VaOpto
LED Manufacturer

Automotive LEDs

World-Class LED Manufacturing Facility

VAOPTO

www.vaopto.com

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2 Automotive LEDs

3 Application Cases

01

About us

- VAOPTO - IS A LEADING "VERTICALLY INTEGRATED" MANUFACTURER OF STANDARD AND CUSTOM LED LIGHTING PRODUCTS SPECIALIZING IN R&D, DESIGN AND MANUFACTURING OF LED CHIPS, LED PACKAGES, LED LIGHT ENGINES AND COMPLETE LED LIGHT FIXTURES.

  > **OPENED US OFFICE IN 2005, CURRENT OFFICE / WAREHOUSE LOCATED IN LAS VEGAS, NEVADA**

  > **VERTICALLY-INTEGRATED-WORLD CLASS LED MANUFACTURING FACILITIES IN CHINA**

  > **CERTIFICATIONS: ISO14001/ISO9001/TS16949/OHSAS1800/ROHS/FCC/BSCI/CULUS/ETL/CSA**

  > **LED COMPONENT AND LIGHTING MANUFACTURING FOR OEM/ODM CUSTOMER PRODUCTS**

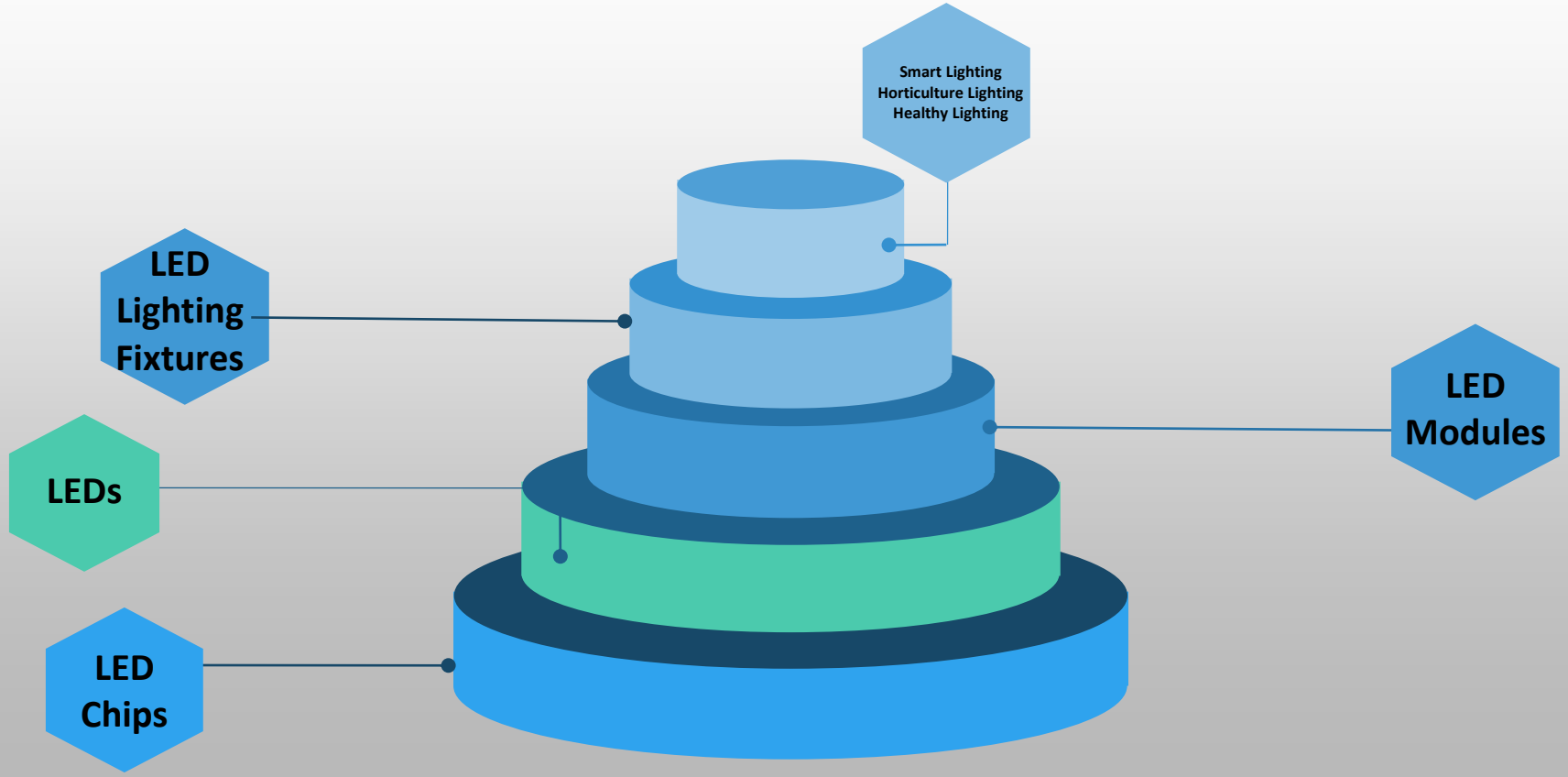
  > **R&D SUPPORT FOR CUSTOMER LED LIGHTING PROJECTS AND CUSTOM PRODUCT DESIGN**

  > **MANUFACTURING OF LEDS, LIGHT ENGINES, AND LUMINAIRES/FIXTURES**

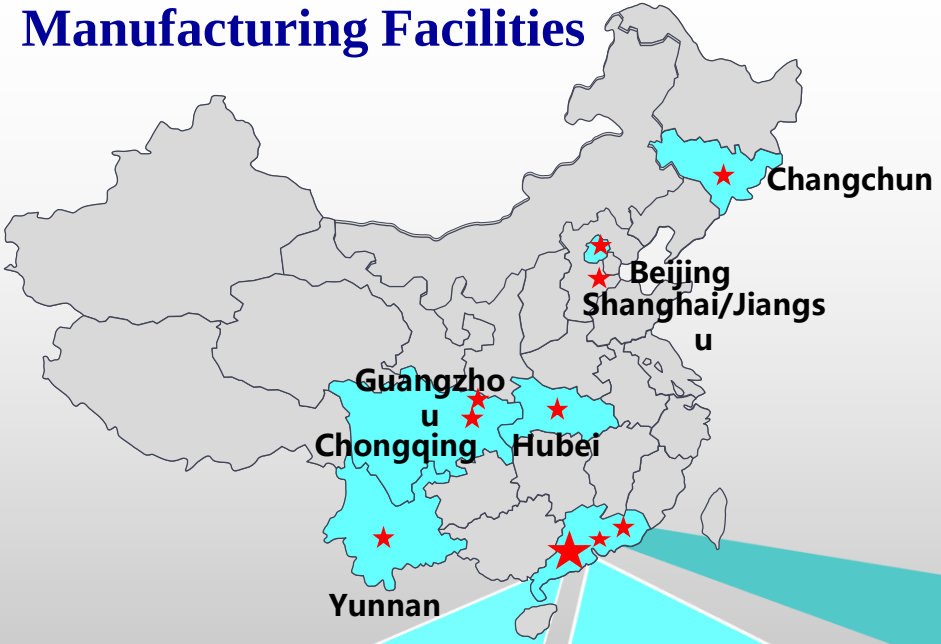
  > **PARTNERSHIP: ENERGY STAR, DLC**

  > **MEMBERSHIP: IES, ALA, ISA**

Competitive Advantage With Our Vertically-Integrated Manufacturing Capabilities



Manufacturing Facilities



Guangdong F1

Guangdong F2

Guangdong F3

Guangdong F4

Automotive Parters

HYUNDAI
KIA MOTORS
吉利汽车 GEELY AUTO
CHERY
JAC 江淮汽车
ZEEKR
BAOJUN
DFM
CHEVROLET
Ford
RIVIAN
蔚来 nio
比亚迪汽车
CADILLAC
MG
HAVAL
CAT
BUICK
启辰
BMW
MASERATI
HONDA
CFMOTO 春风动力

02

Automotive LEDs

· LED · Sensor · Backlighting · Mini LED

Automotive products application overview

Turn signal light

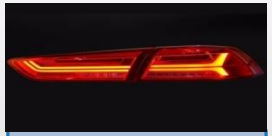
LCD Backlight

Reading light

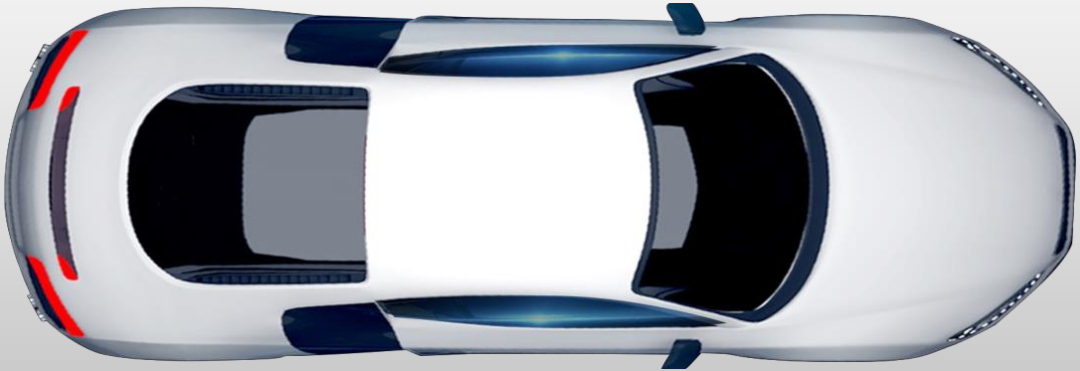
Atmosphere light

Dashboard light

Switch light

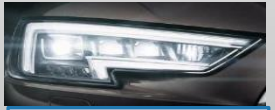


Rear combination light



Daytime running light

Centre high stop lamp



Head lamp

Exterior light

Interior light

Optical sensing

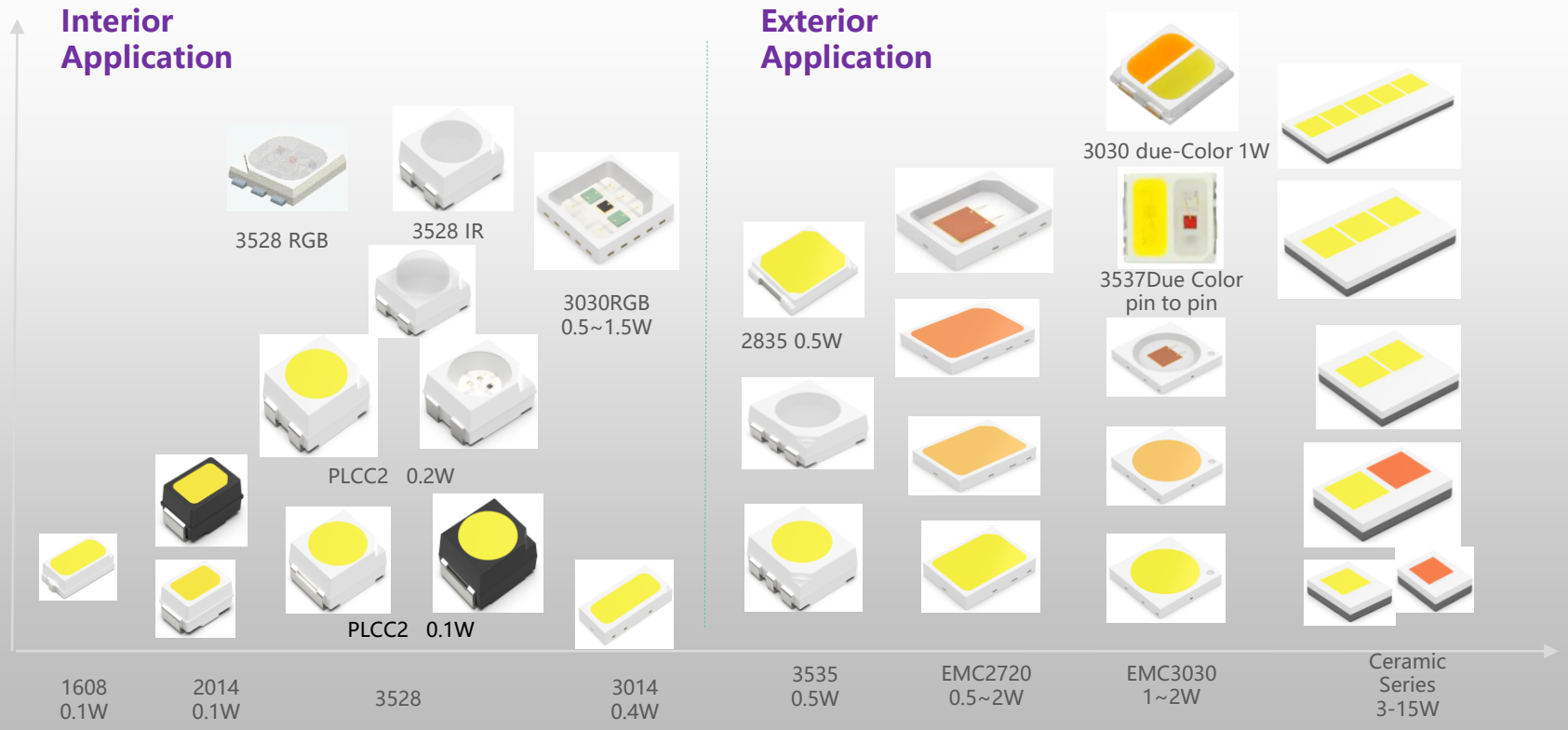
Fatigue driving monitoring

Automatic windshield wiper

Gesture recognition

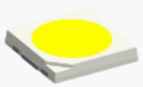
Auto control lighting

2.1 Automotive LED



Application	LED recommendation

Daytime Running Light

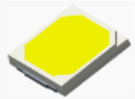


3030 1W

2720 1W

2016 1W

3535 0.5W



2835 0.5W

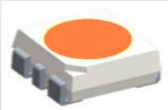
Bi-Function
(DRL + Turn signal)

Turning Signal light

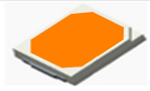
3030 1W

2720 1W

2016 1W



3535 0.5W



2835 0.5W

Head Lamp

1*1

1*2

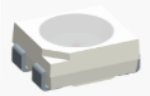
1*3

1*4

1*5

Application	LED recommendation

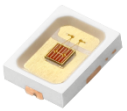
Rear Combination Lamp



3528 0.2W

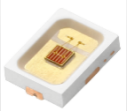
3528 Lens

3535 0.5W

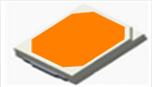


2720 1W

3030 2W



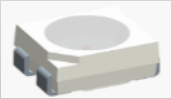
2720 1W



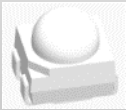
2835 0.5W

3535 0.5W

CHMSL



3528 0.2W



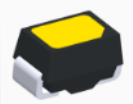
3528 Lens

Application	LED recommendation

Dashboard Backlight

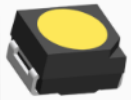
1608

2014



2014

3528



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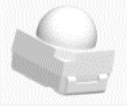


3528
Lens

Switch Backlight

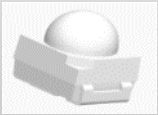
1608

2014

2014

3528

3528



3528 Lens

Application | LED recommendation

Reading Light

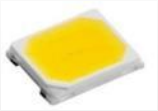
3528
PLCC2

3528 0.2W

2835 0.5W

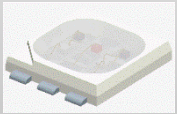
3535 0.5W

3030 1W



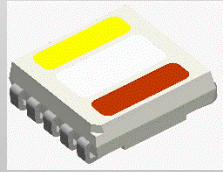
2835 Full Spectrum 0.2W

Atmosphere Light



3528 RGB

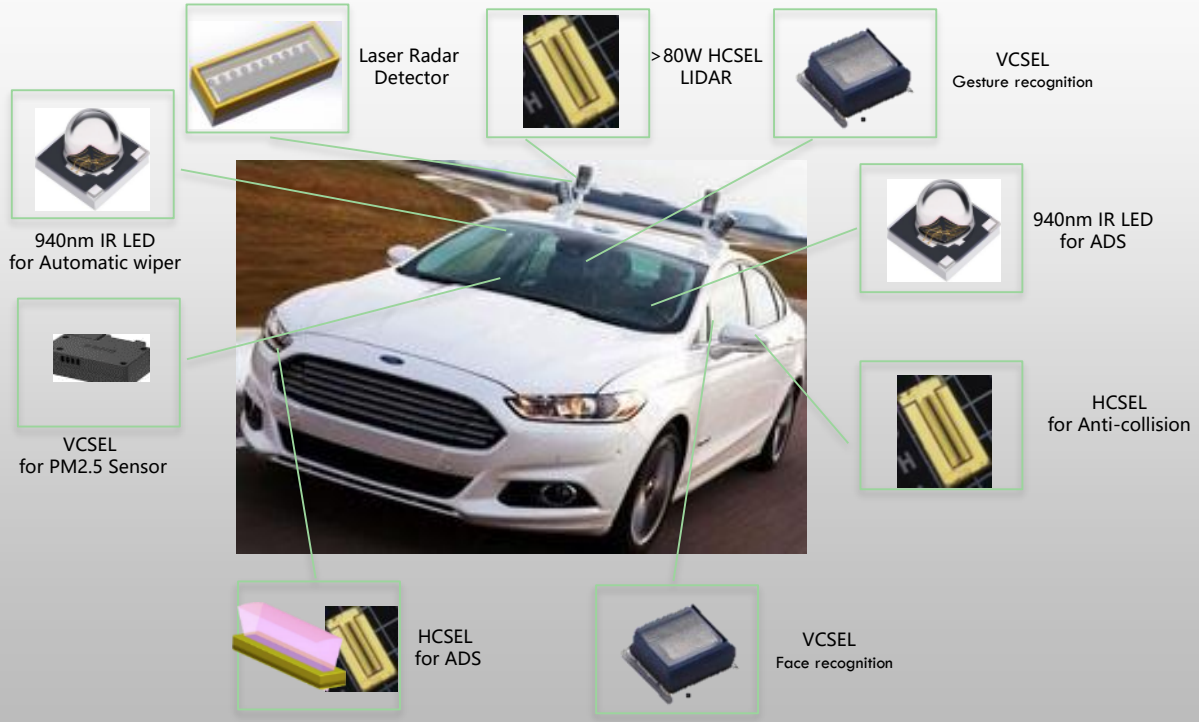
Smart RGB
Under Development

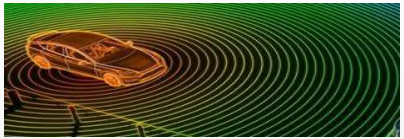
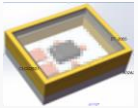
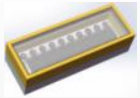
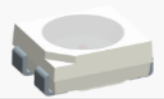
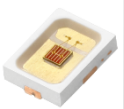
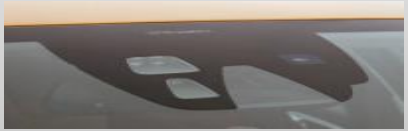
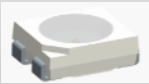
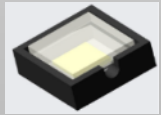


5050RGBWW

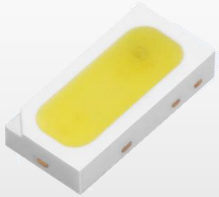
Atmosphere LB

2.2 Optical Sensor for Automotive



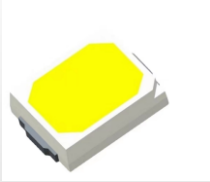
Application scenario	Recommendation		
 LiDAR	 CLCC2531	 CLCC2055	
Gesture recognition	 3528 0.3W	3528 0.3W	 2720 1W
 Automatic windshield wiper	 3528 0.3W	2720 1W	
Fatigue driving monitoring	 3030 2W		

2.3 Back Lighting for Automotive Display



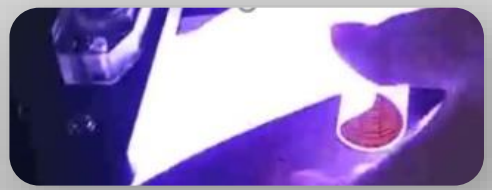
EMC 3014

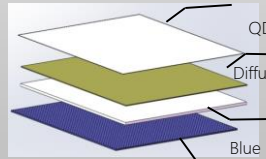
EMC 4014



PCT 2016

PCT 4014

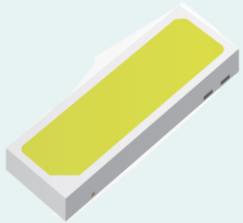




Mini LED Backlighting

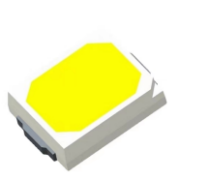
2.3 Back Lighting for Automotive Display

EMC Series

	Part No.	IV(LM)	X/Y(nm)	VF(V)	IF(mA)	2θ1/2 (°)	TJ(°C)	NTSC
		Typ	Typ	Typ	Typ	Typ	Max	
EMC 3014	VO-3014ZWH-EMC-F-YAG	48	0.28,0.265	3	120	120	125	75%
	VO-3014ZWH-EMC-F-GL	45	0.28,0.265	3	120	120	125	85%
	VO-3014ZWH-EMC-F-GL-E	32	0.28,0.265	3	80	120	125	85%
	VO-3014ZWH-EMC-E-YAG	35	0.28,0.265	3	80	120	125	75%
	VO-3014ZWH-EMC-E-GL	30	0.28,0.265	3	80	120	125	85%
 EMC 4014	VO-4014ZWH-EMC-F-YAG	55	0.28,0.265	3	120	120	125	75%
	VO-4014ZWH-EMC-F-GL	50	0.28,0.265	3	120	120	125	85%
	VO-4014ZWH-EMC-F-GL-E	48	0.28,0.265	3	120	120	125	85%
	VO-4014ZWH-EMC-E-YAG	40	0.28,0.265	3	80	120	125	75%
	VO-4014ZWH-EMC-E-GL	35	0.28,0.265	3	80	120	125	85%

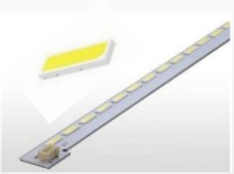
2.3 Back Lighting for Automotive Display

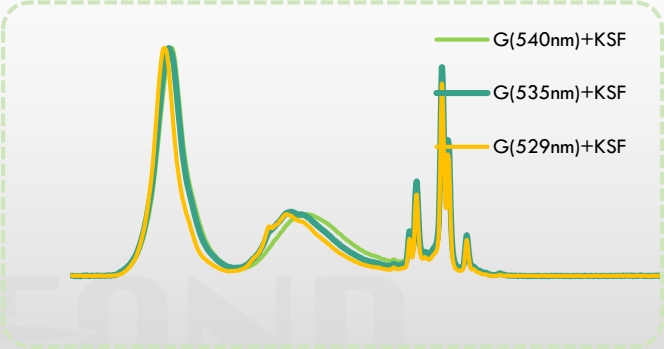
PCT Series

	Part No.	IV(LM)	X/Y(nm)	VF(V)	IF(mA)	2θ1/2 (°)	TJ(°C)	NTSC
		Typ	Typ	Typ	Typ	Typ	Max	
 PCT 2016	VO-2016ZWH-A-GL-YAG	8	0.28,0.265	3	20	120	125	75%
	VO-2016ZWH-A-GL	7	0.28,0.265	3	20	120	125	85%
	VO-2016ZWH-A-GL-E	6	0.28,0.265	3	20	120	125	85%
	VO-2016ZWH-A-GL3	6	0.28,0.265	3	20	120	125	95%
	VO-2016ZTWH-A-GL-YAG	8	0.28,0.265	3	20	135	125	75%
	VO-2016ZTWH-A-GL	7	0.28,0.265	3	20	135	125	85%
	VO-2016ZTWH-A-GL-E	6	0.28,0.265	3	20	135	125	85%
PCT 4014	VO-4014ZWH-PCT-H-YAG	40	0.28,0.265	3	90	120	125	75%
	VO-4014ZWH-PCT-H-GL	38	0.28,0.265	3	90	120	125	85%

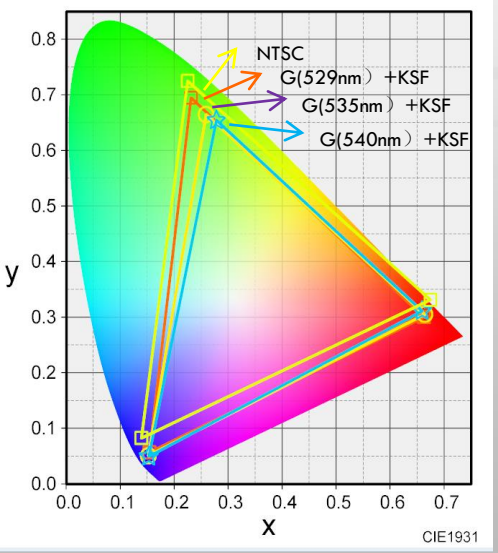
2.3 Back Lighting for Automotive Display

Wide Gamut Products





- **GE Patents**
- **Gamut Customized NTSC75%-97%**
- **High Reliability**



Solution	NTSC	Brightness
G(529nm）+KSF	95.0%	80%
G(535nm）+KSF	91.0%	85%
G(540nm）+KSF	85.0%	100%

2.3 Back Lighting for Automotive Display

Flux comparison between VAOPTO & competitor products

Company	Size	Phosphor	Flux/LM	Forward Voltage/V	Viewangle/°	Effiency lm/W	Color Coordinate (x, y)	Current/mA
E*	3.0*1.4*0.52	YAG	33.87	2.9	120	146.0	0.27，0.25	120
D*	3.0*1.4*0.52	YAG	33.56	2.9	120	144.6	0.27，0.25	120
J*	3.0*1.4*0.52	YAG	33.68	2.9	120	145.2	0.27，0.25	120
VAOPTO	3.0*1.4*0.52	YAG	33.81	2.9	120	145.7	0.27，0.25	120
N*	3.0*1.4*0.52	G+KSF	30.44	2.9	120	131.2	0.28，0.26	120
D*	3.0*1.4*0.52	G+KSF	30.21	2.9	120	130.2	0.28，0.26	120
J*	3.0*1.4*0.52	G+KSF	30.27	2.9	120	130.4	0.28，0.26	120
VAOPTO	3.0*1.4*0.52	G+KSF	30.21	2.9	120	130.2	0.28，0.26	120

2.3 Back Lighting for Automotive Display

Lifetime test comparison between VAOPTO & competitor products

Aging time	0	168	336	672	840	1000	L50 lifetime
VAOPTO	100.00%	99.79%	99.58%	99.17%	98.97%	98.76%	56021
E*	100.00%	99.78%	99.56%	99.13%	98.91%	98.69%	53209
J*	100.00%	99.78%	99.57%	99.14%	98.93%	98.72%	54234
D*	100.00%	99.80%	99.59%	99.19%	98.99%	98.79%	57324

Sulfur Test Comparison

VAOPTO						
	IF(mA)	VF(V)	lm	X	Y	lumen maintenance
0H	120	3.01	33.24	0.2782	0.2615	100%
504H	120	3.01	33.56	0.2847	0.2606	81.32%
E*						
	IF(mA)	VF(V)	lm	X	Y	lumen maintenance
0H	120	3.06	32.89	0.2779	0.2590	100%
504H	120	3.07	33.45	0.2752	0.2623	81.54%
D*						
	IF(mA)	VF(V)	lm	X	Y	lumen maintenance
0H	120	3.02	33.84	0.2794	0.2634	100%
504H	120	3.04	33.23	0.2754	0.2555	79.23%
J*						
	IF(mA)	VF(V)	lm	X	Y	lumen maintenance
0H	120	3.00	33.14	0.2807	0.2581	100%
504H	120	3.00	33.35	0.2752	0.2649	80.23%

2.4 Mini LED

Mini LED Backlighting

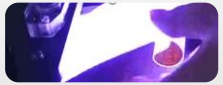
Mini LED Display

2.4 Mini LED

VAOPTO Mini LED Development Milestone

Project start

Y2016



2017.01

Mini LED flexible BL

First Mini BL in China，

0OD，Superthin

2017.10

The first Automation Production Line in China

2018.11

Mini LED Display--P0.68

Smallest pitch in the world

P0.68，4K 118”，2019CES

2019.0

Mini LED Display- -P0.49

Smallest pitch in the world

P0.49，8K 170“，2020ISE

2019.12

Mini LED Display- -P0.39

Smallest pitch in the world

P0.39mm 2020CES

2020.0

Micro Display--”Fly” Series

Single color version

Minimum pitch 0.2mm

2020.10

Micro Display--”Fly” Series

Multi color version

Minimum pitch 0.39mm

2021.0

Micro Display--”Character” Series

Single color version

Minimum pitch 0.2mm

2021.10

Micro Display--” Character” Series

Multi color version

Minimum pitch 0.39mm

2022.3

Mini COB--Automotive version

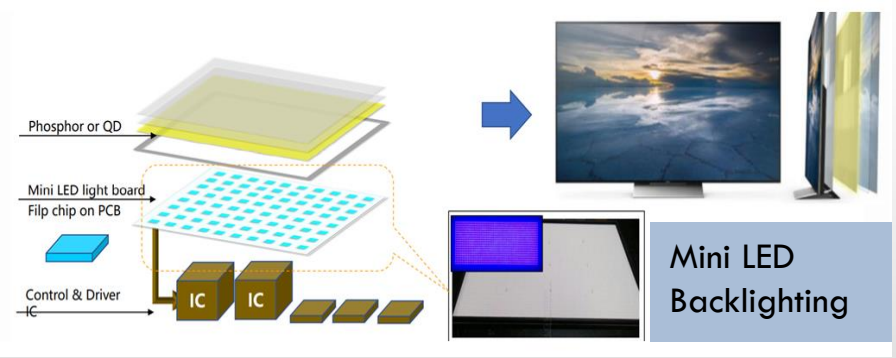
P0.68

2023

Micro Display--” Feather” Series

Creative comsumer application

2.4 Mini LED-- Mini Backlighting



Features

Integrated driver & LED;
More than 1000 Zones;
Wide Gamut, High uniformity;
OD0~OD10;
Loca dimming, High Contrast;
AEC Q102;
ESD≥8KV;
Customized Design;

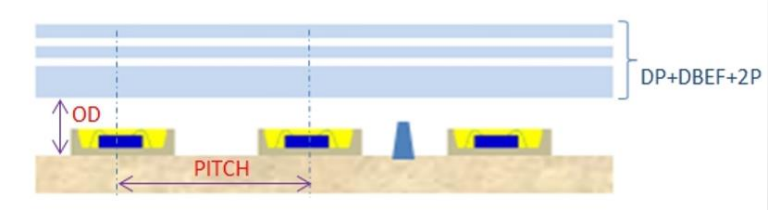
Application

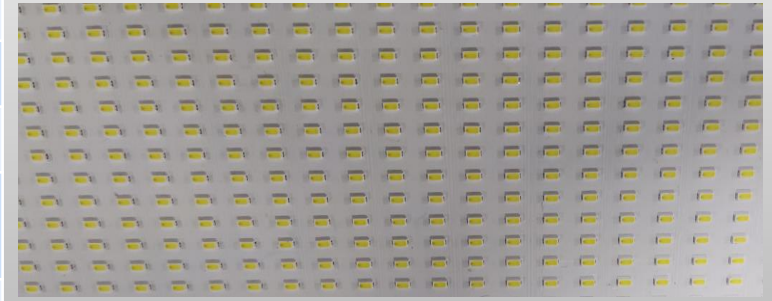
Automotive LCD Backlighting

2.4 Mini LED-- Mini Backlighting

POB Solution

Items	12.3 inch solution
PCBA	336zones 4ea/zone， Board thickness1.05mm Pitch:X:4.8mm Y:5.2mm
PCB	FR4 0.6mm， 120.241mm*302.692mm*0.6mm
LED	1344ea chip1030
Package	EMC2016- 0.55mm thickness
Brightness	75W BLU 65000nit 20W BLU 18000nit
Gamut	>85% NTSC
OD	for OD5~OD10

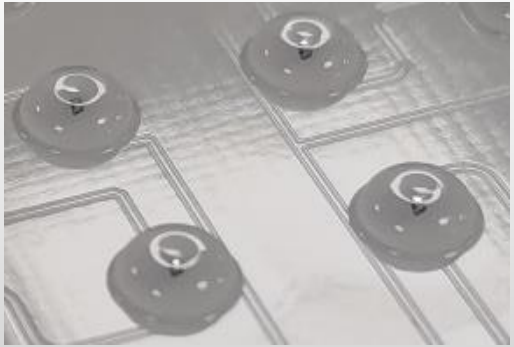




2.4 Mini LED-- Mini Backlighting

COB Solution

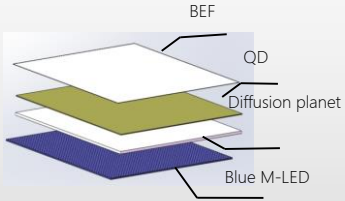
Items	12.3 inch solution
PCBA	1144zones Pitch:X:5.5mm Y:5.8mm Total Thickness<6mm
PCB	FR4 1.2mm， 302.7mm*120.2mm*1.2mm
LED	chip0620
Package	chip on board
Brightness	>40000
Gamut	>100% NTSC(QD film)
OD	for OD0



2.4 Mini LED-- Mini Backlighting Strength

Ultra-thin

Ultra-thin light board 0.3~ 0.35mm



The total thickness of the backlight ≤ 2mm

Good Uniformity

Using mold injection thermosetting, industry's smallest tolerance. The glue thickness can reach 0.1mm

Light board thickness tolerance ±0.05mm.
The best uniformity in the industry

Uniform Structure

VAOPTO's unique patented uniform structure design. Uniformed optical design optimization to improve Mura and lighting problems

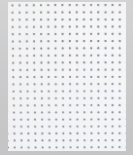
OD0mm /Pitch>5mm

light board thickness tolerance ±0.05mm

High Light Efficiency

VAOPTO unique reflective paper molding technology. Best uniformity, best reflectivity technology solution

Mini LED
light board



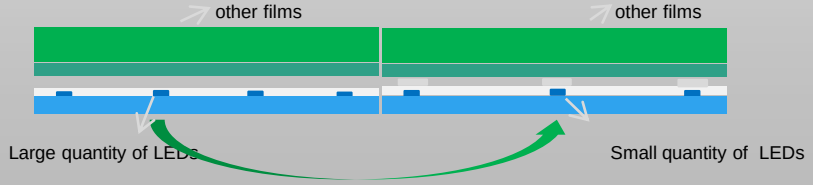
Reflective paper
(automatic affixing)

The unique process technology, peVOectly solves the problem of white oil yellowing

The reflectivity is increased by 5%-10%, and the brightness is increased by more than 15%

Low Cost

VAOPTO's unique patented uniform structure design. Uniformed optical design optimization to improve Mura and lighting problems

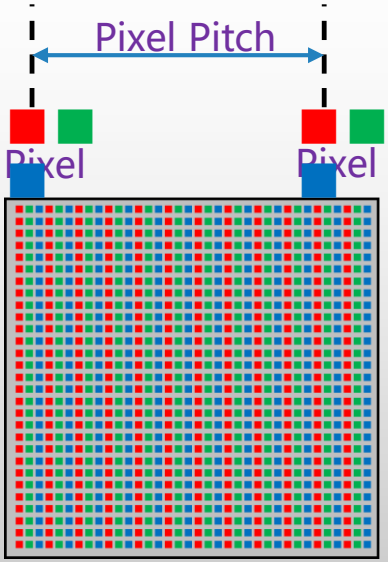


Uniform design reduces the number of LEDs by 30% and optimizes costs

2.4 Mini LED-- Mini Display

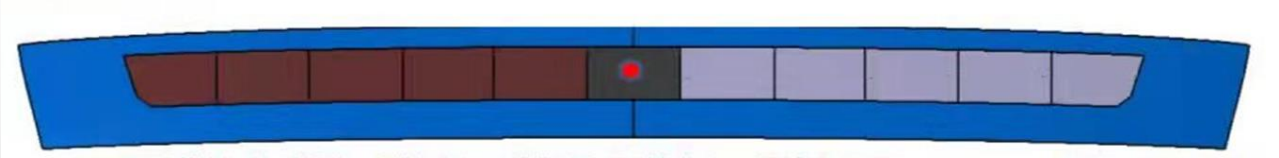
Mini RGB Display Standard Module

Items \ Spec	P1.25	P0.93	P0.68	P0.49
Size	150*168.75mm	150*168.75mm	81.6*91.8mm	78.4*88.2mm
Resolution	120*135	160*180	120*135	160*180
LED Qty.	48600pcs	86400pcs	48600pcs	86400pcs



2.4 Mini LED-- Mini Display

Rear Lights Application



- Pixel Pitch：P0.68mm
- Compose：11 modules/ Unit
- Module Size：81.6*91.8mm
- Module Pixels：120*135
- Module Chip Qty.：48600pcs

2.4 Mini LED-- Mini Display

Logo Display Application

- Pixel Pitch：P0.68mm
- Module Size： Φ150mm
- Module Pixels：222*226
- Signal InteVOace： LVDS

2.4 Mini LED-- Mini Display

Small Display Application

The Mini LED microscreen display is clearer than the digital tube, stronger than the LCD, smaller, brighter, thinner and lighter:

1. Complete display of Chinese characters, clear display of numbers, including various of languages, programmable for the display.
2, high brightness, low heat, wide viewing angle,
3. Various of choice, R, G, B, W, RGB, RG, RB, GB, etc
4、 Pitch 0.2~1.5mm, Freedom customization(PPI:30-140)
5. Light sensor, pressure sensor, voice control, Bluetooth and other functions for option

The strengths comparison for LED digital tube, Mini LED microscreen, and LCD screen

Item	LED Digital Display	VAOPTO Micro Display	LCD Display
Picture			
Reliability	★★ LEDs with wire bounding process;	★★★ Flip chip no wire bounding; COB technology, fast heat dissipation; Epoxy molding, resistant to humidity.	★ Fragile, not resistant to high temperature
Brightness	★★ Max:1000nit	★★★ Max: 2000nit	★ Max: 600nit
Dimension Design Flexibility	★★	★★★	★
Pixel Pitch	★ ~3.75mm	★★ 0.2~1.5mm	★★★ 0.2~0.4mm

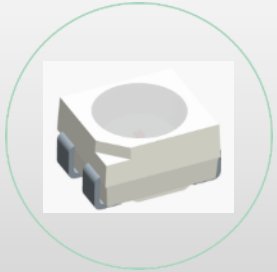
03

Application Cases

Headlamp high and low beam(Baojun, GM)

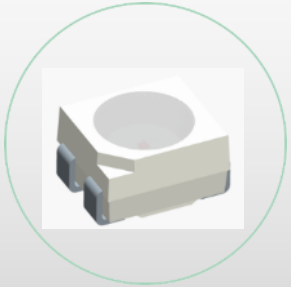
Part No.	IF	Luminous Intensity/Flux	Color	Angle
VO-B4H10-W60P-E4	1000mA	280-300-320-340lm	6000K	120°

Rear Combination Lights--MAN



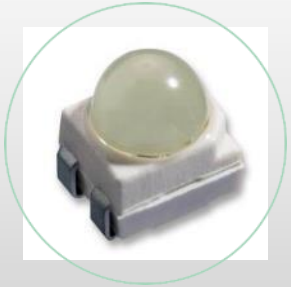
Part No.	IF	Luminous Intensity/Flux	Color	Angle
VO-A2A31-R258-R4	50mA	2500mcd	620nm	120°
VO-A2A31-Y918-Y3	50mA	2200mcd	590nm	120°
VO-A1A36-W56E-A9	150mA	60lm	0.33，0.34	120°

Combined tail lamp--MG



Part No.	IF	Luminous Flux/Intensity	Color	Angle
VO-OMRA35TS-AB-J	150mA	19.6-21.8-24.2-26.9lm	620nm	120°
VO-OMRA30TS-AM-G	50mA	1800-2300-2800-3500mcd	620nm	120°

CHMSL--HAVAL



Part No.	IF	Luminous Intensity	Color	Angle
VO-A2B3B-R228-R4	50mA	4300-5300-6500-8000mcd	617.5-625nm	60°

Turning Lights--GEELY

Part No.	IF	Luminous Flux	WD	Angle
VO-A1T28-WYS9-A4 （PC Amber）	60mA	18lm	590nm	120°

Daytime running lamp / turn signal lamp--JAC

Part No.	IF	Luminous Flux	Color	Angle
VO-A1T35-WYAE-A7 （PC Amber）	150mA	45.3-50-55.3-61.2lm	(0.57/0.42) 590nm	120°
VO-A1T35-W5SE-A9	150mA	50-55.3-61.2-67.8lm	0.33,0.34	120°

Logo –HONGQI

Part No.	IF	Luminous Intensity	Color	Angle
VO-A1E30-WYSE-A9	150mA	45.3-50-55.3-61.2lm	(0.57/0.42) 590nm	120°

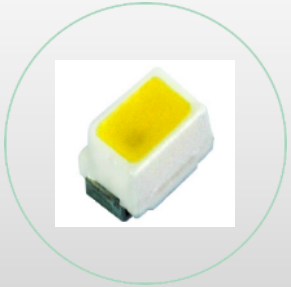
Logo --SANY Heavy Truck

Part No.	IF	Luminous Intensity	Color	Angle
VO-A1T28-W6SE-A6	150mA	55.3-61.2-67.8-75.3lm	(0.32,0.33) 6000K	120°

Switch and Button Lights--HYUNDAI&KIA

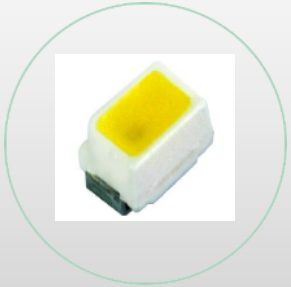
Part No.	IF	Luminous Intensity	Color	Angle
VO-BWRB14DS-FP-B	5mA	35-43-53-65mcd	x0.30,y0.28	120°
VO-BWRA30DS-KK-BZ	5mA	15-180-230mcd	x0.18,y0.27	120°
VO-YURL30TS-BB	20mA	2300-2800-3500mcd	590nm	60°

Switch and Button Lights--HYUNDAI&KIA



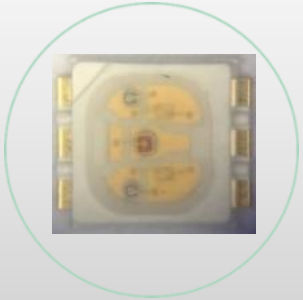
Part No.	IF	Luminous Intensity	Color	Angle
VO-A1P14-WBA5-A3	20mA	800-1000-1200-1500mcd	x0.2,y0.17	120

Sun Visor Lights--TESLA



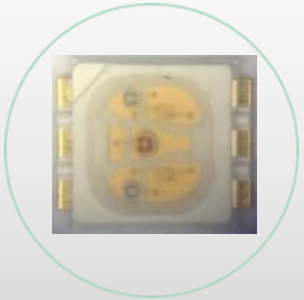
Part No.	Color	Luminous Intensity	IF	Angle
VO-A2P14-W415-A6	x0.38,y0.38	1800-2300-2800-3500mcd	20mA	120°

Atmosphere Lights--TOYOTA



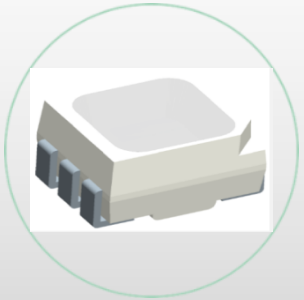
Part No.	IF	Luminous Intensity	Color	Angle
VO-QSMB-6WDD-0A1C1 (Broadcom)	R:14mA G:11mA B:9mA	1600-2600mcd	X0.3,y0.3	120

Atmosphere Lights(Smart Panel)--NISSAN



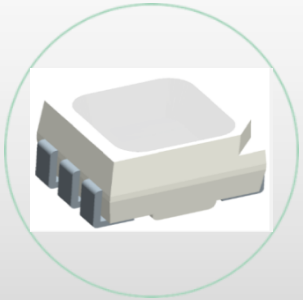
Part No.	IF	Luminous Intensity	Color	Angle
VO-A2A38-4W1T-D1	R:14mA G:11mA B:9mA	1600-2600mcd	X0.3,y0.3	120

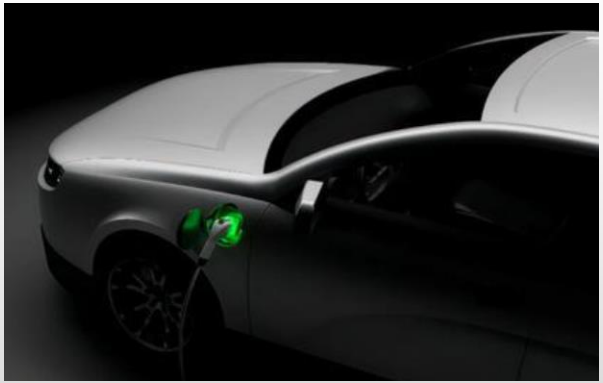
Atmosphere Lights(Smart Panel)--NISSAN



Part No.	IF	Luminous Intensity	Color	Angle
VO-A2A39-RGB5-W2	20mA*3	R:800-1000-1200-1500mcd G:2100-2565-3035-3500mcd B:330-425-520-615mcd	R:620-625-630nm G:520-525-530nm B:460-465-470nm	120

Atmosphere lamp / intelligent panel--DFM

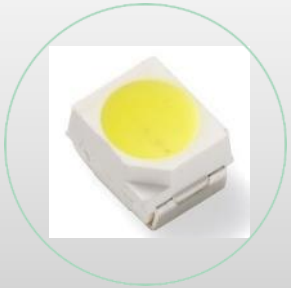




Application

Part No.	IF	Luminous Intensity	Color	Angle
VO-A2A39-RGB5-W2	20mA*3	R:800-1000-1200-1500mcd G:2100-2565-3035-3500mcd B:330-425-520-615mcd	R:620-625-630nm G:520-525-530nm B:460-465-470nm	120

Sun Visor Lights--GM

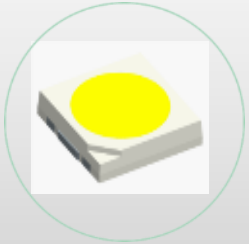


Application

K2XX Platform

Part No.	IF	Luminous Intensity	Color	Angle
VO-A1A30-W3S2-A3	5mA	530-1000mcd	x0.425,y0.40	120°

Dome lights--BUICK



SGM358

Part No.	Color	Luminous Intensity/Flux	IF
VO-A1P1A-W132-A3	x0.30,y0.28	35-43-53-65mcd	5mA
VO-A1P1A-W7S5-A3	x0.31,y0.275	280-350-430-530mcd	20mA
VO-A1E30-W56E-A9A	x0.33,y0.34	117-130-144-160lm	150mA

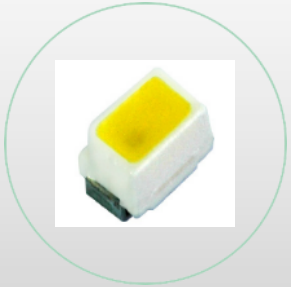
Air conditioning controller--BYD

Part No.	Color	Luminous Intensity/Flux	IF
VO-B1P08-W752-A32	x0.305,y0.295	585-650-720-800mcd	5mA

Dome lights--Mazda

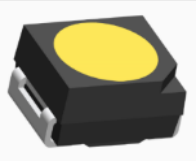
Part No.	IF	Luminous Flux	Color	Angle
VO-A1T28-W5S9-A9	60MA	24.2-26.9-30.0-33.4lm	0.34/0.34	120°

Switch Button Light--SAIC Roewe



Part No.	Color	Luminous Intensity	IF	Angle
VO-A1P1A-W132-A3	x0.30,y0.28	35-43-53-65mcd	5mA	120°
VO-A2P14-WYS6-A4 （PC Amber）	590nm	2300-2800-3500-4300mcd	30mA	120°

Switch and Button Lights—GM Cadillac

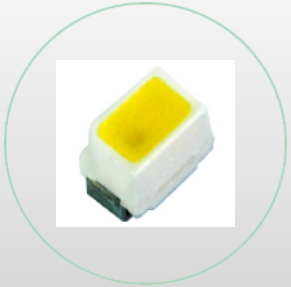


Application

OMEGA Platform

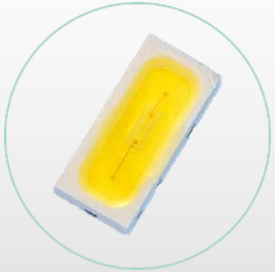
Part No.	IF	Luminous Intensity	Color	Angle
VO-A2A3A-WD61-A3	3mA	28-35-43-53mcd	x0.28,y0.245	120°

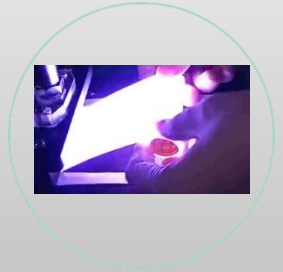
Transmission Panel Backlights--BAIC



Part No.	IF	Luminous Intensity	Color	Angle
VO-A1P14-W851-A3	3mA	53-80mcd	x0.30,y0.28	120°

Central control backlight--TIANMA

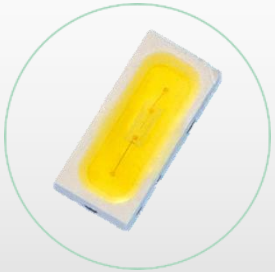


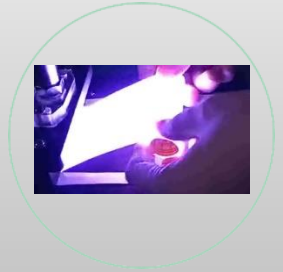


Part No.	IF	Luminous Intensity	Color	Angle
VO-A1F30-W75B-A7	90mA	26.9-30-33.4-37lm	x0.304,y0.297	120°

LTPS 8“ TFT drive,0509 MiniLED inside,more the 10,000 zone(Mini BL)

Central control backlight--BOE





10.5"

12.8"

14.6"

16"

16.7"

Part No.	IF	Luminous Intensity	Color	Angle
VO-A1F30-W75B-A7	90mA	26.9-30-33.4-37lm	x0.304,y0.297	120°
VO-A1F40-W75B-A7	120mA	41-45.3-50-55.3lm	x0.304,y0.297	120°

The End, Thank You!