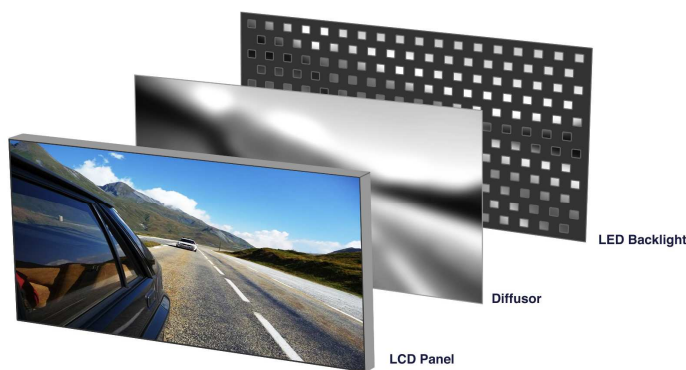


## LED Processing with lasers

LEDs are expected to develop to one of the predominant light sources over the coming decades. However, the pace of development differs depending on specific requirements and constraints. One of the most promising markets today is the display backlight technology. Experts forecast quadrupling of the number of LCD displays with LED backlighting in 2010 superseding conventional cold cathode fluorescent lamps (CCFL). Laser marking is an essential step in manufacturing the required LEDs.

### Reliable High-speed Marking with Real-Time Compensation of Position Tolerances

There are currently two main ways to use LED backlighting in LCD flat panel televisions: LED edge-lighting and full array LED backlighting. The latter places about



hundred backlight segments behind the entire screen allowing for local dimming and a significant increase in contrast range. Each segment consists of hundreds of minuscule LEDs. As each LCD display requires a huge number of LEDs, their

production has to be extremely cost-efficient, which also means fast.

ROFIN is among the few suppliers who can reliably meet those criteria with the PowerLine E 12 IC laser at 532 nm and a double-head setup. Relevant application tests have already been successfully realized in our application lab. Laser marking is extremely demanding with 0.080 mm character height, 0.035 mm line width, exact positioning and more than 1000 characters / s. Engraving is done on a tiny area as an example in white plastic housings. ROFIN's strengths are the real-time compensation of position tolerances which is indispensable for a reliable production process. Moreover, our lasers offer cost-efficient operation and high integration capability.

## Traceability Marking of High-Power LEDs



dashboard lighting with LEDs

Mass market production of LEDs for LCD backlighting typically requires simple marking of type codes and connection labels. But there is also a growing market for high-power LEDs which require full product traceability, like the automotive and mobile phone industry. Interior lights of modern cars already make full usage of LEDs. Stoplights, rear- and headlights will follow in the next years according to expert opinions. Mobile devices rely

on LEDs for display and keyboard backlighting, flashlights and more.

High-power LED production usually requires traceability markings on GaN, sapphire, SiC or GaAs wafers with OCR or T7 data matrix codes. ROFINs Waferlase systems are designed to meet the most stringent requirements of wafer marking, assuring traceability of the manufacturing process for fault analysis of semiconductor devices. The systems all produce marks that are machine-readable, have no negative influence on subsequent manufacturing steps and still permit clear identification at the end of the process chain.

PowerLine E 12 IC SHG lasers mark leadframes during the LED production process with miniscule 2D matrix codes, made up of spots which are just 0.043 mm small. ROFIN's PowerLine E 30 IC SHG lasers also mark white ceramics used as substrate for LEDs, with character heights of 0.15 mm and line widths of 0.020 mm or ECC200 data matrix codes of 1 mm edge length.

### Market With Significant Growth Potential

LED backlighting technology will develop in several stages according to expert opinion. Local dimming currently debuts in high-end displays and is expected to enter more price-sensitive segments while RGB backlighting will find its way into the mass market. This opens up interesting and challenging application fields for laser processing.

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