

**March 2003**  
**Development of a large-output blue-violet laser**  
**(Sanyo Electric Co., Ltd.)**  
**~ Discrete Semiconductor/Others ~**

HD DVD and Blue-Ray were devised as the optical disc systems with 15 to 25GB of storage capacity which was 3-5 times larger than VD, owing to successful room-temperature continuous oscillation of GaN blue-violet lasers in 1997. It became possible to record and reproduce video in high definition for more than 2 hours. The key device for this was a 405nm band blue-violet semiconductor laser.

For reproduction of BD (Blue-Ray-Disc), a laser's output power of about 20mW is enough, but for recording, 50mW or more is required for single-sided single layer recording. The recording speed increases with the output increase, as 2× by 120mW and 6× by 200mW, and the convenience improves. In the case of a multilayer disc, a larger output is required. For example, it takes about 500mW to dub the HTDV program for 8 hours (100GB 4-layer recording) at 12× speed. For this reason, a fierce development competition of high-power blue-violet semiconductor laser began.

In 2003, Shono et al. of Sanyo developed a pulse-oscillating blue-violet semiconductor laser with optical output of 100mW. Instead of the sapphire substrate used in the initial blue-violet laser, they used a large-diameter (2 inch  $\Phi$ ) GaN single crystal substrate developed by Sumitomo Electric Industries, and various techniques were devised such as the reduction of defects in the epitaxial layer, and the control of electron confinement and light confinement by inserting a carrier block layer (CB layer) between the active layer and p-type cladding layer. Incidentally, the sample price of this laser was 200,000 yen

In 2003, the world's first blue-ray disc recorder for home use (450,000 yen) was released by Sony, and wide use of BD started. After that, domestic manufacturers such as Sony, Toshiba, Sharp, and Renesas developed and commercialized high-power blue-violet lasers one after another. In 2008, SANYO developed a blue-violet laser with a light output of 450mW (pulse), 200mW (continuous) that supported 12×speed 4-layer recording Blu-ray disc.

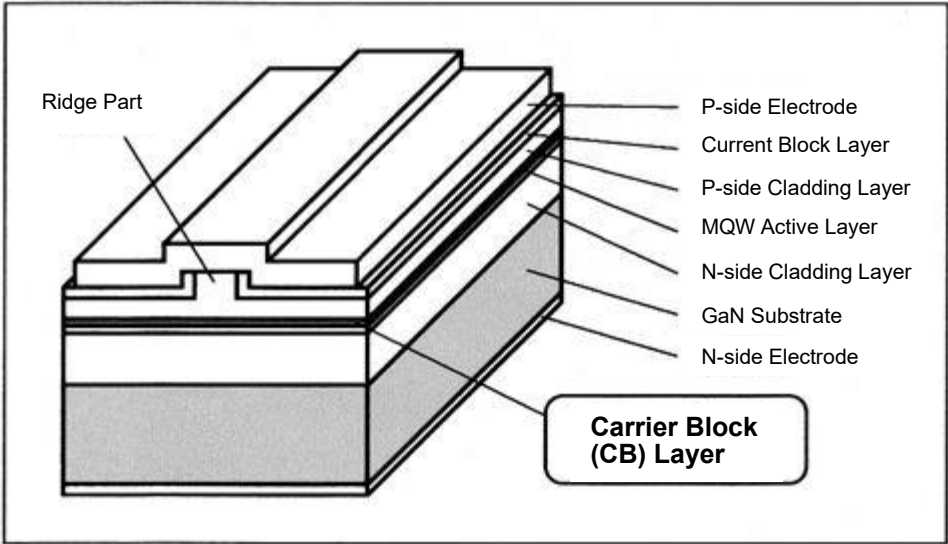
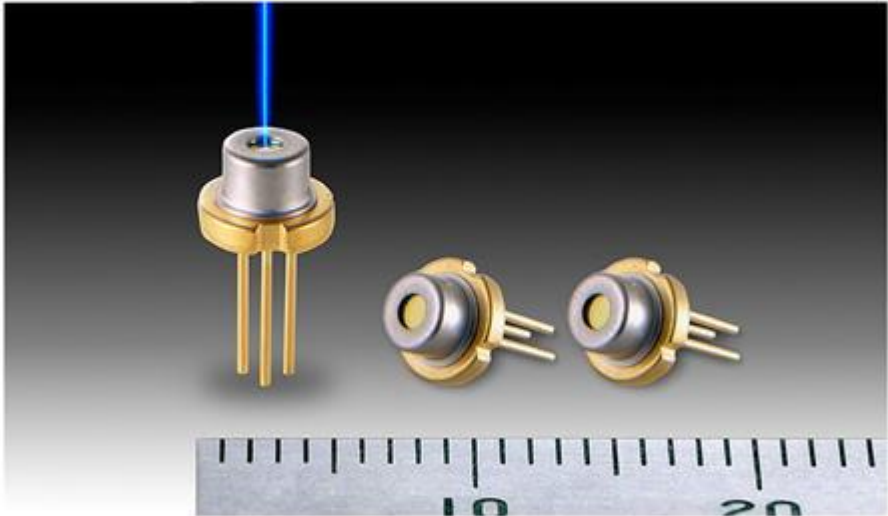


図6 素子構造の模式図  
Fig.6 Schematic drawing of device structure

Outline of cross-sectional structure of blue-violet laser with carrier block layer inserted



高出力青紫色半導体レーザー

High-power blue-violet semiconductor laser (Sanyo)