High-Power Semiconductor Laser Diode Makes 32×-speed CD-R Recording Possible

SLD239VL

The CD-R market continues to exhibit striking growth.
The demands for even higher recording speeds know no bounds in this market.
To respond to these demands, Sony is now releasing the SLD239VL high-power semiconductor laser diode that makes 32×-speed CD-R recording possible.
This device achieves an optical power output of 180 mW (pulse drive) increased by 20% over conventional products.
This device inherits the stable operation at high temperatures, and thus is easy to use in end product designs.

- **High power operation with a maximum output of 180 mW (pulse drive)**
- **Radiation angle design that aims for a high optical efficiency in an optical pickup**
- **Stable operation at temperatures as high as 75°C**

High Power Operation at 180 mW

In CD-R recording, the role of the semiconductor laser diode is that of the optical heat source used for heating the disc material to change its properties and thus write information on the disc. To increase the recording speed, the disc must be heated to a temperature that allows recording to take place in an even shorter time. Thus higher optical power output is required from the semiconductor laser diode. The increasing demand for even higher recording speeds thus becomes an increasing demand for higher semiconductor laser diode output.

Sony has released a sequence of semiconductor laser diodes, from the SLD234VL for 4×-speed recording (up to 80 mW with pulsed operation) to the SLD238VL for 24×-speed recording (150 mW, also for pulsed operation). Now, Sony is releasing the SLD239VL, which reaches an optical power output of 180 mW, a level that will allow 32×-speed recording. (See figure 1.) In developing this product, Sony started with the conventional chip structure as the base, and optimized the cavity length and the quantum well structure of the active layer. This was to prevent the melting of the chip crystal by its own laser output, which would render it unable to function. (See figure 2.)

FFP Design that Aims for High Optical Efficiency in an Optical Pickup

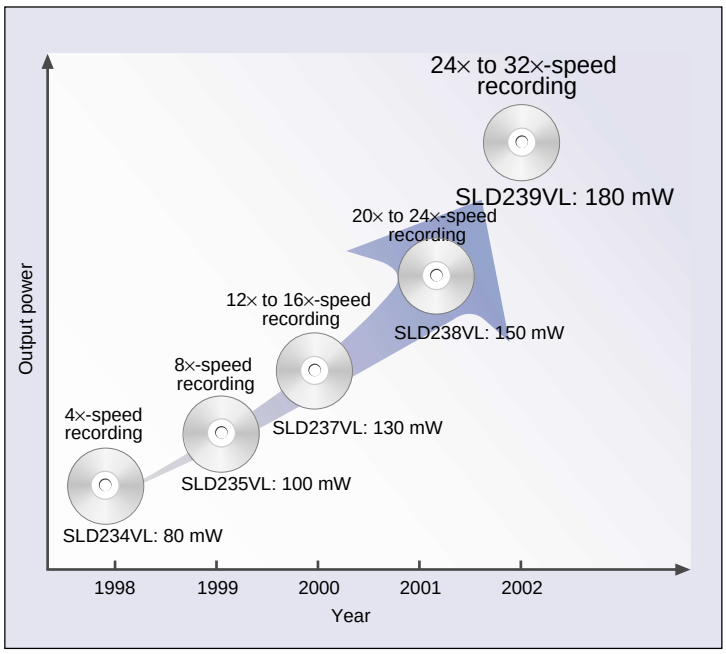
In a high-power laser diode optical pickup (OP) used for CD-R recording, the laser beam emitted by the semiconductor laser diode must be collimated efficiently by a lens. Sony took this point into consideration in designing the SLD239VL, and the radiation angle, and thus the far field pattern (FFP), was made as narrow (small) as possible. Similarly for the current-optical power output characteristics (I-L characteristics), Sony achieved a high power with an efficiency of conversion from electricity to optical power output equivalent to that of conventional products. (See figure 3 and table 1.)

Stable Operation at High Temperatures

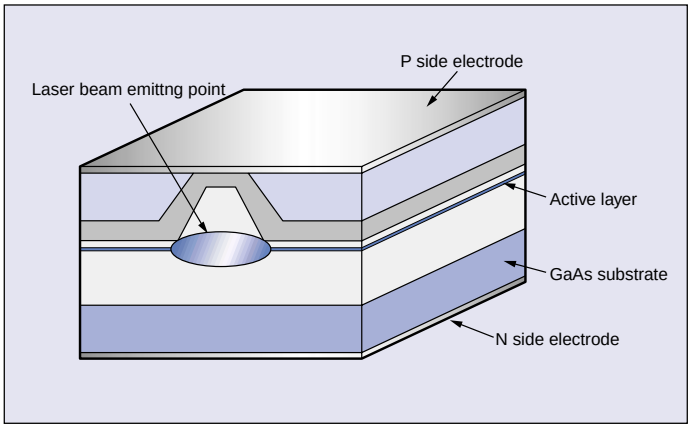
CD-R drives, which are used in computer-related equipment, are often subjected to ambient temperatures around 70°C due to heat generated within the equipment. Furthermore, the semiconductor laser diode is required to operate with minimal variations even in these severe environments. Sony increased the cavity length to 900 µm (an increase of 13% over conventional products) in the SLD239VL and thus achieved stable operation and high reliability.

V O I C E

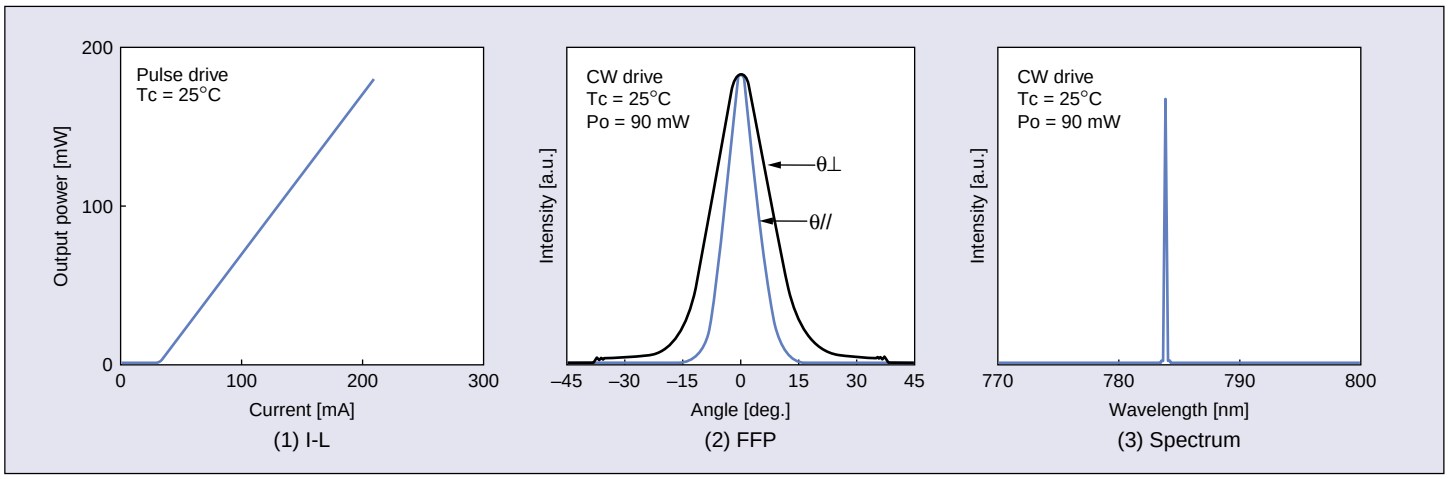
I remember wondering how fast CD-R recording would become back in 1998 when 4×-speed CD-R LDs first became available. In just three years we have achieved 32×-speed recording. At the same time as being astonished by the speed at which technology is advancing, I am also pleased that this technology is rapidly being employed in commercial products with almost no delay. I hope to continue to be able to develop products that respond to market needs in a timely manner.



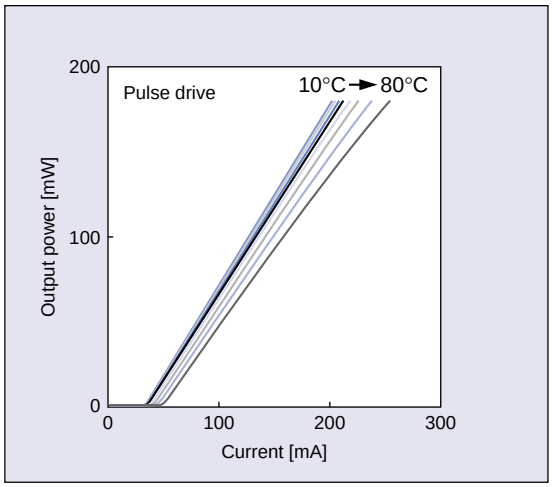
■ **Figure 1 Development Trends in CD-R Laser Diode**



■ **Figure 2 SLD239VL Chip Structure**



■ **Figure 3 SLD239VL Representative Characteristics**



■ **Figure 4 Characteristics Temperature Dependency**

■ **Table 1 SLD239VL Main Characteristics**

Item		Symbol	Typical value	Unit
Threshold current		Ith	30	mA
Operating current		Iop	120	
Operating voltage		Vop	2	V
Wavelength		λp	784	nm
Radiation angle	Parallel	θ//	8.3	deg.
	Perpendicular	θ⊥	16.0	
Differential efficiency		ηD	1.0	mW/mA

Conditions: Tc = 25°C
Po = 90 mW @CW