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Explosive growth of LED driver ICs truly unparalleled, says Petrov Group

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A bottom-up analysis of product portfolio, business performance, and technology and manufacturing trends of 25 IC vendors confirms the explosive growth of LED driver ICs, according to the Petrov Group.

Demand for LED driver ICs and wafers of eighteen device types was analyzed − 13 display and five lighting applications − by device unit shipments, LED penetration, number of LED driver ICs, number of transistors in LED driver ICs, chip area size, pricing, by IC unit, revenues, and wafer demand by technology node (lithography), and by trends in design implementation and requirements in each of 18 application types.

The two major lighting systems are LED display backlight units (BLU) and LED light fixtures (luminaires). The market for LED driver ICs is one of a few, both near- and long-term growth, markets in the semiconductor industry featuring a greater than 20% average CAGR. The exception is the mobile phone segment exhibiting the lowest growth but the largest base. As a result, mobile phones will continue to be a significant unit volume part of the overall market for LED ICs but also with the lowest ASPs.

LED driver IC growth is strongly driven by their target end-market applications. In a rapidly evolving market this requires a timely introduction of products targeted at specific applications.

Thirteen device types among the 18 analyzed will have annual growth exceeding 45% through the year 2015. Moreover, at that time several mega-markets will still be only in their initial high growth stages, noted Boris Petrov, president of the Petrov Group.

The three periods from 2008 to 2013 to 2016 represent a steady stream of layered market growth opportunities. Hence, the overall market growth is strengthened by the timing of the growth stages of various segments − from various backlighting segments to public display to automotive exterior to street lighting to general lighting.

The rapidly evolving market for LED driver ICs presents a broad range of opportunities to analog IC vendors and foundries. The 25 vendors analyzed address the LED driver IC market opportunities with a distinct segment focus and number of generic products in their product portfolios; only a bottom-up analysis validates market size and segmentation.

The common force behind all LED driver IC applications is power saving. However, power savings alone is not a compelling enough value proposition to create a large market potential. LED driver ICs targeted at specific applications should emphasize the added market benefits unique to those applications. High market potential applications typically feature added benefits and incentives unique to one or more applications. For example, in notebook-type PCs these include an ultra-thin profile, light weight, and relatively small cost premium which are absent in the case of PC monitors. In street lighting these include solar power compatibility, light pollution control, and compact size.

About five billion LED driver ICs will be required to meet the demand by 2013. Major contributing device types include public displays and signage, mobile phones, digital TVs, notebook-type PCs, and digital media players. This will require about 1.6 million 8-inch BCD-based wafers, which

represents nearly 30% of today's total wafer fabrication pertinent nodal capacity at four major foundries (TSMC, UMC, Globalfoundries/Chartered, and SMIC).

The near-term demand for LED driver ICs broadly extends across a range of device types providing differentiation opportunities to analog IC vendors as well as foundries. A unique attribute of most LED driver IC products is the need for integrated power MOSFET (CMOS) devices in addition to high analog performance. This, in turn, drives the need for BCD (Bipolar-CMOS-DMOS) technology. Therefore, LED driver ICs have a strong near-term potential to bring BCD technology into the mainstream of analog IC manufacturing. As a result, foundries offering BCD technology will benefit the most from both near-, and long-term LED driver IC market opportunities; TSMC, UMC, and Tower have a current strategic advantage − BCD technology is a prerequisite for benefiting from LED driver IC market opportunities on a broader scale..

LED driver IC revenues will reach about US$3 billion by 2013 with an average CAGR of 26%. The top-four end-market applications are public displays and signage, digital TV backlighting, notebook-type PC backlighting, and camera flash.

There are two basic LED driver integration strategies: on-board and in-board power integration. Target applications strongly influence which power integration strategy is advantageous. For example, in offline applications, such as general lighting, the on-board integration strategy could be the preferred solution. In notebook applications, the in-board integration strategy is typically advantageous.

On-board power integration uses standard DC/DC converters to power LEDs, while the LED driver provides only the necessary current regulation with a given dimming capability. This approach is suitable for signage and LED display (public displays) applications because it provides a high degree of system design flexibility when designing large LED panels in display applications. Design implementations are board-level type.

In-board power integration uses LED driver ICs to integrate the DC/DC converter(s) together with the LED current regulator. An integrated solution features higher power efficiency and performance while simplifying system design.

The range of LED driver IC integration options is extensive, thereby enabling analog vendors to differentiate themselves even at a single product type level. LED driver ICs with integrated DC/DC converters could be implemented using a broad range of topologies and design approaches. Inductor based converters dominate in most applications due to their higher efficiency as well as higher voltage and current handling capability. Charge-pump type converters dominate camera flash applications.

Inductor based converters use buck (preferred), boost, buck-boost, SEPIC (single ended primary inductor converter), and flyback topologies depending on target application(s). Linear regulators meet the need for lower cost at the expense of low efficiency.

Currently there are about 50 analog IC vendors focusing to some degree on the LED driver IC business. A bottom-up analysis of 25 significant IC vendors was required to identify and confirm the above and other Petrov Group's findings.

The broad LED lighting market not only supports a large number of vendors but also provides them an opportunity to differentiate among themselves. The key success factor is to understand the dynamics and features of the LED market landscape and target the most promising growth opportunities. The LED driver IC market landscape extends across six major application areas and it encompasses a large range of electronic device types. As a result, the market landscape is highly fragmented into a very large number of segments enabling a multitude of competing vendors to grow and prosper. In the near term, the displays application area features 13 major device types and five major lighting device types.

In the longer term (beyond 2012), the general lighting application area introduces a large number of entirely new device types. Analog IC vendors with a strategic focus on evolving LED driver IC market opportunities have a major challenge to position themselves and capture the market landscape terrain and dynamics in their strategic plans, Boris Petrov noted.

Petrov Group: LED penetration by device type, 2009-2014		
Device Type	**LED penetration**	**Total LED driver ICs (m units)**
	2014	**2009-14 CAGR**
Mobile phone BLU	90%	6%
Digital media player BLU	80%	11%
Digital camera BLU	35%	112%
PND BLU	35%	104%
Gaming device BLU	25%	69%
Medical device BLU	30%	143%
Notebook BLU	95%	62%
Mini-Notebook BLU	95%	62%
Netbook BLU	100%	31%
PC monitor BLU	21%	102%
Digital photo frame BLU	25%	130%
Digital TV BLU	35%	112%
Public display BLU	70%	80%
High-end LED light fixture	0.50%	46%
Low-end LED light fixture	0.25%	46%
Mobile phone camera flash	80%	12%
Digital camera flash	75%	36%
Automotive front light	10%	58%
Total	-	24%

Source: Petrov Group, compiled by Digitimes, September 2010

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