

A journey for next generation lighting solutions

Better Compact Fluorescent Lamps (CFL) and a new wave of LED lighting!

NXP technology helps to save 500 million kg CO₂ per year

Electricity used for lighting homes, shops, offices, signs, public spaces, and streetlights – accounts for roughly 20 percent of all electricity consumption worldwide. With a number that high, it's no surprise that consumers, companies, and governments around the globe are looking for energy-efficient alternatives to traditional lighting.

NXP calculates that switching to more efficient technologies, such as CFL (Compact Fluorescent Lighting) would enable up to an 80 percent saving in electricity costs from lighting.

Till September 2009, NXP had sold 300 million fluorescent lighting driver ICs. Fluorescent lamps are highly energy-efficient lighting solutions that save 80% energy compared with traditional incandescent light bulbs. Thanks to these fluorescent lamps, NXP has helped save 500 million kg CO₂ per year compared to Incandescent lighting solutions.

NXP was one of the first semiconductor companies to recognize the importance of energy-efficient lighting, and have made lighting a focus for more than 15 years. NXP is committed to supporting energy-saving trends in the lighting industry, for example, daylight harvesting, in which lighting levels are adjusted according to the amount of natural daylight available. NXP supplies the dimmable drivers for a range of technologies used in everyday lighting for shops and offices, such as HF TL (High Frequency Tube Lamp), CFL (Compact Fluorescent Lamp – also called “Energy Saving Lamps”), HID (High Intensity Discharge Lighting) and Solid State Lighting (SSL – also called LED lighting).

A breakthrough in quality, performance and features for Compact Fluorescent Lamps

These energy efficient CFL lamps have become a familiar replacement for incandescent lights and promise to continue growing in popularity.

However, among the 4 billion CFL lamps sold annually, only a minority fraction fulfill the consumer's expectation in terms of quality, functionality and performance raising concerns by both government and industry leaders. Initiatives are triggered in all continents to set new and more stringent standards: The European Union released earlier this year a new set of requirement while the US already published the “SuperCFL” specification. Both continents calls for higher qualification standard, better light, longer lifetime, smaller form factor, faster ignition and new feature namely “dimming”.

NXP IC portfolio is specifically tailored to match or even exceed the most demanding requirement and therefore to enable this new generation to massively upgrade the CFL market: now the CFL lamps can behave like incandescent bulbs while consuming 4 to 5 times less energy! CFL lamps using NXP IC solutions allow for lamp lifetime performance exceeding 10,000 hr and even 15,000 hours. Dimming CFL lamps down to 10% is also proven based on



NXP IC solutions. IC solutions replacing traditional discrete implementation also bring a solid advantage in terms of total lamp quality and smaller size.

Setting the pace in the emerging LED retrofit lamp market

NXP is also supplying a broad portfolio of driver IC's for a new lighting technology called Solid State Lighting, which is based on the use of LEDs for general lighting purposes. Solid State Lighting shows great promise for reliability, design flexibility, and longevity. It delivers bright colors at a high intensity, while consuming less overall power. Potential uses include, amongst other, outdoor applications, where it can provide efficient, dimmable lighting along city streets and highways. During quieter periods, using the dimmable drivers supplied by NXP, LED lights can control light intensity. This saves energy and reduces light pollution while maintaining safe driving conditions. Solid State Lighting is also penetrating residential lighting applications, where the demand for dimmability is increasing. In this area too, NXP can offer dimmable driver solutions.

"At NXP we believe that taking responsibility for our impact on the world around us is fundamental to success. Environmental conscious design principles are reflected across the NXP's leadership domains, involving home electronics, automotive and multi-market semiconductors. After our recent achievement in lowering PC power wastage with our GreenChip™ PC solution, which attained the 80plus GOLD level, I am proud that NXP technology has been able to play such an important role in driving energy saving in the lighting application area," once commented Rene Penning de Vries, chief technology officer, NXP.

NXP Semiconductors: the semiconductor partner to the lighting industry

NXP is a known leader in power conversion products with millions of devices shipped for computing power supplies and domestic appliances. NXP is also the number 1 supplier for conventional lighting IC drivers for systems such as HFTL, CFL and HID.

Here are some latest examples specially recommended to China market which is the known manufacturing base of the majority of CFL lamps and expected to play an equivalent role in the LED lighting domain.

CFL IC driver solution: a complete range

Phasing out incandescent lighting is a tremendous challenge that is now happening around the World with scheduled milestones. The days of incandescent lamps are numbered: in many countries, purchasing incandescent lamps become a challenge. CFL lamps of various size, power, and light intensity are now populating retail and DIY shops. Overall 100's of models are proposed to consumers by several brands.

Electronics plays an important role in the CFL lamp form factor, performance, quality and feature. IC solutions bring clear benefits in all areas:

- smaller size is obvious thanks to higher integration level,
- better performance like higher power conversion efficiency and faster ignition time are unique benefits of IC solutions. Better control of the ignition phase and steady state enables extension of burner lifetime over the 10.000 hours.
- better quality thanks – again – to integration
- increased feature set: true light dimming down to 10% makes CFL lamps behaving like incandescent!

IC solutions also make engineering work of CFL lamps easier: indeed, with large spread of CFL lamp portfolio, the lamp engineering and manufacturing is a challenge. IC can also contribute in this domain by offering platform and design tool that makes electronic design easy.

NXP CFL IC portfolio is tailored with all above in mind! Whatever the CFL lamp requirements are, NXP has an easy to adopt solution with best-in-class integration level and performance:

Dimmable

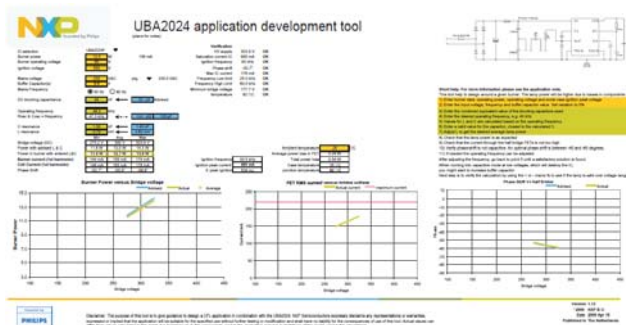
Type	Packaging	Power	Switch	Dimming	Comment
UBA2014	T (SO16) P (DIP16)	Any	Controller	100% – 10%	Can also be used for TL applications
UBA2028	T (SO20)	< 21W	Controller	100% – 10%	Same controller as UBA2014

Fixed output

Type	Packaging	Power	Switch	Dimming	Comment
UBA2021	T (SO14) P (DIP14)	Any	Controller	Fixed	Feed forward / adjustable preheat Can also be used for TL applications
UBA2024	T (SO14) P (DIP8)	< 15W	Integrated driver	Fixed	Fully integrated CFL driver
UBA2024A	T (SO14) P (DIP8)	< 21W	Integrated driver	Fixed	Pin compatible with UBA2024
UBA2025	T (SO16)	< 25W	Integrated driver	Fixed	Same controller as UBA2021

A full suite of design tools comes together with NXP's IC solutions. Here is as illustration, the example of the UBA2024 fully integrated driver IC for non dimmable CFL lamps:

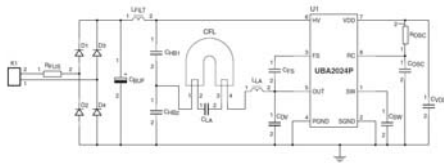
- dedicated software to help customizing the application to the lamp characteristics



- hardware illustration of an electronic module using NXP IC solutions



reference schematics



Best-in-Class mains LED driver

2009 is a pivot year in the emergence of LED in the general lighting market. Performance of LED now makes possible the first quality LED retrofit lamps! This is definitely a promising step towards higher adoption of LEDs. NXP Semiconductors anticipated this trend and provides IC solutions to drive the LED for each of the main segments.

Dimmable

Type	Packaging	Power (W)	Configuration	Dimming	Comment
SSL2101	SO16	< 15	Fly-back / buck	100% – 1%	The only LED driver available that matches LED lifetimes
SSL2102	SO20	< 25	Fly-back / buck	100% – 1%	Same controller function as SSL2101

Fixed output

Type	Packaging	Power (W)	Configuration	Dimming	Comment
SSL1522	T (SO14)	< 15	Fly-back / buck	Fixed	External supplied PWM for dimming
SSL1523	P (DIP8)	< 25	Fly-back / buck	Fixed	External supplied PWM for dimming
SSL1623PH	DIP16	< 24	Fly-back / buck	Fixed	External supplied PWM for dimming

SSL2101 / SSL2102:

This small, highly integrated and highly efficient driver is the next step in SSL retrofit LED lighting. It supports the majority of available dimmers (TRIAC and transistor) and is ideal for small form-factor applications with closed casings. It includes a unique natural dimming curve (logarithmic correction) and enable deep dimming below 1% with a large set of dimmers in the market (e.g. TRIAC, transistor).

SSL2101 and SSL2102 have been designed with the target to match LED light source lifetime. Since market introduction, NXP runs lifetime test that now demonstrates unique lifetime performance in line with LED lifetime

performance claimed by the LED industry. Combining SSL2101 or SSL2102 with LED in lamps or luminaires makes perfect sense!

Typical applications include

- SSL retrofits (e.g. GU10, E27) from 3 W to 8 W
- LED modules (e.g. LED spots, down lights) from 8 W to 15 W



Both isolated and non isolated are possible (buck and flyback configurations) allowing a wide range of system topologies. NXP markets these 2 devices with the full application collaterals including boards and calculation tools.



Conclusion

NXP commitment to serve the lighting industry is more than ever core of NXP strategy. Together with our customers, NXP contributes to makes lighting solutions simply better to the benefit of the consumers around the globe!

As incandescent bulbs are phased out, CFL lamps need a breakthrough in Quality, Performance and Feature to match consumer expectation of "Quality lighting". NXP solutions bring the best in class solution with a comprehensive product portfolio.

NXP further pursue its efforts to accelerate the emergence of the next generation of energy saving lamps. With LED lighting, once more, NXP is the lighting industry partner!