

Coaxial Uncooled DFB Laser Diode Module for C-WDM Applications

1. INTRODUCTION

Recent years have seen widespread use of the coarse-wavelength division multiplexing (C-WDM) system, since the recent growth of broadband access has made it essential to increase the capacity of metro systems. In the C-WDM system, wavelength multiplexing is effected at a certain wavelength interval (e.g. 20 nm) that is coarser than that of ordinary WDM systems, thereby the transmission capacity per single fiber is increased. Recently, the C-WDM systems are being introduced into analog communications as well as into digital communications, including CATV and mobile communications systems. In CATV systems optical fibers are used in the links nearer to the base station for the purpose of capacity increase. In mobile communications systems also, optical repeaters are used for dead zones of poor radio wave reception such as in tunnels and underground malls. Against this background, Furukawa Electric has developed a coaxial uncooled DFB laser module for C-WDM applications, and began products shipping.

2. FEATURES

2.1 Structure

Figure 1 shows the appearance of the product. The package is a coaxial type without built-in temperature control function, and three flange types are available including horizontal, vertical and flangeless types. The pigtail fiber has a flame-retardant coating of Hytrel †, and is compatible with various connectors. Also, a single or semi-double stage optical isolator is built in.



Figure 1 Appearance of coaxial DFB LD module.

2.2 Wavelength Lineup

A broad wavelength lineup of 18 wavelengths is provided with an interval of 20 nm ranging from 1270 nm to 1610 nm.

2.3 Specifications for Digital Applications

Table 1 shows the specifications for digital communications. The product amply satisfies the characteristics for 2.5-Gb/s modulation, and thus can deal with 2.5-Gb/s digital modulation. Figure 2 shows a typical eye diagram during 2.5-Gb/s modulation.

Table 1 Specifications for digital communications.

Item		Spec.	Condition
Spectrum width	nm	≤ 1.0	2.5 Gb/s, -20 dB width
Rise time	ps	≤ 0.10	20-80 %
Fall time	ps	≤ 0.15	20-80 %

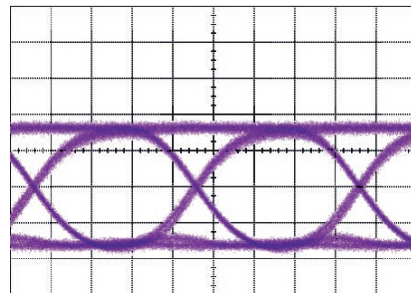


Figure 2 Eye pattern at 2.5-Gb/s modulation.

2.4 Specifications for Repeater Applications in Mobile Communications

In mobile communications where the frequency bands of the second generation (i.e. 800 MHz) and the third generation (i.e. 1.9 GHz and 2.2 GHz) are used, the laser modules to be applied to optical repeaters are required to have such performance as high output (4 mW), low third order inter-modulation distortion (IMD3) and low relative intensity noise (RIN). Typical specifications for the third generation are shown in Table 2.

† Hytrel is a registered trademark of DuPont.

Table 2 Specifications for repeater applications in mobile communications.

Item		Spec.	Condition
Cut-off frequency	GHz	Typ.3	
IMD3	dBc	≤ -56	2 tone, f1=2.2 GHz, f2=2.2025 GHz, OMI=20 %/tone
RIN	dB/Hz	≤ -145	f=2.2 GHz
Isolation	dB	≤ 30	

2.5 Specifications for CATV Return-path Applications

In CATV return-path the adoption of a semi-double stage optical isolator and an angled PC connector is standardized since stringent measures against reflected light are needed. Also, low inter-modulation distortion and low spurious noise are required together with low RIN. Table 3 shows the typical specifications.

Table 3 Specifications for CATV return-path applications.

Item		Spec.	Condition
IMD2	dBc	≤ -50	2 tone, f1=13 MHz, f2=19 MHz, OMI=10 %/tone
IMD3	dBc	≤ -60	
Spurious noise with carrier	dBc	Typ.-55	1 tone, f=19 MHz, OMI=10 %/tone, SMF: 20 km
Spurious noise without carrier	dBc	Typ.-50	
RIN	dB/Hz	≤ -150	f=5~200 MHz
Isolation	dB	≥ 50	

3. CONCLUSIONS

Furukawa Electric has brought into market the coaxial uncooled DFB laser module for C-WDM applications having a broad wavelength lineup of 18 wavelengths ranging from 1270 nm to 1610 nm with an interval of 20 nm. The product can deal with both the digital and analogue communications, thus satisfactorily meeting customer needs.

For further information, please contact:

Optical Devices Department, R&D Div.

TEL: +81-436-42-1617 FAX: +81-436-42-1736