

LD-6-4

High Power and High Temperature Operation of InGaAsP/InP
Buried Crescent Laser Diode emitting at 1.3 μ m

Y.SAKAKIBARA, E.OOMURA, H.HIGUCHI, Y.NAKAJIMA, H.NAMIZAKI,
K.IKEDA and W.SUSAKI

LSI Research & Development Laboratory, Mitsubishi Electric Corporation
4-1, Mizuhara, Itami, Hyogo 664, Japan

High power CW operation of 80mW at room temperature and 5mW CW operation at 120°C have been realized with newly developed InGaAsP/InP Buried Crescent (BC) laser with p-type InP substrate.

The p-substrate BC (PBC) laser was fabricated on p-InP substrate by two-step LPE growth. In the first LPE growth, current blocking layers were grown. In the second LPE growth, crescent shaped active layer and cladding layers were grown. The schematic structure of PBC laser is shown in Fig. 1. The laser chips were mounted on BeO heatsinks with junction up configuration. Cavity length of the laser was 300 μ m. Mirror coat was done on the rear facet of the laser ($R_r=87\%$).

Figure 2 shows the light output power vs. injection current (P-I) characteristics of a PBC laser at various temperatures. Threshold current of the laser is 10mA at 30°C, 19mA at 70°C and only 42mA even at 110°C. The laser shows good linearity in the P-I curves up to 90°C. The light output power of 10mW is obtained even at 110°C. At the temperature as high as 120°C, the output power more than 5mW was realized. Maximum lasing temperature under CW condition is 135°C in spite of junction up mounting. The characteristic temperature of the threshold current in PBC lasers is 60-90 K (15-90°C). Output power characteristics are also improved by the structure, 80mW under CW condition is realized at room temperature by applying anti-reflective coating on the front facet ($R_f=8\%$).

The PBC laser has a similar structure to the BC laser with n-type InP

substrate except that each layer in the PBC laser has opposite conduction type to the BC laser. The high output power and high temperature CW operation characteristics of the PBC laser, however, are much better than those of the BC laser.

We have been carrying out a preliminary aging test at 70°C with a constant light output of 5mW. Five samples of PBC laser without any screenings were used in this test. They have been operating stably for more than 1100 hours. The operation currents of five lasers are inclined to be saturated. The mean value of the increasing rate of operation current is within 5% of the initial value.

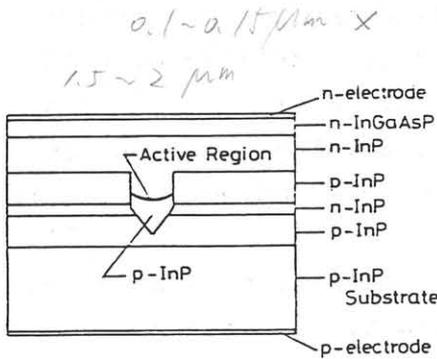


Fig. 1 The schematic structure of PBC laser

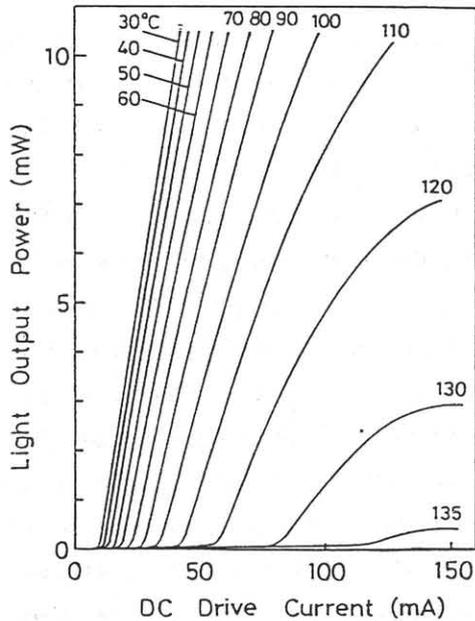


Fig. 2 The P-I characteristics of a PBC laser at various temperatures