High Power Laser Diode
that Achieves High-Speed CD-R Recording

SLD234VL

In the optical disc area, including CD, MD, and now DVD as well, Sony continues to lead the industry.
The laser diode is the critical device in optical disc systems, and Sony continues to provide the most advanced technology in this area as well.
Now, Sony has developed a new high power laser diode for CD-R recording, an area with increasing demand as a large-capacity computer data storage medium.
The SLD234VL achieves the high power levels of 60 mW in CW (continuous wave) mode and 80 mW in pulsed mode and thus makes 4× speed CD-R recording a possibility.

- **Real index guide laser**
- **High power:**
  60 mW CW, 80 mW pulsed
- **Low operating current:**
  Iop = 70 mA at 50 mW CW (Iop = 100 mA at 80 mW pulsed mode)
- **High reliability**

The following points must be considered to achieve both high power and high reliability in laser diodes.

· Lowering the density of the light at the point the light is emitted to prevent melting of the crystals in the laser diode itself by the emitted light.
· Increasing the efficiency with which the supplied current is converted to light.
· Suppressing absorption of light within the semiconductor material.

V O I C E

The key point for this device was to achieve the highest possible power while still assuring reliability. Thus, while the directions in which we should proceed were naturally limited, from those possibilities we determined which aspects to aim for based on current requirements and costs, and by introducing new technologies as well, arrived at the product described here. I think this device can also be applied to high-speed recording in other optical discs as well as CD-R. I hope you will consider this product for your other applications as well.

We adopted the structure described below, which is made possible by Sony's superlative MOCVD crystal growth technology that allows nanometer order (a nanometer is one billionth of a meter) fine control, and achieved both high power and high reliability.

Multi-Quantum Well Structure

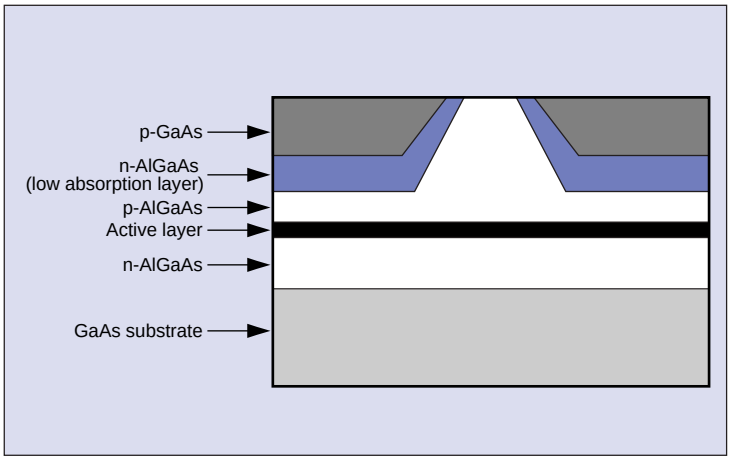
A multi-quantum well (MQW) structure is adopted in the active layer in the SLD234VL. This technique acquires quantum effects by making the layers that contribute to active layer optical emissions extremely thin, having thicknesses of about 10 nm, and thus achieves even more efficient optical conversion. Also, optical enclosure was suppressed by reducing the thickness of the whole of the active layer region, which reduced the optical density at the emission point.

Real Index Guide Structure

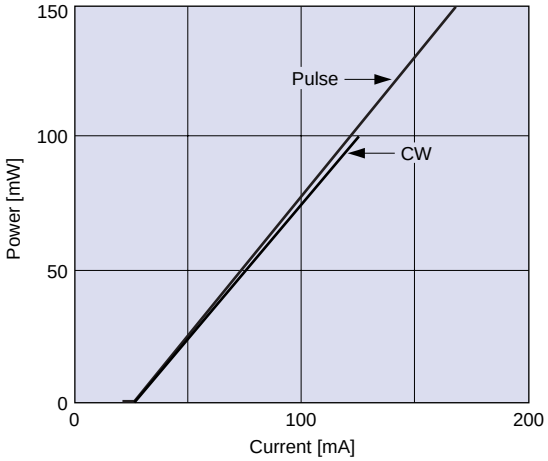
A real index guide structure, which has minimal internal absorption is used as the laser diode internal optical waveguide. (See figure 1.) Improvements to the crystal growth and fabrication processes that started with an analysis of this structure resulted in a 60% reduction in internal absorption in sections other than the optically active sections as compared to the earlier Sony SLD203BVL. Figure 2 shows the characteristics of the SLD234VL which result from this concentration of technology. This device achieves an operating current, Iop, of 70 mA at 50 mW CW and 100 mA at 80 mW pulsed, and exhibits no crystal melting even at 150 mW in pulsed mode. (See figure 2-1.) The FFP (far field pattern) is 8.8 degrees (typical) for the active layers in the horizontal direction ($\theta//$), and is 22 degrees (typical) for the active layers in the vertical direction ($\theta\perp$). (See figure 2-2.) Also, the oscillation wavelength is 784 nm (typical), which matches the sensitivity of CD-R discs. (See figure 2-3.) In addition, this device has superlative thermal characteristics, and, as shown in figure 3, can operate at over 100 mW in pulsed mode even at 80°C. In reliability testing, no degradation was seen after 1000 hours of 80 mW pulsed mode operation at 75°C, and thus this device provides more than adequate reliability for practical application. (See figure 4.)

Sony will continue striving to develop devices with even higher power.

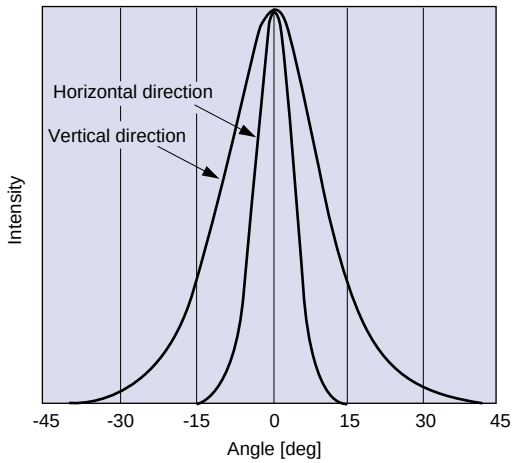
New Products



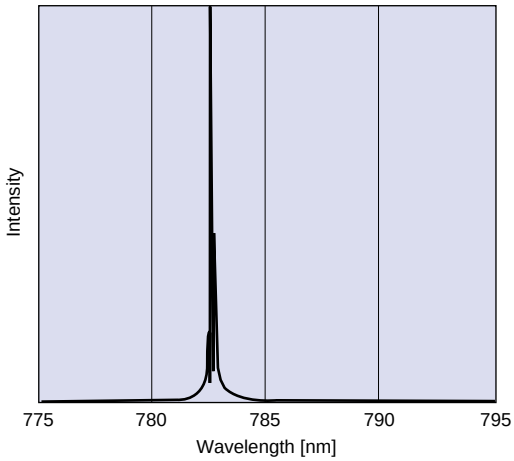
■ Figure 1 SLD234VL Chip Structure (Real Index Structure)



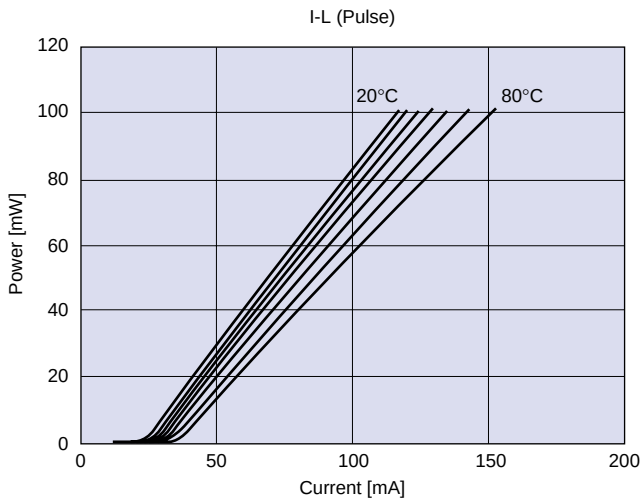
■ Figure 2-1 SLD234VL I-L Characteristics



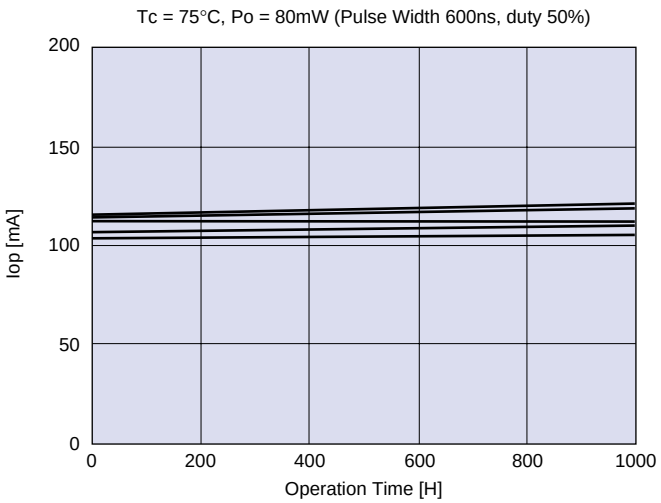
■ Figure 2-2 SLD234VL Far Field Pattern



■ Figure 2-3 SLD234VL Spectrum



■ Figure 3 SLD234VL Temperature Characteristics



■ Figure 4 SLD234VL Reliability Characteristics