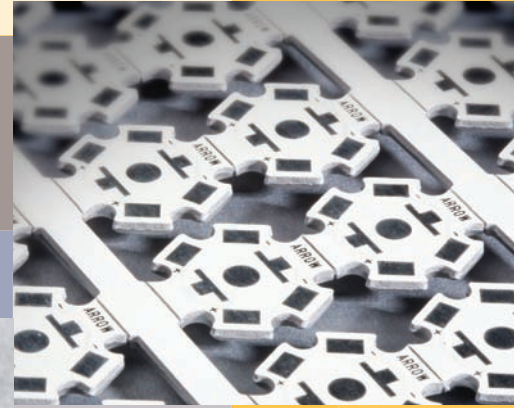
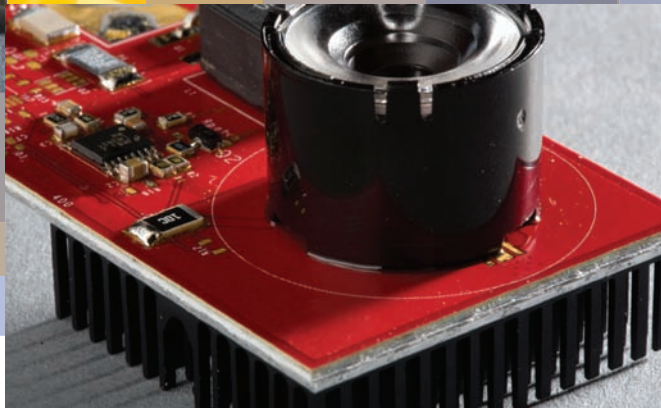
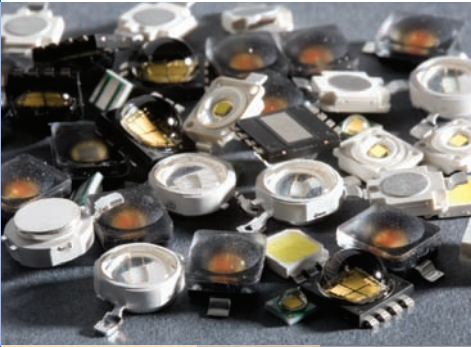


ARROW | LIGHTING



Spring | 09

ARROW LIGHTING SELECTOR GUIDE

Making Bright Ideas BrilliantSM

ARROW[®]

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Lighting your way.

Every Day, Around The World, Our Lighting Technologies Deliver A Measurable Advantage To People And Products.

From stadium displays to residential lighting, innovation in lighting is taking advantage of broad-based technological progress. For over 60 years, Tyco Electronics has worked with leaders in the lighting industry to lower costs, increase reliability, and devise new and novel ways to create and apply lighting products. Today, as the leader in passive electronic components -- offering over 500,000 part numbers -- we can put our expertise to work on your development program.

Whether it's providing our broad product offering, proposing a value-added solution, or designing a new product, our commitment to advanced engineering and world-class manufacturing delivers innovation that can enhance any lighting project.

 **Tyco Electronics**
Our commitment. Your advantage.

Arrow >>

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Customer Opinions Count! >>

Tell us how we are doing with the Arrow Lighting Selector Guide by May 31, 2009 and be entered to **WIN a Starbuck's Gift Card!***

In order for Arrow Electronics to continue bringing you the best lighting design tools, please complete our online customer survey.

Go to www.arrownac.com/lightingsurvey to fill out the survey.

*Twenty winners will be chosen on May 31, 2009.



Arrow Electronics Lighting Group

Making Bright Ideas BrilliantSM

Dedicated to providing LED alternatives to incandescent, halogen, and fluorescent lighting. Our focus is on providing a wide range of solutions from components to total systems that deliver high reliability, lighting efficiency, shock resistance, and vivid color effects for a lower total cost of ownership. We offer solutions developed around products containing High Brightness Light Emitting Diodes (HB-LEDs) to support your designs for solid-state lighting as your requirements evolve and expand. Whether you need solutions for signage, flashlights, architectural, automotive, commercial, or backlighting applications, Arrow offers real-world components, solutions, and value-added assemblies.

Complete HB-LED Solutions from Concept through Production >>

The Arrow Lighting line card features the latest RoHS-compliant materials and process technologies, including InGaN

and AlInGaP HB-LEDs, LED drivers, optics, and thermal management solutions. Our supplier base consists of many of the world's leading LED

lighting suppliers and integrators, which means we can deliver complete solutions from individual components, through integrated devices, or design kits, when you need them.

Arrow's unsurpassed supply chain management services allow you to streamline your supply chain from start to finish. Services include vendor managed inventory, in-plant store and consignment programs, and supply chain integration, resulting in greater flexibility and responsiveness for your supply chain. Our staff, facilities, and infrastructure are ready to meet your needs at every point.

Additional Arrow Services >>

- arrowdevtools.comTM
- [Testdrive](#)SM
- Arrow's LCD Offering
- Supply Chain Services
- Arrow Consulting Engineering Services

The Right Team for the Job >>

Our diverse team specializes in various vertical markets and can help you find solutions for your most complicated lighting designs. The Arrow Electronics Lighting Group is comprised of experienced Regional Lighting Specialists, dedicated Account Development Specialists, and specially trained Lighting Applications Engineers who are among the industry's most knowledgeable experts.

Environmentally Friendly, RoHS Compliant Products Can Help Change the World >>

Consider this. Worldwide, electric lighting accounts for 2.9 billion metric tons of carbon dioxide emissions per year,¹ and the demand for electricity is only expected to increase. If solid-state lighting replaced all existing lights in the United States, it is estimated there would be a 10 percent reduction in greenhouse emission gases nationwide,² which is another good reason to make the switch to HB-LEDs.

On their own, LEDs are considered efficient, but frequently the components surrounding them negate this efficiency. To be truly efficient, you need a complete energy-efficient solution. Arrow offers a broad range of drivers and other components that preserve the efficiency of LEDs. And all of our lighting solutions are RoHS compliant. Arrow can solve even the most challenging lighting scenarios and protect the environment at the same time.

1. *IAEEL Newsletter*. http://www.iaeel.org/IAEEL/NEWSL/2000/ettva2000/NatGlob_a_1-2_00.html. May 25, 2007.

2. *Next Generation Lighting Industry Alliance Website*. <http://www.nglia.org/>. May 25, 2007.

Design Tools >>

Arrow's dedicated design tools page on our lighting website offers tools from a variety of lighting manufacturers to help you choose the right parts for your designs. Quickly access technical papers, training, and other information links to help you understand, compare, and evaluate the right parts for your lighting applications. Now you can solve your design challenges and speed time-to-market. Start now at <http://lighting.arrow.com/designtools>

Features and Benefits of HB-LEDs:

- Lower total cost of ownership compared to incandescent solutions
- Long life span (30,000 to 100,000 hours of continuous operation), means less-frequent lamp replacement
- Capable of flashing without reduced life span
- Low voltage DC operation
- Resistant to shock and vibration, for higher reliability
- Ability to operate within -40°C to +125°C temperature range and therefore ideal for outdoor, industrial, and automotive applications
- Dimmable/brightness control without color shift
- Dynamic color control and a full range of saturated colors
- Environmentally friendly RoHS compliance; lead- and mercury-free
- No heat (IR) in the light beams means it won't harm what it illuminates



Photo courtesy of OSRAM

Arrow Lighting

constantly discovers opportunities to expand your business by researching new markets and identifying compelling technologies with potential for growth and synergies. To cultivate these markets Arrow forges key partnerships with new and existing manufacturers and delivers a complete solution for your needs, expanding well beyond traditional component support.

Backlighting >>

Backlighting applications provide an enormous opportunity for HB-LEDs to outperform existing CCFL solutions.

Features and Benefits:

- Bright, saturated colors
- Very bright source of white light
- Outperform CCFL in LCD TVs regarding RGB solutions
- Lower power consumption vs. incandescent light sources
- RoHS/WEEE compliant (no mercury)
- Long life (30,000 to 100,000 hrs.)



Flashlights >>

Generally used in less than ideal situations, flashlights have a history of not working when needed the most. The durability, long life, and low power consumption of HB-LEDs spell higher reliability for flashlight applications. The compact nature of HB-LEDs means flashlights can be small yet more effective.

Features and Benefits:

- Durability and long life in extreme conditions
- Small size and light weight
- Low-power consumption allows smaller battery packs

Transportation >>

Lighting for transportation is a necessity that provides many opportunities to improve safety standards and express style. Numerous interior and exterior applications benefit from HB-LEDs, and the prospects are growing.

Features and Benefits:

- Resist failure from shock and vibration
- Low power consumption
- Cycle on and off in milliseconds
- Allow designs that can enhance appearance, style, and safety

Signage >>

HB-LEDs are finding their way into a realm once dominated by neon and other light sources. Readability at distances, effective luminance, appropriate viewing angle and set back, and shading are all factors that can be controlled by using HB-LEDs. Their dimmable and programmable nature make them a natural fit for signage applications.

Features and Benefits:

- No filaments or glass components to break
- Low-voltage power supplies
- Real-time message updating/changing
- No moving parts
- Millions of colors available with RGB LED emitters
- Reduced installation and maintenance

Commercial Lighting >>

Light adds two exciting elements to architectural and commercial applications materials:

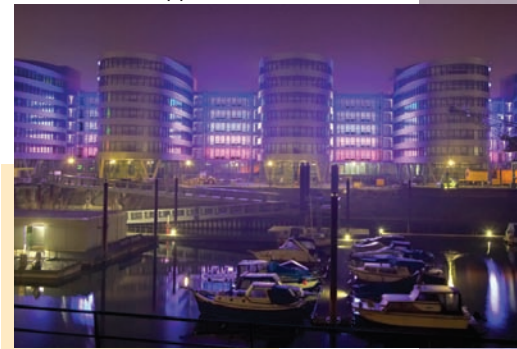
movement and change.

Because of these, the possibilities for commercial lighting are tremendous. Because of their ability to dim and

the extremely broad range of colors, HB-LEDs can be used to create a mood or catch attention. Pendant lighting, cove lighting, under- and over-cabinet lighting, sconces and wall washing, street and roadway lighting, and retail accent lighting, to name a few, can all benefit from the flexibility of HB-LEDs.

Features and Benefits:

- Long life and low maintenance
- True saturated colors and a wide temperature range
- Dimming extends LED component life and won't change color temperature
- Easily integrated with control systems
- Detect failure modes
- Low energy consumption
- Low-voltage DC operation
- Operate with low- or high-voltage inputs
- White color temperatures available from cool to warm (6,500°K to 2,500°K)
- Available in fixed optical angles



Arrow Lighting Supplier Listing

Arrow's comprehensive lighting line card offers a full range of services and technologies. With these manufacturers, the Arrow Lighting Group is committed to supporting your lighting design from components to complete solutions.

Controls >>

Altera Corporation
Analog Devices, Inc.
Atmel
Color Kinetics
Cypress Semiconductor
Freescale Semiconductor
NXP Semiconductors
- Founded by Philips
OSRAM SYLVANIA
STMicroelectronics
Texas Instruments

LED Drivers >>

ICs

Allegro MicroSystems
Analog Devices, Inc.
Diodes Incorporated
Freescale Semiconductor
Infineon Technologies
International Rectifier
Linear Technology
National Semiconductor
NXP Semiconductors
- Founded by Philips
ON Semiconductor
Semtech
STMicroelectronics
Supertex
Texas Instruments

Modules

CML Innovative Technologies (CML)
Delta Power
Dialight Lumidrives
Magtech Industries Corp.
OSRAM SYLVANIA

Light Sources >>

HB-LEDs

Avago Technologies
Cree, Inc.
Everlight
Harvatek
Lite-On
OSRAM Opto Semiconductors
Sharp
Stanley Electric
TT electronics
- OPTEK Technology
Unity Microelectronics
Vishay

LED Modules

CML Innovative Technologies (CML)
Color Kinetics
Dialight
Everlight
Harvatek
OSRAM SYLVANIA
Stanley Electric

Non-Visible Light

OSRAM Opto Semiconductors
TT electronics
- OPTEK Technology

Optics >>

Avago Technologies
CML Innovative Technologies (CML)
Dialight Lumidrives
Fraen Corporation
Harvatek
TT electronics
- OPTEK Technology
Unity Microelectronics

Thermal Management >>

Aavid Thermalloy
AVC America
Comair Rotron
TT electronics
- IRC
Texas Instruments

Passive Components >>

Bourns
Cooper Bussmann
- Coiltronics
EPCOS
Littelfuse
Molex
NIC Components
Nichicon
Panasonic Electric Works
Pulse
Tyco Electronics

Integration Partners >>

TT electronics
- OPTEK Technology

ARROW | Supplier Briefs



Photo courtesy of Cree



Photo courtesy of Peter Paige





XLamp® High-Power LEDs

Cree® is an industry leader in LED technology, and set the lighting-class standard for LEDs with the XLamp® XR product family in 2006. The introduction of the XP and MC product families further demonstrates Cree's commitment to delivering unprecedented levels of white LED brightness and efficacy along with the white-point stability needed for use in general illumination.



Cree® XLamp® product families:
XP (left), MC (center), XR (right)

Features ▶

- Full portfolio of white and color LEDs
- Correlated color temperature (CCT) from 2,600°K to 10,000°K
- Available with drive currents up to 1,000 mA
- Electrically isolated thermal path
- Tested to the highest standards in the LED industry

Benefits ▶

- Lighting-class brightness and efficacy
- Stable white point over time
- Proven reliability
- Lifetime up to 50,000 hours
- Directional light output

Applications ▶

- Indoor and outdoor general lighting
- Portable lighting
- Architectural lighting
- Transportation lighting
- Emergency vehicle lighting

Product Specifications ▶

Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets
XPEWHT-L1-0000-XXXXX	XLamp XP-E	Cool white	5,000-10,000	-	700	350	3.2	115	87.4-122	-	CL FL TR BL SI
XPEWHT-L1-0000-XXXXX		Neutral white	3,700-5,000	-	700	350	3.2	115	80.6-107	-	CL FL TR BL SI
XPEWHT-L1-0000-XXXXX		Warm white	2,600-3,700	-	700	350	3.2	115	67.2-93.9	-	CL FL TR BL SI
XPCWHT-L1-0000-XXXXX	XLamp XP-C	Cool white	5,000-10,000	-	500	350	3.4	110	73.9-100	-	CL FL TR BL SI
XPCWHT-L1-0000-XXXXX		Neutral white	3,700-5,000	-	500	350	3.4	110	67.2-87.4	-	CL FL TR BL SI
XPCWHT-L1-0000-XXXXX		Warm white	2,600-3,700	-	500	350	3.4	110	56.8-73.9	-	CL FL TR BL SI
MCE4WT-A2-0000-XXXXXX	XLamp MC-E	Cool white	5,000-10,000	-	700 per die	350 per die	3.2	110	370-490	-	CL FL TR
MCE4WT-A2-0000-XXXXXX		Neutral white	3,700-5,000	-	700 per die	350 per die	3.2	110	320-430	-	CL FL TR
MCE4WT-A2-0000-XXXXXX		Warm white	2,600-3,700	-	700 per die	350 per die	3.2	110	240-370	-	CL FL TR
XREWHT-L1-0000-XXXXX	XLamp XR-E	Cool white	5,000-10,000	-	1,000	350	3.3	90	80.6-114	-	CL FL TR BL SI
XREWHT-L1-0000-XXXXX		Neutral white	3,700-5,000	-	700	350	3.3	90	62-100	-	CL FL TR BL SI
XREWHT-L1-0000-XXXXX		Warm white	2,600-3,700	-	700	350	3.3	90	56.8-87.4	-	CL FL TR BL SI
XREROY-L1-0000-XXXXX		Royal blue	-	450-465	1,000	350	3.3	100	300-500 mW	-	CL TR BL SI
XREBLU-L1-0000-XXXXX		Blue	-	465-485	1,000	350	3.3	100	23.5-39.8	-	CL TR BL SI
XREGRN-L1-0000-XXXXX		Green	-	520-535	700	350	3.3	100	67.2-87.4	-	CL TR BL SI
XRCWHT-L1-0000-XXXXX	XLamp XR-C	Cool white	5,000-10,000	-	500	350	3.5	90	56.8-93.9	-	CL FL TR BL SI
XRCWHT-L1-0000-XXXXX		Neutral white	3,700-5,000	-	500	350	3.5	90	56.8-87.4	-	CL FL TR BL SI
XRCWHT-L1-0000-XXXXX		Warm white	2,600-3,700	-	500	350	3.5	90	45.7-73.9	-	CL FL TR BL SI
XRCROY-L1-0000-XXXXX		Royal blue	-	450-465	500	350	3.5	100	250-350 mW	-	CL TR BL SI
XRCBLU-L1-0000-XXXXX		Blue	-	465-475	500	350	3.5	100	13.9-23.5	-	CL TR BL SI
XRCGRN-L1-0000-XXXXX		Green	-	520-535	500	350	3.7	100	39.8-67.2	-	CL TR BL SI
XRCAMB-L1-0000-XXXXX		Amber	-	585-595	350	350	2.2	90	23.5-51.7	-	CL TR BL SI
XRCRDO-L1-0000-XXXXX		Red orange	-	610-620	700	350	2.2	90	30.6-51.7	-	CL TR BL SI
XRCRED-L1-0000-XXXXX	Red	-	620-630	700	350	2.2	90	23.5-51.7	-	CL TR BL SI	

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

Choose the Right Cree LED ▶

Visit our new website www.arrow.com/cree and get the information you need to select the best Cree LEDs for your lighting designs.

- Access the new Cree Product Characterization Tool
- Download datasheets and technical information
- View new products
- Much more

Round and Oval High-Brightness LEDs

Cree® offers a range of high-brightness LEDs in a variety of colors, including red, green, blue, white, and amber. They come in 4 mm and 5 mm oval packages with 70° or 110° viewing angles. The 5 mm round packages are available with 15°, 23°, 30°, and other viewing angles. The Screen Master® oval LEDs are designed for monochrome and full-color video screens. They have a very smooth, matched radiation pattern, ensuring superior displayed image quality.



Cree® offers a wide selection of high-performance round and oval LEDs

Features ▶

- Intensity and color binning
- Radiation pattern matching for Screen Master® oval LEDs
- High quality
- Bulk or ammo pack options
- RoHS compliant

Benefits ▶

- Uniform display brightness
- Superior image quality
- Long lifetime
- Automatic machine insertion

Applications ▶

- Full-color video screens
- Gas price signs
- Variable-message signs
- Gaming machines
- Channel letters

Product Specifications ▶												
Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets	
C503B-WAN	5 mm round	White	6,500-9,000	-	25	20	3.2	15	-	14,400-32,900	FL TR SI	
C535A-WJN		White	6,500-9,000	-	25	20	3.2	110	-	770-3,300	FL SI	
C503B-RAS		Red	-	624	50	20	2.1	15	-	5,860-23,500	TR SI	
C503B-RBS		Red	-	624	50	20	2.1	23	-	3,000-12,000	TR SI	
C503B-RCS		Red	-	624	50	20	2.1	30	-	3,000-12,000	TR SI	
C503B-AAS		Amber	-	591	50	20	2.1	15	-	5,860-23,500	TR SI	
C503B-ABS		Amber	-	591	50	20	2.1	23	-	3,000-12,000	TR SI	
C503B-ACS		Amber	-	591	50	20	2.1	30	-	3,000-8,200	TR SI	
C503B-GAS		Green	-	527	25	20	3.2	15	-	16,800-46,100	TR SI	
C503B-GCS		Green	-	527	25	20	3.2	30	-	5,860-23,500	TR SI	
C503B-BAS		Blue	-	470	25	20	3.2	15	-	5,860-23,500	TR SI	
C503B-BCS		Blue	-	470	25	20	3.2	30	-	2,130-8,200	TR SI	
C4SMF-RJS		4 mm oval	Red	-	621	50	20	2.1	40 x 110	-	1,100-4,180	TR SI
C4SMG-RJS			Red	-	621	50	20	2.1	40 x 110	-	550-2,130	TR SI
C4SMF-GJS	Green		-	527	25	20	3.4	40 x 110	-	2,130-8,200	TR SI	
C4SMG-GJS	Green		-	527	25	20	3.4	40 x 110	-	1,100-4,180	TR SI	
C4SMF-BJS	Blue		-	470	25	20	3.4	40 x 110	-	550-2,130	TR SI	
C4SMG-BJS	Blue		-	470	25	20	3.4	40 x 110	-	390-1,520	TR SI	
C5SME-RJS	5 mm oval	Red	-	621	50	20	2.1	40 x 110	-	770-2,130	TR SI	
C4SMF-RJS		Red	-	621	50	20	2.1	40 x 110	-	1,100-4,180	TR SI	
C5SMF-GJS		Green	-	527	25	20	3.4	40 x 110	-	2,130-8,200	TR SI	
C5SMF-BJS		Blue	-	470	25	20	3.4	40 x 110	-	550-2,130	TR SI	
C566C-RFS		Red	-	621	50	20	2.1	30 x 70	-	1,100-4,180	TR SI	
C566C-AFS		Amber	-	591	50	20	2.1	30 x 70	-	1,520-4,180	TR SI	
C566C-GFS		Green	-	527	25	20	3.4	30 x 70	-	2,130-12,000	TR SI	
C566C-BFS		Blue	-	470	25	20	3.4	30 x 70	-	770-4,180	TR SI	

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

Choose the Right Cree LED ▶

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- Access the new Cree Product Characterization Tool
- Download datasheets and technical information
- View new products
- Much more



P4 and SMD High-Brightness LEDs

Cree's high-performance P4 and SMD LEDs demonstrate the company's commitment to providing industry-leading technology in standard, cost-effective packages. Cree's P4 LEDs feature high luminous flux with superior heat dissipation. These LEDs are perfect for use in illumination and accent lighting applications. Cree's high-brightness SMD LEDs provide unique features that benefit a wide range of lighting applications and are available with 2, 4, or 6 leads.



P4 and SMD high-brightness LEDs

Features ▶

- Color and intensity binning
- High-brightness
- High quality and reliability
- High performance
- RoHS compliant

Benefits ▶

- Improved LED matching
- Low power consumption
- Reduced maintenance cost
- Long lifetime

Applications ▶

- Gaming machines
- Full-color video screens
- Accent/linear lighting
- Variable-message signs
- Channel letters

Product Specifications ▶

Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets
CP41B-WES	7.6 x 7.6 P4	White	6,500	-	30	30	3.6	60	3.8-11.0	-	CL TR SI
CP41B-WGS		White	6,500	-	30	30	3.6	90	3.8-11.0	-	CL TR SI
CP41B-RDS		Red	-	624	70	70	2.5	40	4.4-11.0	-	CL TR SI
CP41B-RFS		Red	-	624	70	70	2.5	70	4.4-11.0	-	CL TR SI
CP41B-RHS		Red	-	624	70	70	2.5	100	4.4-13.2	-	CL TR SI
CP41B-ADS		Amber	-	527	70	70	2.5	40	4.4-13.2	-	CL TR SI
CP41B-AFS		Amber	-	527	70	70	2.5	70	5.5-13.2	-	CL TR SI
CP41B-AHS		Amber	-	527	70	70	2.5	100	5.5-13.2	-	CL TR SI
CP43B-RGS		Red	-	624	70	70	2.5	35 x 90	2.1-8.2	-	CL TR SI
CP43B-AGS		Amber	-	527	70	70	2.5	35 x 90	2.1-8.2	-	CL TR SI
CP41B-BFS		Blue	-	470	35	30	3.6	70	1.6-3.3	-	CL TR SI
CP41B-GFS		Green	-	527	35	30	3.6	70	4.4-8.7	-	CL TR SI
CLM1C-WKW		3.2 x 2.7 PLCC2	White	6,800	-	25	20	3.2	120	-	710-1,800
CLM1B-RKW	Red		-	624	50	20	2.1	120	-	450-1,120	TR BL SI
CLM1B-AKW	Amber		-	591	50	20	2.1	120	-	355-900	TR BL SI
CLM1B-GKW	Green		-	527	25	20	3.4	120	-	710-2,240	TR BL SI
CLM1B-BKW	Blue		-	470	25	20	3.4	120	-	280-710	TR BL SI
CLA1A-WKW	3.2 x 2.7 PLCC4	White	5,500	-	35	30	3.6	120	1.8-4.5	-	TR BL SI
CLA1A-MKW		Warm white	3,200	-	35	30	3.6	120	1.1-3.5	-	TR BL SI
CLM4B-RKW		Red	-	624	70	50	2.4	120	-	1,120-2,800	TR BL SI
CLM4B-AKW		Amber	-	591	70	60	2.4	120	-	1,120-2,800	TR BL SI
CLM4B-GKW		Green	-	527	30	30	3.6	120	-	1,400-3,550	TR BL SI
CLM4B-BKW	Blue	-	470	30	30	3.6	120	-	355-900	TR BL SI	
CLP6C-FKB	6.0 x 5.0 3-in-1 full color	RGB	-	R=621/G=527/ B=470	R=50/G=50/ B=50	R=20/G=20/ B=20	R=2.0/G=3.2/ B=3.2	115	-	R=560-1,120/G=1,120-2,240/ B=280-560	TR BL SI
CLV1A-FKB	3.2 x 2.8 3-in-1 full color	RGB	-	R=621/G=527/ B=470	R=50/G=25/ B=25	R=20/G=20/ B=20	R=2.0/G=3.2/ B=3.2	120	-	R=355-900/G=560-1,400/ B=180-450	TR BL SI
CLP6B-WKW	6.0 x 5.0	White	6,800	-	3 x 50	3 x 50	3.8	115	15.0-30.0	7,100-18,000	CL TR
CLN6A-MKW		Warm white	3,200	-	350	300	3.8	115	51.0-85.6	-	CL TR
CLN6A-WKW		White	5,500	-	350	300	3.8	115	60.5-101.8	-	CL TR

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

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Golden DRAGON Plus, Golden DRAGON, and Diamond DRAGON (1W-5W Typical)



OSRAM's newly expanded family of DRAGON LEDs offers high-power LED performance from the smallest possible light sources. Featuring proprietary ThinFilm/ThinGaN technology, OSRAM's Golden DRAGON Plus, Golden DRAGON, and Diamond DRAGON LEDs emit maximum light from a small, low-profile package. Reflow solderability, silicone encapsulation for long lifetime, and low thermal resistance provide optimum efficiency in assembly and performance.

Features ▶

- Maximum current ratings of 1,000 mA through 2,000 mA
- Available in 2,700°K to 6,500°K white, red, amber, yellow, true green, verde, blue, and deep blue
- Utilizes OSRAM's patented high-efficiency, low V_F , surface-emitting ThinFilm/ThinGaN die
- Chip-level phosphor conversion for uniform white color across the radiation pattern
- White products available with ANSI-compliant binning

Benefits ▶

- Suitable for ultra high-brightness applications
- Meets a wide variety of application needs; great for multi-color uses
- Saves power and reduces heat while providing more available light
- Low manufacturing cost, reduces depth, survives high temperatures, and transfers heat well
- Ideal radiation pattern for coupling secondary optics

Applications ▶

- General lighting—architectural, decorative, and entertainment
- Transportation lighting—automotive exterior, trucking, and emergency vehicle
- Specialty lighting
- Traffic signals, street and tunnel lighting
- Backlighting large screen LCDs



Golden DRAGON Plus

Product Specifications ▶											
Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets
LUW W5AM	Golden DRAGON Plus	Daylight white	6,500/5,700	–	1,000	350	3.2	170	82-130	–	CL FL TR BL SI
LW W5AM		White	5,600	–	1,000	350	3.2	170	61-97	–	CL FL TR BL SI
LCW W5AM		Warm white	4,500/4,000/3,500/3,000/2,700	–	1,000	350	3.2	170	45-97	–	CL FL TR BL SI
LR W5AM		Red	–	625	1,000	400	2.2	170	39-71	–	CL BL SI
LA W5AM		Amber	–	617	1,000	400	2.2	170	45-82	–	CL TR BL SI
LY W5AM		Yellow	–	590	1,000	400	2.2	170	39-71	–	CL TR BL SI
LT W5AM		True green	–	528	1,000	350	3.2	170	52-97	–	CL TR BL SI
LB W5AM		Blue	–	470	1,000	350	3.2	170	18-33	–	CL TR BL SI
LD W5AM		Deep blue	–	455	1,000	350	3.2	170	320 mW-500 mW	–	CL BL
LUW W5SM		Golden DRAGON	Daylight white	6,500/5,700	–	1,000	350	3.2	120	61-97	–
LW W5SM	White		5,600	–	1,000	350	3.2	120	52-97	–	CL FL TR BL SI
LCW W5SM	Warm white		4,500/4,000/3,500/3,000/2,700	–	1,000	350	3.2	120	33-82	–	CL BL
LR W5SM	Red		–	625	1,000	400	2.2	120	33-61	–	CL BL SI
LA W5SM	Amber		–	617	1,000	400	2.2	120	39-71	–	CL TR BL SI
LY W5SM	Yellow		–	590	1,000	400	2.2	120	33-61	–	CL TR BL SI
LT W5SM	True green		–	528	1,000	350	3.2	120	45-82	–	CL TR BL SI
LV W5SG	Verde		–	505	500	350	3.8	120	18-33	–	CL BL SI
LB W5SM	Blue		–	470	1,000	350	3.2	120	13-24	–	CL TR BL SI
LD W5SM	Deep blue		–	455	1,000	350	3.2	120	280 mW-450 mW	–	CL BL
LUW W5AP	Diamond DRAGON	Daylight white	6,500/5,700	–	2,000	1,400	3.5	140	210 -390	–	CL FL TR BL SI
LW W5AP		White	5,600	–	2,000	1,400	3.5	140	150-280	–	CL FL TR BL SI
LCW W5AP		Warm white	4,500/4,000/3,500/3,000/2,700	–	2,000	1,400	3.5	140	112-280	–	CL FL TR BL SI
LR W5AP		Red	–	625	2,000	1,400	2.5	140	97-210	–	CL BL SI
LA W5AP		Amber	–	617	2,000	1,400	2.5	140	112-240	–	CL TR BL SI
LY W5AP		Yellow	–	590	2,000	1,400	2.5	140	82-180	–	CL TR BL SI
LT W5AP		True green	–	528	2,000	1,400	3.5	140	130-280	–	CL TR BL SI
LB W5AP		Blue	–	470	2,000	1,400	3.5	140	39-97	–	CL TR BL SI
LD W5AP		Deep blue	–	455	2,000	1,400	3.5	140	900 mW-1,800 mW	–	CL BL

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

OSRAM

Opto Semiconductors

Advanced Power TOPLED LEDs (1/2W Typical) and 6-Lead MULTILED

This versatile 6-lead package is the perfect choice for a wide range of applications. Single-color versions feature OSRAM's latest ThinFilm/ThinGaN chips. The MULTILED devices feature three chips in red, green, and blue. Now 50 percent brighter than previous generations, this device offers brightness levels previously available only in higher power LED devices. Silicone encapsulation ensures exceptionally long lifetimes, and the low thermal resistance maximizes brightness and reduces heat. White products available with ANSI-compliant binning.



6-lead MULTILED

Features ▶

- Maximum current ratings of 200 mA to 250 mA for single-color devices, 50 mA or 60 mA for multi-color
- Available in white, four shades of warm white, red, amber, yellow, true green, and blue—plus RGB and AGB versions
- Utilizes OSRAM's patented high-efficiency, low V_F , surface-emitting ThinFilm/ThinGaN die
- Reflow solderable; 1.9 mm package height; +125°C T_j to +150°C T_j
- 120° lambertian radiation pattern

Benefits ▶

- Suitable for high-brightness applications
- Meets a wide variety of application needs; great for multi-color and color-changing applications
- Saves power and reduces heat while providing more available light
- Low manufacturing cost, reduces depth, and survives high temperatures
- Ideal radiation pattern for coupling secondary optics

Applications ▶

- Video walls and displays
- Color-changing and RGB applications
- Automotive, trucking, and transportation applications
- Backlighting medium-sized LCD panels

Product Specifications ▶

Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets
LW G6SP	Advanced Power TOPLED	White	5,600	–	250	140	3.6	120	25.2 typ.	5,600-11,200	CL FL TR BL SI
LCW G6SP		Warm white	4,500/4,000/3,500/3,000/2,700	–	250	140	3.6	120	22.6 typ.	3,550-11,200	CL TR BL
LR G6SP		Red	–	625	200	140	2.1	120	13.4 typ.	2,800-7,100	CL BL SI
LA G6SP		Amber	–	617	200	140	2.1	120	16.8 typ.	3,550-9,000	CL TR SI
LY G6SP		Yellow	–	590	200	140	2.2	120	12.6 typ.	2,240-7,100	CL TR SI
LT G6SP		True green	–	528	250	140	3.6	120	18.7 typ.	3,550-11,200	CL BL SI
LB G6SP		Blue	–	470	250	140	3.6	120	4.9 typ.	900-2,800	CL BL SI
LRTB G6TG		6-lead MULTILED	Red/true green/blue	–	R=625/TG=528/B=470	70/50/50	20	R=2.1/TG=3.2/B=3.2	120	–	R=280-900/TG=710-1,400/B=180-560
LRTB G6SG	Red/true green/deep blue		–	R=625/TG=528/B=458	70/50/50	20	R=2.1/TG=3.2/B=3.2	120	–	R=280-900/TG=450-1,400/B=112-560	CL TR BL SI
LATB G66B	Amber/true green/blue		–	A=617/TG=528/B=470	70/30/30	20	A=2.0/TG=3.5/B=3.6	120	–	A=180-450/TG=355-1,120/B=71-280	CL TR BL SI
LATB G6FTG	6-lead MULTILED INLINE	Red/true green/blue	–	R=625/TG=528/B=470	40/50/50	20	R=2.05/TG=3.2/B=3.2	120	–	R=355-1,800/TG=900-2,240/B=125-630	CL TR BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE



Advanced Power TOPLED

Power TOPLED and Power TOPLED with Lens

OSRAM's versatile Power TOPLED and Power TOPLED with Lens are high-brightness surface-mount LEDs featuring OSRAM's ThinFilm/ThinGaN chip technology, now 50 percent brighter than previous versions. With a full color palette and choice of three radiation patterns—plus automotive reliability, SMT manufacturing, high-temperature capability, low thermal resistance, and long lifetimes—Power TOPLED is clearly the right choice. White products available with ANSI-compliant binning.

OSRAM

Opto Semiconductors



Power TOPLED

Features ▶

- Maximum current ratings of 70 mA (50 mA for white, blue, and true green)
- Available in white, five shades of warm white, super red, red, amber, orange, yellow, true green, and blue
- Uses OSRAM's patented high-efficiency, low V_F , surface-emitting ThinFilm and ThinGaN die
- Reflow solderable; 1.9 mm package height (flat top), 3.5 mm to 3.8 mm package height (with lens); +125°C T_j
- 120° lambertian, 30°, and 60° radiation patterns

Benefits ▶

- Suitable for high-brightness applications
- Meets a wide variety of application needs; great for multi-color and color-changing applications
- Saves power and reduces heat while providing more available light
- Low manufacturing cost, reduces depth, survives high temperatures
- Ideal for coupling into secondary optics or as stand alone point sources of light

Applications ▶

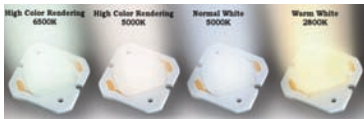
- Automotive, trucking, transportation exterior, and signal lighting
- Channel letters, video walls and displays, variable message signs
- Interior lighting for cars, trucks, airplanes, and buildings
- Backlighting (LCD, switches, keys, and displays)
- Color-changing and RGB applications

Product Specifications ▶												
Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets	
LW E6SG	Power TOPLED	Ultra white	6,500/5,700	-	50	30	3.3	120	6.3	1,400-3,550	CL FL TR BL SI	
LW E6SG		White	5,600	-	50	30	3.3	120	4.3	900-1,800	CL FL TR BL SI	
LCW E6SG		Warm white	4,500/4,000/ 3,500/3,000/2,700	-	50	30	3.4	120	3.8	710-2,240	CL TR BL SI	
LS E6SF		Super red	-	633	70	50	2.15	120	4.7	900-2,240	CL BL SI	
LR E6SF		Red	-	625	70	50	2.15	120	4.9	900-2,800	CL BL SI	
LA E6SF		Amber	-	617	70	50	2.15	120	6.4	1,120-3,550	CL TR SI	
LO E6SF		Orange	-	606	70	50	2.15	120	8.8	1,400-4,500	CL TR SI	
LY E6SF		Yellow	-	590	70	50	2.15	120	4.5	900-2,240	CL TR BL SI	
LT E6SG		True green	-	525	50	30	3.4	120	4.0	900-1,800	CL BL SI	
LB E6SG		Blue	-	469	50	30	3.4	120	1.2	224-560	CL TR BL SI	
LS E63F		Power TOPLED with Lens	Super red	-	633	70	50	2.15	30	3.8	5,600-14,000 mlux	CL TR
LS E65F			Super red	-	633	70	50	2.15	60	4.5	2,240-5,600 mlux	CL TR
LA E63F			Amber	-	617	70	50	2.15	30	5.1	7,100-22,400 mlux	CL TR
LA E65F			Amber	-	617	70	50	2.15	60	6.0	2,800-9,000 mlux	CL TR
LY E63F	Yellow		-	590	70	50	2.15	30	3.8	5,600-14,000 mlux	CL TR	
LY E65F	Yellow		-	590	70	50	2.15	60	4.3	2,240-5,600 mlux	CL TR	

MARKETS LEGEND: CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

SHARP[®]**MICROELECTRONICS
OF THE AMERICAS****LED Lighting Solutions**

The SHARP Zenigata modules are mounted on ceramic substrates for superior heat transfer—simplifying cooling design. Offered in 3.6W and 6.7W power options, with a selection of color temperatures, these modules are suitable for a variety of lighting applications. In addition, our surface-mount devices (SMD) pack enormous light output into a small package.

**Features** ▶

- High lumen output
- High efficiency
- High CRI
- Long life >40,000 hours
- Color consistency

Benefits ▶

- Small packaging
- High intensity
- Low package thermal resistance
- High efficiency
- Long life and high reliability

Applications ▶

- General lighting
- Architectural highlighting
- Portable illumination
- Indoor and outdoor lighting
- Backlighting

Product Specifications ▶

Part Number	Package Type	Color	Color Temp. (°K)	Dominant Wavelength (nm)	Max. Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (deg)	Luminous Flux (lm)	Luminous Intensity (mcd)	Markets	
GM5BW96385A	PLCC2 SMD	White	5,300	–	30	20	3.2	120	6.3	2,200	CL FL TR BL SI	
GM5BW97330A	PLCC4 SMD	White	5,300	–	80	60	3.2	120	17	6,400	CL FL TR BL SI	
GM5BW97331A		White	5,000	–	80	60	3.2	120	17	7,000	CL FL TR BL SI	
GM5BW97332A		Cool white	6,700	–	80	60	3.2	120	15	5,800	CL FL TR BL SI	
GM5BW97333A		Cool white	11,500	–	80	60	3.2	120	12	5,100	CL FL TR BL SI	
GM5SAE65POA		PLCC2 SMD	Warm white	2,700	–	30	20	3.2	120	5.8	2,000	CL FL TR BL SI
GM5SAE30POA	Warm white		3,000	–	30	20	3.2	120	5.8	2,050	CL FL TR BL SI	
GM5SAE35POA	Warm white		3,500	–	30	20	3.2	120	5.8	2,100	CL FL TR BL SI	
GM5SAE40POA	White		4,000	–	30	20	3.2	120	5.8	2,150	CL FL TR BL SI	
GM5SAE45POA	White		4,500	–	30	20	3.2	120	5.8	2,200	CL FL TR BL SI	
GM5SAE50POA	White		5,000	–	30	20	3.2	120	5.8	2,200	CL FL TR BL SI	
GM5SAE57POA	Cool white		5,700	–	30	20	3.2	120	5.8	2,200	CL FL TR BL SI	
GM5SAE65POA	Cool white		6,500	–	30	20	3.2	120	5.8	2,200	CL FL TR BL SI	
GM5BW05341A	5.0 x 5.0 SMD with lens		Cool white	6,500	–	25/25/25	20/20/20/20	3.2	60	25	10,000	CL FL TR BL SI
GM5BW01300A	6.0 x 5.0 SMD		Cool white	6,500	–	40/40/40	35/35/35	3.4	120	11	4,000	CL FL TR BL SI
GM1BD78140A	Light brick 2.64 x 1.64 SMD	Warm white	2,800	–	200	150	3.5	120	24	5,800	CL FL TR BL SI	
GM1BW78140A		White	5,000	–	200	150	3.5	120	24	5,800	CL FL TR BL SI	
GM5BN72xxxA	Double dome 3.2 x 3.2 x 2.1 SMD	Warm white	3,000	–	150	105	3.4	120	22	–	CL FL TR BL SI	
GM5BN72xxxA		Neutral white	5,300	–	150	105	3.4	120	25	–	CL FL TR BL SI	
GM5BN72xxxA		Cool white	6,500	–	150	105	3.4	120	22	–	CL FL TR BL SI	
GW5BDC15L02	Zenigata 18 mm x 18 mm	Warm white	2,800	–	400	360	10.2	120	200	–	CL FL TR BL SI	
GW5BWC15L02		White	5,000	–	400	360	10.2	120	280	–	CL FL TR BL SI	
GW5BNC15L02		High CRI white	5,000	–	400	360	10.2	120	190	–	CL FL TR BL SI	
GW5BNC15L12		High CRI cool white	6,500	–	400	360	10.2	120	190	–	CL FL TR BL SI	
GW5BDF15L00		Warm white	2,800	–	700	640	10.2	120	400	–	CL FL TR BL SI	
GW5BWF15L00		White	5,000	–	700	640	10.2	120	540	–	CL FL TR BL SI	
GW5BNF15L00		High CRI white	5,000	–	700	640	10.2	120	350	–	CL FL TR BL SI	
GW5BNF15L10		High CRI cool white	6,500	–	700	640	10.2	120	350	–	CL FL TR BL SI	
GM1WA55311A		RGB 1.6 x 1.6 SMD	RGB	–	0.27/0.26 mixed colors	10	5	1.9/3.0/2.9	110	–	20/70/23	CL TR BL SI
GM1WA55321A			RGB	–	0.27/0.26 mixed colors	10	5	2.0/3.0/2.9	110	–	28/75/25	CL TR BL SI
GM4WA25300A	RGB 5.0 x 2.5 SMD	RGB	–	0.27/0.26 mixed colors	30/30/30	20/20/20	2.2/3.3/3.3	110	–	640/1,200/400	CL TR BL SI	
GM5WA94313A	RGB 2.8 x 3.5 SMD	RGB	–	627/523/463	80	20/20/20	2.2/3.3/3.2	110	–	600/1,000/300	CL TR BL SI	
GM5WA94310A		RGB	–	0.27/0.26 mixed colors	80	20/20/7	2.2/3.3/3.2	110	–	620/1,180/270	CL TR BL SI	
GM5WA06256A		RGB 6.0 x 5.0 SMD	RGB	–	0.27/0.26 mixed colors	50/50/50	22/35/13	2.3/3.7/3.7	110	–	470/500/280	CL TR BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

LED Modules

TT electronics/OPTEK Technology offers decades of experience in custom product development and manufacturing capability. Our expertise extends from die placement through finished product assembly and testing. OPTEK has the experience and the facilities to accommodate the most stringent assembly requirements.



A subsidiary of TT electronics plc

Features ▶

Product Design

- From concept through characterization to design

Product Assembly

- Full manufacturing capability for a wide variety of circuit configurations

Thermal Management

- Optek OptoTherm™, a superior thermal management substrate

Benefits ▶

Product Design

- On-shore design, production engineering, and product support

Product Assembly

- Full integration of all board-level components

Thermal Management

- Multiple thermal management solutions available, including OptoTherm™

Applications ▶

- Architectural
- Transportation
- Flashlights
- Backlighting
- Signage



Product Specifications ▶												
Part Number	Type	Color	Color Temp. (°K)	Wavelength (nm)	Voltage (V)	Power Consumption (W)	Lens Type	Viewing Angle (°)	Luminous Flux (lm)	Luminous Intensity (Lux @ 1m)	Markets	
OPA729W	Light engines*	White	4,500-10,000	–	18	12.6	Flat	120/lambertian	480	–	CL FL TR BL SI	
OPA729WD		White	4,500-10,000	–	18	12.6	Domed	40	480	–	CL FL TR BL SI	
OPA730W		White	4,500-10,000	–	21.6	12.6	Flat	120/lambertian	576	–	CL FL TR SI	
OPA730WD		White	4,500-10,000	–	21.6	12.6	Domed	40	576	–	CL FL TR SI	
OPA731W		White	4,500-10,000	–	18	25.2	Flat	120/lambertian	960	–	CL FL TR BL SI	
OPA731WD		White	4,500-10,000	–	18	25.2	Domed	40	960	–	CL FL TR BL SI	
OPA733W		White	4,500-10,000	–	3.6	1.26	Flat	120/lambertian	48	–	CL FL TR BL SI	
OPA733WD		White	4,500-10,000	–	3.6	1.26	Domed	40	48	–	CL FL TR BL SI	
OPA739W		White	4,500-10,000	–	10.8	3.78	Flat	120/lambertian	144	–	CL FL TR BL SI	
OPA739WD		White	4,500-10,000	–	10.8	3.78	Domed	40	144	–	CL FL TR BL SI	
OPA740W-23		White	4,500-10,000	–	18	12.6	Secondary	23/lambertian	408	–	CL FL TR BL SI	
OPA741W-23		White	4,500-10,000	–	21.6	12.6	Secondary	23/lambertian	490	–	CL FL TR BL SI	
OPA742W-23		White	4,500-10,000	–	3.6	1.26	Secondary	23/lambertian	41	–	CL FL TR BL SI	
OVTLZ1LGAx**		Optimal I Star	Various	–	Various	2.6-3.4	1	Flat	135	12-60	–	CL FL TR BL SI
OVTLZ1LGAW			Cool white	7,000	–	3.4	1	Flat	135	65	–	CL FL TR BL SI
OVTLZ1LGAWD	Daylight white		5,800	–	3.4	1	Flat	135	60	–	CL FL TR BL SI	
OVTLZ1LGAWW	Warm white		3,500	–	3.4	1	Flat	135	50	–	CL FL TR BL SI	
OPAKIT100	Design kit	RGBYW	Various	Various	3.6-21.6	1.26-25.2	Various	23/40/120/lambertian	41-960	–	CL FL TR BL SI	
OVPL5W3K	Power line design kit	White	4,500-10,000	–	15	1.9	Flat	120/lambertian	250	–	CL TR BL SI	
OPA773	Power line light strip	White	4,500-10,000	–	14-16	1.9	Flat	120/lambertian	50	–	CL TR BL SI	
OPA775		White	4,500-10,000	–	14-16	1.9	Flat	120/lambertian	50	–	CL TR BL SI	
OPA776		White	4,500-10,000	–	24-26	3.8	Flat	120/lambertian	100	–	CL TR BL SI	
OV4ZRGBA	Optimal IV	RGBA	–	625/530/460/590	2.5-3.9	4	Domed	60	35/30/5/36	–	CL FL TR BL SI	
OV4Zxxx	Optimal IV–monocolor	Various	Various	625-530/460/590	8.6-13.1	4	Domed	60	29-73	–	CL FL TR BL SI	
OV4ZW		Cool white	6,000-8,000	–	12.6	4	Domed	60	165	–	CL FL TR BL SI	
OV4ZWD		Daylight white	4,750-6,000	–	12.6	4	Domed	60	162	–	CL FL TR BL SI	
OV4ZWW		Warm white	2,760-3,800	–	12.6	4	Domed	60	150	–	CL FL TR BL SI	
OVQ12S30x7**	Flexible strip	RYGBW/WW	5,500/3,300	625/590/525/470	12	1.8	Flat	120/lambertian	20-68 lux	–	CL TR SI	
OVM12F3x7**	3 LED module	RYGB/WD	5,000-7,000	625/590/525/470	12	0.3-0.5	Flat	120/lambertian	6-20 lux	–	CL TR SI	
OVM18F4x7**	4 LED module	RYGB/WD	5,000-7,000	625/590/525/470	18	0.4-0.8	Flat	120/lambertian	8-24 lux	–	CL TR SI	

MARKETS LEGEND

- CL COMMERCIAL LIGHTING
- FL FLASHLIGHTS
- TR TRANSPORTATION
- BL BACKLIGHTING
- SI SIGNAGE

*Light engines are also available in red, yellow, blue, and green

**x: R=red, B=blue, G=green, A=amber, Y=yellow



OVPL5W3K power line kit

OSRAM

Opto Semiconductors



IR Golden DRAGON

High-Efficiency and Ultra High-Power Infrared LEDs

OSRAM offers one of the largest selections of 850 nm and 940 nm infrared LEDs. OSRAM's unique ThinFilm technology enables very high efficiency and output powers of up to 3.6W. Designed specifically for CCTV applications and for use in night vision equipment, they deliver a wavelength specially adapted to CMOS/CCD camera systems. These LEDs are offered in thru-hole packages and a variety of surface-mount packages such as TOPLED, Power TOPLED, MIDLED, Golden DRAGON, and OSTAR Observation. OSTAR Observation is the optimum choice when long distances and extensive areas need to be covered and monitored with infrared light, especially in applications that require continuous operation and/or high ambient temperatures.

Features ▶

- Small dimensions, big performance
- 50 mW output power from 0.3 mm x 0.3 mm die and 500 mW from 1 mm x 1 mm die
- Low forward voltage of 1.8V
- Maximum DC current of 1A
- High forward currents allowed at high temperatures

Benefits ▶

- High optical IR output, even in continuous operation
- Exceptionally low thermal resistance for optimum thermal management
- Certified for automotive applications at temperatures up to +125°C
- Easy design for external lenses
- Low forward voltage provides longer life in battery operated devices

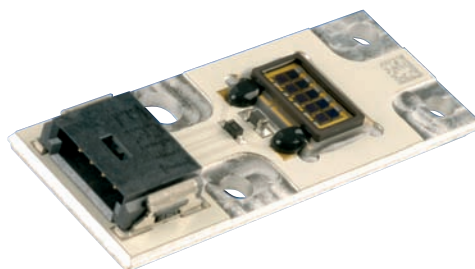
Applications ▶

- Infrared illumination for CMOS cameras
- Surveillance systems
- Automotive—driver assistance systems
- Machine vision
- IR data transmission

Product Specifications ▶									
Part Number	Package Type	Dominant Wavelength (nm)	Max Current (mA)	Tested Current (mA)	Forward Voltage (V)	Viewing Angle (°)	Radiant Flux (mW)	Radiant Intensity (mW/sr)	Markets
SFH 4050	SmartLED	850	100	100	1.5	160	50	7	TR
SFH 4230	Golden DRAGON	850	1,000	1,000	1.8	120	440	170	FL TR
SFH 4231		940	1,000	1,000	1.8	120	1,000	200	FL TR
SFH 4250	Power TOPLED	850	100	100	1.5	120	40	15	TR
SFH 4240		940	100	100	1.5	120	45	15	FL TR
SFH 4243		940	70	50	1.5	120	33	11	TR
SFH 4255	SIDELED	850	100	100	1.5	120	40	15	TR
SFH 4244		940	70	50	1.5	120	33	11	TR
SFH 4257	TOPLED	850	100	100	1.5	120	18	7	TR
SFH 4252		850	100	100	1.5	120	40	16	TR
SFH 4258	Power TOPLED with Lens	850	100	100	1.5	30	45	90	TR
SFH 4259		850	100	100	1.5	50	45	55	TR
SFH 4248		940	100	100	1.5	30	50	100	TR
SFH 4249		940	100	100	1.5	50	50	55	TR
SFH 4350	3 mm (T1)	850	100	100	1.5	26	50	70	TR
SFH 4550	5 mm (T1 3/4)	850	100	100	1.5	6	50	700	TR
SFH 4650	MIDLED	850	100	100	1.5	40	40	40	TR
SFH 4655		850	100	100	1.5	40	40	40	TR
SFH 4730	OSTAR Observation	850	1,000	1,000	1.8	120	3,000	1,000	FL TR
SFH 4740		850	1,000	1,000	1.8	120	3,600	1,200	FL TR

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION EL BACKLIGHTING SI SIGNAGE



OSTAR Observation

LED Drivers—Lighting and Display Solutions

Allegro MicroSystems offers a broad portfolio of LED drivers for lighting and display applications.



Features ▶

- Small packages
- Excellent matching
- Low quiescent current
- Charge pump and boost designs
- Multiple control methods
- Output currents up to 350 mA per channel
- 10-bit PWM per channel
- 7-bit current-control DACs for color calibration (dot correction)
- Open and shorted LED detection
- Thermal shutdown and under voltage lockout

Benefits ▶

- Reduced solution size
- Uniform brightness
- Longer battery life
- More solution choices
- Flexible dimming control
- Drive high-brightness LEDs
- Precise brightness control
- Accurate color balance and white point
- Remote diagnostics
- Full protection of driver IC

Applications ▶

- Mobile phones
- Notebooks/desktop LCD panels
- Portable media players
- GPS/navigation systems
- Digital cameras
- Full-color LED video displays
- Monochrome to full-color message and graphic displays
- Channel letter signs
- Architectural/decorative lighting
- Stage/entertainment lighting
- Automotive interior lighting
- Automotive exterior signal lighting



Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
A8430	Boost	PWM/analog	2-6	1	Series	2.5-10	36	25	87	TSD	PWM/analog	BL
A8431		PWM/analog	2-6	1	Series	2.5-10	32	25	87	TSD/OVM	PWM/analog	BL
A8500		PWM/analog	8-12	8	Series	5-25/ 4.3-5.5	47	25 x 8	92	TSD/OVM/LOD	Serial/PWM/analog	BL
A8501		PWM	8-12	4	Series	8-21	38	100 x 4	92	TSD/OVM/LOD	Serial/PWM	BL
A8503		PWM/analog	8-11	6	Series	5-25/ 4.3-5.5	50	20 x 6	92	TSD/OVM/LOD	Serial	BL
A8504		PWM/analog	8-11	8	Series	5-25/ 4.3-5.5	47	40 x 8	92	TSD/OVM/LOD	Serial/PWM/analog	BL
A8435		Charge pump	PWM/analog	1	4	Parallel	2.7-5.5	6	30 x 4	92	TSD/OVM/LOD	Serial
A8434	PWM/analog		1	6	Parallel	2.7-5.5	6	30 x 6	92	TSD/OVM/LOD	Serial	BL
A8530	PWM/analog		1	6	Parallel	2.7-5.5	6	30 x 4 and 100 x 2	92	TSD/OVM/LOD	Serial	BL
A6285	Linear	Internal DAC/external PWM/ external resistor	3	16	Series/parallel	3-5	13	80	–	LOD/TSD/UVLO	Serial/PWM/analog	TR BL SI
A6279		External PWM/ external resistor	4	16	Series/parallel	3-5	17	90	–	LOD/TSD/UVLO	Serial/PWM/analog	TR BL SI
A6282		External PWM/ external resistor	3	16	Series/parallel	3-5	13	50	–	TSD/UVLO	Serial/PWM/analog	TR BL SI
A6278		External PWM/ external resistor	4	8	Series/parallel	3-5	17	90	–	LOD/TSD/UVLO	Serial/PWM/analog	TR BL SI
A6277		Logic input dims to 50%/ external PWM or resistor	6	8	Series/parallel	5	24	150	–	UVLO	Serial/PWM/analog	TR BL SI
A6280		Internal PWM/internal DAC/ external resistor	4	3	Series/parallel	5-17	17	150	–	TSD/UVLO	Serial/PWM/analog	CL TR BL SI
A6281		Internal PWM/internal DAC/ external resistor	4	3	Series/parallel	5-17	17	150	–	TSD/UVLO	Serial/PWM/analog	CL TR BL SI
A6260	Linear regulator	External PWM/analog	12	1	Series	6-40	Input=2.25V at 350 mA	350	–	TSD/OVM (current foldback)	PWM or analog	CL TR
A6210	Constant-current buck switching regulator	PWM	–	–	QFN	9-46	3.5-31	3A	–	–	–	CL FL TR BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, UVLO: Under voltage lock out, OVM: Output voltage monitoring, LOD: LED open detection



Low-Voltage Controller and Integrated Switch Products

The Zetex family of low-voltage controller and integrated switch products from Diodes Incorporated enables high accuracy, compact solutions across a wide range of applications. Housed in the tiny and thermally efficient DFN package, the ZXLD132x series supports highly optimized solutions for the latest 1.5A LEDs, whereas the ZXLD381/ZXLD383 provide the simplest, single 50 mA LED drivers, including direct connection to solar cells. The controllers offer a flexible and scalable alternative approach.



ZXLD1320EV1 evaluation board – a buck LED driver easily configured to drive up to four external LEDs at 1A or 1.5A, housed in the 3 mm x 4 mm TDFN1443 package

Features ▶

- Tiny DFN14, SOT23, and SOT23-5 packages
- High- and low-sided current sensing
- Ultra-low operating voltage from 0.8V to 20V
- Single-pin on/off and brightness control using DC voltage or PWM
- High efficiency (up to 85%)

Benefits ▶

- Minimum solution size
- Enhanced accuracy and noise immunity
- Ideally matched with today's high-brightness LEDs
- Flexible dimming options
- Minimizes solution energy costs

Applications ▶

- High-power LED flashlights and other portable illumination
- Low-voltage halogen lamp replacement LEDs
- LED back-up and emergency lighting
- Solar garden lights
- Automotive lighting

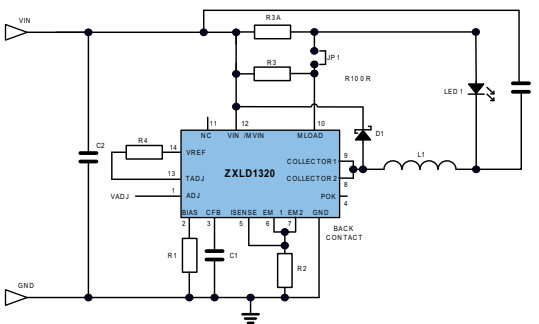
Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
ZXLD1320	Buck	PWM/analog	4	1	Series	4.0-18.0	18	1,500	85	TSD/POK	Analog/PWM	CL FL TR SI
ZXLD1321	Boost	PWM/analog	5	1	Series	1.2-12.0	18	1,000	85	TSD/TM	Analog/PWM	CL FL BL SI
ZXLD381		Input voltage	4	1	Series	0.9-2.2	V _{IN} to 20	76	85	None	None	FL BL
ZXLD383		Input voltage	2	1	Series	0.9-3.3	V _{IN} to 20	65	85	None	Solar cells	CL FL
ZXSC400		PWM/analog	Flexible	1	Series	1.8-8.0	V _{IN} to 30	100	80	None	Analog/PWM	FL BL SI
ZXLD1322	Buck/boost	PWM/analog	3	1	Series	2.5-15.0	18	700	80	TSD/TM	Analog/PWM	CL FL BL SI
ZXSC310		PWM/analog	Flexible	1	Series	0.8-8.0	V _{IN} to 20	100	85	None	PWM	FL BL SI

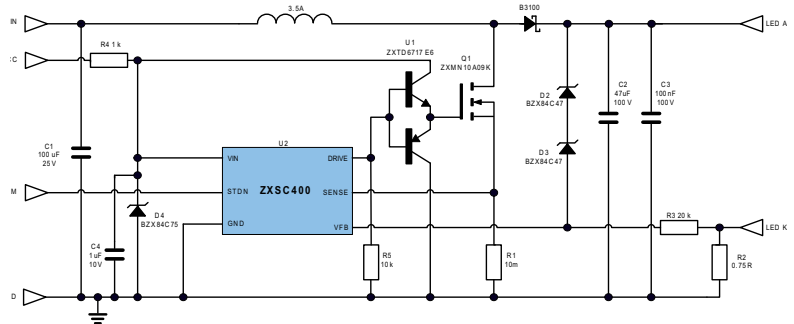
MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*TSD: Thermal shutdown, POK: Power OK pin, TM: Thermal management



The ZXLD1320 is a 4V to 20V, 1.5A LED current continuous mode LED driver. The thermally enhanced package and topology can be configured to optimize LED driving



The ZXSC400 is flexible, low-voltage controller that can be used to drive single 50 mA type LEDs to large strings of latest generation power LEDs.

Evaluation Board Information

Board Order Code	LED Board Description
ZXLD1320EV1	ZXLD1320 with output for off-board LEDs
ZXLD1321EV1	ZXLD1321 with output for off-board LEDs
ZXLD1322EV1	ZXLD1322 with output for off-board LEDs
ZXLD381EV1	ZXLD381 with output for off-board LEDs
ZXLD383EV1	ZXLD383 with white 50 mA on-board LED
ZXSC310EV(1)	ZXSC310 LED driver for LCD backlight
ZXSC400EV2	ZXSC400 LED string driver; 25W at 350 mA LED current; terminal output for off-board LEDs

Design Support Tools

Item	Description
Lighting design handbook (DN81)	Contains design ideas and application notes with test results and bill of materials for a wide range of applications.
Calculators	Designed to quickly try out a range of LED configurations that simplify calculations when designing with Zetex LED drivers.
Circuit simulator	Enables you to draw a circuit that can be tested in simulation prior to prototyping, and to determine the best components for your application.

To access these design tools, visit lighting.arrow.com/designtools

Medium-Voltage Integrated Switches

The Zetex ZXLD135x and ZXLD136x ranges of medium-voltage, integrated switch LED drivers from Diodes Incorporated support voltages from 6V to 60V and achieve up to 97 percent efficiency. With up to 1 MHz operating frequencies, they can drive 15 high power LEDs at up to 1A. Simple to use and requiring just four external components, output currents can be adjusted with dimming ratios of 1000:1. Available in the tiny TSOT23-5 and DFN6 packages, they are ideal for space starved applications.



Features ▶

- Inherently stable hysteretic topology
- Internal switch (30V/60V)
- Up to 1A output current (high-sided current sense)
- Single-pin on/off and brightness control using DC voltage or PWM
- High efficiency (up to 97%)
- Simple, low parts count

Benefits ▶

- Operates over a wide range of voltage and LED combinations
- Lowest total solution cost
- Ideally matched with today's high-brightness LEDs
- Flexible dimming options
- Minimizes solution energy costs
- Reduces development time

Applications ▶

- Low-voltage halogen lamp replacement LEDs
- Automotive lighting
- Low-voltage industrial and retail lighting
- LCD TV back-lighting
- Illuminated signs

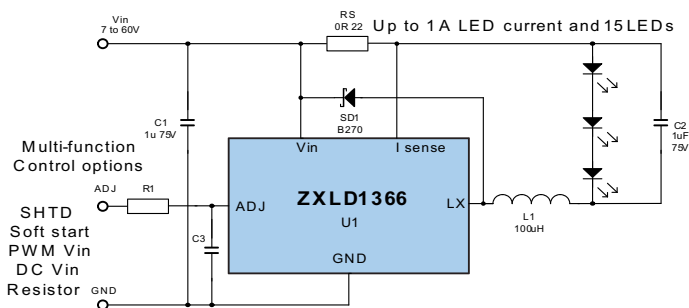


ZXLD1362EV3 evaluation board— a hysteretic buck LED driver in TSOT23-5, configured to drive a single onboard LED with thermal control or up to 15 external 3W LEDs

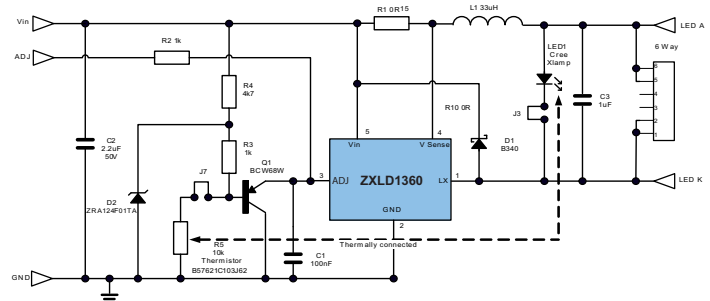
Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
ZXLD1350	Buck/hysteretic	PWM/DC/resistive	8	1	Series	7-30	30	350	95	—	PWM/analog	CL TR BL SI
ZXLD1352		PWM/DC/resistive	8	1	Series	7-30	30	350	95	—	PWM/analog	CL TR BL SI
ZXLD1356		PWM/DC/resistive	15	1	Series	6-60	60	550	97	—	PWM/analog	CL TR BL SI
ZXLD1360		PWM/DC/resistive	7	1	Series	7-30	30	1,000	95	—	PWM/analog	CL TR BL SI
ZXLD1362		PWM/DC/resistive	15	1	Series	6-60	60	1,000	95	—	PWM/analog	CL TR BL SI
ZXLD1366		PWM/DC/resistive	15	1	Series	6-60	60	1,000	97	—	PWM/analog	CL TR BL SI

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE



The ZXLD1366 is a 1A, 60V hysteretic buck LED regulator with enhanced current control, thermal packaging, and fast PWM dimming capability



The ZXLD1360 is a 1A, 30V hysteretic buck LED regulator that provides a simple, easy-to-use LED driver over a wide range of series 3W-LED combinations

Evaluation Board Information

Board Order Code	LED Board Description
ZXLD1350EV3	ZXLD1350 with on-board LEDs
ZXLD1352EV1	ZXLD1352 with outputs for off-board LEDs
ZXLD1356EV1	ZXLD1356 with outputs for off-board LEDs
ZXLD1360EV8	ZXLD1360 with on-board LED and terminal outputs
ZXLD1362EV3	ZXLD1362 with aluminium PCB and outputs for off-board LEDs
ZXLD1366EV1	ZXLD1366 with outputs for off-board LEDs

Design Support Tools

Item	Description
Lighting design handbook (DN81)	Contains design ideas and application notes with test results and bill of materials for a wide range of applications.
Calculators	Designed to quickly try out a range of LED configurations that simplify calculations when designing with Zetex LED drivers.
Circuit simulator	Enables you to draw a circuit that can be tested in simulation prior to prototyping, and to determine the best components for your application.

To access these design tools, visit lighting.arrow.com/designtools



Linear-Mode LED Drivers

Infineon Technologies' linear-mode LED driver family, BCR401, BCR402, BCR405, and newly introduced BCR450, provides efficient, low-cost constant-current solutions for LED strings from 10 mA to 700 mA. Our constant-current drivers keep light emission consistent over power supply and temperature variations, eliminate the effect of V_F variation, and help prevent thermal runaway in applications. We also offer low forward voltage Schottky diodes, including single-package reverse polarity protection diode arrays (RPP).



Ultra small 2 mm x 2.1 mm SOT343 package

Features ▶

- Constant current adjustable from 10 mA to 60 mA, up to 500 mW power dissipation
- Current range may be extended up to 700 mA with addition of external "boost" transistor (e.g., BCX68-25)
- Selection of 18V or 40V maximum rating across driver
- On/off feature enables PWM/FM modulation
- LED-circuit protection due to negative-temperature coefficient (NTC)

Benefits ▶

- Efficient active current regulation, accuracy of I_{OUT} at $\pm 1\%/V$ voltage variation
- Maintains consistent light emission across LED strings independent of V_F , power supply, and temperature variation
- Enables using more LEDs in one branch due to low voltage drop compared to resistor biasing schemes
- Eliminates problem of stocking multiple-bias resistor values to match incoming LED V_F bins

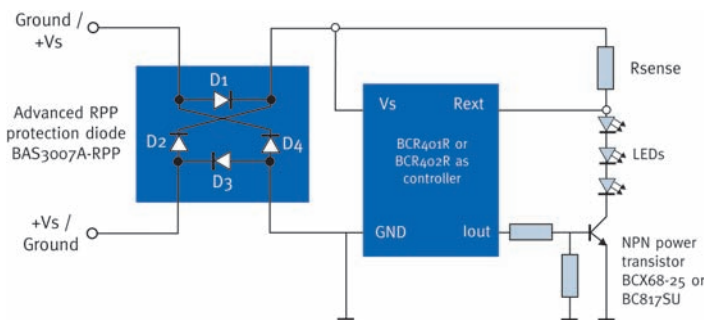
Applications ▶

- Channel lighting
- Advertising signage
- Home/office lighting (recess lamps, pendant lamps, etc.)
- Rope lighting/neon replacement
- Automotive (e.g., center high-mounted stop light "CHMSL")

Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
BCR401R/BCR402R	Single-output channel	PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 18 across device	Linear w/ low-voltage drop	Adjustable 10-60	-	-	Discrete interface	CL TR SI
BCR401W/BCR402W		PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 18 across device	Linear w/ low-voltage drop	Adjustable 10-60	-	-	Discrete interface	CL TR SI
BCR401U/BCR402U/BCR405U		PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 40 across device	Linear w/ low-voltage drop	Adjustable 10-65	-	-	Discrete interface	CL TR SI
BCR450		PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 27 across device	Linear w/ low-voltage drop	Adjustable 0-85	-	-	Discrete interface	CL TR SI
BCR401R + BCX68-25		PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 18 across device	Linear w/ low-voltage drop	Adjustable 65-700	-	-	Discrete interface	CL TR SI
BCR450 + BCX68-25		PWM/FM capable on/off input	At 12V supply voltage four red or two blue LEDs	1	Series	Max. 27 across device	Linear w/ low-voltage drop	Adjustable 65-1,000	-	-	Discrete interface	CL TR SI

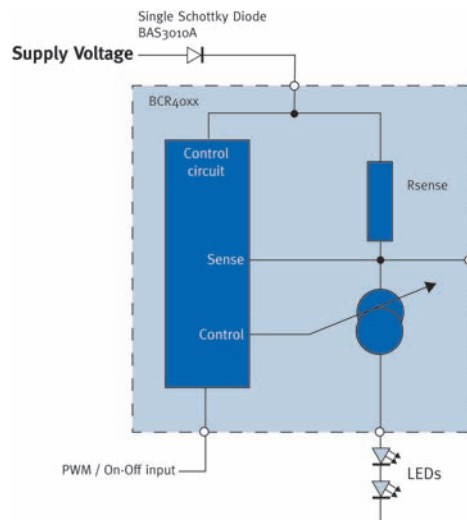
MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE



60 mA to 700 mA range LED driver with booster transistor and reverse polarity protection

*BAS3007A: If max.=700 mA, $V_F=0.38V$ (typ.) for each diode, V_{REV} max.=30V



10 mA to 65 mA range stand alone LED driver with reverse polarity protection

*BAS3010A: If max.=1A, $V_F=0.38V$ (typ.), V_{REV} max.=30V

Linear Constant-Current LED Drivers

To address the increasing growth of LED usage in the automotive market, Infineon offers power supplies specifically developed for these applications.

Infineon products are designed to supply constant current to white or color LEDs up to 500 mA, independently from supply voltage or LED forward voltage class. This provides appropriate operating conditions to the connected LEDs, enabling constant brightness and ensuring extended LED lifetime.

Products with adjustable output current and PWM input enable flexible use of LEDs in applications that require brightness regulation avoiding color shift. Diagnostic capability is also offered with the open load detection feature.

Infineon LED drivers are outstanding solutions that benefit from the advantages of LEDs providing full protection to lighting applications in automotive. Connected LEDs are fully protected from short circuit, overheating, reverse polarity transients, and input voltages up to 45V.

Features ▶

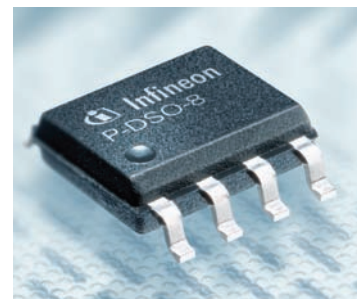
- Adjustable constant-output current
- Wide input voltage range
- Over-temperature protection
- Open load detection
- Wide temperature range: -40°C to +150°C

Benefits ▶

- Efficient active current regulation, accuracy of I_{OUT} at $\pm 1\%/V$ voltage variation
- Maintains consistent light emission across LED strings independent of V_F , power supply and temperature variation
- Enables use of more LEDs in one branch due to low-voltage drop compared to resistor biasing schemes
- Eliminates problem of stocking multiple-bias resistor values to match incoming LED V_F bins

Applications ▶

- Emergency lighting
- Traffic lighting
- Architectural or concert lighting
- Automotive (interior and exterior) lighting
- Display backlighting (e.g., LCD)

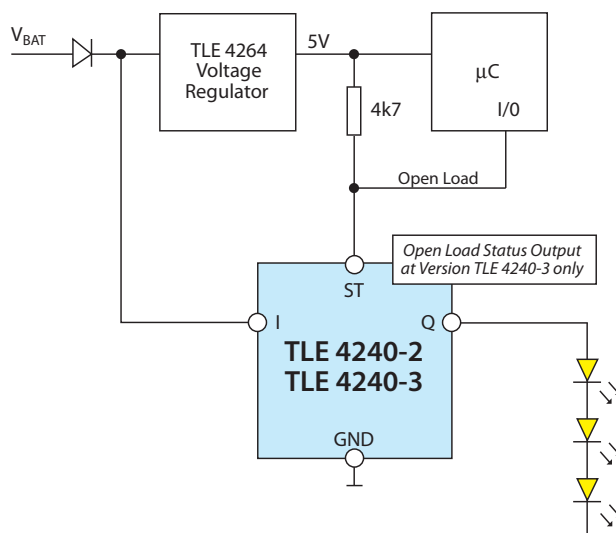


P-DSO-8, 5 mm x 6 mm

Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
TLE4241	Linear	PWM	10	1	Single	Up to 45	40	70	-	TSD/TEF/OVM/LOD	PWM	CL FL TR BL SI
TLE4242		PWM	10	1	Single	Up to 45	40	500	-	TSD/TEF/OVM/LOD	PWM	CL FL TR BL SI
TLE4309		PWM	10	1	Single	Up to 45	40	500	-	TSD/OVM	PWM	CL FL TR BL SI
TLE4240-2M/3M		PWM	10	1	Single	Up to 45	6	58	-	TSD/TEF/OVM/LOD	PWM	CL FL TR BL SI

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

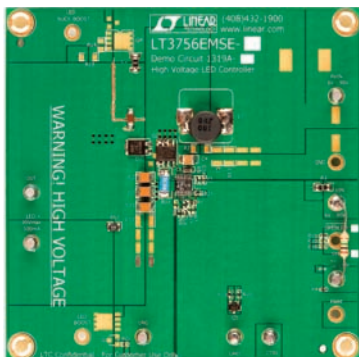
*Diagnostic capabilities: TSD: Thermal shutdown, TEF: Thermal error flag, OVM: Output voltage monitoring, LOD: LED open detection





High Current (350 mA to 10A) LED Drivers—Buck

High current, inductor-based, step-down switching LED drivers provide tiny, efficient high power LED lighting solutions for automotive, architectural, and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing, and high switching frequency.



Features ▶

LT3756

- 3000:1 True Color PWM dimming
- Wide input voltage range: 6V to 100V
- Output voltage up to 100V
- Constant-current and constant-voltage regulation
- 100 mV high side current sense

Benefits ▶

- Enables wide dimming range
- Ideal for automotive and industrial applications
- Easy dimming
- Enables one-wire LED connector
- Compact solution footprint

Applications ▶

- Automotive and avionic lighting
- Architectural detail lighting
- Display backlighting
- Constant-current sources

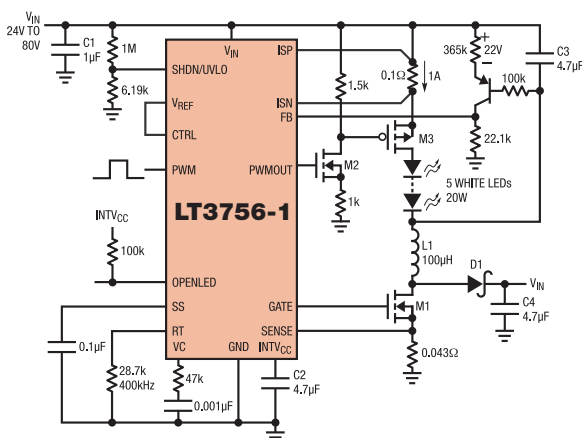
Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/ String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3474/-1	Buck LED driver	400:1 PWM	3 x 500 mA	1	Series (3 max.)	4-36	15	1	87	TSD/OVM	PWM	CL TR BL
LT3592		10:1 Analog	4	1	Series	4-36	30	0.8	88	-	PWM	-
LT3517	Buck/boost/buck-boost	5000:1 PWM	10 x 100 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3518		5000:1 PWM	10 x 200 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3496	Triple LED driver	3000:1 PWM	5	3	3 series strings	3-30	45	3 x 750	92	-	PWM	-
LT3475/-1	Dual-buck LED driver	3000:1 PWM	3 x 1.5A	2	2 x multiple series string (3 max.)	4-36	15	2 x 1.5	88	TSD/OVM	PWM	CL TR BL
LT3478/-1	Buck/boost/buck-boost	3000:1 PWM	8 x 1.5A	1	1 series string (8 max.)	2.7-36	40	4.5	92	TSD/OVM	PWM	CL TR
LT3476	Quad LED driver	1000:1 PWM	5	4	4 series strings	2.8-36	30	4 x 1.5	92	-	PWM	-
LTC3783	SEPIC/buck/boost/buck-boost/flyback/inverter	3000:1 PWM/ 10:1 analog	4 x 12 x 1A	1	Series/parallel	3-36+	Limited by ext. FET	<10	97	TSD/OVM	PWM	CL TR
LT3755/-1	Buck/buck-boost/ boost controller	3000:1 PWM	14 x 1A	1	Series	4.5-40	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI
LT3756/-1		3000:1 PWM	14 x 1A	1	Series	6-100	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI

MARKETS LEGEND

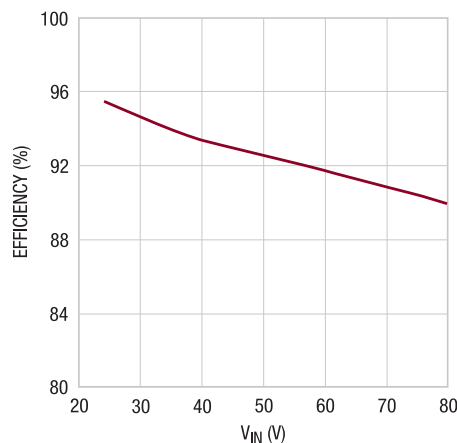
CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring

**Switch current



Efficiency vs. V_{IN}



High Current (350 mA to 10A) LED Drivers—Boost

High current, inductor-based, step-up switching LED drivers provide compact, efficient, high power LED lighting solutions for automotive, architectural, and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing, and high switching frequency.



Features ▶

LT3755

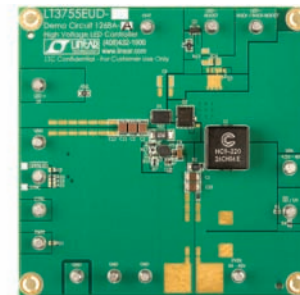
- 3000:1 True Color PWM dimming
- Wide input voltage range: 4.5V to 40V
- Output voltage up to 75V
- Constant-current and constant-voltage regulation
- 100 mV high side current sense

Benefits ▶

- Can drive 6 x 700 mA LEDs in boost configuration
- No need for external sense resistor
- Enhances reliability
- Keeps externals tiny
- Compact solution footprint

Applications ▶

- Automotive and avionic lighting
- Architectural detail lighting
- Display backlighting
- Constant-current sources



Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**†	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3486	Dual LED driver	1000:1 PWM	7 x 350 mA	2	Dual parallel strings	2.7-24	35	2 x 1.3	85	TSD/OVM	PWM	CL TR BL SI
LT3517	Buck/boost/buck-boost	5000:1 PWM	10 x 100 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT1618	Buck/boost/buck-boost LED driver	DC/PWM	7 x 350 mA	1	Parallel or series strings	1.6-18	36	1.5	80	TSD/OVM	PWM	CL TR BL SI
LT3518	Buck/boost/buck-boost	5000:1 PWM	10 x 200 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3496	Triple LED driver	3000:1 PWM	4	3	3 series strings	3-30	45	3 x 750	87	–	PWM	–
LT3478/-1	Boost LED driver	3000:1 PWM	6 x 700 mA	1	Series strings	2.7-36	40	4.5	91	TSD/OVM	PWM	CL TR
LT3476	Quad buck/boost/buck-boost LED driver	1000:1 PWM	8 x 350 mA	4	4 x multiple series string	2.8-16	36	4 x 1.5	83	TSD/OVM	PWM	CL TR BL SI
LTC3783	SEPIC/buck/boost/buck-boost/flyback/inverter	3000:1 PWM/ 10:1 analog	12 x 3 x 1A	1	Series/parallel	3-36+	Limited by ext. FET	Ext. FET	95	TSD/OVM	PWM	CL TR
LT3755/-1	Buck/buck-boost/boost controller	3000:1 PWM	14 x 1A	1	Series	4.5-40	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI
LT3756/-1	Buck/buck-boost/boost controller	3000:1 PWM	14 x 1A	1	Series	6-100	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI

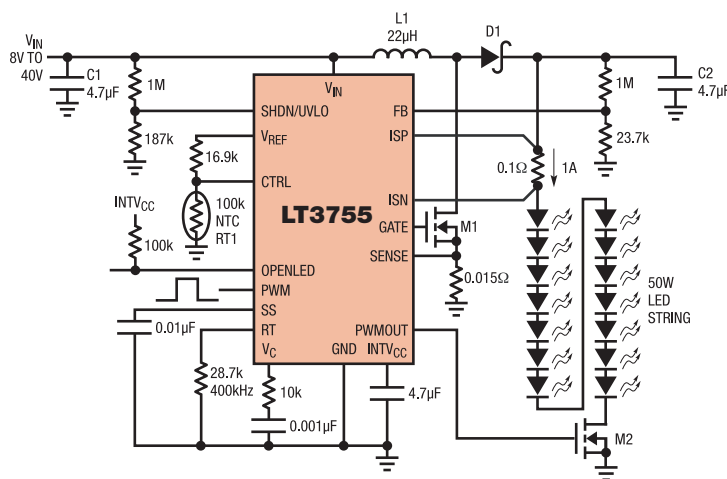
MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

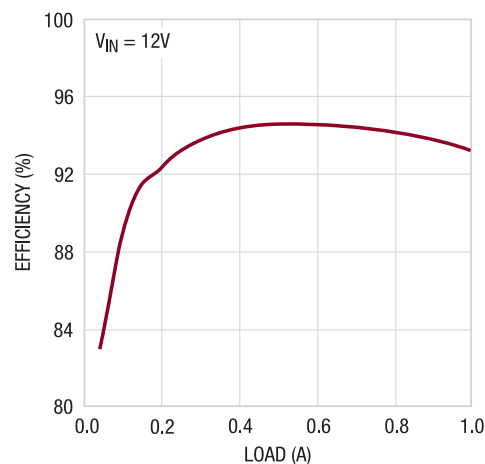
*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring

** $I_{OUT} \sim 0.65 I_{SW} \times (V_{IN}/V_{OUT})$ —estimate may vary depending on external component selection

†Switch current



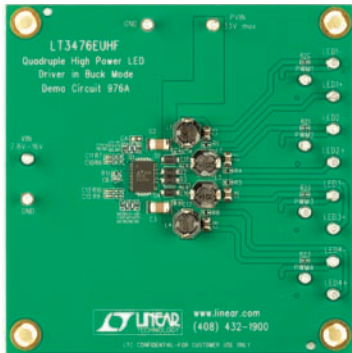
Efficiency vs. Load





High Current (350 mA to 10A) LED Drivers—Buck-Boost

High current, inductor-based, buck-boost switching LED drivers provide flexible, tiny, efficient solutions for TFT backlighting, automotive, and avionic lighting applications. Key features include high current, high voltage switches, adjustable LED currents, wide input voltage range, and high switching frequency.



Features ▶

LT3476

- True Color PWM delivers up to 5000:1 dimming ratio
- LED current regulation with high side sense
- V_{ADJ} pin accurately sets LED current sense threshold over range 10 mV to 120 mV
- Four independent driver channels with 1.5A, 36V internal NPN switches
- Frequently adjust pin: 200 kHz to 2 MHz

Benefits ▶

- Enables one-wire connection of LEDs
- Easy dimming
- Compact solution for 4-channel applications
- Keeps solution footprint tiny
- Reduces heat

Applications ▶

- RGGB lighting
- Automotive and avionic lighting
- TFT LCD backlighting
- Constant-current sources

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3517	Buck/boost/buck-boost	5000:1 PWM	3 x 100 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3518	Buck/boost/buck-boost	5000:1 PWM	3 x 200 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3496	Triple LED driver	3000:1 PWM	3	3	3 series strings	3-30	45	3 x 750	80	-	PWM	-
LT3478/-1	Buck/boost/buck-boost	3000:1 PWM	4 x 1A	1	Series	2.7-36	40	4.5	92	TSD/OVM	PWM	CL TR
LT3476	Quad buck/boost/buck-boost LED driver	1000:1 PWM	4 x 350 mA	4	4 x multiple series string	2.8-16	36	4 x 1.5	78	TSD/OVM	PWM	CL TR BL
LTC3783	SEPIC/buck/boost/buck-boost/flyback/inverter	3000:1 PWM, 10:1 analog	12 x 3 x 1A	1	Series/parallel	3-36	Limited by ext. FET	Ext. FET	93	TSD/OVM	PWM	CL TR
LT3755/-1	Buck/buck-boost/boost controller	3000:1 PWM	6 x 1A	1	Series	4.5-40	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI
LT3756/-1	Buck/buck-boost/boost controller	3000:1 PWM	6 x 1A	1	Series	6-100	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI

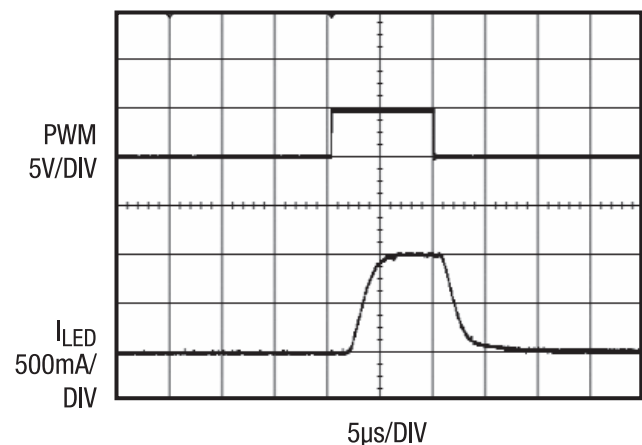
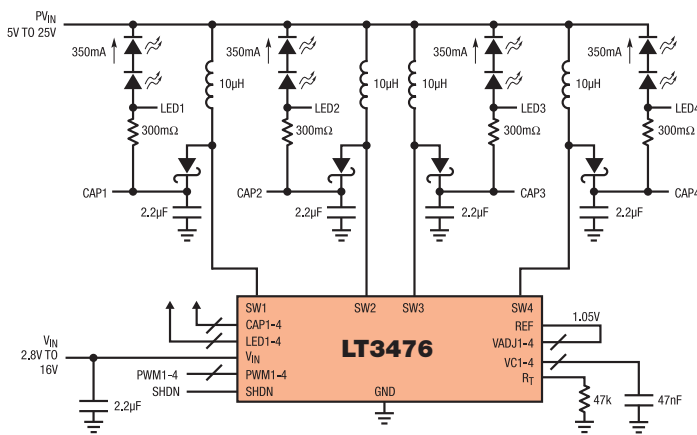
MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring

**Switch current

1000:1 PWM Dimming at 100 Hz



High Current (350 mA to 10A) LED Drivers— SEPIC and Flyback



High current, inductor-based, multi topology, switching LED drivers provide flexible solutions for high voltage LED arrays. Key features include high current, wide input voltage range, scalable output power, and wide-ranging True Color dimming.

Features ▶

LT3755

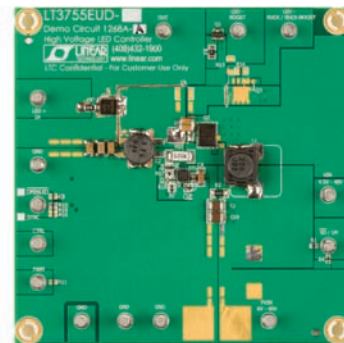
- High current
- High voltage
- Protection
- True Color PWM 3000:1 digital dimming
- Multi topology

Benefits ▶

- Delivers high current ($\geq 1.5A$) and powers high brightness (HB) and super HB-LEDs
- Easily drives strings (series) or clusters (series + parallel) of LEDs
- Accurate current and output voltage protects HB-LEDs; additional protection includes overvoltage, overcurrent, and soft start
- Preserves LEDs constant color over a wide dimming ratio; capable of additional analog 100:1 dimming
- Adjustable LED brightness

Applications ▶

- High power LED applications
- Industrial
- Automotive



Product Specifications ▶

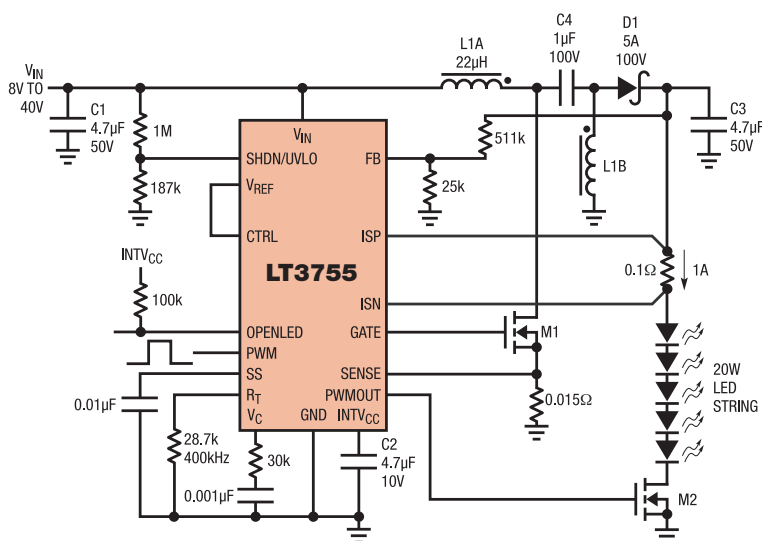
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3517	Buck/boost/buck-boost	5000:1 PWM	10 x 100 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3518	Buck/boost/buck-boost	5000:1 PWM	10 x 200 mA	1	Series	3-30 (40 max.)	45	1A	92	TSD/OVM	PWM	CL TR BL SI
LT3478/-1	Buck/boost/buck-boost	3000:1 PWM	8 x 1.5A (in buck-mode)	1	Series	2.7-36	Depends on configuration	4.5	92	TSD/OVM	PWM	CL TR
LT3476	Quad buck/boost/buck-boost LED driver	1000:1 PWM	4 x 8 x 1A (in buck-mode)	4	4 x multiple series string	2.8-16	Depends on configuration	4 x 1.5	96	TSD/OVM	PWM	CL TR BL
LTC3783	SEPIC/buck/boost/buck-boost/flyback/inverter	3000:1 PWM, 10:1 analog	4 x 12 x 1A (in buck-mode)	1	Series/parallel	3-36	Limited by ext. FET	Ext. FET	90+	TSD/OVM	PWM	CL TR
LT3755/-1	Buck/buck-boost/boost controller	3000:1 PWM	14 x 1A	1	Series	4.5-40	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI
LT3756		3000:1 PWM	14 x 1A	1	Series	6-100	Ext. FET	Ext. FET	92	TSD/OVM	PWM	CL TR BL SI

MARKETS LEGEND

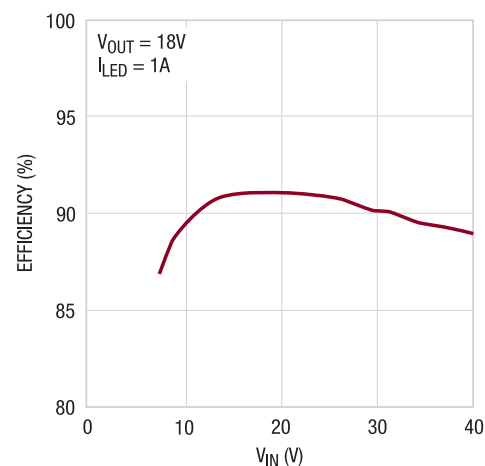
CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring

**Switch current



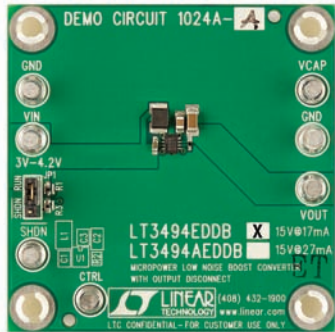
SEPIC Efficiency vs. V_{IN}





Organic LED (OLED) Bias—Low to High Current (50 mA to 2A) Drivers

Linear Technology delivers highly integrated solutions for OLED bias applications. Key features include output disconnect, soft start, and integrated Schottky diodes. Their small circuit size and high efficiency make them ideal solutions for space-conscious, portable device applications such as cellular phones and media players.



Features ▶

- LT3494**
- Low-quiescent current
 - 65 μ A in active mode
 - 1 μ A in shutdown mode
 - Switching frequency is non-audible over entire load range; ideal for wireless and MP3 applications
 - Integrated power NPN:
 - 350 mA current limit (LT3494A)
 - 180 mA current limit (LT3494)
 - Integrated Schottky diode
 - Integrated output disconnect

Benefits ▶

- Maximizes battery-run time
- Ideal for OLED display
- Compact, highly-integrated OLED solution

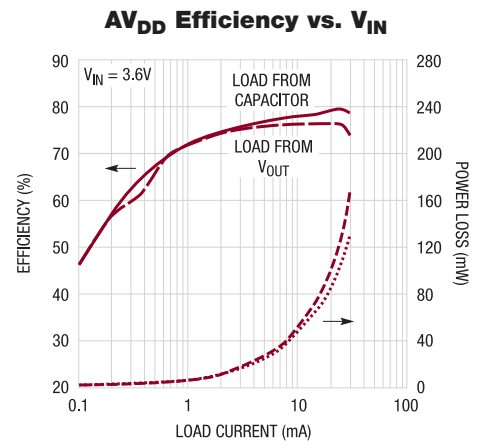
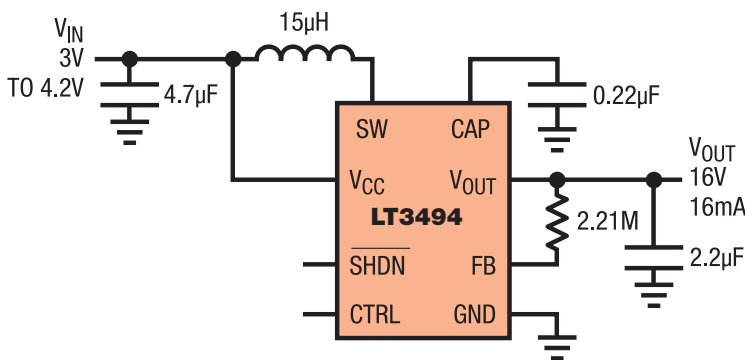
Applications ▶

- Organic LED power supply
- Digital cameras
- White LED power supply
- Cellular phones
- Medical diagnostic equipment

Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LTC3459	Synchronous boost	-	1	-	Single	1.5-5.5	10	60	89	TSD	-	CL TR BL SI
LT3464	Boost	-	1	-	Single	2.3-10	34	85	84	TSD	-	CL TR BL SI
LT3494/A		Pin adj.	1	-	Single	2.3-16	40	150/350	85	TSD	-	CL TR BL SI
LT3498	LED driver plus OLED power	DC/PWM	10 x 25 mA + OLED	2	Single LED/string OLED	2.5-12	32	10 x 25 + 30	75	TSD	PWM	CL TR BL SI
LT3463	Boost and inverter	-	2	-	Dual	2.4-15	\pm 40	180/320	77	TSD	-	CL TR BL SI
LT3472		-	2	-	Dual	2.2-16	\pm 40	250/300	83	TSD	-	CL TR BL SI
LT3582		-	2	-	Dual	2.58-5.5	\pm 14	290/500	83	TSD	-	CL TR BL SI
LT1613	Boost	-	1	-	Single	0.9-10	34	550	89	TSD	-	CL TR BL SI
LT3495(B)/-1		Pin adj.	1	-	Single	2.3-16	40	650/350	85	TSD	-	CL TR BL SI
LT3487	Boost and inverter	-	2	-	Dual	2.3-16	\pm 28	750/900	77	TSD	-	CL TR BL SI
LT3473/A	Boost	-	1	-	Single	2.2-16	36	1.2A	77	TSD	-	CL TR BL SI
LT3467/A		-	1	-	Single	2.4-16	40	1.4A	90	TSD	-	CL TR BL SI
LT3471	Boost or inverter	-	2	-	Dual	2.4-16	\pm 40	2A/1.5A	86	TSD	-	CL TR BL SI
LTC3458/L	Synchronous boost	-	1	-	Single	1.5-6	7.5/6	1.4A/1.7A	96	TSD	-	CL TR BL SI

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown
 **Switch current



Medium Current (100 mA to 350 mA) LED Drivers—Buck



Medium current, inductor-based, step-down switching LED drivers provide tiny, efficient high power LED lighting solutions for automotive, architectural, and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing, and high switching frequency.

Features ▶

LT3592

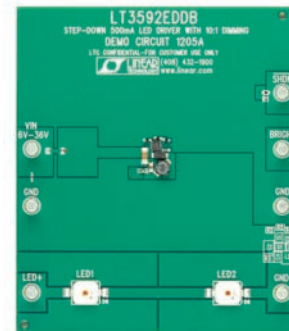
- Wide input voltage range operation from 3.6V to 36V
- Resistor adjustable 400 kHz to 2.2 MHz switching frequency
- Shorted and open-LED protection
- External resistor programs LED current, pin selects 10:1 ratio
- 50 mA/500 mA LED current settings

Benefits ▶

- Enables wide dimming range
- Ideal for automotive and industrial applications
- Easy dimming
- Enables one-wire LED connector
- Compact solution footprint

Applications ▶

- Automotive and avionic lighting
- Architectural detail lighting
- Display backlighting
- Constant-current sources



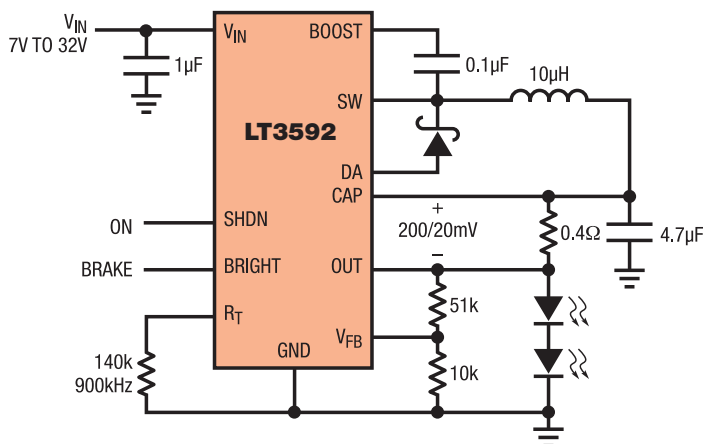
Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3591	Buck	80:1 PWM	5 x 200 mA	1	Series	2.5-12	30	0.5	92	TSD/OVM	PWM	CL TR BL SI
LT3517		5000:1 PWM	5 x 300 mA	1	Series	3-30	30	1.5	92	TSD/OVM	PWM	CL TR BL SI
LT3592		10:1 analog	6 x 350 mA	1	Series	3-36	32	0.8	92	-	-	-
LT3496		3000:1 PWM	3 x 5 x 300 mA	3	3x multiple series	3-30	30	3 x 0.75	92	TSD	PWM	CL TR BL SI

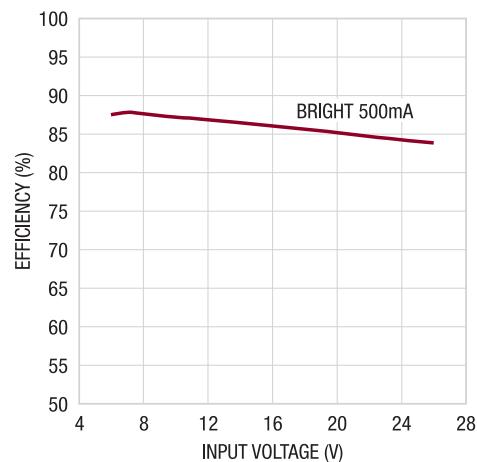
MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring



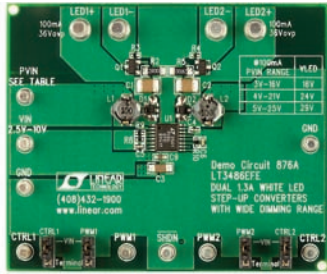
LED Power Efficiency vs I_{LED}





Low to Medium Current (20 mA to 100 mA/LED) Multi Channel LED Drivers—Inductor Based

Multi display, inductor-based, white LED drivers are capable of driving up to 20 white LEDs from a single-cell Li-Ion input. Key features include high voltage internal power switches, internal Schottky diodes, adjustable switching frequency, DC dimming control, open LED protection, and optimized internal compensation. They are ideal solutions for multi panel LCD backlight applications or space constrained portable applications such as cellular phones, PDAs, and digital cameras.



Features ▶

- LT3486**
- Drives up to 16 white LEDs at 25 mA from a 3.6V supply
- Drives up to 16 white LEDs at 100 mA from a 12V supply
- True Color PWM dimming delivers constant color with 1000:1 dimming range
- Two independent step-up DC/DC converters with independent dimming and shutdown
- Wide input voltage range: 2.5V to 24V

Benefits ▶

- Ideal for TFT-LCD screens up to 6" in handhelds
- Ideal for automotive displays with TFT-LCD screens up to 10"
- Eliminates the color shift normally associated with LED current dimming
- 1000:1 dimming ratio is required on many automotive and handheld displays
- Ideal for applications with multiple screens

Applications ▶

- Main/sub-displays
- Digital cameras and sub-notebook PCs
- PDAs/handheld computers
- Automotive

Product Specifications ▶

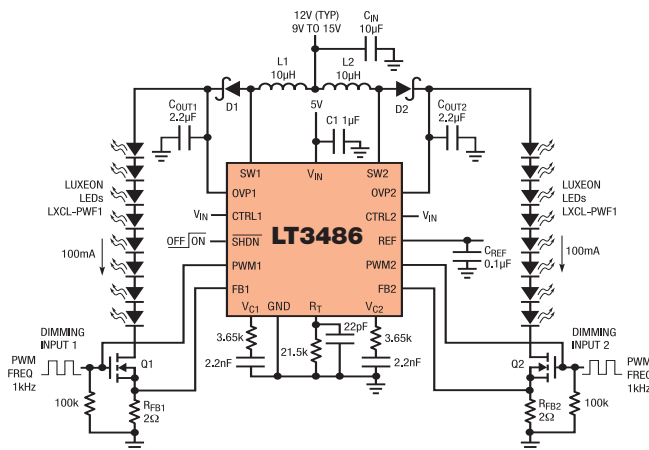
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3466-1	LED driver and boost converter	DC/PWM	10 x 25 mA	1	Series	2.7-24	39.4	2 x 320	84	TSD	PWM	CL TR BL SI
LT3466	Dual LED driver	DC/PWM	10 x 25 mA	2	Dual series strings	2.7-24	39.4	2 x 320	84	TSD	PWM	CL TR BL SI
LTC3452	Synchronous buck-boost LED driver	DC/PWM	5 x 20 mA + 1 x 200 mA	1	Parallel	2.7-5.5	4.5	1A	88	TSD	PWM	CL TR BL SI
LT3486	Dual LED driver	1000:1 PWM	10 x 100 mA	2	Dual series strings	2.7-24	35.4	2 x 1.3A	85	TSD	PWM	CL TR BL SI
LT3598	6-channel boost LED driver	3000:1 PWM	10	6	6 strings of series LEDs	3-30	44	30	90	-	PWM	TR BL SI
LT3599	4-channel boost LED driver	3000:1 PWM	10	4	4 strings of series LEDs	3-30	44	30	90	-	PWM	TR BL SI

MARKETS LEGEND

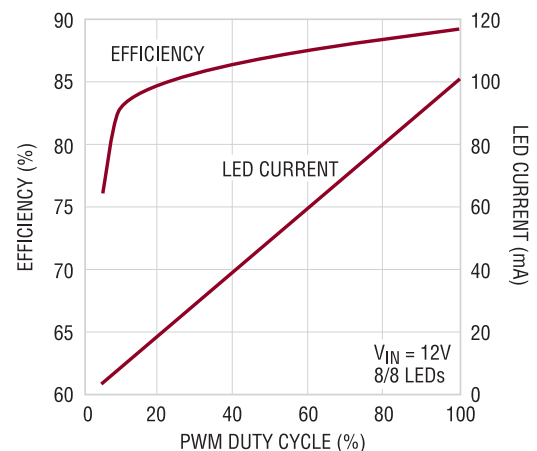
CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown

**Switch current



LED Efficiency and Current vs. PWM Duty Cycle



Low Current (20 mA to 50 mA) LED Drivers—Boost

Low current, inductor-based switching LED drivers ensure light intensity matching across LEDs. Key features include the purest white LED color dimming control, low standby mode quiescent current, selectable current level, guaranteed LED brightness matching, and extremely small circuit size, making them well suited for cellular phone and other portable backlight applications.



Features ▶

LT3593

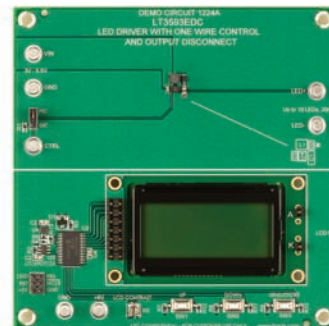
- Drives up to 10 white LEDs from a 3V supply
- One-pin shutdown and current programming
- LEDs disconnected in shutdown
- 32:1 linear brightness control range
- V_{IN} range: 2.7V to 5.5V

Benefits ▶

- Ideal for most cell phones/PDAs/MP3 and media players
- Enables one-wire current source
- Ideal for single-cell Li-Ion/Polymer applications
- Keeps noise out of critical RF bands, enables the use of tiny externals
- Enables precise dimming control for handheld application without color shifts of the LEDs

Applications ▶

- Cellular phones
- Digital cameras
- PDAs/handheld computers
- MP3 players
- GPS receivers



Product Specifications ▶

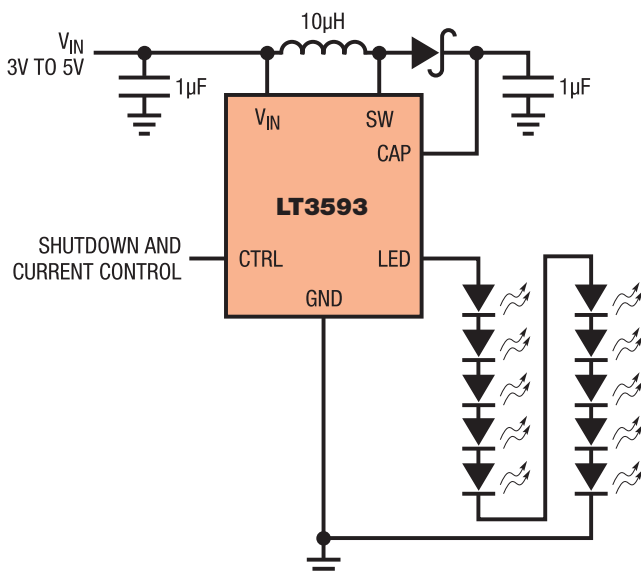
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)**	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LT3491	Boost LED driver	300:1 PWM	6 x 25 mA	1	Series	2.5-12	27	260	76	TSD/OVM	PWM	CL FL TR BL SI
LT3498	Boost LED driver and OLED	DC/PWM	6	1	Series	2.5-12	32	300 + 180	80	TSD/OVM	PWM	CL FL TR BL SI
LT3591	Boost LED driver	90:1 PWM	10 x 20 mA	1	Series	2.5-12	42	450	77	TSD/OVM	PWM	CL FL TR BL SI
LT3593		DC/PWM	10	1	Series	2.5-5.5	45	550	80	-	-	-
LT3497	Dual boost LED driver	DC/PWM	6	2	Dual series strings	2.5-10	32	2 x 300	80	-	-	TR BL SI
LT3466		DC/PWM	2 x 10 x 25 mA	2	2 parallel series strings of 10	2.7-24	40	2 x 320	84	TSD/OVM	PWM	CL FL TR BL SI
LT3466-1	LED driver/boost converter	DC/PWM	10 x 25 mA	1	Series	2.7-24	40	2 x 320	84	TSD/OVM	PWM	CL FL TR BL SI
LT3598	6-channel boost LED driver	DC/PWM	10	6	6 series strings	3-30 (40V _{MAX})	44	1.5A	88	-	-	-
LT1942	Quad DC/DC converter and LED driver	DC/PWM	12 x 25 mA	1	2 parallel series strings of 6	2.6-16	44	550	77	TSD/OVM	PWM	CL FL TR BL SI

MARKETS LEGEND

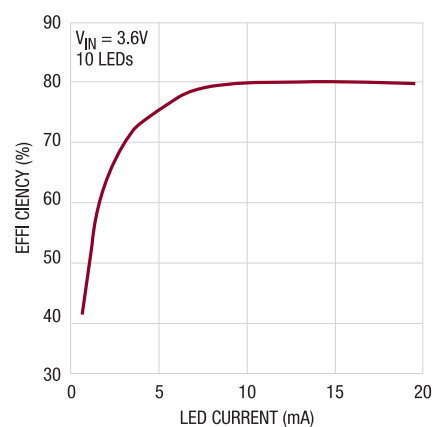
CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring

**Switch current



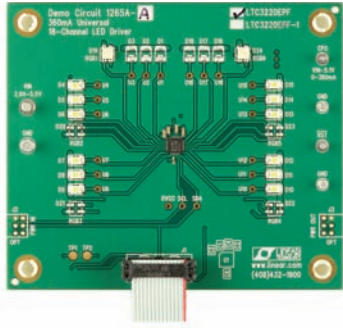
Conversion Efficiency





Low Current Multi Display LED Drivers—Inductorless

Linear Technology's family of inductorless, charge pump-based, multi display LED drivers features the highest level of integration, smallest footprint, and highest efficiency. Universal configuration and individual display driver outputs eliminate the need for ballast resistors. These ICs optimize flexibility for product designers, ranging from fully-featured, multi display cellular phones to high current/high resolution camera flash electronic devices to keypad illumination.



Features ▶

LTC3220/-1

- Drives up to 18 universal independently configurable 20 mA current sources
- 64-step brightness control
- Slow-rate limited switching
- High efficiency operation up to 91%:
1x, 1.5x, or 2x boost modes with automatic mode switching
- 28-lead (4 mm x 4 mm x 0.55 mm) ultra-thin QFN package, <math><56\text{ mm}^2</math> solution area

Benefits ▶

- Design flexibility for highly featured, multi-display cell phones and system status LED lighting
- High resolution
- Reduces conducted and radiated noise
- Extends battery run time
- Compact, ultra-low profile footprint

Applications ▶

- Ideal for applications with noise sensitive circuitry onboard, minimizes size of externals

Product Specifications ▶

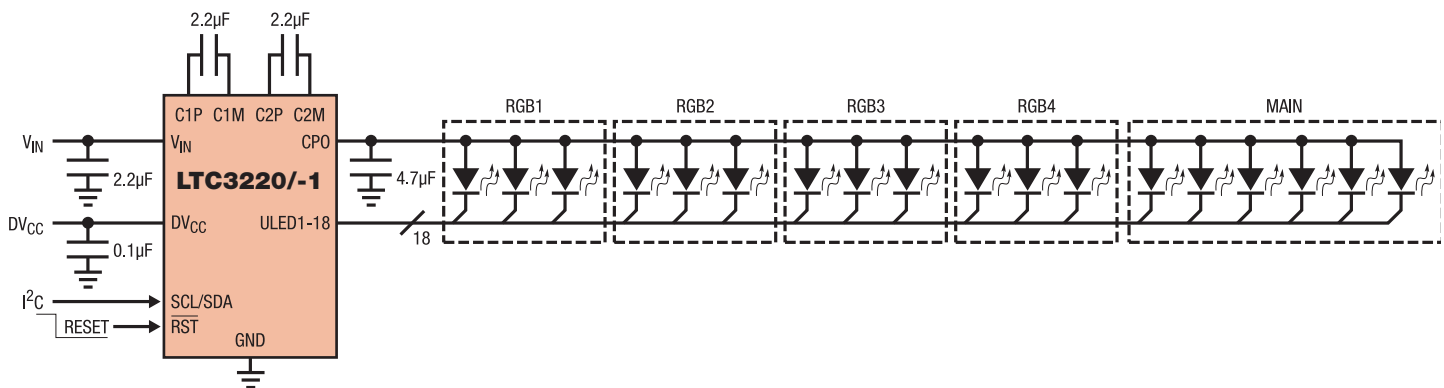
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LTC3212	Multi display LED driver	1-wire	3	1	Parallel, RGB	2.7-5.5	-	75	92	TSD	1-wire	FL BL
LTC3230		1-wire	5	1	Parallel, Main/SUB + 2 LDOs	2.7-5.5	-	125	91	TSD	1-wire	FL BL
LTC3219		I ² C	9	1	Parallel, Universal	2.9-5.5	-	250	93	TSD	I ² C	FL BL
LTC3220/-1		I ² C	18	1	Parallel, Universal	2.9-5.5	-	360	91	TSD	I ² C	FL BL
LTC3206		SPI**	9	1	Parallel, Main/SUB/RGB	2.8-4.5	-	400	90	TSD	SPI**	FL BL
LTC3210/-1		1-wire	5	1	Parallel, Main/CAM	2.9-4.5	-	500	93	TSD	1-wire	FL BL
LTC3209-1		I ² C	8	1	Parallel, Main/CAM/Aux.	2.9-4.5	-	600	94	TSD	I ² C	FL BL
LTC3209-2		I ² C	8	1	Parallel, Main/CAM/Aux.	2.9-4.5	-	600	94	TSD	I ² C	FL BL
LTC3207		I ² C	13	1	Parallel, Universal	2.9-5.5	-	600	90	TSD	I ² C	FL BL
LTC3208		I ² C	17	1	Parallel, Main/SUB/CAM/RGB/Aux.	2.9-4.5	-	1,000	90	TSD	I ² C	FL BL

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown

**Serial peripheral interface



Integrated Constant-Current Buck-LED Drivers

National Semiconductor offers a broad portfolio of easy to design, energy-efficient buck regulators ideal for driving LEDs in a wide variety of applications. With integrated switching MOSFETs and online design tools as well as extensive protection features and dimming capability, National's buck-LED drivers maximize ease of design without sacrificing functionality. National's LED drivers also feature low feedback voltages and very high efficiencies to enable energy-efficient lighting solutions.



Features ▶

- Online design tools ease IC selection, enable design simulation, and offer orderable evaluation kits with custom BOMs
- Low external component counts
- Fast PWM dimming inputs
- Low (≤ 200 mV) feedback voltages
- Thermal, open-circuit, and short-circuit protection

Benefits ▶

- Design tools and integrated switches increase ease of design and time to market
- Low external component counts minimize BOM cost and total solution size
- Low feedback voltages, high efficiencies, and excellent package technologies maximize heat dissipation
- Wide input voltage ranges and high current capabilities increase design flexibility
- Supports all ceramic output capacitors and capacitor-less outputs for smallest solution size

Applications ▶

- General illumination
- Automotive lighting
- Industrial lighting
- Architectural lighting
- Signage



LM3402/02HV evaluation board with female 6-pin SIP connector and two standard 94 mil turret connectors for easy connection to LED array

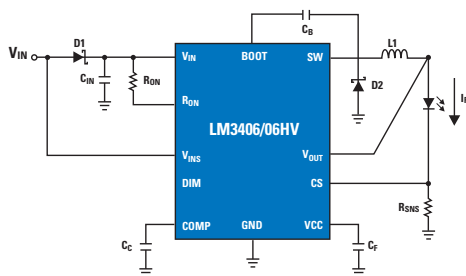
Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
LM3401	Buck	PWM	1-9	1	Series	4.5-35	35	>3,000	95	TSD/LOD	PWM	CL FL TR SI
LM3402		PWM	1-10	1	Series	6-42	40	500	90	Over-current protection/TSD/LOD	PWM	CL FL TR BL SI
LM3402HV		PWM	1-20	1	Series	6-75	70	500	90	Over-current protection/TSD/LOD	PWM	CL FL TR BL SI
LM3404		PWM	1-10	1	Series	6-42	40	1,000	90	Over-current protection/TSD/LOD	PWM	CL FL TR BL SI
LM3404HV		PWM	1-20	1	Series	6-75	70	1,000	90	Over-current protection/TSD/LOD	PWM	CL FL TR BL SI
LM3405		PWM	1-4	1	Series	3-15	14	1,000	90	Over-current protection/TSD/LOD/OVM/UVLO	PWM	CL FL TR BL SI
LM3405A		PWM	1-5	1	Series	3-22	20	1,000	90	Over-current protection/TSD/LOD/OVM/UVLO	PWM	CL FL TR BL SI
LM3406		PWM	1-10	1	Series	6-42	40	1,500	90	TSD, UVLO, broken open check	-	CL SI
LM3406HV		PWM	1-20	1	Series	6-75	70	1,500	90	TSD, UVLO, broken open check	-	CL SI
LM3407		PWM	1-7	1	Series	4.5-30	27	350	96	Over-current protection/ TSD/LOD/UVLO	PWM	CL FL TR BL SI
LM3433	PWM/analog	1	1	Series	-9 to -14	-6	>6,000	96	TSD/LOD	PWM/analog	CL TR BL SI	

MARKETS LEGEND

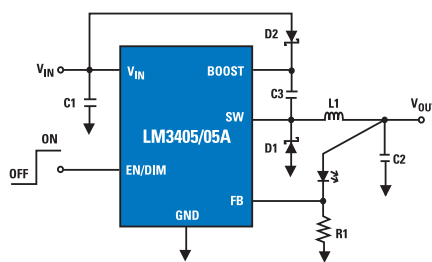
CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring, UVLO: Under voltage lock out, LOD: LED open detection



LM3406 schematic

The LM3406/06HV are monolithic switching regulators capable of delivering up to 1.5A constant currents to high-power LEDs. True average current control, broken and open LED protection, low-power shutdown, and thermal shutdown features allow for design robustness and flexibility



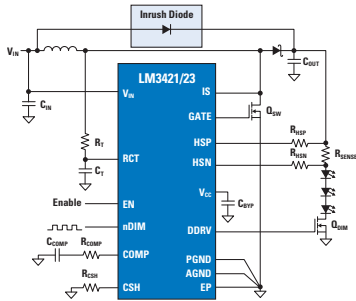
LM3405/05A schematic

The LM3405/05A are 1A constant-current buck regulators designed to provide simple, high-efficiency solutions for driving high-power LEDs. These devices feature a low 205 mV feedback voltage to reduce heat dissipation, and can support up to five 1W or 3W LEDs in series



Constant-Current Boost Regulators

National's portfolio of constant-current boost regulators features inductive and switched-capacitor solutions for applications such as backlighting, flash, and portable lighting. For higher currents, National has a variety of high-efficiency inductive-boost LED drivers. National's switched-capacitor LED drivers offer small, inductor-less, low-noise solutions for both parallel and series LED configurations. Features such as multiple dimming interfaces and current matching can also be found in inductive and switched capacitor drivers.



LM3421/3

Features ▶

LM3421/3

- Adjustable highside current sense threshold
- Peak current mode control with predictive off-time
- Zero current shutdown
- PWM dimming

Benefits ▶

- Allows for high efficiency design
- Eases design of loop compensation
- Great design flexibility

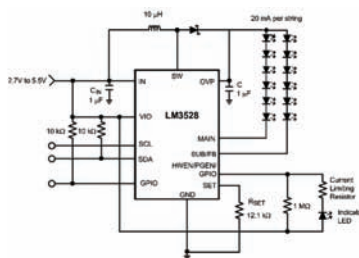
Applications ▶

- General illumination
- Automotive
- Architectural lighting

Product Specifications ▶													
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets	
LM3410	Boost/SEPIC	PWM	1-6	1	Series	2.7-5.5	24	1,000	88	Over-current protection/TSD/LOD	PWM	CL FL BL SI	
LM3430/32	Boost	PWM/analog	1-20	6	Series/parallel	6-40	80	40 per string	92	Over-current protection/TSD/LOD/UVLO	PWM/analog	CL TR BL SI	
LM3431		PWM/analog	1-10	3	Series/parallel	5-36	40	150 per string	88	Over-current protection/TSD/OVM/LOD	PWM/analog	CL TR BL SI	
LM3509		I ² C	1-5	2	Series/parallel/OLED	2.7-5.5	21	30 per string	92	TSD/soft start	I ² C	CL TR BL SI	
LM2756		I ² C	1	8	Parallel	2.7-5.5	4.6	180	91	TSD/OVP/soft start	I ² C	BL	
LM2757		-	-	1-10	-	-	2.7-5.5	4.1/4.5/5	180	92	Over-current protection/TSD/shutdown w/high impedance/soft start	Binary	BL
LM3553		-	-	1-2	1	Series	2.7-5.5	19	1,200	90	TSD/OVM/Flash pulse safety timer	I ² C	BL
LM4510		-	-	-	-	Series/parallel/OLED	2.7-5.5	18	280	85	TSD/output short-circuit protection/feedback fault protection/input UVLO/soft start/true shutdown isolation	Binary	FL
LM2755		I ² C	1	3	Parallel	3-5.5	5	90	90	TSD/soft start	I ² C	BL	
LM3528		Exponential	6	2	Series/parallel	2.7-5.5	20	30	1.27M	-	-	-	BL
LM5022		Boost/SEPIC/flyback	PWM	1-20	1	Series	6-60	80	>1,000	95	TSD/LOD	PWM	CL TR BL SI
LM3421/3	Buck/boost/buck-boost/SEPIC	PWM	1-20	1	Series	4.5V-75V	75V	>2,000	2.0 MHz	OVP/FLT/LED ready/broken open check	PWM	CL TR BL SI	

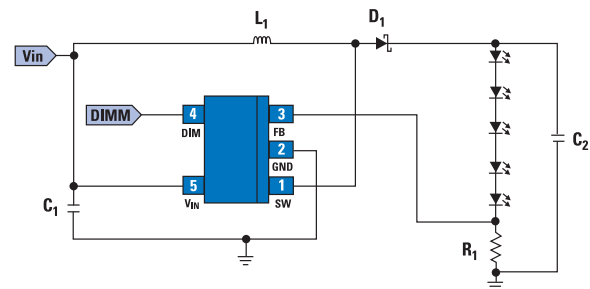
MARKETS LEGEND: CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, UVLO: Under voltage lock out, LOD: LED open detection



LM3528 schematic

The LM3528 is a high-efficiency boost converter for white LEDs and/or OLED displays with dual-current sinks and I²C-compatible brightness control. This LED driver is ideal for small- to medium-sized displays in battery-powered applications



LM3410 schematic

The LM3410 is a high-frequency, very small, constant-current boost LED driver. A low external component count makes this driver easy to design and minimizes the total solution size and cost. The LM3410 has an input voltage range down to 2.7V to support single Li-Ion cells

TRIAC Dimmable LED Driver

National's TRIAC dimmable offline LED driver solution is perfect for any application where an LED driver must interface to a standard TRIAC wall dimmer. The LM3445 delivers a wide, uniform dimming range free of flicker, best-in-class dimming performance, and high efficiency—all while maintaining ENERGY STAR power factor requirements in typical application.



Features ▶

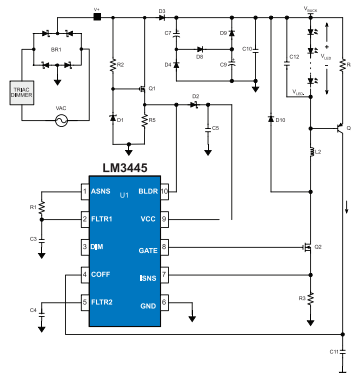
- Angle detector/decoder
- Simplified constant off-time
- Allows master-slave operation control in multi-chip solutions
- Fully WEBENCH® enabled

Benefits ▶

- Enables 150:1 full range DIM capability
- Ease of design
- Smaller BOM and solution size
- Control multiple strings of LEDs with consistent dimming, free of flicker

Applications ▶

- General illumination
- Architectural lighting



Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/ String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
LM3455	Buck	TRIAC dimmable	4-12	1	Series	80-277 AC	45V	1,000	85	–	PWM/analog	CL

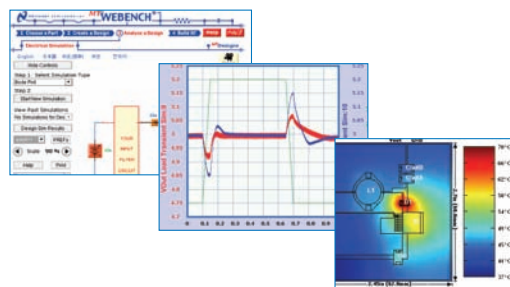
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Design Tools and Packaging ▶

WEBENCH® Online Design Environment

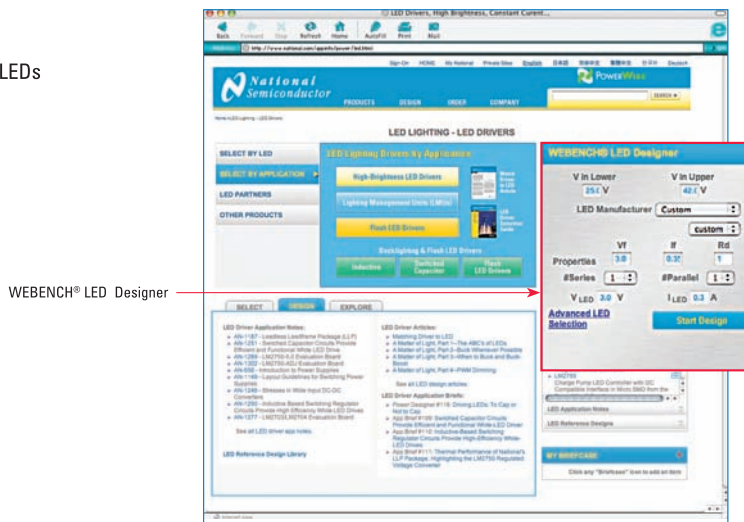
Use this online design and prototyping environment to accelerate your design process in just four simple steps:

1. Choose a part
2. Create a design
3. Analyze it using electrical and thermal simulation
4. Build it with your custom kit



WEBENCH® LED Designer

Find power solutions for High-Brightness LEDs



Visit lighting.arrow.com/designtools to access free design tools, including National's LED reference designs and WEBENCH® LED Designer online tools.



High-Efficiency AC/DC LED Driver Solutions

The SSL152x, SSL16xx, and SSL1750 families of offline switched-mode power supply (SMPS) controllers are ideal for driving the latest high-brightness LEDs with high efficiency and a full suite of built-in protection features. For SSL indoor lighting solutions below 15W, the SSL152x family is the right choice. The ICs operate directly from the rectified universal mains. They are ideal for retrofitting LED lamps and for LED driver solutions used in cabinet, kitchen, and many other lighting applications in the home. With just a minimum of additional components it offers a driver solution that is fully compatible with transistor- and thyristor- (TRIAC-) based wall-mounted dimmers. Between 15W and 24W, the SSL1623PH is very suitable for SSL applications due to the special heat spreader underneath the IC package. For SSL applications higher than 25W, NXP offers the SSL1750, flyback control, and power-factor correction (PFC) integrated into one IC.



SSL1523 and SSL1750

Features ▶

- Universal mains 80 VAC to 270 VAC
- Support of power-factor correction when required
- Wide range of built-in protection circuits
- Meets safety/isolation regulations (UL 1598 Class 2 and IEC60950)

Benefits ▶

- High-energy efficiency—valley switching for minimum switch-on loss
- Wide input voltage range
- Wide current drive capability
- Supports next generation of HB-LEDs

Applications ▶

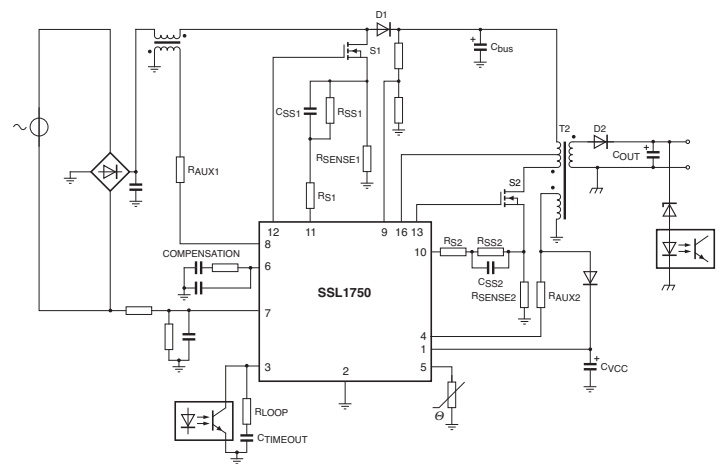
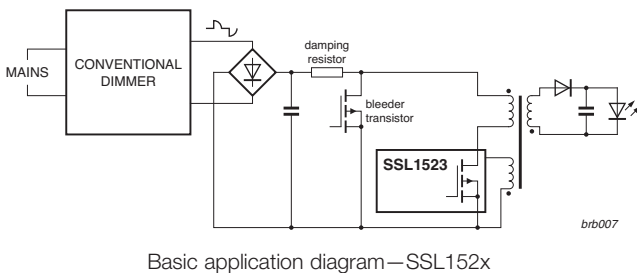
- General LED lighting indoor (residential, office, and building)
- General LED lighting outdoor (street lighting, parking lots, tunnel lighting)
- Industrial lighting
- Signage

Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/ String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
SSL152x	Flyback SMPS	PWM and TRIAC-transistor	Pending on output wattage selected	–	String/series	80-276	User defined	User defined	Application defined	TSD/OVM	AC/DC	CL SI
SSL153x		PWM	Pending on output wattage selected	–	String/series	80-276	User defined	User defined	Application defined	TSD/OVM	AC/DC	CL SI
SSL1623PH		PWM and TRIAC-transistor	Pending on output wattage selected	–	String/series	80-276	User defined	User defined	Application defined	TSD/OVM	AC/DC	CL SI
SSL1750		PWM	Pending on output wattage selected	–	String/series	80-276	User defined	User defined	Application defined	TSD/OVM	AC/DC	CL SI
SSL1610	Resonant power supply	–	Pending on output wattage selected	–	String/series	80-276	User defined	User defined	Application defined	TSD/OVM	AC/DC	CL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring



DC/DC LED Driver Solutions

The UBA3070 is a versatile high-voltage LED controller IC designed for applications where a high number of LEDs need to be driven in an accurate and highly energy efficient way. The flexible design allows the use of both low-power or high-power LEDs and can be used in combination with LED-strings containing hundreds of LEDs.



Features ▶

- Direct PWM dimming
- LED thermal and IC overheating protection
- Accurate DC/DC conversion with switch-mode buck converter

Benefits ▶

- Lower system costs
- Higher reliability and extended IC lifetime
- Supports next generation of HB-LEDs

Applications ▶

- General LED lighting (spotlights and downlights)
- General LED lighting (retail display)
- Channel letter and contour lighting
- Signage
- LCD backlighting



UBA3070

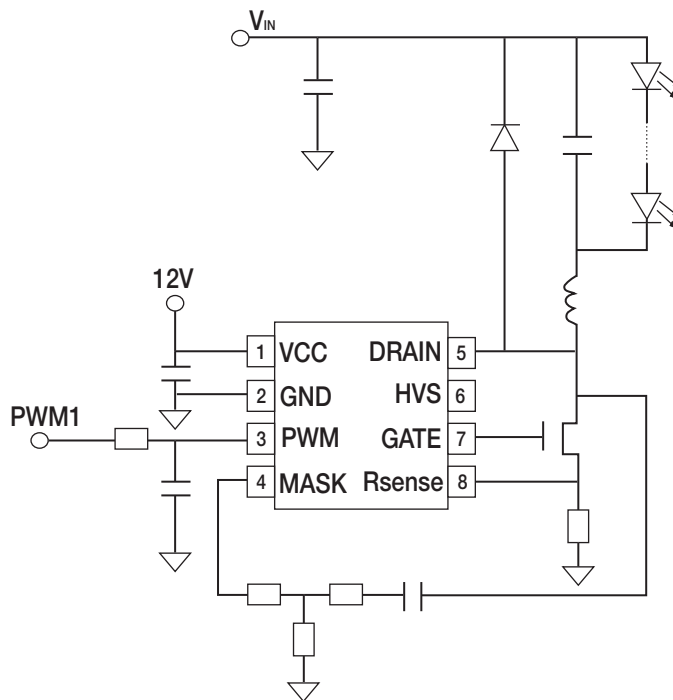
Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
UBA3070	LED driver	PWM	Up to 200	-	String/series	600	-	User defined	Application defined	TSD/OVM	DC/DC	CL BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Diagnostic capabilities: TSD: Thermal shutdown, OVM: Output voltage monitoring



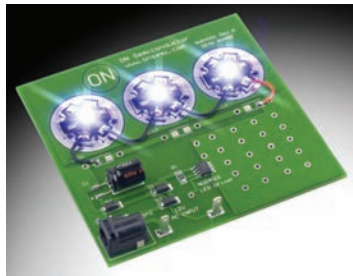
Basic application diagram—UBA3070

ON Semiconductor®



LED Driver Solutions

ON Semiconductor offers solutions for a wide range of LED applications whether run off an AC main or battery powered. With a broad portfolio of LED driver solutions, ON Semiconductor addresses everything from LCD backlighting, flashlights, wide DC-input range of applications, including automotive, solar powered, and commercial/landscape lighting powered from 12V DC/AC, to offline applications such as lighting ballasts and power factor correction solutions.



Features ▶

- Linear and switching topologies
- Wide-input DC-DC solutions to 40V
- Extended temperature range from -40°C to +125°C
- Optimized portable backlighting solutions
- Broad choice of packages

Benefits ▶

- Enhanced designer flexibility
- Suitable for automotive environment
- Robust and highly reliable
- Low passive parts count
- Demo boards and application notes available

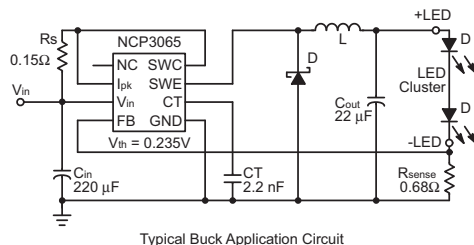
Applications ▶

- Backlighting (small to medium LCD panels)
- Flashlights (torch and camera flash)
- Transportation (interior/exterior lighting, displays, and marine)
- General lighting (architectural, landscape, streetlighting, task lighting, and low-voltage AC/DC)
- Signage (addressable and neon replacement)

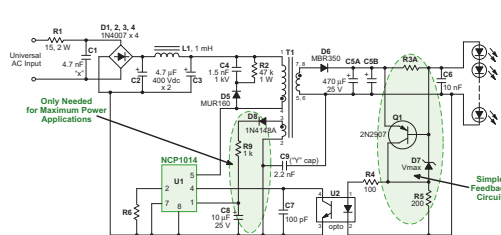
Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
NCP3066	Boost/buck/SEPIC	PWM/analog	12	1	Series	3-40	40	1,200	89	TSD	Enable control	CL TR BL
NCP3065		PWM/analog	12	1	Series	3-40	40	1,200	89	TSD	-	CL TR BL
NCP/NCV3063		PWM/analog	12	1	Series	3-40	40	1,200	89	TSD	Enable control	CL TR BL
CAT4201	Buck	PWM/analog	8	1	Series	7-36	32	350	94	TSD	PWM/analog	CL TR SI
NCP1034		PWM/analog	20	1	Series	12-100	80V	Flexible/controller >1A	92	SS/OCP/UVLO	PWM	CL BL
NCP1013	Fixed frequency flyback	PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	5W-up to 1,000	83	TSD/OVP/SS/UVLO	-	CL SI
NCP1014		PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	8W-up to 1,000	83	TSD/OVP/SS/UVLO	-	CL SI
NCP1028		PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	15W-up to 1,000	83	TSD/OVP/SS/UVLO	-	CL SI
NCP1216		PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	Flexible/controller	90	OCP/UVLO/TSD	-	CL BL
NCP1351	Variable OFF time flyback	PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	Flexible/controller	90	OCP/UVLO/TSD/OPP	-	CL BL
NCP1607B	PFC boost or flyback	PWM/analog	-	1	Series	85-305 VAC	Depends on V _{IN}	Flexible/controller >1A	90	OVP/UVLO	PWM/analog	CL SI
CAT4016	Low drop out driver (LDO)	PWM	1	16	Parallel	3-5.5	7	100	-	TSD	Serial	SI
CAT4101	Linear	PWM	6	1	Series	3-5.5	25	1,000	-	TSD	PWM	CL FL
CAT4109		PWM	6	3	Parallel	3-5.5	25	175	-	TSD	PWM	CL BL SI
NUD4001		PWM/analog	8	1	Series	3.6-30 and 60V for load dump	27	500	-	-	Enable	CL TR BL SI
NUD4011		PWM/analog	50	1	Series	5-200	198	50	-	-	Enable	BL

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

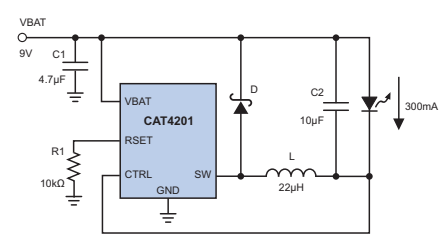
*Diagnostic capabilities: TSD: Thermal shutdown, OVP: Overvoltage protection, SS: Soft start, UVLO: Under voltage lock out, OCP: Overcurrent protection, OPP: Overpower protection



NCP3065 LED driver—buck configuration



NCP1014 configured as a constant-current isolated offline LED driver



1W step-down, inductor-based LED driver for multivolt (6V to 36V) systems

LED Driver Solutions for Handheld Applications



Portable applications require solutions that provide high efficiency, require minimal board space, and low height. ON Semiconductor offers LED driver solutions in linear, charge pump, and inductive DC-DC converter topologies for optimal space savings and inductive solutions for optimal power efficiency. In addition, ON Semiconductor offers a broad selection of high-current drivers to support flashlight and camera flash applications, and highly integrated lighting management ICs that support backlight of the display, keyboard, and color indicators.

Features ▶

- Linear, inductive, and charge pump solutions
- High efficiency
- Highly integrated solutions
- Ultra-thin micro package 0.55 mm
- Simple to use

Benefits ▶

- Enhanced designer flexibility
- Extended battery life
- Low overall parts count
- Thinner and smaller end products
- Demo boards and application notes available

Applications ▶

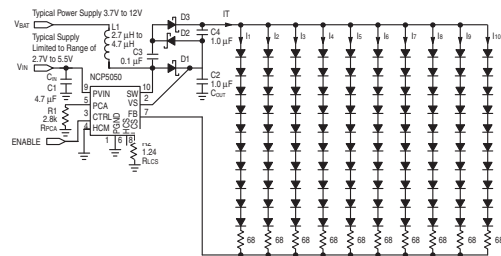
- Small and medium size LCD backlighting
- Keyboard backlighting
- Flashlights, torch, and headlamps
- Camera flash
- Medical instruments



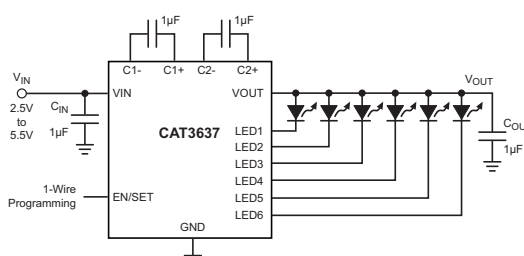
Product Specifications ▶												
Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
NCP1529A	Buck	PWM	1	1	Series	2.7-5.5	5.5	1,000	96	TSD/SCP/UVLO	PWM	FL
NCP5030	Buck-boost	PWM/analog	1	1	Series	2.7-5.5	5.5	Up to 900	94	OVP/TSD/UVLO	Enable	FL
CAT4106	Boost/linear	PWM	8	4	Parallel	3.0-5.5	36	175	-	TSD/OLP/SLP	PWM	BL
NCP1400A	Boost	PWM/analog	1	1	Series	0.8-5.0	5	100	89	SS	Enable	FL
NCP1406		PWM/analog	6	1	Series	1.8-5.5	25	500 mW (25 mA@25V)	85	TSD/UVLO/SS	Enable	BL FL
NCP1422		PWM/analog	1	1	Series	1.0-5.0	5	600	92	TSD/UVLO/SS	Enable	FL
NCP5050		PWM/analog	6	1	Series	2.7-5.5	22	Up to 600	90	Timeout/OVP/TSD	Enable	BL FL
NCP5890		PWM	8	1	Series	2.7-5.5	34	25	90	TSD/UVLO/OVP	I ² C	BL
NCP5005		Boost w/enhanced RFI immunity	PWM/analog	5	1	Series	2.7-5.5	21	1,000 mW (50 mA@20V)	90	OVP/TSD	Enable
NCP5010	Boost w/integrated Schottky	PWM/analog	5	1	Series	2.7-5.5	22	500 mW (25 mA@20V)	84	OVP/TSD	Enable	BL
CAT3224	Super cap charge pump	-	1	2	Parallel	2.5-5.5	5.5	2,000	-	Timeout/TSD/OCP/OVP	PWM	FL
CAT3637	Charge pump	PWM	1	6	Parallel	2.5-5.5	7	30	92	TSD/OVM/SCP	1-wire	BL
NCP5602		I ² C	1	2	Parallel	2.7-5.5	5.5	30	88	OVP/TSD	I ² C	BL
NCP5603		PWM	1	1-10	Parallel	2.7-5.5	5.5	200	90	TSD/SCP	Enable	BL FL
CAT3200		PWM	1	1-6	Parallel	5	5.5	100	90	TSD	PWM	BL
NCP5608		PWM	1	8	Parallel	2.7-5.5	5.5	4@25/4@100	86	OVP/TSD	Enable	BL FL
NCP5612		S-wire link	1	2	Parallel	2.7-5.5	5.5	30	88	OVP/TSD	Enable/dim	BL
NCP5604A/B		PWM	1	4	Parallel	2.7-5.5	4.8	30	87	OVP/SCP	Enable	BL
NCP5623A		RGB charge pump	I ² C	1	3	Parallel	2.7-5.5	5.5	30	93	OVP/SCP	I ² C
NCP5623DT	Linear RGB	I ² C	1	3	Parallel	2.7-5.5	5.2	30	-	TSD/SCP/UVLO	I ² C	CL BL

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

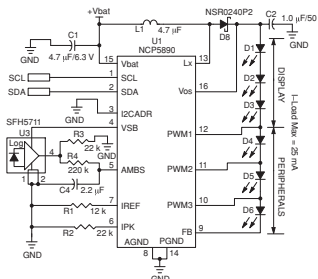
*Diagnostic capabilities: TSD: Thermal shutdown, UVLO: Under voltage lock out, SS: Soft start, OVP: Over voltage protection, SCP: Short circuit protection, SLP: Shorted LED protection, OLP: Open LED protection



NCP5050 drives 10 x 10 LED for backlighting medium-size LCD panel



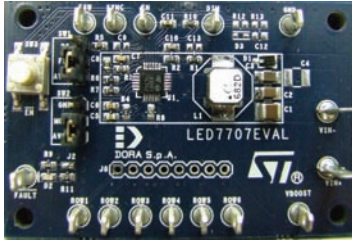
CAT3637 schematic



NCP5890 typical schematic



LED7707 Monolithic DC/DC Converter for LED Driving



LED7707 demo board

The new LED7707 is a monolithic DC/DC converter for LED driving specifically designed for LCD backlighting and general lighting. It consists of a highly-efficient boost converter integrating a power MOSFET and six controlled-current generators (ROWS). The device can manage an output voltage up to 36V (example is 10 white LEDs x row). The boost section is based on a constant switching frequency, peak current-mode architecture. The boost output voltage is controlled so that the lowest voltage of the ROW, referred to SGND, is equal to an internal reference voltage (700 mV typical). The input voltage range is from 4.5V up to 36V. In addition, the LED7707 has an internal 5V LDO regulator that supplies the internal circuitry of the device and is capable of delivering up to 40 mA. The input of the LDO is the main input voltage (V_{BATT}). The boost section switching frequency can be externally adjusted from 200 kHz to 1 MHz. It also has an internal fixed value of 660 kHz (typical), which eliminates the need for a resistor, an important feature in minimum component-count applications. The frequency pin (FSW) can also be used as the synchronization input, allowing the LED7707 to operate both as the master or the slave. The generators can be externally programmed to sink from 16 mA up to 85 mA and can be dimmed via a PWM signal (1 percent dimming duty-cycle at 1 kHz can be managed). For high-current LEDs, it is possible to parallel the outputs to get the maximum output current value of 510 mA (6 ROWs x 85 mA). The device is able to detect and manage open- and shorted-LED faults. If some ROWs are not used, during the start up, the device is able to self-detect and automatically disconnect the ROWs without any fault detection. Output over-voltage, internal power MOSFET over-current, and thermal shutdown are provided as protection.

Features ▶

- Constant-frequency, peak, current control mode
- Internal power MOSFET
- External sync for multi-device applications
- Pulse-skip power saving mode at light load
- Programmable soft-start and over voltage protection
- Ceramic output capacitor
- Six ROWs with 85 mA maximum current capability (adjustable)
- Parallelable rows up to 510 mA (6 ROWs x 85 mA)
- Up to 36V output voltage (example 10 white LED per row)
- 2% current matching between ROWs
- LED failure (open- and short-circuit) detection
- Housed in VQFPN-24L space-saving package

Benefits ▶

- High efficiency thanks to adaptive-output voltage
- High-performance 36V rated current generators
- 1% dimming duty-cycle at 1 KHz can be managed
- Keeps externals tiny
- Demo board and application notes available

Applications ▶

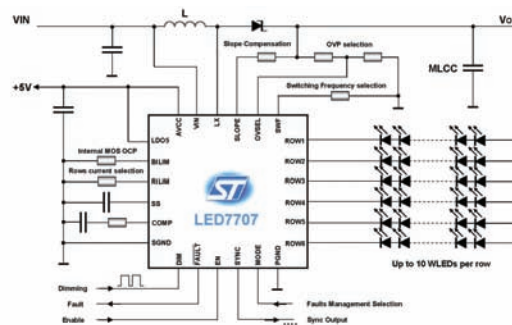
- Backlighting in LCD panels for battery/AC adapter supplied equipment such as:
 - GPS navigator backlighting
 - LCD monitor backlighting
- General lighting

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/ String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
LED7707	Boost converter	PWM	36V (example 10 white LEDs)	6	Series/parallel	4.5-36	Adaptive to 36V	6 ROWs x 85	>90	Short/open	-	CL BL

MARKETS LEGEND

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LED7707 application schematic

24-Bit Constant-Current LED Sink Driver with Output Error Detection



The STP24DP05 is a monolithic, low-voltage, low current-power 24-bit shift register designed for LED panel displays. The 24-bit are grouped into three sets of 8-bit for RGB control to simplify PCB layout in parallel to achieve high resolution video display. In the output stage, 24 regulated current sources were designed to provide 5 mA to 80 mA constant current to drive the LEDs. The 8 x 3 shift registers data flow sequence order can be managed with two dedicated pins. The STP24DP05 has a dedicated pin to activate the outputs with a sequential delay that will prevent in-rush current during outputs turn-on. The device detection circuit checks three different conditions that can occur on the output line: short-to-GND, short-to-VO, or open line. The data detection results are loaded in the shift registers and shifted out via the serial line output. The detection functionality is activated with a dedicated pin, or as an alternative, through a logic sequence that allows the user to enter or exit from detection mode. Through three external resistors, users can adjust the output current for each 8-channel group, controlling the light intensity of LEDs.



STP24DP05 evaluation board

Features ▶

- 20V output driving capability
- 25 MHz clock frequency
- 3.3V and 5V supply voltage range
- Up to 80 mA drive capability per channel
- Thermal shutdown
- Thermal error flag
- Gradual outputs delay
- Short- and open-LED detection
- Controlled in-rush current
- TQFP-48 exposed pad, high thermal efficiency package

Benefits ▶

- Superior display quality
- Finer brightness control through three independent external resistors
- Accurate color balance and white points
- Remote diagnostics

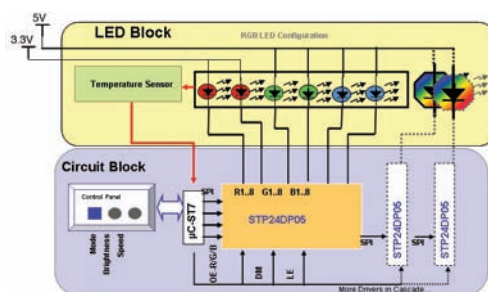
Applications ▶

- Full-motion RGB video wall display
- Monochrome LED signs
- Billboards and scoreboards
- Large-panel LCD backlighting units
- Traffic display
- Gaming machine
- Channel letter signs

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
STP24DP05	Linear	SW/PWM signaling	20V (example 6 green LEDs)	24	Series/parallel	3.3-5	20	80	-	Open/short LED detection	SPI	CL TR BL SI

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

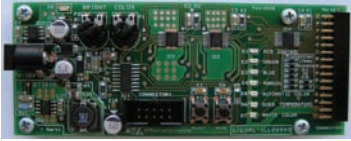


STP24DP05 typical application circuit



4-Bit Constant-Current Power-LED Sink Driver

STMicroelectronics has introduced the STP04CM05, a monolithic 4-bit shift register designed to supply high-power RRGB LEDs achieving high precision color control. Each channel provides a controlled current ranging from 80 mA to 400 mA. The device has 1 percent precision among the channels and 6 percent chip-to-chip. The STP04CM05 guarantee 20V output driving capability, allowing users to connect more LEDs in series. The high clock frequency, 30 MHz, makes the device suitable for high data transmission. The 3.3V voltage supply is useful in applications that interface with 3.3V microcontroller.



STP04CM05 evaluation board

Features ▶

- 20V output driving capability
- 30 MHz clock frequency
- 3.3V and 5V supply voltage range
- Controlled in-rush current
- Thermal shutdown
- Available in SO, TSSOP, and TSSOP exposed pad
- Adjustable output current through one external resistor

Benefits ▶

- Constant voltage and constant current
- Adjustable current limit
- Simple to implement
- Over-voltage protection
- High efficiency

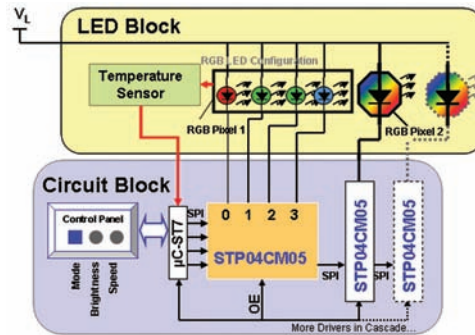
Applications ▶

- Architectural lighting
- Special illumination
- Ambient lights
- Automotive interior lighting
- Light indicator for white goods

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
STP04CM05	Linear	SW/PWM signaling	20V (example 5 green LEDs)	4	Series/parallel	3.3-5.5	20	400	-	TSD	SPI	CL TR
MARKETS LEGEND						CL COMMERCIAL LIGHTING	FL FLASHLIGHTS	TR TRANSPORTATION	BL BACKLIGHTING	SI SIGNAGE		

*Diagnostic capabilities: TSD: Thermal shutdown



STP04CM05 typical application diagram

15W TRIAC Dimmable LED Driver Based on L6562A

The L6562A is the latest proposal for power factor correction. The application note AN2711 presents a 15W driver for LEDs, based on single stage fly-back PFC, that is compatible with TRIAC phase-control dimmers. The design gives luminaire manufacturers a low-cost, commonly available dimming option for home fixtures. An additional benefit is that when not wired to a dimmer, the unit's power factor is over 0.9. This solution is scalable up to 60W.



Features ▶

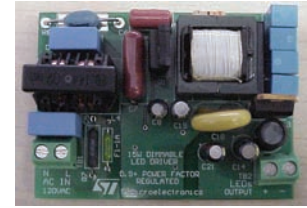
- High efficiency >87%
- No large electrolytic capacitor
- Able to meet FCC class B
- High power factor >0.9

Benefits ▶

- Solution compatible with common TRIAC dimmers
- Small form factor
- Scalable up to 60W

Applications ▶

- Downlight
- Dimmable ballast replacement
- Chandelier



STEVAL-ILL016V1 evaluation board

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
STEVAL-ILL016V1	Evaluation board	TRIAC dimmable	8 (1W)	2	Series/parallel	120 VAC	36V	350	87	-	-	CL

MARKETS LEGEND CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE



ST LED Evaluation Boards

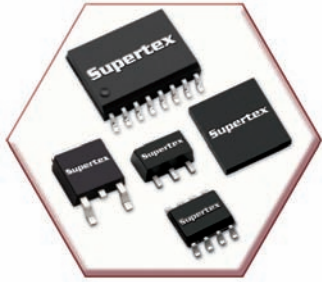
ST Board Order Code	LED Board Description
STEVAL-ILL001V1	Dimmable driver for HB power LEDs with Viper22A (DALI connector)
STEVAL-ILL002V3	HB-LED with diagnostic (40 LED) based on STP08DP05
STEVAL-ILL002V4	HB-LED with diagnostic (40 LED) based on STP08DP05
STEVAL-ILL003V1	HB-LED without diagnostic (32 LED) based on STP16CP596
STEVAL-ILL003V2	HB-LED without diagnostic (32 LED) based on STP16CP05
STEVAL-ILL005V1	VIPer12A offline, constant-current driver for high-intensity LEDs
STEVAL-ILL006V1	VIPer22A offline, constant-current driver for high-intensity LEDs
STEVAL-ILL007V1	High intensity LED driver for MR-16 format based on L5973D
STEVAL-ILL008V1	LED flashlight demo
STEVAL-ILL009V3	OSTAR projection module
STEVAL-ILL009V4	OSRAM DRAGON LEDs module
STEVAL-ILL009V5	New RGB color control board based on STP04CM05 and ST1S10
STEVAL-ILL010V1	High-intensity LED dimming driver based on L6902
STEVAL-ILL014V1	Constant-current controller for high brightness LEDs based on STCS1
STEVAL-ILL015V1	HB-LED driver with diagnostic based on STP24DP05 and STM32
STEVAL-ILL016V1	15W offline TRIAC dimmable LED driver based on L6562AD and TSM1052 (USA Market-115V)
STEVAL-ILL018V1	OSRAM Golden DRAGON white LED module (LUW W5AM)
STEVAL-ILL018V2	OSRAM Golden DRAGON warm white LED module (LCW W5AM)
STEVAL-ILL018V3	OSRAM Golden DRAGON amber (red) LED module (LA W55M)
STEVAL-ILL018V4	OSRAM Golden DRAGON blue LED module (LB W55M)
STEVAL-TLL001V1	White LED controller based on STLD40D
STEVAL-TLL002V1	Flash driver based on STCF01
STEVAL-TLL003V1	Power Flash driver based on STCF02
STEVAL-TLL004V1	Power Flash driver based on STCF03
STEVAL-TLL005V1	Power Flash evaluation board based on STCF03 and ST7 MCU (include the STEVAL-TLL004V1)

Arrow Electronics Lighting Group

1.888.9LIGHT1

<http://lighting.arrow.com>

Supertex inc. LED Drivers



Supertex offers an extensive line of high-performance LED driver ICs for solid-state lighting applications, including general illumination, LCD screen backlighting, building, street, automotive, and decorative lighting. Our LED driver ICs range from simple, low-cost linear regulators to feature-rich switching regulators configured in buck, boost, buck-boost, and SEPIC topologies. These LED driver ICs offer high efficiency, excellent LED current matching, very low noise, and a wide dimming range. In addition, they have a very wide input voltage range and multiple output capabilities in the smallest footprints.

Features ▶

- DC to 450V input range
- PWM, linear, and phase dimming
- Low harmonic distortion
- Small size

Benefits ▶

- Supports universal AC
- Supports TRIAC-based phase dimming
- Power-factor correction
- Integrated protection features
- Minimum number of external components

Applications ▶

- Traffic signals
- Automotive lighting
- Backlighting for LCD displays
- Offline lamps and fixtures
- Street lighting

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/ String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities	Interface	Markets
AT9933	Cuk	PWM	Configurable	1	Series	9-75	Configurable	Ext. FET	>80	-	-	TR
HV9930		PWM	Configurable	1	Series	8-200	Configurable	Ext. FET	>80	-	-	CL BL SI
CL2	Linear	-	1-30	1	Series/parallel	5-90	5-90	20	-	-	-	CL
CL25		-	1-30	1	Series/parallel	5-90	5-90	25	-	-	-	CL
CL320		Ext. PWM	1-30	3	Series/parallel	5-90	4-90	20	-	-	Independent enable	CL BL
CL325		Ext. PWM	1-30	3	Series/parallel	5-90	4-90	25	-	-	Independent enable	CL BL
CL330		Ext. PWM	1-30	3	Series/parallel	5-90	4-90	35	-	-	Independent enable	CL BL
CL520		-	1-30	1	Series/parallel	4.75-90	1-90	20	-	-	-	CL BL
CL525		-	1-30	1	Series/parallel	4.75-90	1-90	25	-	-	-	CL BL
CL6		-	1-30	1	Series/parallel	6.5-90	90	100	-	-	-	CL
CL7		Ext. PWM	1-30	1	Series/parallel	6.5-90	4-90	100	-	-	EN	CL
HV9903		Boost	PWM/linear	1-8	1	Series	1.8-12.5	<35	5-40	>90	-	-
HV9910B	Buck	PWM/linear	Any	1	Series	8-450	<0.8* V _{IN}	Ext. FET	>90	-	-	CL BL SI
HV9919		PWM/linear	Any	1	Series	4.5-40	<0.8* V _{IN}	Ext. FET	>90	-	-	CL SI
HV9921		-	4-20	1	Series	20-400	12-80	20	>80	-	-	CL
HV9922		-	4-20	1	Series	20-400	12-80	50	>80	-	-	CL
HV9923		-	4-20	1	Series	20-400	12-80	30	>80	-	-	CL
HV9925		PWM	4-20	1	Series	20-400	12-80	20-50	>80	-	-	CL
HV9980		PWM/linear	Configurable	3	Series	20-200	Configurable	70	>85	-	-	CL BL SI
HV9911		Boost/buck/ SEPIC	PWM/linear	Configurable	1	Series	9-250	Configurable	Ext. FET	>90	-	-
HV9912	PWM/linear		Configurable	1	Series	9-100	Configurable	Ext. FET	>90	-	-	CL BL SI
HV9982	PWM/linear		Configurable	3	Series	10-40	Configurable	Ext. FET	>90	-	-	CL BL
HV9931	Buck-boost-buck	PWM/phase	1-50	1	Series	8-450	2-200	Ext. FET	>80	-	-	CL

MARKETS LEGEND

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Linear and Switchmode LED Drivers

The TPS40211 is a wide-input voltage (4.5V to 52V), non-synchronous boost LED driver. It is suitable for boost, flyback, and SEPIC topologies. Current mode control provides improved transient response and simplified loop compensation. It is capable of driving 3A constant current for HB-LEDs.



Features ▶

- Input voltage: 4.5V to 52V
- Flexible output voltage
- 260 mV Isense voltage
- Switching upto 500 kHz
- 8V LDO for external μ C

Benefits ▶

- Select appropriate topology based on system needs
- Select external components to fit application
- Drive long series of HB-LEDs from low input voltage

Applications ▶

- Automotive headlamp
- Industrial portable lighting
- Channel lighting
- Architectural lighting



TPS40211 wide-input voltage boost controller

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
TPS40211	Boost/flyback/SEPIC	PWM	>20	4	Series	4.5-52	8->150	<3,000	90	Overcurrent, overtemp	PWM signal	FL TR
TPS75105	Linear	PWM	1	4	Parallel	2.7-5.5	$V_{in}-27$ mV	25	83	Overcurrent, overtemp	PWM signal	BL
TPS60250	Boost	PWM	1	7	Parallel	2.7-6.5	6	125	85	Overcurrent, overvoltage, overtemp	I ² C	FL TR BL
TPS61042		PWM	7	1	Series	1.8-6.0	36	500	85	Overtemp, overvoltage	PWM signal	FL TR BL
TPS61050		Digital	1	1	–	2.5-6.0	$V_{in}-5.5V$	1,200	96	TSD/LOD	I ² C	FL
TPS61062		PWM	6	1	Series	2.7-6.0	30	400	81	Overtemp, overvoltage	PWM signal	FL TR BL
TPS61081		PWM	6	1	Series	2.7-6.0	27	1,300	87	Overtemp, overvoltage	PWM signal	FL TR BL
TPS61087		PWM	4	1	Series	2.5-6.0	$V_{in}+0.5V-18.5V$	3,200	>90	TSD	PWM signal	CL FL
TPS61200		PWM	1	1	Series	0.3-5.5	5.5	1,500	91	Overtemp, overvoltage	PWM signal	FL TR BL
TPS61500		PWM, analog	10	1	Series	2.9-18	$V_{in}-38V$	3,000	93	Overvoltage	PWM signal	BL
TPS61140		On/off	6	2	2x series	3.0-6.0	24	700	85	Overtemp, overvoltage	PWM signal	FL TR BL
TPS61150/51		On/off, analog	8	2	2x series	3.0-6.0	2x36	700	85	Overtemp, overvoltage	PWM signal/resistor	FL TR BL
TPS61160/61		Digital, analog	6	1	Series	2.7-18	26	700	87	Overtemp, overvoltage	Easy scale/PWM signal	FL TR BL
TPS61165		Digital, analog	7	1	Series	2.7-18	38	1,200	87	Overtemp, overvoltage	Easy scale/PWM signal	FL TR BL
TPS61180/81/82		Digital, analog	10	6	Parallel	5.0-24	40	1,500	90	Overcurrent, overvoltage, overtemp	Easy scale/PWM signal	FL TR BL
TPS63000		Buck-boost	PWM	1	1	Series	5.5-1.8	5.5-1.2	1,800	96	Load disconnect, overtemp	PWM signal
TPS63030	–		1	1	–	1.8-5.0	1.2-5.5	800	96	TSD	PWM signal	FL

MARKETS LEGEND

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*Diagnostic capabilities: TSD: Thermal shutdown, LOD: LED open detection



This Arrow sponsored Texas Instruments Analog eLab™ Videocast series partners with Cree, a leader in high-brightness and lighting-class LEDs, and focuses on solid-state lighting along with specific applications like solar powered lighting, cove lighting, and MR16 lamp replacement. Visit www.arrow.com/TIeLabsCree for the latest video; there will be a new videocast launched each week.



TLC59xxx Family of Linear LED Drivers

TLC59xxx devices offer up to 1 percent channel-to-channel and 3 percent chip-to-chip current regulation accuracy. The serial data input devices can run up to speeds of 30 MHz. The speed of the image display can be improved by these devices quick turn on and turn off time. Also, note the small amount of voltage headroom over the LEDs V_F to bias the internal linear element.



TLC5942 offers separate control lines for analog and digital dimming

Features ▶

- TLC59116–I²C interface with group dimming and blinking
- TLC5916/17–simple global dimming
- TLC5923–channel-to-channel dimming
- TLC5924–removes ghosting from multiplexed displays

Benefits ▶

- TLC5940–on-chip storage of analog dimming values
- TLC5941–lower cost TLC5941
- TLC5942–greater control over PWM and analog dimming
- TLC5943–high-resolution PWM dimming
- TLC5945–best for high-speed video

Applications ▶

- Full-motion RGB video wall displays
- Gaming
- Electronic billboard advertisement
- Large panel LCD backlighting units
- Professional lighting

Product Specifications ▶

Part Number	Type	Dimming Type	Number of LEDs/String	Number of Strings	Configuration	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Peak Efficiency (%)	Diagnostic Capabilities*	Interface	Markets
TLC59116	Linear	PWM/analog	4	16	Series/parallel	3.3-5	17	100	–	TSD/LOD	I ² C	CL TR BL SI
TLC5916		Analog	4	8	Series/parallel	3.3-5	17	120	–	TSD/TEF/LOD	Serial	CL TR BL SI
TLC5917		Analog	4	8	Series/parallel	3.3-5	17	120	–	TSD/TEF/LOD	Serial	CL TR BL SI
TLC5923		Analog	4	16	Series/parallel	3.0-5.5	17	80	–	OVM/TSD/LOD	Serial	CL TR BL SI
TLC5924		Analog	4	16	Series/parallel	3.0-5.5	17	80	–	OVM/TSD/LOD	Serial	CL TR BL SI
TLC5940		PWM/analog	4	16	Series/parallel	3.0-5.5	17	120	–	TSD/LOD	Serial	CL TR BL SI
TLC5941		PWM/analog	4	16	Series/parallel	3.0-5.5	17	80	–	TSD/LOD	Serial	CL TR BL SI
TLC5942		PWM/analog	4	16	Series/parallel	3.0-5.5	17	50	–	TSD/LOD	Serial	CL TR BL SI
TLC5943		PWM/analog	4	16	Series/parallel	3.0-5.5	17	50	–	TSD/LOD	Serial	CL TR BL SI
TLC5945		PWM/analog	4	16	Series/parallel	3.0-5.5	17	80	–	TSD/LOD	Serial	CL TR BL SI
TLC5946	PWM/analog	4	16	Series/parallel	3.0-5.5	17	40	–	TSD/LOD	Serial	CL TR BL SI	

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*Diagnostic capabilities: TSD: Thermal shutdown, TEF: Thermal error flag, OVM: Output voltage monitoring, LOD: LED open detection



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Fast and Connected ARM7® for Lighting Control Systems



NXP Semiconductors' newest entry in a growing line of ARM7® microcontrollers is a perfect fit for "Connected Lighting Controller" applications. NXP combines the high-performance connectivity of a dual-AHB architecture, enlightened combinations of peripherals (Ethernet, USB OTG, and CAN) with unique, fast, and deterministic I/O ports. With the embedded Ethernet MAC and the feature-rich serial ports, designers can use the LPC24xx as a bridge from IP to DMX512. The fast I/O ports are perfect for software-based PWM intensity control of light sources. Add an external LCD controller and gain the potential for a cost-effective touchscreen lighting scene controller.

Features ▶

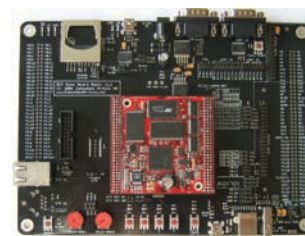
- 72 MHz, 32-bit ARM7TDMI-S with dual-AHB buses and DMA
- Fast I/O suitable for bit-banging PWM outputs at up to 17.5 MHz
- 10/100 Ethernet MAC interface with DMA and MII/RMII interface
- Wide range of peripherals, including CAN, I²S, ADC, and PWM

Benefits ▶

- Dual buses with DMA allow concurrent transactions to get the most performance possible
- External interfaces provide flexibility regarding peripherals and memory
- Give customers the flexibility of lighting control with Ethernet

Applications ▶

- Architectural or landscape lighting
- Signage and gaming
- DMX512-to-Ethernet bridges



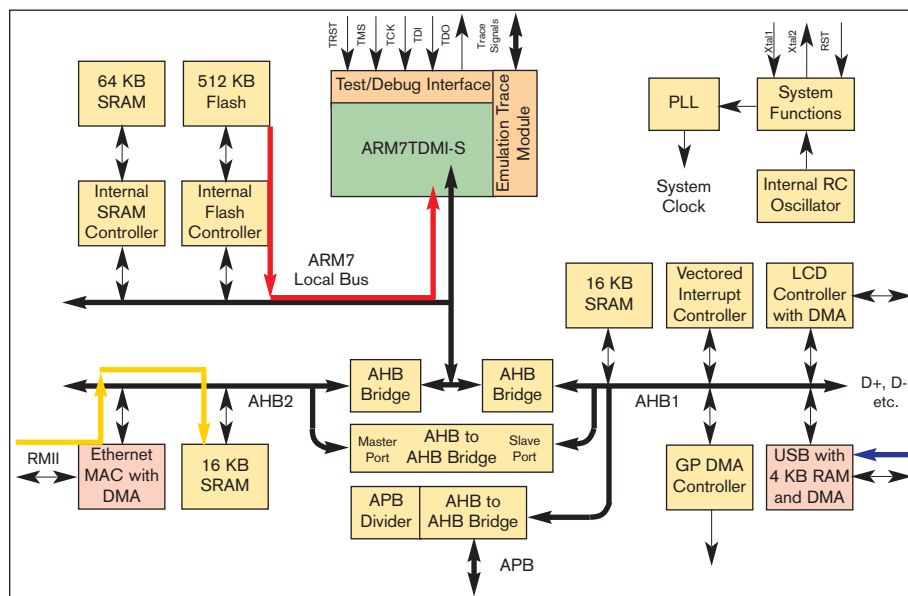
LPC2468 demo board (OM10010)

Product Specifications ▶

Part Number	Type	PWM Ch. (#)/ Res. (bits)	Flash (KB)	RAM (KB)	ZigBee® Enabled (Y/N)	Core Supply (V)	IO Supply (V)	I ² C/Ch. (#)	UART/Ch. (#)	SPI/Ch. (#)	Operating Temperature (°C)	Markets
LPC2460	General purpose ARM7® microcontroller with Ethernet, USB, and CAN	HW: 2 PWM/4 timers SW: Scalable	-	98	N	3.0-3.6	3.0-3.6	3	4	3	-40 to +85	CL TR BL SI
LPC2468		HW: 2 PWM/4 timers SW: Scalable	512	98	N	3.0-3.6	3.0-3.6	3	4	3	-40 to +85	CL TR BL SI

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Development software required



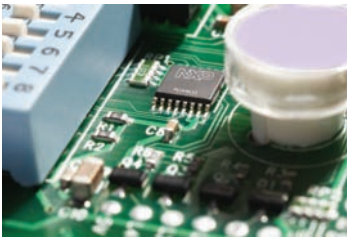
Two AHB buses with three DMA engines allow concurrent transactions for high performance





I²C LED Color Controllers

NXP Semiconductors offers a wide-variety of LED color controllers based on the I²C control bus. I²C provides easy connectivity while the integrated PWMs provide smooth color control. Drive quickly changing displays with the new PCA963x when using the fast-mode plus I²C protocol for I²C speeds up to 1 MHz and 10x the drive on the I²C bus for large networks. Set each LED to a specific brightness and dim or blink all of them with the same value. Special I²C command features optimize I²C bus commands in multi-LED control applications.



Color-mixing RGB LED drivers for mobile, entertainment, and architectural lighting

Features ▶

- I²C provides a software scalable architecture; many devices allow 126 nodes on a single bus
- Each output provides up to 25 mA of sink current and 5V tolerant outputs
- 8-bit PWMs on all devices with the PCA963x devices providing an 8-bit global PWM
- Small packages available including SO, TSSOP/MSOP, HVQFN, and HVSON
- New "sub call" command in the PCA963x devices

Benefits ▶

- Easily connects nodes in a multi-drop configuration
- High sink current, 5V tolerance is suitable for driving large transistors or constant-current sources
- 256 levels of brightness control on all devices with the PCA963x devices providing 256 levels of global brightness or blinking
- Small packages allow use in portable applications or space-constrained lighting modules
- Controls color of all devices (or four groups of devices) with a single I²C command sequence (PCA963x devices)

Applications ▶

- Architectural or landscape lighting
- Signage and gaming
- LCD backlights
- LCD or keypad backlights
- Hands-free device status indicators

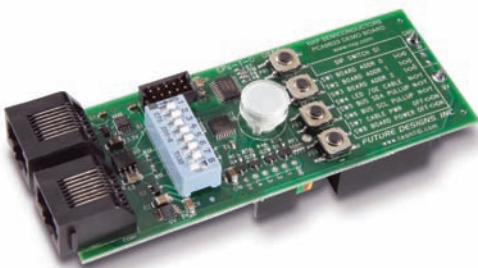
Product Specifications ▶

Part Number	Type	PWM Ch. (#)/ Res. (bits)	Flash (KB)	RAM (KB)	ZigBee® Enabled (Y/N)	Core Supply (V)	IO Supply (V)	I ² C/Ch. (#)	UART/Ch. (#)	SPI/Ch. (#)	Operating Temperature (°C)	Markets
PCA9530	I ² C LED dimmer 2 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9531	I ² C LED dimmer 8 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9532	I ² C LED dimmer 16 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9533	I ² C LED dimmer 4 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9550	I ² C LED blinker 2 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9551	I ² C LED blinker 8 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9552	I ² C LED blinker 16 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9553	I ² C LED blinker 4 outputs	2/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9633	I ² C LED color controller-4 outputs 1 MHz fast-mode plus	4/8 + global/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9634	I ² C LED color controller-8 outputs 1 MHz fast-mode plus	8/8 + global/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI
PCA9635	I ² C LED color controller-16 outputs 1 MHz fast-mode plus	16/8 + global/8	-	-	N	2.3-5.5	5.5	1	-	-	-40 to +85	CL TR BL SI

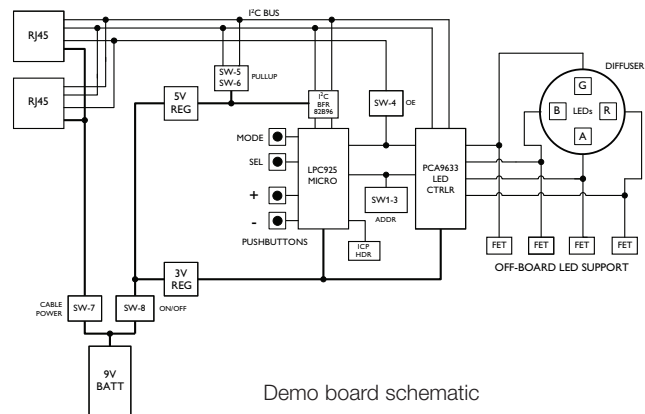
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Development software required



The PCA9633 demo board drives and mixes four LED colors (RGBA) to easily demonstrate networked I²C for signage and architectural lighting applications; order number OM6276



Demo board schematic

ZigBee® Wireless Lighting Control

ZigBee® is a standard for low-power wireless mesh networks intended for monitoring and control. This makes ZigBee an ideal solution for lighting systems and enables users to fully control all lights and reduce energy costs. The ZigBee technology can be used in a number of application areas including home lighting, commercial lighting, industrial lighting, and street lighting.



Features ▶

- Low-power wireless mesh network
- Open global standard
- Based on well-known IEEE 802.15.4 specification
- Over air download

Benefits ▶

Low-Power Wireless Mesh Network

- Reliable and robust self-healing wireless network
- Ideal for battery-operated devices
- Easily extendable

Open Global Standard

- Multiple vendors with certified ZigBee® stacks available
- Standardized installation
- Suitable both for private networks and networks that require interoperability

Based on IEEE 802.15.4 Specification

- Excellent co-existence with Bluetooth® and Wi-Fi™
- Very small footprint for radios and system-on-chips
- A standardized radio ensures low-cost solutions
- Over air download: firmware can be upgraded in the field

Applications ▶

- General lighting control
- Home and building automation
- Industrial monitoring and control
- Sensor networks
- Meter reading

Product Specifications ▶

Part Number	Type	Input Voltage (V)	Over Air Data Rate (kbps)	Data Throughput (kbps)	Frequency (Hz)	Power Consumption	Range (Meters)	System Resources (KB)	Markets
CC2520	Transceiver	1.8-3.6	250	40-150	2,394 MHz-2,507 MHz	RX: 18.5 mA/sleep: <1 uA	10-400	2x 128 byte RX/TX FIFOs	CL
CC2430	System-on-chip	2.0-3.6	250	40-150	2,400 MHz-2,483 MHz	RX: 27 mA/sleep: <1 uA	10-100	4+4 kB SRAM/128 kB Flash	CL
CC2480	Network processor	2.0-3.6	250	40-150	2,400 MHz-2,483 MHz	RX: 27 mA, sleep: <1 uA	10-100	-	CL

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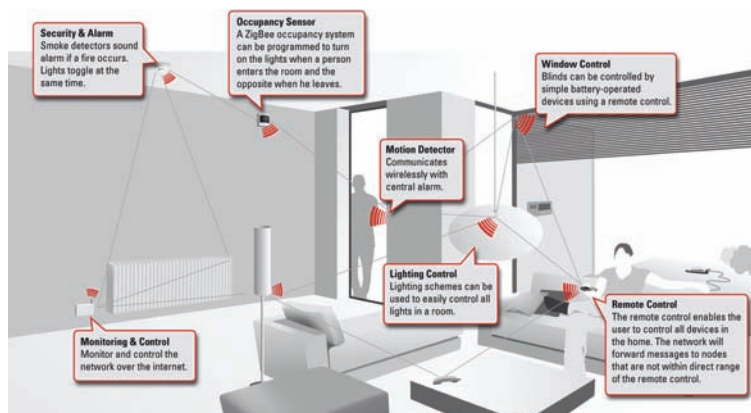
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Software ▶

In addition to hardware, TI offers a ZigBee® and ZigBee Pro compliant ZigBee protocol stack, the Z-Stack. We offer the full ZigBee stack free of charge: Z-Stack version 2.1.0, including Home Automation Profile

Development Tools

Part Number	Development Tool
CC2520	CC2520DK
CC2430	CC2430ZDK
CC2480	eZ430-RF2480



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TMS320C2000™ High-Performance 32-bit Microcontrollers

C2000 MCUs can control not only the power stage, but regulate LED currents as well, eliminating the need for multiple controllers and reducing system cost. On-chip control peripherals allow accurate voltage and current regulation for precise light intensity and color mixing, temperature monitoring to prevent thermal runaway, intelligent/adaptive dimming, and fault detection (over voltage/current, blown string). C2000 also enables communication with external systems via power-line communication (PLC) or wireless technology, and interfaces with other devices via on-chip serial communication peripherals.



Features ▶

- 40 MHz to 150 MHz C28x core
- 32 KB to 512 KB Flash, 12 KB to 68 KB RAM
- Up to 16 hi-res PWM channels with 150 ps resolution
- 12-bit ADC with up to 16 ADC channels and 12.5 MSPS
- SPI, SCI, CAN, I²C, McBSP, and XINT

Benefits ▶

- Single controller simplifies design and reduces cost
- Precise LED lighting control
- Increased flexibility and additional functionality through software
- Communication with external systems and devices

Applications ▶

- LED street lighting
- LED backlighting
- LED displays
- Automobile lights

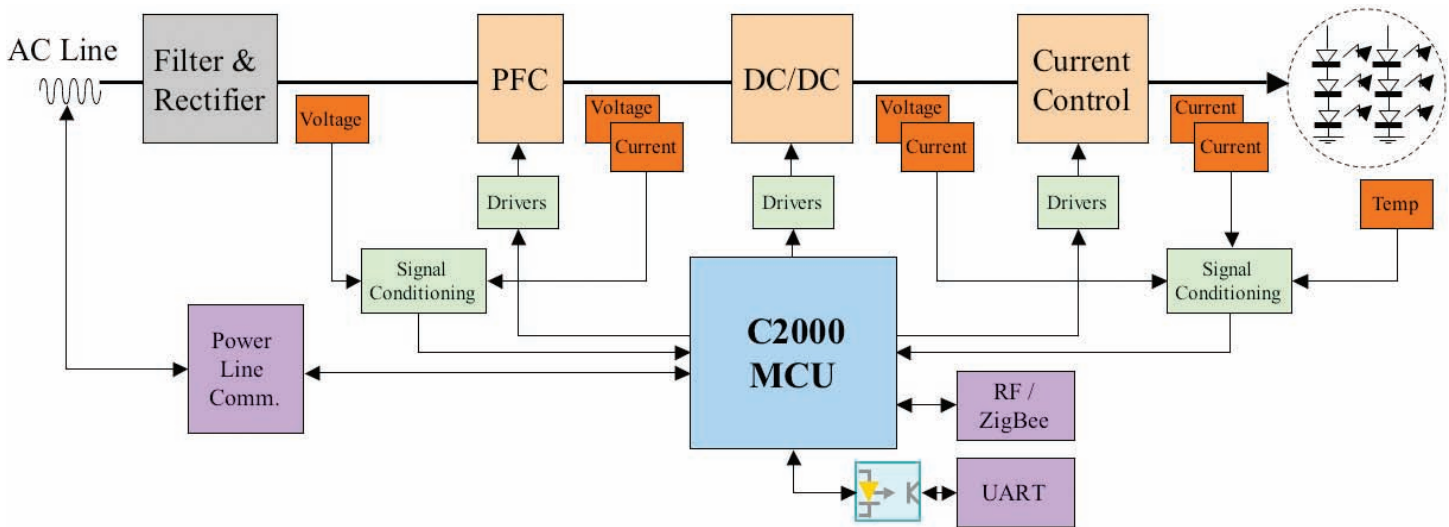
Product Specifications ▶

Part Number	Type	PWM Ch. (#)/Res. (bits)	Flash (KB)	RAM (KB)	ZigBee® Enabled (Y/N)	Core Supply (V)	IO Supply (V)	I ² C/Ch. (#)	UART/Ch. (#)	SPI/Ch. (#)	Operating Temperature (°C)	Markets
TMS320F28023	38 TSSOP/48 LQFP	8/15	64	12	N	1.8	3.3	1	1	1	-40 to +125	CL TR BL SI
TMS320F28027		8/15	64	12	N	1.8	3.3	1	1	1	-40 to +125	CL TR BL SI
TMS320F28035	64 TQFP/80 LQFP	14/15	128	20	N	1.8	3.3	1	2	2	-40 to +125	CL TR BL SI
TMS320F2808	100 LQFP/100 BGA	16/15	128	36	N	1.8	3.3	1	4	3	-40 to +125	CL TR BL SI

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C2000 LED Lighting SBD



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Lumidrives Lenses

Dialight's standard lenses and lens kits, drivers, and light engines allow designers to develop real-world, solid-state lighting solutions with minimal design effort. Lens styles with multiple radiation patterns accommodate all leading manufacturers of LEDs and are complemented by intelligent constant-current drivers, as well as light engines in circular or linear styles.

Dialight

Features ▶

- Designed for HB-LEDs from all leading manufacturers
- Multiple radiation patterns—narrow, medium, wide spot, and oval distribution
- Available in kit or individual form

Benefits ▶

- Precise location over LED for maximum light transmission
- Easy-to-apply self-adhesive lens
- Snap-on secondary lenses provide medium, wide, and oval beam distribution

Applications ▶

- Machine and task lighting
- Architectural and theme lighting
- Portable lighting
- Equipment illumination

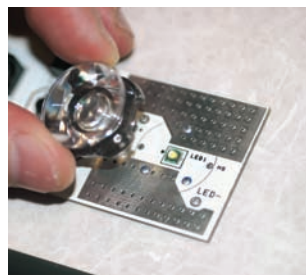


Product Specifications ▶

Part Number	Type	LED Type	Distribution Type	Material Type	Distribution Angle (θ)	Attachment Method	Optical Holder (V/N)	Max. Operating Temp. (°C)	Markets
OPTX-1-006	Secondary	CreeXLamp	Spot	PMMA acrylic	12	Self-adhesive	N	105	CL FL TR SI
OPGD-1-002		OSRAM Golden DRAGON	Spot	PMMA acrylic	4	Self-adhesive	N	105	CL FL TR SI
OPK2-1-003		Luxeon 1W, 3W, 5W/K2	Spot	PMMA acrylic	6	Self-adhesive	N	105	CL FL TR SI
OPC1-1-SPOT		Luxeon Rebel*	Spot	PMMA acrylic	5	Self-adhesive	N	120	CL FL TR SI
OPC1-1-MED		Luxeon Rebel	Medium	PMMA acrylic	8	Self-adhesive	N	120	CL FL TR SI
OPC1-1-WIDE		Luxeon Rebel	Wide	PMMA acrylic	20	Self-adhesive	N	120	CL FL TR SI
OPC1-1-OVAL		Luxeon Rebel	Oval	PMMA acrylic	8 x 25	Self-adhesive	N	120	CL FL TR SI
OPC1-1-SDIF		Luxeon Rebel	Frosted spot	PMMA acrylic	7	Self-adhesive	N	120	CL FL TR SI
OPC1-1-COL-SP		Luxeon Rebel	Spot	PMMA acrylic/metallized	7	Self-adhesive	N	120	CL FL TR SI
OPC1-1-COL-WD		Luxeon Rebel	Wide	PMMA acrylic/metallized	13	Self-adhesive	N	120	CL FL TR SI
OPXP-1-SPOT		Cree XP	Spot	PMMA acrylic	5	Self-adhesive	N	120	CL FL TR SI
OPXP-1-MED		Cree XP	Medium	PMMA acrylic	8	Self-adhesive	N	120	CL FL TR SI
OPXP-1-WIDE		Cree XP	Wide	PMMA acrylic	20	Self-adhesive	N	120	CL FL TR SI
OPXP-1-OVAL		Cree XP	Oval	PMMA acrylic	8 x 25	Self-adhesive	N	120	CL FL TR SI
OPXP-1-SDIF		Cree XP	Frosted spot	PMMA acrylic	7	Self-adhesive	N	120	CL FL TR SI
OPAA-1-DF		Tertiary	CreeXLamp	Medium	PMMA acrylic	16	Clip onto self-adhesive	N	105
OPAA-1-WSL	CreeXLamp		Wide	PMMA acrylic	32	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-OSL	CreeXLamp		Oval	Polycarbonate	16 x 50	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-DF	OSRAM Golden DRAGON		Medium	Polycarbonate	10	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-WSL	OSRAM Golden DRAGON		Wide	Polycarbonate	30	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-OSL	OSRAM Golden DRAGON		Oval	PMMA acrylic	8 x 54	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-DF	Luxeon 1W, 3W, 5W/K2, Seoul Semiconductor		Medium	PMMA acrylic	12	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-WSL	Luxeon 1W, 3W, 5W/K2, Seoul Semiconductor		Wide	PMMA acrylic	24	Clip onto self-adhesive	N	105	CL FL TR SI
OPAA-1-OSL	Luxeon 1W, 3W, 5W/K2, Seoul Semiconductor		Oval	PMMA acrylic	8 x 54	Clip onto self-adhesive	N	105	CL FL TR SI

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CREE XP optic — adhesive backed system



Innovative Optical Solutions for Maximizing Light

Fraen Corporation's Optical Manufacturing Group (Fraen OMG) develops, designs, and manufactures optical solutions for high-powered LEDs. Fraen is a leading provider of both standard off-the-shelf optical solutions as well as complex, custom-developed systems for our customers.



Features ▶

- High-efficiency TIR and reflector solutions
- Wide variety of optic types, beam patterns, and sizes for the leading high-powered LEDs
- Illumination data available for luminaire development
- Range of optic mounting features available
- Design methodology allows for customization

Benefits ▶

- Specialization in custom solutions for complex lighting requirements
- Global manufacturing and sales support
- Refined design and development process
- Prototyping and pre-production capabilities

Applications ▶

- Architectural lighting
- Street lights
- Portable lighting
- Emergency lighting
- General illumination (MR11, MR16, and downlights)

Product Specifications ▶

Part Number	Type	LED Type	Distribution Type	Material Type	Distribution Angle (θ)	Attachment Method	Optical Holder (V/N)	Max. Operating Temp. (°C)	Markets
FC-N2-XR79-ZZ	Secondary	Cree XR-E 7090 LED	Narrow beam	Optical grade PMMA	8	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FC-M2-XR79-ZZ		Cree XR-E 7090 LED	Medium beam	Optical grade PMMA	21	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FC-W2-XR79-ZZ		Cree XR-E 7090 LED	Wide beam	Optical grade PMMA	29	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FC-E2-XR79-ZZ		Cree XR-E 7090 LED	Elliptical beam	Optical grade PMMA	8 x 44	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FCP-N1-XPE1-ZZ		Cree XP-E LED	Narrow beam	Optical grade PMMA	10	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FCP-M1-XPE1-ZZ		Cree XP-E LED	Medium beam	Optical grade PMMA	21	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FCP-W1-XPE1-ZZ		Cree XP-E LED	Wide beam	Optical grade PMMA	27	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FCP-E1-XPE1-ZZ		Cree XP-E LED	Elliptical beam	Optical grade PMMA	10 x 50	Holder can be glued to PCB	zz=OR or HRF	80	CL FL TR BL SI
FCT3-N2-XR79-ZZZZ		Cree XR-E 7090 LED	Narrow beam	Optical grade PMMA	8	Holder can be glued to PCB	ZZZZ=HRLC or HRCN	80	CL FL TR BL SI
FCT3-M2-XR79-ZZZZ		Cree XR-E 7090 LED	Medium beam	Optical grade PMMA	21	Holder can be glued to PCB	ZZZZ=HRLC or HRCN	80	CL FL TR BL SI
FCT3-W2-XR79-ZZZZ		Cree XR-E 7090 LED	Wide beam	Optical grade PMMA	29	Holder can be glued to PCB	ZZZZ=HRLC or HRCN	80	CL FL TR BL SI
FCG-N1-XR79-ZZ		Cree XR-E 7090 LED	Narrow beam	Optical grade PMMA	6	Holder can be heat staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FCG-M1-XR79-ZZ		Cree XR-E 7090 LED	Medium beam	Optical grade PMMA	28	Holder can be heat staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FCG-W1-XR79-ZZ		Cree XR-E 7090 LED	Wide beam	Optical grade PMMA	50	Holder can be heat staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FCG-E1-XR79-ZZ		Cree XR-E 7090 LED	Elliptical beam	Optical grade PMMA	7 x 45	Holder can be heat staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FC3-N1-XR79-H		Cree XR-E 7090 LED	Narrow beam	Optical grade PMMA	6	Holder can be heat staked to PCB	N	80	CL FL TR BL SI
FC3-M1-XR79-H		Cree XR-E 7090 LED	Medium beam	Optical grade PMMA	28	Holder can be heat staked to PCB	N	80	CL FL TR BL SI
FC3-W1-XR79-H		Cree XR-E 7090 LED	Wide beam	Optical grade PMMA	50	Holder can be heat staked to PCB	N	80	CL FL TR BL SI
FNP-N1-N083-ZZ		Nichia 083 Rigel LED	Narrow beam	Optical grade PMMA	10	Holder can be glued to PCB	zz=OR or HR	80	CL FL TR BL SI
FNP-M1-N083-ZZ		Nichia 083 Rigel LED	Medium beam	Optical grade PMMA	27	Holder can be glued to PCB	zz=OR or HR	80	CL FL TR BL SI
FNP-W1-N083-ZZ	Nichia 083 Rigel LED	Wide beam	Optical grade PMMA	40	Holder can be glued to PCB	zz=OR or HR	80	CL FL TR BL SI	
FNP-E1-N083-ZZ	Nichia 083 Rigel LED	Elliptical beam	Optical grade PMMA	13 x 42	Holder can be glued to PCB	zz=OR or HR	80	CL FL TR BL SI	
FRC-N1-0E2B-0	Reflector	Cree XR 7090 LED	Narrow beam	Ultem	11	Holder can be glued to PCB	N	150	CL FL TR BL SI
FRC-N1-XR79-OR		Cree XR 7090 LED	Narrow beam	PC	7	Holder can be glued to PCB	N	120	CL FL TR BL SI
FRC-N1-MCE-OR		Cree MC-E LED	Narrow beam	PC	13.5	Holder can be glued to PCB	N	120	CL FL TR BL SI
FRC-M1-MCE-OR		Cree MC-E LED	Medium beam	PC	32	Holder can be glued to PCB	N	120	CL FL TR BL SI
FRC-W1-MCE-OR		Cree MC-E LED	Wide beam	PC	45+	Holder can be glued to PCB	N	120	CL FL TR BL SI
FXGR-N1-XR79-OR		Cree XR-E 7090 LED	Narrow beam** Focusing component A	PC	6	See datasheet for mechanical instructions	N	120	CL FL TR BL SI
FXGR-W1-XR79-OR		Cree XR-E 7090 LED	Wide beam** Focusing component B	PC	60	See datasheet for mechanical instructions	N	120	CL FL TR BL SI
FXGL-VN-XR79-OR		Lens	Cree XR-E 7090 LED	Focusing lens	Optical grade PMMA	8-12 degrees	Application specific	N	80

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Distribution angle changes with LED color (see product datasheets); FWHM=full beamwidth measured at one-half of peak intensity; some lenses can be ordered either alone, or with a spacer ring, or assembled with a holder; spacers must be ordered separately (when required); OS: lens only; OR: lens only; HS: square flange with holder; HR: round flange with holder; HST: square flange with transparent holder; HRF: round holder with flat bottom; If using FDG lens without holder, a spacer ring (p/n FDS-0S) is required and must be ordered separately. See Fraen datasheet for more details. **Parts must be used with one another in order to obtain the focusing results stated on the datasheet. †Beam angle is estimated from computer simulation

Innovative Optical Solutions for Maximizing Light

As one of the premier optic providers for high-powered LEDs, Fraen continues to develop leading-edge custom and standard optical components. Fraen has recently developed numerous patent-pending solutions, including optics for architectural lighting, color mixing, entertainment lighting, focusable lighting, and streetlight applications.



Features ▶

- High-efficiency TIR and reflector solutions
- Wide variety of optic types, beam patterns, and sizes for the leading high-powered LEDs
- Illumination data available for luminaire development
- Range of optic mounting features available
- Design methodology allows for customization

Benefits ▶

- Specialization in custom solutions for complex lighting requirements
- Global manufacturing and sales support
- Refined design and development process
- Prototyping and pre-production capabilities

Applications ▶

- Architectural lighting
- Street lights
- Portable lighting
- Emergency lighting
- General illumination (MR11, MR16, and downlights)



Product Specifications ▶

Part Number	Type	LED Type	Distribution Type	Material Type	Distribution Angle (°)	Attachment Method	Optical Holder (Y/N)	Max. Operating Temp. (°C)	Markets
FDP-N1-D01-ZZ	Secondary	OSRAM Golden DRAGON	Narrow beam	Optical grade PMMA	13	Holder can be heat-staked to PCB	zz=OS, HS, or HSA	80	CL FL TR BL SI
FDP-M1-D01-ZZ		OSRAM Golden/Platinum DRAGON	Medium beam	Optical grade PMMA	18	Holder can be heat-staked to PCB	zz=OS, HS, or HSA	80	CL FL TR BL SI
FDG-N1-D01-ZZ		OSRAM Golden/Platinum/Diamond DRAGON	Narrow beam	Optical grade PMMA	6.5	Holder can be heat-staked to PCB	zz=OS, HS	80	CL FL TR BL SI
FDG-M1-D01-ZZ		OSRAM Golden/Platinum/Diamond DRAGON	Medium beam	Optical grade PMMA	20.5	Holder can be heat-staked to PCB	zz=OS, HS	80	CL FL TR BL SI
FDG-W1-D01-ZZ		OSRAM Golden/Platinum/Diamond DRAGON	Wide beam	Optical grade PMMA	33.5	Holder can be heat-staked to PCB	zz=OS, HS	80	CL FL TR BL SI
FDG-E1-D01-ZZ		OSRAM Golden/Platinum/Diamond DRAGON	Elliptical beam	Optical grade PMMA	10 x 20	Holder can be heat-staked to PCB	zz=OS, HS	80	CL FL TR BL SI
FD3-N1-D01-H		OSRAM Golden/Platinum DRAGON	Narrow beam	Optical grade PMMA	10	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FD3-M1-D01-H		OSRAM Golden/Platinum DRAGON	Medium beam	Optical grade PMMA	13	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FD4-M1-D01-0		OSRAM Golden/Platinum DRAGON	Medium beam	Optical grade PMMA	21.5	Custom MR 16	N	80	CL FL TR BL SI
FSP-N1-SSP4-ZZ		Seoul Semiconductor z-power P4	Narrow beam	Optical grade PMMA	10	Holder can be heat-staked to PCB	zz=OR or HRF	80	CL FL TR BL SI
FSP-M1-SSP4-ZZ		Seoul Semiconductor z-power P4	Medium beam	Optical grade PMMA	24	Holder can be heat-staked to PCB	zz=OR or HRF	80	CL FL TR BL SI
FSP-W1-SSP4-ZZ		Seoul Semiconductor z-power P4	Wide beam	Optical grade PMMA	38	Holder can be heat-staked to PCB	zz=OR or HRF	80	CL FL TR BL SI
FSP-E1-SSP4-ZZ		Seoul Semiconductor z-power P4	Elliptical beam	Optical grade PMMA	10 x 50	Holder can be heat-staked to PCB	zz=OR or HRF	80	CL FL TR BL SI
FP3-N1-SSP4-H		Seoul Semiconductor z-power P4	Narrow beam	Optical grade PMMA	10	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FP3-M1-SSP4-H		Seoul Semiconductor z-power P4	Medium beam	Optical grade PMMA	24	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FP3-W1-SSP4-H		Seoul Semiconductor z-power P4	Wide beam	Optical grade PMMA	38	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FSG-N1-SSP4-ZZ		Seoul Semiconductor z-power P4	Narrow beam	Optical grade PMMA	6	Holder can be heat-staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FSG-M1-SSP4-ZZ		Seoul Semiconductor z-power P4	Medium beam	Optical grade PMMA	24	Holder can be heat-staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FSG-W1-SSP4-ZZ		Seoul Semiconductor z-power P4	Wide beam	Optical grade PMMA	37	Holder can be heat-staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FSG-E1-SSP4-ZZ		Seoul Semiconductor z-power P4	Elliptical beam	Optical grade PMMA	14 x 32	Holder can be heat-staked to PCB	zz=OR or HR	80	CL FL TR BL SI
FS3-N1-SSP4-H		Seoul Semiconductor z-power P4	Narrow beam	Optical grade PMMA	6	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FS3-M1-SSP4-H		Seoul Semiconductor z-power P4	Medium beam	Optical grade PMMA	24	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FS3-W1-SSP4-H		Seoul Semiconductor z-power P4	Wide beam	Optical grade PMMA	37	Holder can be heat-staked to PCB	N	80	CL FL TR BL SI
FCM-N1-SSP5-Z		Seoul Semiconductor z-power P5	Narrow beam	Optical grade PMMA	17	Holder can be heat-staked to PCB	z=0 or H	80	CL FL TR BL SI
FCM-M1-SSP5-Z		Seoul Semiconductor z-power P5	Medium beam	Optical grade PMMA	32	Holder can be heat-staked to PCB	z=0 or H	80	CL FL TR BL SI
FCM-W1-SSP5-Z		Seoul Semiconductor z-power P5	Wide beam	Optical grade PMMA	42	Holder can be heat-staked to PCB	z=0 or H	80	CL FL TR BL SI
FCM-E1-SSP5-Z	Seoul Semiconductor z-power P5	Elliptical beam	Optical grade PMMA	17 x 40*	Holder can be heat-staked to PCB	z=0 or H	80	CL FL TR BL SI	
FRC-M1-OE2B-0	Reflector	OSRAM 4-chip Ostar LED	Medium beam	Ultem	25	Holder can be glued to PCB	N	150	CL FL TR BL SI
FRC-N1-A3P7-OR		Seoul Semiconductor P7 LED	Narrow beam	PC	15	Holder can be glued to PCB	N	120	CL FL TR BL SI
FRC-M1-A3P7-OR		Seoul Semiconductor P7 LED	Medium beam	PC	29	Holder can be glued to PCB	N	120	CL FL TR BL SI
FRC-W1-A3P7-OR		Seoul Semiconductor P7 LED	Wide beam	PC	45*	Holder can be glued to PCB	N	120	CL FL TR BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE

*Distribution angle changes with LED color (see product datasheets); FWHM=full beamwidth measured at one-half of peak intensity; some lenses can be ordered either alone, or with a spacer ring, or assembled with a holder; spacers must be ordered separately (when required); OS: lens only; OR: lens only; HS: square flange with holder; HR: round flange with holder; HST: square flange with transparent holder; HRF: round holder with flat bottom; If using FDG lens without holder, a spacer ring (p/n FDS-OS) is required and must be ordered separately. See Fraen datasheet for more details. **Parts must be used with one another in order to obtain the focusing results stated on the datasheet. †Beam angle is estimated from computer simulation

Arrow Electronics Lighting Group

1.888.9LIGHT1

<http://lighting.arrow.com>



Cooling Solutions

Aavid Thermalloy is ready to guide customers through thermal design issues from concept to production with solutions that provide a competitive advantage. With a wide selection of standard products, Aavid Thermalloy provides fast access to cooling solutions for the new generation of LED light sources. Standard products are easily configured for rapid prototyping and our global footprint delivers the integrated solution cost effectively.



Extruded 637303B03000G

Features ▶

Stamping

- Lightweight
- Variety of fin configurations

Pin Fin

- Fin array allows airflow in any direction
- Compact size
- Available with pre-applied thermal tape

Extrusion

- Highly configurable
- Low thermal resistance

Benefits ▶

Stamping

- Requires minimal structural support
- Use with natural or forced convection airflow
- Can support high-volume production

Pin Fin

- Excellent forced convection cooling
- Reduced space requirement
- Simple assembly

Extrusion

- Can incorporate structural and aesthetic elements
- Cools multiple devices

Applications ▶

Stamping

- Commercial lighting
- Signals
- Transportation

Pin Fin

- Commercial lighting
- Signals
- Transportation

Extrusion

- Commercial lighting
- Signals
- Transportation

Product Specifications ▶

Part Number	Type	Shape	LED Wattage (W)	Material Type	Thermal Expansion ($10^{-6}\text{m/m/}^{\circ}\text{K}$)	Thermal Conductivity ($\text{W/m}\cdot^{\circ}\text{K}$)	Thermal Impedance ($^{\circ}\text{C/W}$)	Size L x W x H (mm)	LED Surface Area (mm^2)	Volume (mm^3)	Markets
500400B0000G	Stampings	Square	10	Al-1100	23.6	220	5.0	46 x 46 x 32	2,116	67,712	CL TR BL SI
569000B0000G		Square	9	Al-1100	23.6	220	5.5	46 x 46 x 33	2,116	69,828	CL TR BL SI
373024B00000G	Pin fin	Square	2	Al-6063	23.4	209	33.3	28 x 28 x 9	784	7,056	CL TR BL SI
371824B00000G		Square	2	Al-6063	23.4	209	31.9	35 x 35 x 7	1,225	8,575	CL TR BL SI
364424B00000G		Square	3	Al-6063	23.4	209	18.4	40 x 40 x 11	1,600	18,240	CL TR BL SI
374424B00035G	Pin fin/thermal tape	Square	2	Al-6063	23.4	209	20.3	27 x 27 x 18	729	13,122	CL TR BL SI
375024B00032G		Square	4	Al-6063	23.4	209	12.2	40 x 40 x 18	1,600	28,800	CL TR BL SI
374724B00032G		Square	3	Al-6063	23.4	209	15.3	35 x 35 x 18	1,225	22,050	CL TR BL SI
637303B03000G	Extruded sink	Square	27	Al-6063	23.4	209	1.8	76 x 76 x 57	5,776	329,232	CL TR BL SI
766203B04000G		Square	28	Al-6063	23.4	209	1.8	102 x 102 x 32	10,404	332,928	CL TR BL SI
601403B06000G		Square	51	Al-6063	23.4	209	1.0	154 x 154 x 44	23,716	1,043,504	CL TR BL SI
656053B07000G		Square	106	Al-6063	23.4	209	0.5	177 x 177 x 71	31,329	2,224,359	CL TR BL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING

FL FLASHLIGHTS

TR TRANSPORTATION

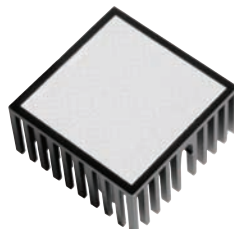
BL BACKLIGHTING

SI SIGNAGE

Contact Arrow for samples



Stamped 569000B00000G



Pin fin/thermal tape
374724B00032G



Extruded 766203B04000G

Integrated Temperature Sensors, Switches, and Fan Controllers

Texas Instruments offers high-accuracy, low-power temperature sensors specified for operation from -40 degrees Celsius to +125 degrees Celsius. Designed for cost-effective thermal management solutions, TI temperature sensors like the TMP102 feature precision for digital temperature sensors which offer +0.5 degrees Celsius (typical) true to 12-bit accuracy, and 1.4V operation in micro-packaging. The TMP300 analog temperature switch offers flexibility for PWM applications designed for reduced power dissipation. As lighting solutions increase demand for tighter thermal management and reduced power dissipation, TI temperature sensors bring performance, low power, and micro-packaging to innovative next-generation designs.

Features ▶

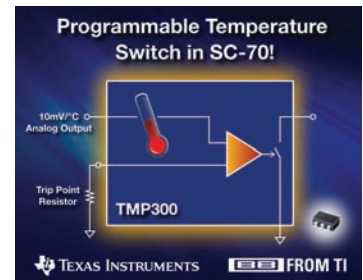
- Highest level of digital temperature sensor accuracy and wide range of package options
- Flexible programmability including over- and under-temperature thresholds, alarm functions, and measurement resolution
- Broad portfolio of digital temperature sensors, remote temperature sensors, temperature switches, and fan controllers

Benefits ▶

- Maximize power dissipation control in thermal management designs
- Increase system reliability and longevity
- Simplify design process and reduce time to market

Applications ▶

- Entertainment lighting
- Architectural lighting
- Signage
- LCD displays



TMP300 analog temperature switch

Product Specifications ▶

Part Number	Type	Description	Accuracy Over Temp. Range (°C)	Specified Temp. Range (°C)	Operating Temp. Range (°C)	Resolution (bits)	Supply Voltage (V)	Supply Current (µA)	Smallest Package	Markets
TMP100	Digital I ² C/SM bus	Digital temperature sensor	2 3	-25 to +85 -55 to +125	-55 to +125	9-12	2.7-5.5	45	SOT23-6	CL
TMP102		Ultra-low power digital temperature sensor in micro-surface-mount package	2 3	-25 to +85 -55 to +125	-55 to +150	12	1.4-3.6	7	SOT563-6	BL SI
TMP275		Ultra-high accuracy digital temperature sensor	0.5 1	+10 to +85 -40 to +125	-55 to +127	9-12	2.7-5.5	50	MSOP-8	SI
TMP75		Industry standard sensor w/2-wire interface	2.0 3.0	-25 to +85 -40 to +125	-55 to +127	9-12	2.7-5.5	50	MSOP-8	CL
TMP123	Digital SPI interface	Digital temperature sensor w/SPI interface	1.5 2	-25 to +85 -55 to +125	-55 to +150	12	2.7-5.5	35	SOT23-6	CL
TMP300	Analog switch	Comparator-output temperature switch w/additional analog output	±2	-40 to +125	-40 to +150	Output: 10 mV/°C	1.8-18	110	SC70-6	CL
AMC6821	Fan controller	±1°C remote and local temperature sensors w/integrated fan controllers	±1	-40 to +125	-40 to +150	Output: programmable PWM	2.7-5.5	2 mA	SOP-16	CL SI

MARKETS LEGEND

CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE



This Arrow sponsored Texas Instruments Analog eLab™ Videocast series partners with Cree, a leader in high-brightness and lighting-class LEDs, and focuses on solid-state lighting along with specific applications like solar powered lighting, cove lighting, and MR16 lamp replacement. Visit www.arrow.com/TIeLabsCree for the latest video; there will be a new videocast launched each week.

In addition to providing access to many of the world's top LED lighting suppliers, Arrow has relationships with knowledgeable and experienced integrators that offer complete solutions via integrated devices. Our world-class integrators deliver complete lighting solutions for even the most challenging requirements.



Photo Courtesy of Peter Paige

ACES Partners ▶▶

The Arrow Consulting Engineering Services (ACES) program puts you in touch with pre-screened, qualified, and certified third-party lighting solutions and design services companies to save time, effort, and resources. The superior core competencies of our partners allow them to provide complete outsourced designs—while allowing you to focus on your core competency.

Designspring: This well established industrial design and engineering consulting firm provides comprehensive product development services. Designspring's offerings include:

- Consumer and commercial product development from concept to manufacturing
- Software development and packaging

Illumination Devices: This engineering firm specializes in design configuration and electrical integration of solid-state lighting systems for general illumination applications. Illumination Devices offers:

- Light engine/system development for new and existing fixtures
- On-board driver circuit and microprocessor integration

LED Specialists: This engineering services firm specializes in design and integration of high-performance LED lighting solutions and offers:

- Requirement analysis and rapid prototyping
- Optical, electronic driver and mechanical design, including thermal management

Metaphase: This firm provides straightforward lighting solutions using LEDs in non-imaging applications. Metaphase offers expertise in the design of components such as secondary optics for LEDs and fully developed lighting systems including:

- Design team consultation and prototyping for design verification
- Full OEM component and system manufacturing

TXP Corporation: This PCB assembly firm provides pre-manufacturing services for the electronics industry that help OEMs bring products to market both faster and more cost-effectively. TXP Corporation offers:

- Preview PCB layout and design for manufacturability (DFM) analysis
- Get quick turn prototype PCB assembly—consigned or turn-key
- Advanced technology capabilities:
 - PoP (package-on-package)
 - 0.4 mm BGAs
 - High-density assemblies

Integration Partners ▶▶

CML Innovative Technologies

For 90 years, CML has added value to light sources. CML solves the most difficult issues in thermal management, optics, and drivers, and offers a complete range of solid-state products that range from power LEDs to LED light engines. CML offerings include:

- Advanced software simulation ensures custom products meet expectations
- Rapid prototypes and engineering support

Dialight Lumidrives

This industry leader applies LED technology to the spectrum of visual applications. Dialight specializes in status indication for the communications and industrial markets, as well as signaling for transportation and rapidly emerging illumination products. Dialight offers:

- Light engines, standard optics, and drivers
- Complete design and manufacturing for custom lighting applications

TT electronics/OPTEK Technology

OPTEK's strength is in providing application-specific optoelectronic solutions. As an integrator, OPTEK provides quality products that range from chips to fully functioning assemblies. OPTEK offers:

- Custom optoelectronic solutions
- Broad range of devices and industry expert support

Unity Microelectronics

Unity offers engineering and manufacturing capabilities for custom lighting assemblies and a wide selection of visible and IR optoelectronic products. Unity is dedicated to providing products that perform consistently over their lifecycle and offers:

- Tight binning with rigorous quality and testing procedures
- Low-cost/high-volume manufacturing

To learn more about our integration partners, please contact your local Arrow representative or call 1-888-9LIGHT1.



Total Solutions

TT electronics/OPTEK Technology offers decades of experience in custom product development and manufacturing capability. Our expertise extends from die placement through finished product assembly and testing. OPTEK has the experience and the facilities to accommodate the most stringent assembly requirements.



A subsidiary of TT electronics plc

Features ▶

Product Design

- OPTEK has vast experience in many markets with a broad variety of applications

Product Assembly

- OPTEK is a vertically-integrated company with the ability to accommodate a wide range of circuit configurations

Thermal Management

- OPTEK has OptoTherm™ substrate material

Benefits ▶

Product Design

- Customers can draw on OPTEK's knowledge to find the perfect design to fit their needs

Product Assembly

- No aspect of product design and manufacture is beyond OPTEK's capability; this means custom manufacturing solutions from chip placement to integrated assemblies can be provided

Thermal Management

- OptoTherm™ accommodates the heat dissipation required by high-brightness LEDs

Scalable

Applications ▶

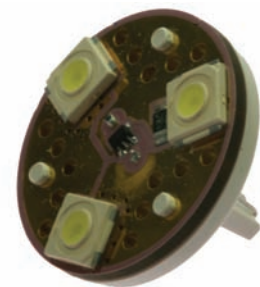
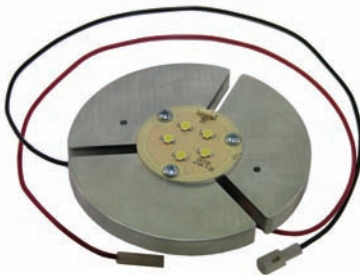
- General illumination
- Task lighting
- Backlighting
- Signage
- Specialty lighting
- Cove lighting



Product Specifications ▶										
Type	Fixture Design (Y/N)	PCB Design (Y/N)	Testing (Y/N)	Manufacturing (Y/N)	Component #1 HB-LEDs (Y/N)	Component #2 Drivers (Y/N)	Component #3 Optics-Standard (Y/N)	Component #4 Optics-Custom (Y/N)	Component #5 Thermal Management (Y/N)	Markets
Total solution	Y	Y	Y	Y	Y	Y	Y	Y	Y	CL FL TR BL SI
MARKETS LEGEND					CL COMMERCIAL LIGHTING FL FLASHLIGHTS TR TRANSPORTATION BL BACKLIGHTING SI SIGNAGE					

Featured Products ▶

OPTEK offers a variety of both standard and custom VLED products and assemblies





Expertise Applied | Answers Delivered

Deliver High Reliability, Low Maintenance, and Long Term Life of LED Lighting Products

From 1W to 300W, indoor, outdoor—even highly exposed pole-mounted applications—Littelfuse offers a wide range of protection technologies that enhance LED lighting designs with solutions that minimize maintenance and warranty costs.

Varistor Products ▶

TMOV® Series

The TMOV's integrated thermal element helps facilitate TVSS module compliance, with appropriate enclosure, to UL1449 for both cord connected and permanently connected applications. The TMOV offers quick thermal response and lower inductance than most discrete solutions resulting in improved clamping performance to fast over voltage transients.



Fuse Products ▶

464 Series

Offering a miniature, fast-acting surface-mount 250V fuse, compliant with IEC Publication IEC60127-4, the 464 series was specifically designed to support power supply and lighting systems designs.



477 and 505 Series

Both designed for high energy and power supply applications: The 477 series offers 400 VDC/500 VAC rated, time-lag, surge withstand fuses offered in a miniature 5 mm x 20 mm package. The 505 series offers 500 VAC/VDC rated fuse with remarkable interrupting rating up to 50 kA in a 6.3 mm x 32 mm package.



TVS Diode Products ▶

AK6/AK10 Series

The AK6 and AK10 series are very high-current rated Transient Voltage Suppressors (TVS) designed specially to protect AC and DC line inputs from damaging transient voltages. Rated at 6 kA (8 μs x 20 μs) and 10 kA (8 μs x 20 μs) the AK series is ideal for applications intended for very harsh environments.



15KPA/30KPA Series

The 15KPA and 30KPA are high-current rated Transient Voltage Suppressors (TVS) designed to protect AC and DC input lines from damaging transient voltages. Rated at 15,000W and 30,000W respectively, these TVS are ideal to protect LED lighting applications intended for exposed environments.



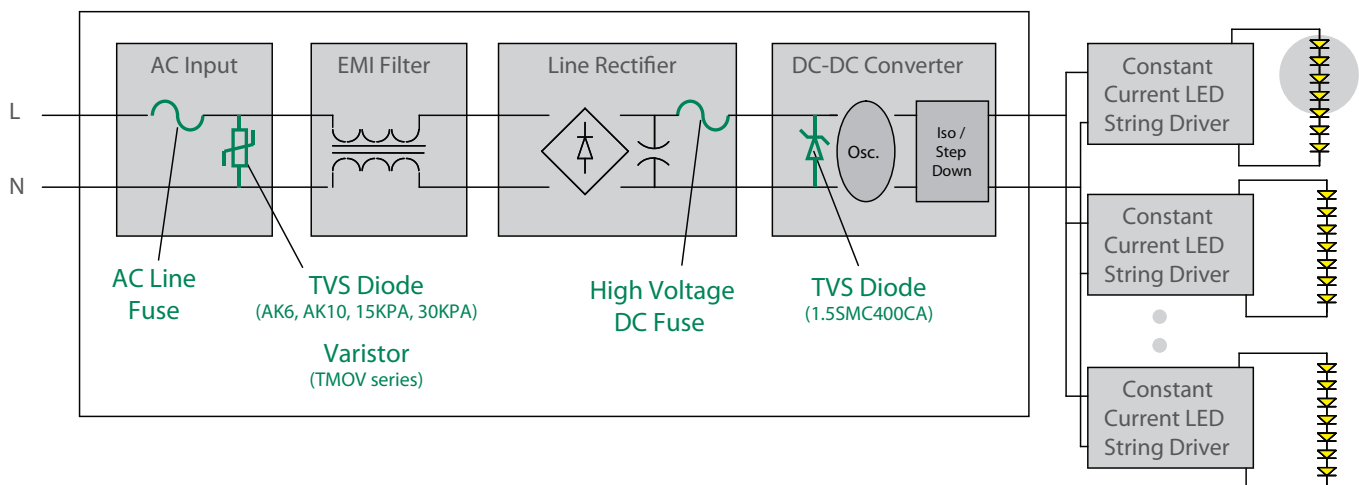
1.5SMC Series

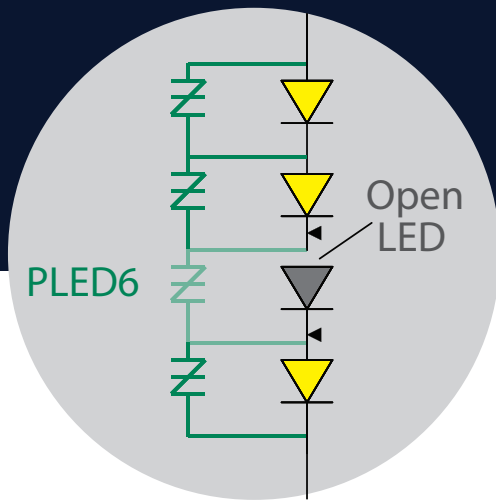
The 1.5SMC series is a Transient Voltage Suppressor (TVS) device rated at 1,500W making it ideal to protect DC-DC converters from transient voltages. The 1.5SMC series is packaged in a surface-mount DO-214AB (SMC).



Switch Mode Power Supply

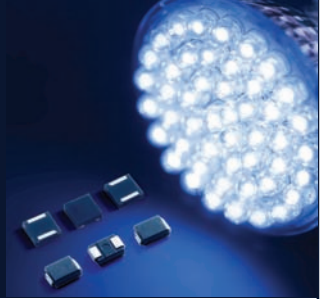
LED Arrays



Spotlight On ▶


PLED

Open LED Protector Series

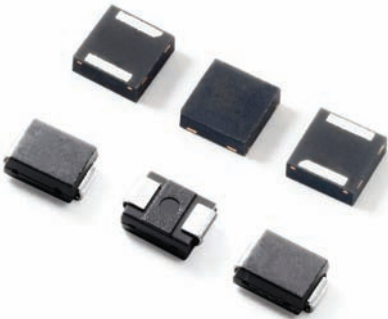


The new Littelfuse PLED series provides added reliability to LED lighting designs by minimizing the impact due to the loss of a single LED in a series string of LEDs.

The PLED provides a switching electronic shunt path that activates only when an LED goes open circuit. This shunt path bypasses the open LED and allows current to flow to the remaining LED in the string.

- Compatible with 1W, 2W, and 3W LED that have a nominal 3V forward characteristic
- Available in DO-214 AA or a chip scale QFN package
- Automatically resets after a power cycle
- Compatible with PWN dimming speeds up to 10 KHz
- Available in the following versions:
 - 6V – Ideal for placing in parallel with a single LED
 - 9V – Ideal for placing parallel with 2 LED
 - 13V – Ideal for placing in parallel with 3 LED

By minimizing the impact due to the loss of a single LED, the PLED is ideal for high reliability LED lighting destined for harsh environments.



Littelfuse offers one of the broadest and deepest portfolios of circuit protection products and a global network of technical support.

Visit our design support center to access:

- | | | |
|-----------------------|---------------------------|---------------------------|
| • Reference designs | • SPICE models | • Technical articles |
| • Application notes | • Local technical support | • Certification documents |
| • Application testing | • Product samples | • Data sheets |

Visit lighting.arrow.com/designtools to access design tools including the Littelfuse design support center.

Panasonic

Panasonic Electric Works

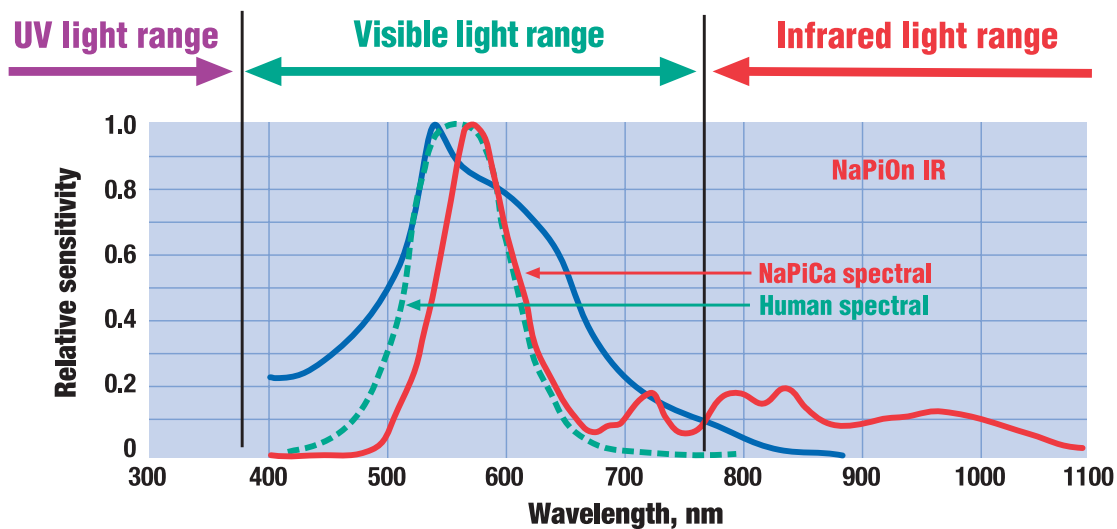
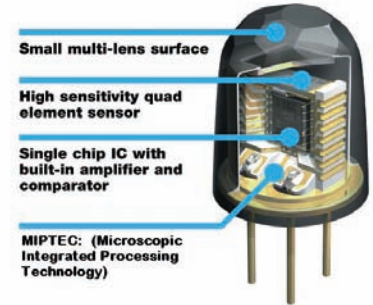


NaPiOn sensors are used in various energy-saving applications including lighting equipment

Fully Integrated Miniature Motion Sensor Detects Human Infrared Radiation

The NaPiOn motion sensor from Panasonic Electric Works is a passive infrared (PIR) type sensor specially designed to detect human body infrared radiation. All necessary components are combined into a package that is less than 10 mm in diameter. Environmentally safe and energy efficient, the NaPiOn motion sensor offers these outstanding features:

- Fully integrated assembly
- Built-in amplifier and multi-surface lens construction
- Miniature size: 9.5 mm in diameter and 14.5 mm in height
- Excellent noise withstanding capability
- Digital and analog output available
- Dual lens colors (black and white) for design flexibility
- Low power consumption available operating on a 3V power supply



Cadmium-Free Light Sensor with Built-In Optical Filter

Applications for the NaPiCa include brightness detection for circuits in household lighting, crime prevention lighting, automatic lighting for vending machines, and LCD backlight control.

The NaPiCa light sensor has spectral response similar to that of the human eye. Cd-free and Pd-free, the NaPiCa comes with a built-in photocurrent amplifier in a miniature SMD package—1.0 mm (L) x 3.2 mm (W) x 1.0 mm (H). All that and these features:

- Linear photo current output
- Operates on 1.5 VDC to 6 VDC, suitable for battery operation
- Uses environmentally friendly silicon chips



Thru-hole and SMD types available

Arrow Electronics Lighting Group

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<http://lighting.arrow.com>

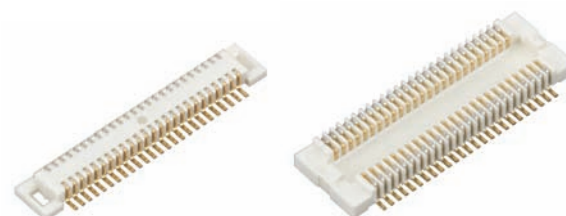
Narrow-Pitch P5 Series Connectors— for Board-to-Board Connection

Panasonic

Panasonic Electric Works

This series of connectors offers strong resistance to adverse environments and high-contact reliability due to Panasonic's unique "tough contact" construction.

- Tough against dropping: bellows contact construction increases resistance to shock of dropping
- Tough against foreign particles and flux: V-notch improves contact reliability
- Tough against solder rise due to Ni barrier construction
- Tough against corrosive gases because of porosity treatment
- P5KF—two-piece structure and 0.5 mm pitch; mated height of 1.5 mm, 2.0 mm, and 2.5 mm
- Simple locking structure; superior mating operation with click feel to indicate that mating is complete
- P5K—0.5 mm pitch; mated height of 3.0 mm and 3.5 mm
- P5KS—0.5 mm pitch; mated height of 4.0 mm, 4.5 mm, 5.0 mm, 5.5 mm, 6.0 mm, 6.5 mm, 7.0 mm, 8.0 mm, and 9.0 mm



P5KF header and socket



P5K header and socket



P5KS header and socket



F4S header and socket

Narrow-Pitch F4S Series Connectors— for Board-to-FPC Connection

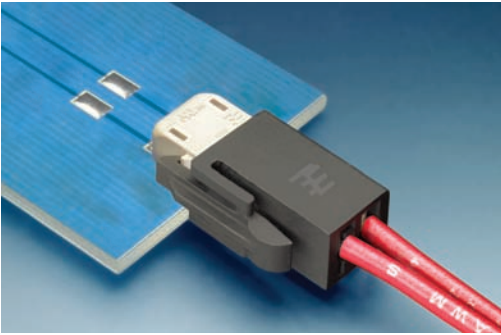
The F4S series of connectors offers strong resistance to adverse environments and high-contact reliability due to Panasonic's unique "tough contact" construction.

- Tough against dropping: bellows contact construction increases resistance to shock of dropping
- Tough against foreign particles and flux: V-notch improves contact reliability
- Tough against solder rise due to Ni barrier construction
- Tough against corrosive gases because of porosity treatment
- Low-profile 0.4 mm pitch connectors that form a board-to-FPC connection with 1.0 mm and 1.2 mm mated height
- Space-saving 3.6 mm width
- Simple lock structure gives tactile feedback that ensures a superior mating/unmating operation feel
- Gull-wing terminals facilitate automatic mounting inspections



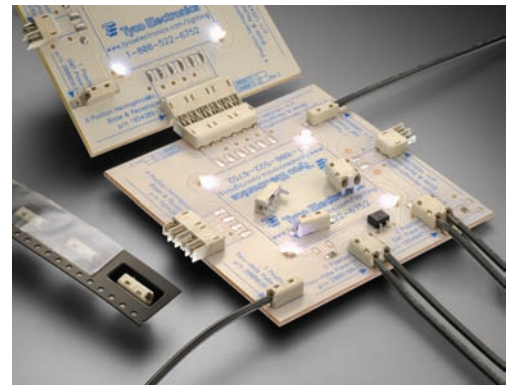
Wire-to-Board Hermaphroditic Blade and Receptacle Connector Simplifies PCB Layout

Tyco Electronics' wire-to-board hermaphroditic blade and receptacle connector brings power leads attachment to a string of aluminum-clad printed circuit boards used for LED strings, lighting controls, and LED modules as well as conventional glass-epoxy printed circuit boards populated with the hermaphroditic board-to-board connectors. The wire-to-board connector is available in two, four, and six positions with a 6A, 125 VAC/125 VDC rating on 18-22 AWG stranded wire. The latest version of the board-to-board connectors has a side embossment latching feature that accepts the latch from the wire-to-board connector. Therefore, customers can now manufacture a single board layout per application rather than creating two separate boards with different power connections. A dust cover connector is also available to enclose the last hermaphroditic connector in a string of boards.



Next Generation SMT and Thru-Hole Poke-In Wire Expands Product Offering for LED String Application

Tyco Electronics' SMT and thru-hole poke-in wire connectors provide a low-profile, quick, and reliable labor saving termination alternative to hand soldering wires to single-sided, aluminum clad PCB-based LED strings, lighting controls, and other non-lighting FR4 PCB applications. The connectors accept 18-22 AWG solid wire; 18-20 AWG pre-bond wire, and 18 AWG stranded wire (16 strands maximum) and are rated for 5A with a 250 VAC/250 VDC voltage rating (4A on 22 AWG wire). They are available in one or two positions, with single-position connectors offered in white or black for easy polarity identification. The standard- and low-insertion-force (recommended for 18 AWG stranded wire) versions of the connectors are side-to-side stackable on 4 mm centers. Gel-filled versions are available for indoor or outdoor application where moisture is an issue. The poke-in wire LED connectors are available in tape-and-reel packaging for high-speed SMT and thru-hole processing equipment. Housings are made of high-temperature plastic that is reflow solder process compatible.

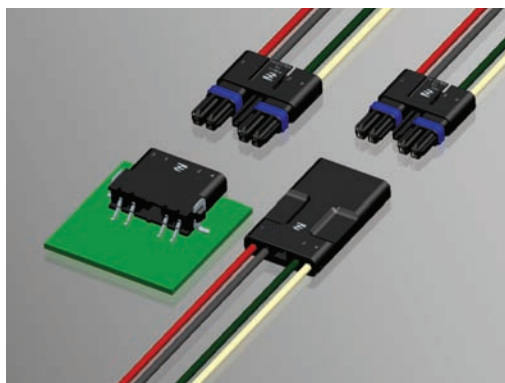
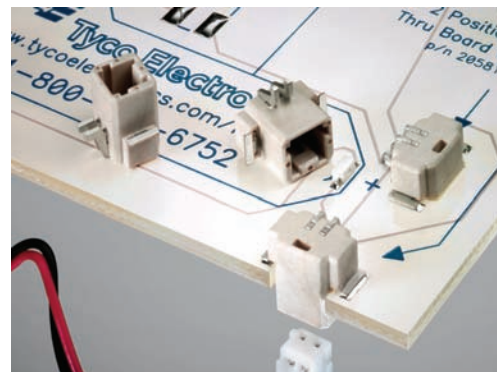


TE logo and Tyco Electronics are trademarks.

Inverted SMT Thru-Board Connectors Allow Power from Underside of Boards—Speeds LED Assembly

The Tyco Electronics inverted SMT thru-board connector provides a means to bring power from the underside of an aluminum-clad or FR4 PC board, thus eliminating dressing wire leads on the top side of LED boards. With a space-saving, low-profile design and rounded corners to minimize shadowing, the two- through six-position connectors fit through a hole or notch in the board to present an underside interface. The connector accepts the standard Tyco Electronics Mini CT connectors and uses surface-mount hold-downs to provide stability during mating and unmating. The inverted design facilitates easier assembly and installation of solid-state LED lighting in architectural, residential, and commercial applications. The Mini CT connector is rated for 3A per contact on 24 AWG wire. High-temperature materials allow the connector to be reflow soldered, while a flat top surface provides compatibility with vacuum pickup. With UL Listing and CSA Certification, the connectors meet the requirements of UL 1977, File No. E2847

 **Tyco Electronics**
Authorized Distributor



Sealed Lighting Connector for Outdoor Applications

Tyco Electronics' low-profile sealed lighting connector is designed specifically for outdoor lighting applications. The product family is available in two through four positions in wire-to-wire and wire-to-board styles—including vertical- and right-angle headers in SMT and thru-hole configurations. The connectors accept 18-26 AWG wire and have a 5A, 120 VAC rating with an operating temperature of -40 degrees Celsius to +105 degrees Celsius. They are manufactured using UV-resistant material with an IP67 seal rating. The polarized connectors have positive latching and a long grounding pin option for make-first/break-last capability. The connectors are shipped fully assembled with interfacial seals, rear seals, and wire guide in place ready to accept crimp-snap terminals.

Choose 7.5 mm MiniHVL When Size and Easy Interconnection is Required

Tyco Electronics' 7.5 mm MiniHVL connector system is suitable for power connection and coupling between lamps and fixtures in offices, kitchens, bathrooms, shops, household furniture, display cabinets, and mountable lighting. Designed according to the IEC 60320 standard for lighting industry applications, this system is ideal when size and easy interconnection are key requirements. Installable in small fixtures, the connector system is available in wire-to-wire configuration, offering outlet and plug assemblies with two contact positions. Using widely adopted MQS contacts, it provides a six-way distributor connector with an additional switch feature. The switch version is available using an additional seventh way and specially-coded red plug for external switch input. Applications include general two-pole appliance wiring system for household and similar purposes from low voltage up to 250V. An outlet bridge, splitter, panel-mount outlet, and bus-bar splitter expands interconnection options.



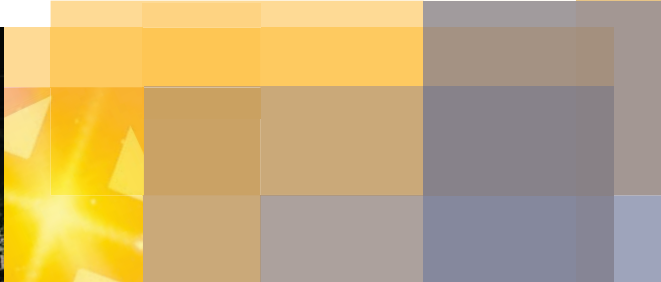
7.5 mm MiniHVL, TE logo, and Tyco Electronics are trademarks.

Arrow Electronics Lighting Group

1.888.9LIGHT1

<http://lighting.arrow.com>

ARROW | Appendices



Glossary

Accent Lighting

Directional lighting emphasizing a particular object or area

AlGaAs (Aluminum Gallium Arsenide)

Active material used to produce infrared emitting diodes (IREDs)

AllnGaP (Aluminum Indium Gallium Phosphide)

Active material used to produce red, amber, and yellow LEDs

Ambient Lighting

Lighting available in area absent of sources inside that area

Ambient Temperature

The temperature of the air around a fixture

Ballast

An enclosed device that regulates electrical power to a specific type of light source; also known as a driver module

Black Body Curve or Planckian Locus

The curve on the CIE chart representing the colors of a black body radiator at a specified temperature. Low temperature radiators begin at the red edge of human vision and move through white toward blue, though the curve ends well before reaching saturated blue

Candela (cd)

The measure of luminous intensity of a source in a given direction. The unit is equivalent to lumens per steradian (lm/sr)

Candlepower

An obsolete term for luminous intensity; current practice is to refer to this simply as candelas

CCT (Correlated Color Temperature)

A measurement of color that maps spectral output to the apparent color of a heated object (black body) at the specified temperature

Chromaticity

The color of light as mapped to the CIE 1931 color chart, expressed as x and y coordinates

Color Bin

The region of the CIE 1931 chart that an individual LED fits into; the bin boundaries may vary between suppliers

Color Temperature

See CCT (Correlated Color Temperature)

Cool White

A general term for higher CCT, bluer white light sources; typically indicates CCTs from 5,000°K up to 10,000°K

CRI (Color Rendering Index)

A scale from 0-100 that indicates the similarity of reflected light off select colors in comparison to a pure black body at the same CCT

Daylight White

5,000°K to 7,500°K; CIE defines daylight over a range, CCT: 5,000°K (CIE D50) is Equal Energy Daylight White, 5500°K (CIE D55) is Direct Sunlight, (Noon Sky sunlight), 6,500°K (CIE D65) is Average Daylight, 7,500°K (CIE D75) is Northern Sky Daylight

Dominant Wavelength

The apparent wavelength of an LED to the human eye

DMX (Digital MultipleXing)

A digital lighting control standard employed primarily by the theater industry, frequently used to color control LED fixtures

Efficacy

A measurement of a light source's effectiveness in converting electrical energy to lumens of visible light; expressed in lumens per watt (LPW)

Efficiency

The percent of electrical energy converted to light, i.e. watts of visible light produced for each watt of electrical power

Eye Sensitivity

The response of the human eye to light with respect to wavelength; peak response is at 555 nm

Fill Light

Lighting throughout an area that produces general illumination

Flood Light

A fixture designed to emit usable light over a wide beam angle

Footcandle (fc)

A unit of illuminance equivalent to the illumination produced by a source of one candle, at a distance of one foot; equal to one lumen incident per square foot; can be written as lm/ft^2 (see Lux)

Forward Current

Current through an LED in the direction that will produce light

Forward Voltage (V_F)

The voltage across an LED for a given forward current

GaAs (Gallium Arsenide)

Active material used to produce IREds

I²C

Two-wire, serial protocol developed by Philips in the early 1980s; used in today's mobile applications

Illuminance (E)

The amount of light arriving on a surface, measured in lux or footcandles

Infrared Light

Electromagnetic waves with a wavelength of 1 mm to 700 nm

InGaN (Indium Gallium Nitride)

Active material used to produce blue, green, and white LEDs

Intensity Bin

A group of LEDs defined by pre-established upper and lower brightness bounds

IREDD

Infrared emitting diode

Kelvin (K)

A temperature scale starting with 0°K (= -273.16°C) at the absolute zero temperature; a difference in temperature of one Kelvin (K) is equal to the difference in temperature in degrees Celsius

Key Light

Directional lighting used to highlight an object in order to draw attention

Leadframe

A metal frame used to mount and connect to LED chips; the lead-frame channels current and often heat to and from the LED

Light Trespass (Spill Light)

Light that escapes the optical system that contains the light source

Lumen Maintenance

A measure of how the light output of a light source degrades over time

Luminaire

A fixture with power requirements and light sources included

Luminaire Efficiency

Percentage of lumens emitted by the lamp that escapes the luminaire

Luminance (L)

The amount of visible light leaving a point in a given direction; the light can be reflected, transmitted, or emitted; luminance is measured in nits, equivalent to one candela per square meter (cd/m²)

Luminous Flux

A measure of total emitted light weighted by the human eye's sensitivity expressed in lumens (lm); peak lumens per watt of radiated light occurs at 555 nm and 683 lm for 1W radiated

Luminous Intensity

Luminous flux emitted per unit solid angle in a particular direction; standard unit of luminous intensity is a candela (cd)

Lux (lx)

A unit of illuminance or light incident on a surface, one lux is one lumen per square meter; ten lux approximately equals one footcandle (see footcandle)

MacAdam Ellipse

A region on the CIE chart where all colors are indistinguishable to human vision. Some regions are referred to as multiple "step" MacAdam Ellipses. These regions contain colors, which can be distinguished by a given amount to the human eye. A two-step MacAdam Ellipse contains colors that are only slightly different to human vision, a three step more so, etc.

PAR Lamp (Parabolic Aluminized Reflector)

A standard in directional, screw type lamps; the number following PAR indicates eighths of an inch in diameter

Phosphor

A chemical compound designed to absorb light and convert it into other wavelength(s); used in white LEDs to convert the single emitted wavelength into a broader spectrum

Photometry

The measurement of quantities associated with light; useful in selecting or comparing lighting products

Pixel

Term used in video applications to denote one-color controllable element in an image

Radiant Flux

Total radiant energy per unit time, unadjusted for eye sensitivity; standard unit for radiant flux is a watt (W)

Resolution

The number of pixels contained in a display, expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis; the sharpness of the image on a display depends on the display's resolution and size

Solid State

The electronic properties of crystalline (generally semiconductor) material

Spot Light

A lamp or fixture with a tight beam of light

Task Lighting

Usable light intended to illuminate a surface for specific work functions

Valance Lighting

Lighting from light sources on a wall typically above eye level, shielded by horizontal panels; the light may be directed upward or downward

Viewing Angle

The position left/right and up/down of vertical axis where the luminous intensity reduces to 50 percent of its peak value

Warm White

A lower CCT white, typically from 2,700°K to 3,800°K, which appears as a yellowish-white light

Wavelength

The distance between two consecutive peaks of a wave; the wavelength of visible light is between 400 nm to 700 nm

Binning for LEDs

Manufacturing

of light emitting diodes (LEDs) results in variations of characteristics from part to part. The human eye can detect differences in light output and color depending on the range of variation.



LEDs are therefore sorted by certain parameters in a range based on a fixed-forward test current. The parts are then assigned a code and combined together with LEDs of the same or similar characteristics.

Specific bin selection of LEDs may be necessary to optimize a lighting design in some applications. In other applications, tight binning may not be required and a system can be engineered with design methods to avoid or limit bin sorting. There may be cases where all bin ranges are

available on a particular LED; this is called full distribution.

The manufacturer or the customer can sort LEDs. Manufacturers bin LEDs to the yields they obtain from production. Low-yielding parts can limit the product availability.

For questions regarding LED binning and your lighting designs, contact your Arrow Lighting Group at 1.888.9LIGHT1 or lightingsolutions@arrow.com.

LED manufacturers each have sets of parameters that define their own unique bin selections and are sorted by some or all of the following:

Brightness ▶▶

Luminous Intensity

The power perceived by the human eye in a particular direction, measured in candelas.

Luminous Flux

The total amount of power perceived in all directions by the human eye, measured in lumens.

Voltage ▶▶

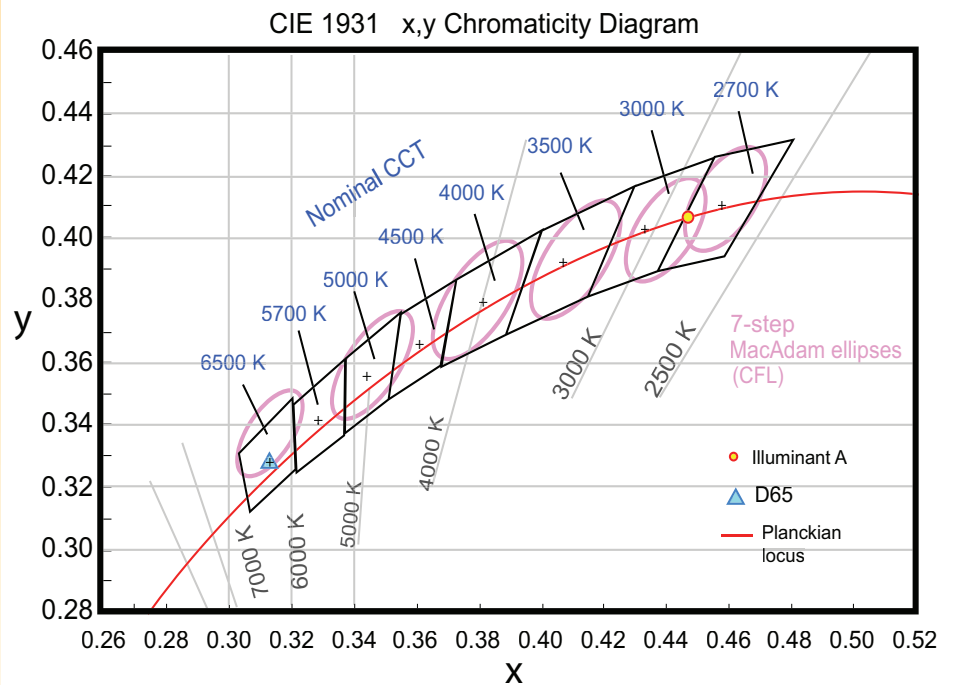
Forward voltage, measured in volts

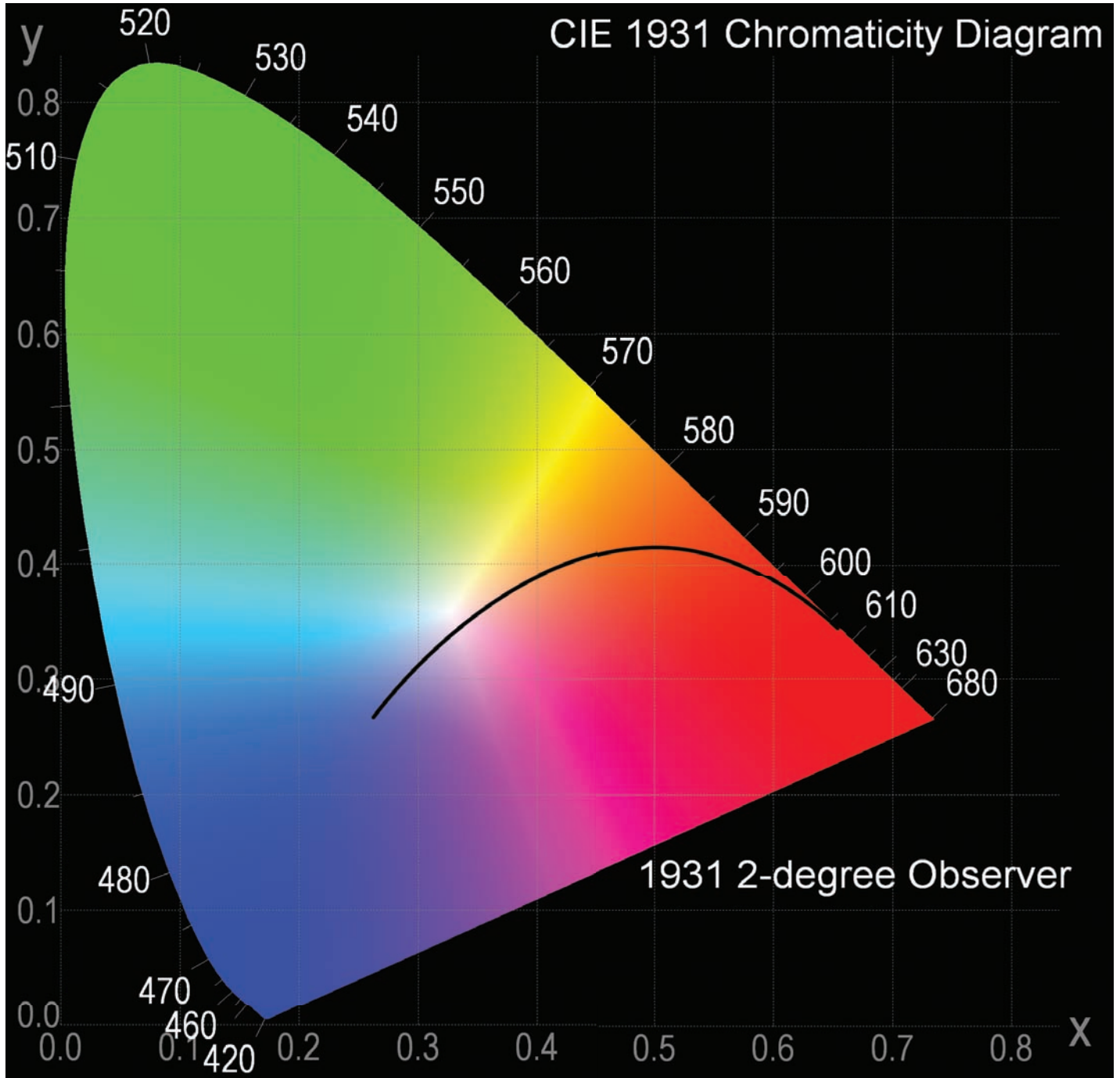
Color ▶▶

Chromaticity

- Plotting x and y coordinates within the CIE 1931 chromaticity chart
- Specified dominant wavelengths, measured in nanometers
- Color temperatures, measured in degrees Kelvin, pertains to white light only

**CIE 1931 Chromaticity Diagram
Showing the Eight Nominal CCT Quadrangles**





Applicable Agency Requirements

Applicable North American Agency Requirements ▶				
Agency Specification Number	Description	Comment #1	Comment #2	Comment #3
UL 486A	Wire connectors and soldering lugs for use with copper wire	Connectors for use with all alloys of copper conductors, for providing contacts between current-carrying parts	30 AWG to 8 AWG insulated conductors	Voltage levels above 600V (1,000V in a sign, lighting fixture, or luminaire)
UL 486C	Splicing wire connectors	Hand- or tool-applied splicing wire and cable connectors intended for use with all alloys of copper	30 AWG to 6 AWG insulated conductors	Voltage levels less than 600V (1,000V in a sign or luminaire)
UL 1573	Stage and studio luminaires, accessories, and connector strips	Stage and studio luminaires rated 600V or less for use in theatres, studios, and similar locations	-	-
UL 1598	Luminaires	Luminaires for use in non-hazardous locations and that are intended for installation on branch circuits of 600V nominal or less between conductors	-	-
UL 1977	Connectors for use in data, signal, control, and power applications—component	Single and multi-pole connectors	Factory installed to copper wiring, copper alloy conductors, or printed circuit boards	-
UL 2108	Low-voltage lighting systems	Class 2 low voltage lighting systems	Low voltage exposed conductor lighting systems and luminaires incorporating exposed conductors	-
UL 2459	Insulated multi-pole splicing wire connectors	Insulated multi-pole mating or non-mating wire connectors intended for field wiring and for use in accordance with the National Electrical Code, ANSI/NFPA-70	These wire connectors are intended to facilitate the connection of devices, such as prefabricated wiring assemblies, smoke detectors, and lighting products, to the branch circuit conductors of buildings. They are multi-polarity devices used to connect to two or more branch circuit conductors	-
CSA C22.2 182.3	Special use attachment plugs, receptacles, and connectors	Applies to plugs, receptacles, power inlets and outlets, connectors, and similar wiring devices intended for use in electronic and electrical applications	Voltage ratings less than 600V	-
CSA C22.2 NO. 250.0-04	Luminaires	Luminaires for use in non-hazardous locations and that are intended for installation on branch circuits of 600V nominal or less	Similar to UL1598	-

Applicable European Agency Requirements ▶				
Agency Specification Number	Description	Comment #1	Comment #2	Comment #3
IEC 61535	Installation couplers intended for permanent connection in fixed installations. It applies to two to five wire installation couplers with or without earthing contact with a rated voltage up to and including AC 500V	Installation couplers shall be provided with retaining means which engage automatically when the installation coupler is connected and which is capable of disengagement for disconnecting. The retaining means to be removable with the aid of a common tool only (not easily by hand) → 80N min. retention force	Applicable for rewirable and non-rewirable connectors; rated connecting capacity up to and including 10 sqmm; total contact resistance wire-to-wire 1,0 mOhm max.	Protection against electric shock ensured by IP40 minimum → use special plastic caps or equivalent device to be removable with the aid of a common tool only (not easily by hand); Instruction sheets must be provided by manufacturer
IEC 60320	Appliance couplers for household and similar purposes; this norm is applicable to appliance couplers for AC only, with or without earthing contact, with a rated voltage not exceeding 250V and a rated current not exceeding 16A	It is intended for the connection of a supply cord (lead) to electrical appliances or other electrical equipment for 50 Hz or 60 Hz supply	Connectors shall be so designed that the cord cannot be subjected to excessive bending where it enters the connector: verification by 10,000 flexings for rewirable connectors and 20,000 flexings for non-rewirable connectors → requirement is no interruption of test current and no short circuit	Appliance couplers complying with this standard are suitable for use at ambient temperatures not exceeding +25°C, but occasionally reaching +35°C
IEC 61984	Connectors safety requirements and tests; this norm applies to connectors with rated voltage above 50V and up to 1,000V and rated currents up to 125A	Suitable for fixed and free connectors (e.g., free hanging versions)	Applicable for rewirable and non-rewirable connectors; connectors must have protective earth contact and (for free connectors) the cable clamp	For connectors according to this standard, voltage/current/breaking capacity values shall be specified in compliance with mechanical and environmental conditions given in the manufacturer specification

Charts courtesy of Tyco Electronics, Inc.

Guide Index ▶

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		HB-LEDs	LED Modules	Non-Visible Light						
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Linear Technology	16-24				•					
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TT electronics/ OPTEK Technology	9		•							
	49							•		
Tyco Electronics	54-55								•	



Drive LEDs Your Way



High Efficiency LED Drivers

Part No.	Topology	Dimming Type	Input Voltage Range (V)	Max. Output Voltage (V)	I _{LED(MAX)} (A) *	Package
LT3466	Dual Boost Mode	DC/PWM	2.7 to 24	39	0.02	3x3 DFN-10
LT3598	Boost Mode	3,000:1 PWM	3 to 30	44	0.03	4x4 QFN-24
LT3590	Buck Mode	200:1 PWM	4.5 to 55	n/a	0.05	2x2 DFN-6, SC-70
LT3599	Boost Mode	3,000:1 PWM	3 to 30	44	0.13	5x5 QFN-32, TSSOP-28E
LT3592	Buck Mode	10:1 PWM	3.6 to 36	n/a	0.50	2x3 DFN-10, MSOP-10E
LT3517/18	Buck, Boost, Buck/Boost Mode	5,000:1 PWM	3 to 30 (40 _{MAX})	45	1.0/2.0	4x4 QFN-16
LT1618	Buck, Boost, Buck/Boost Mode	DC/PWM	1.6 to 18	36	1.00	3x3 DFN-10 MSOP-10
LT3474/-1	Buck	400:1 PWM	4 to 36	9/30	1.00	TSSOP-16E
LT3496	Triple Buck, Boost, Buck/Boost Mode	3,000:1 PWM	3 to 30 (40 _{MAX})	45	0.50	4x4 QFN-28
LT3486	Dual Boost Mode	1,000:1 PWM	2.7 to 24	35	0.10	3x5 DFN-16
LT3477	Buck, Boost, Buck/Boost Mode	DC/PWM	2.5 to 25	40	2.00	4x4 QFN-20, TSSOP-20
LT3475/-1	Dual Buck	3,000:1 PWM	4 to 36 (40 _{MAX})	9/30	1.50	TSSOP-20E
LT3478/-1	Buck, Boost, Buck/Boost Mode	3,000:1 PWM	2.8 to 36 (40 _{MAX})	40	4.00	TSSOP-16E
LT3476	Quad Buck, Boost, Buck/Boost Mode	1,000:1 PWM	2.8 to 16	36	1.00	5x7 QFN-38
LT3595	Buck Mode	3,000:1 PWM	4.5 to 55	n/a	0.50	5x9 QFN-56
LTC3783	Buck, Boost, Buck/Boost Mode	3,000:1 PWM	3 to 36	Limited by ext. FET	Ext FET	4x5 DFN-16, TSSOP-16
LT3755/56/-1	Buck, Boost, Buck/Boost Mode	3,000:1 PWM	4.5 to 40/6 to 100	Limited by ext. FET	Ext FET	3x3 QFN-16, MSOP-16E

Info & Free Samples

www.linear.com/LEDdrivers

1-800-4-LINEAR



Free Power Management for LEDs Brochure

www.linear.com/ledsolutions

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