

Eight-Channel WDM Intraboard Optical Interconnect Device by Integration of Add/Drop Multiplexers in Thin-Film Waveguide

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Abstract—A wavelength-division-multiplexing (WDM) optical interconnect device has been proposed and investigated in order to realize broadband signal transmission in intraboard chip-to-chip interconnection. Focusing grating couplers (FGCs) and distributed Bragg reflectors were integrated in a thin-film waveguide to form free-space-wave add/drop multi-/demultiplexers for the WDM optical interconnections. This time, FGC coupling efficiency was improved by careful fabrication with multistep deposition and measurements of reflection spectra. An eight-channel WDM interconnect device was fabricated and characterized in the wavelength dependence.

Index Terms—Focusing grating couplers (FGCs), integrated optics, optical add/drop multiplexers, optical interconnections, optical waveguides, wavelength-division multiplexing (WDM).

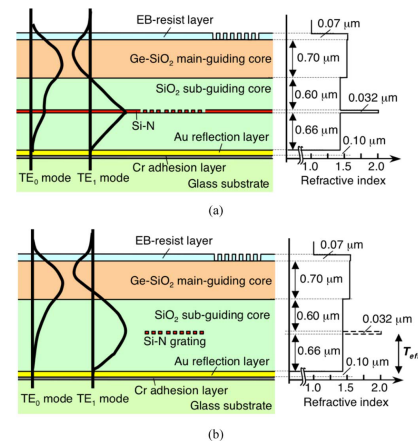


Fig. 2. Cross-sectional structures and refractive index profiles of the thin-film waveguides (a) with and (b) without Si-N layer in the whole.

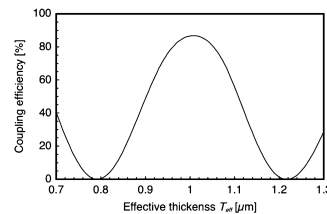


Fig. 3. Dependence of the output coupling efficiency of TE mode by GMS-FGC on the effective thickness.

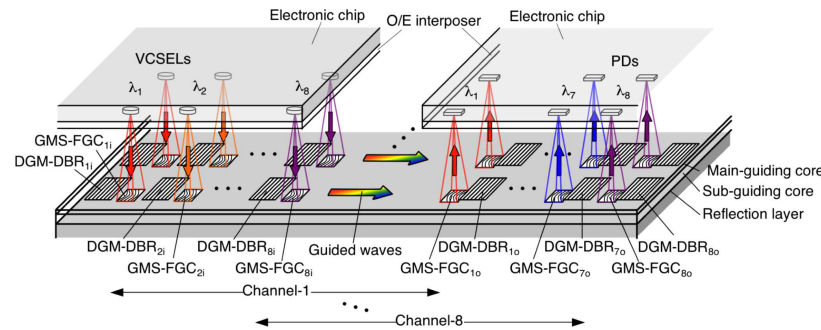


Fig. 1. Schematic view of WDM optical interconnection, using free-space-wave add/drop multi-/demultiplexers integrated in a thin-film waveguide.

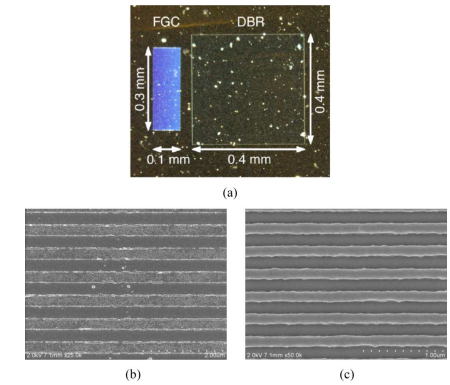


Fig. 4. (a) Dark-field microscope photograph of the fabricated GMS-FGC and DGM-DBR. SEM photographs of (b) GMS-FGC and (c) DGM-DBR.

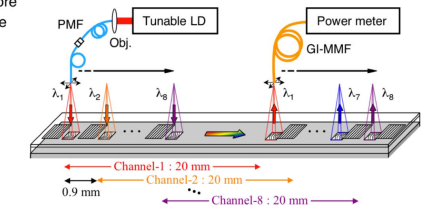


Fig. 5. Schematic view of experimental setup for the insertion loss measurements.

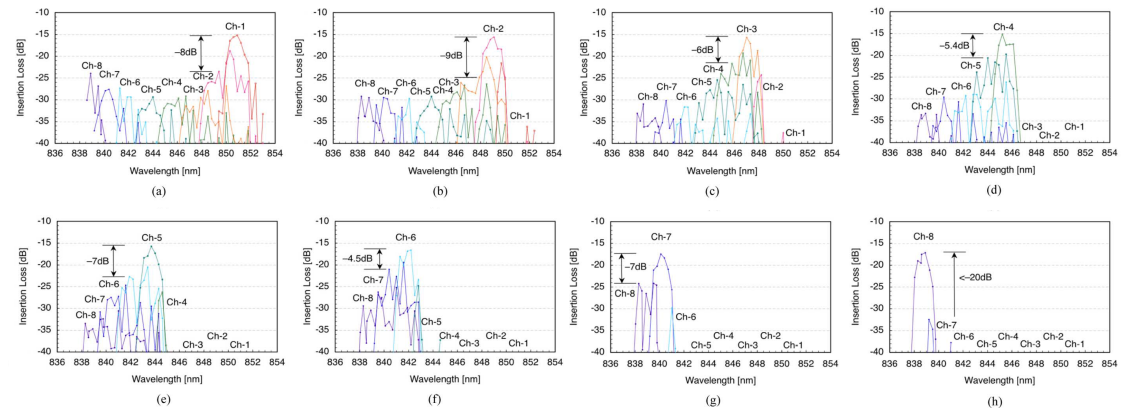


Fig. 6. Wavelength dependencies of insertion loss and the crosstalk noise for (a) channel-1 output, (b) channel-2 output, (c) channel-3 output, (d) channel-4 output, (e) channel-5 output, (f) channel-6 output, (g) channel-7 output, and (h) channel-8 output. Labels in the figures denote the input channel number.