OLED Lighting technology

Rear light technology: A signaling function evolves into a display

Similar to the headlights, the rear lights have seen a rapid evolution at Audi as well. In 2011, LEDs provided the rear lights of the Audi A6 with a new visual homogeneity and enhanced the efficiency of lighting technology, which also benefits other road users: The LED brake light responds instantaneously and thus two tenths of a second faster than an incandescent lamp. As a result, the driver of a following vehicle can react faster. Accordingly, at 100 km/h (62 mph), the distance on which a following vehicle is able to brake is extended by nearly 6 meters (20 ft).

In 2012, the turn signal with dynamic indication was introduced in the Audi R8. This pioneering achievement, in which Audi worked closely together with approval authorities, has since become standard equipment. Due to the movements of the turn signal, directional changes are more clearly perceptible by the drivers of following vehicles, especially from a distance and at night.

OLED rear lights on the Audi TT RS rang in a new era in 2016. The light of the light-emitting diodes, which consist of organic material, is extremely homogeneous and precise. OLED light sources are ultra-thin area light sources and do not require reflectors. This technology is efficient, lightweight and visually impressive. In 2020, Audi was the first manufacturer to digitize the rear lights that turns them into a display and opens up new potential in terms of styling, personalization and safety. Due to the increased segmentation of the digital OLEDs to currently 18 segments, diverse rear light designs can be achieved for the first time. Customers purchasing a Q5 can choose between three rear light signatures. Irrespective of these choices, a particularly sporty signature can be set in “dynamic” mode in Audi drive select. In addition, the proximity indication feature enhances traffic safety: When the Q5 is standing still and another road user approaches from behind at a distance of less than two meters (6.5 ft), all OLED segments are activated. As a result, the visible area is enlarged and perceptibility enhanced. A total of five different visual lighting patterns can be achieved here with just a single set of hardware.
On or off: Those were the lighting options for the parking light, low and high beam in the analogue age. Functions above and beyond purely seeing and to be seen hardly existed. Styling potential was rather limited up until the nineteen-eighties. Smaller light sources paved the way for increasingly individual and distinctive designs. Halogen incandescent lamps enabled free-form headlights. The clear cover lenses appearing in the late nineteen-

nineties and the small xenon lamps gave Audi's headlights a look resembling the pupil of a human eye. They permitted more compact headlight shapes and component arrangements. This marked the advent of a new business segment of offering options in the area of lighting and a resulting opportunity for differentiation underscoring the brand's premium character in line with technical progress.

An experience for the senses: Design, signature and dynamics

Segmentation and modularization allow for styling freedoms in vehicle design and foster new creativity in the design and animation of light. In combination with digitization, new functionalities emerged such as lighting signatures and dynamic lighting scenarios. As is typical for Audi, all lighting signatures are designed for absolute precision and homogeneity. They emphasize the width of the vehicle by means of distinctive horizontal lines and accentuating details on the car's exterior. In their interaction, these segments form a body, ensuring that the vehicle sports a visually wider look and sits squarely on the road.

Styling innovations and customer experience always go hand in hand with maximum functionality and high customer value. In 2004, LED daytime running lights defined Audi's face for the first time while enhancing visibility. Today, on the A3 as the first model range, Matrix LED headlights can feature model- and line-specific signatures in the daytime running lights using just one set of hardware.

The dynamic lighting scenario of the leaving and coming home function in the Audi A7 Sportback and A8 created a new customer experience. This function is activated when unlocking and leaving the car. The digital Matrix LED headlights with DMD technology for the Audi e-tron are now offering five different welcoming versions within the range of extended dynamic lighting scenarios. They can appear as projections on a wall or on the ground. With such diversity and innovative prowess, Audi has been and will remain not just the globally leading brand in automotive lighting technology, but also makes this type of "Vorsprung durch Technik" visible in the design of lighting signatures and their dynamic enactment.
Light at Audi stands for a symbiosis of technology, design, safety and customer experience. Connectivity ensures smart functionality. Lamps turn into displays and a one-dimensional signaling and warning function of the past will evolve into a versatile means of communication with the external world, going forward.

Versatile and forward-thinking: Safety, communication and interaction

Be it at the front or rear, thanks to freely selectable signatures with identical hardware, a wealth of variety has found its way into the brand's model ranges. Going forward, it is

conceivable that, via the MMI, owners will be able to switch between a wide range of signatures or achieve custom designs. Via the myAudi app, Audi e-tron customers already have the opportunity of booking additional lighting functions even after having purchased their car – anytime and with great flexibility. Other models will follow.

Today, the digital Matrix LED headlight with DMD technology already offers projections for specific lane guidance and orientation, which serve to make driving easier and avoid accidents.As a forward-thinking prospect, this technology, combined with other ideas, may enhance the driver's attention as well as mutual consideration and respect among road users.

Since 2020, the proximity indication feature in the Audi Q5 has made car-to-x communication of the rear lights a reality as well. Hence Audi is pursuing an anthropocentric path and, with the digital OLED rear lights, paving the way into a new age. The rear lights are evolving into a display medium, which can be extended by versatile functions in the next evolution. In the medium run, the digital OLED will have more than 60 segments, each of which can be individually controlled and systematically activated. Looking forward, besides enabling the versatile styling and personalization of lighting designs, the digital OLED, for instance, will be able to issue early warnings of local hazards such as slippery roads and the end of traffic jams to other road users.

Looking forward even further, Audi is working on the flexible digital OLED. Instead of the roughly 0.7 millimeter (0.03 in) thin yet rigid supporting material, flexible substrates such as thin glass, plastic films or metal foils may be used, which can be bent in one or several directions. This new potential provides greater styling freedoms for rear light designs. The technology's key characteristics are retained as well as the low weight of the existing two-dimensional OLED displays. For the first time, the light emitted will be able to shine in a three-dimensional way. Flexible digital OLEDs facilitate the integration of the "display area" all the way into the vehicle's flanks, thereby visibly enlarging the usable area for lighting design and communication with the surroundings once again.

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