书注册号: 0298760

  
 Product Compliance Management  
 慕尼黑, 2018年04月10日

第1页, 共1页

TÜV SÜD Management Service GmbH • Zertifizierungsstelle • Ridlerstraße 65 • 80339 München • Germany  
www.tuev-sued.de/certificate-validity-check



LM-80 Report  
TM-21 Report

IATF 16949

EPI Wafer and LED chip  
invention patents.

# Thank you !

