

Chapter-3

The Long March to a Silicon- Photonics Union

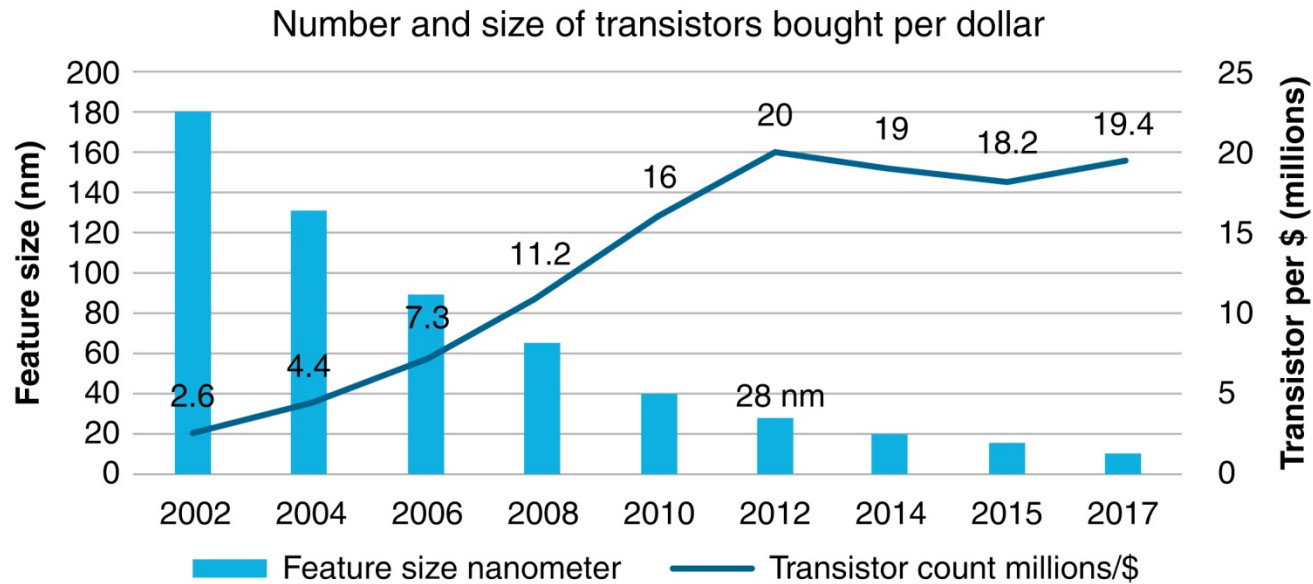


Figure 3.1:The changing economics of the chip industry. From The Linley Group.

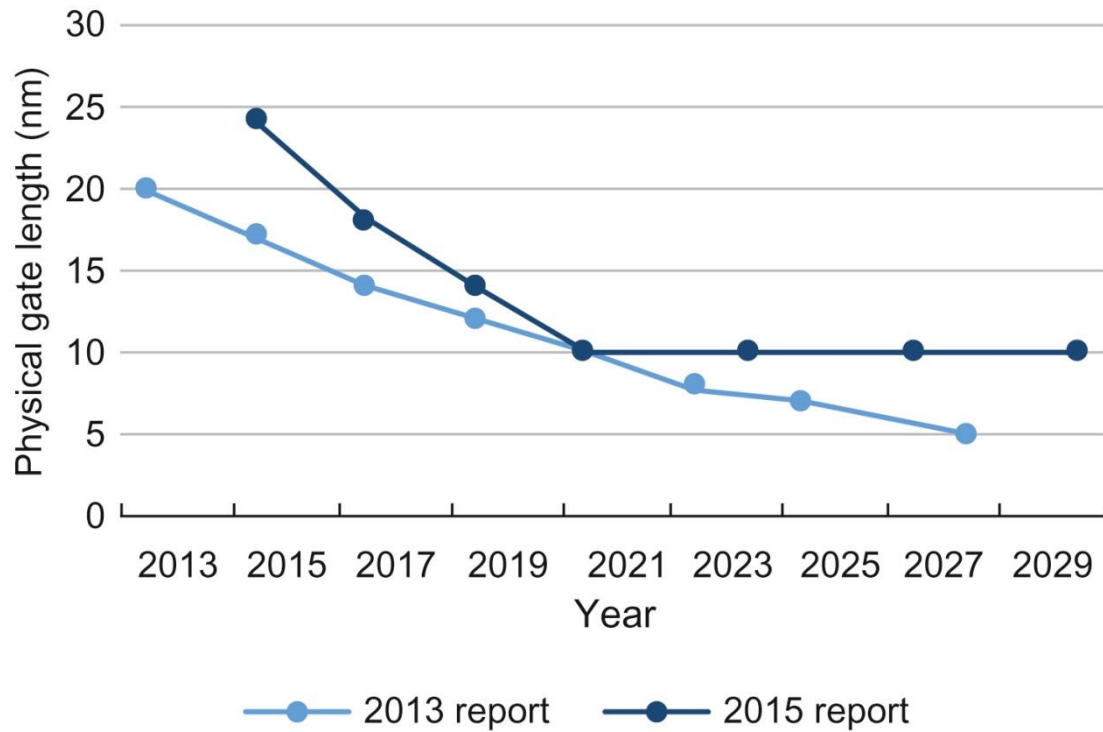


Figure 3.2: Moore's law coming to an end from 2021. Courtesy of ITRS.

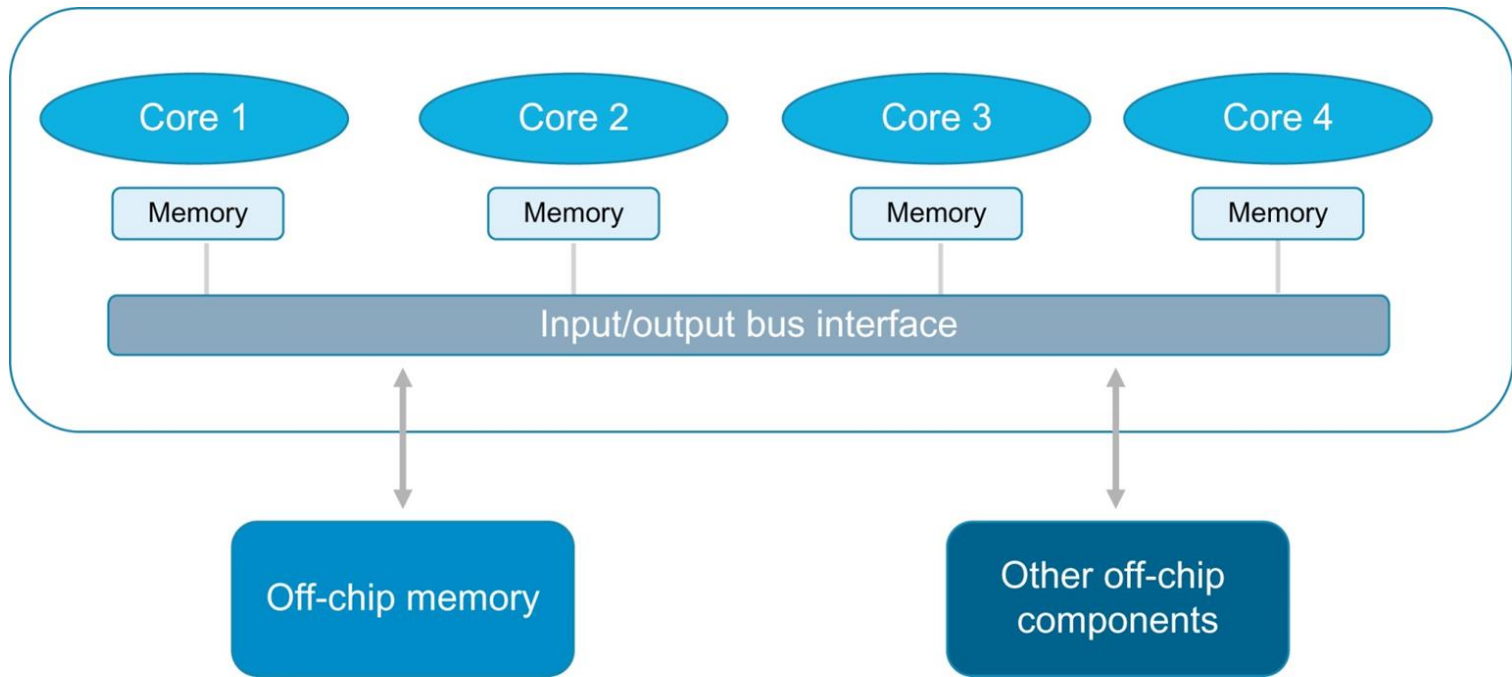


Figure 3.3: Multicore chip architecture.

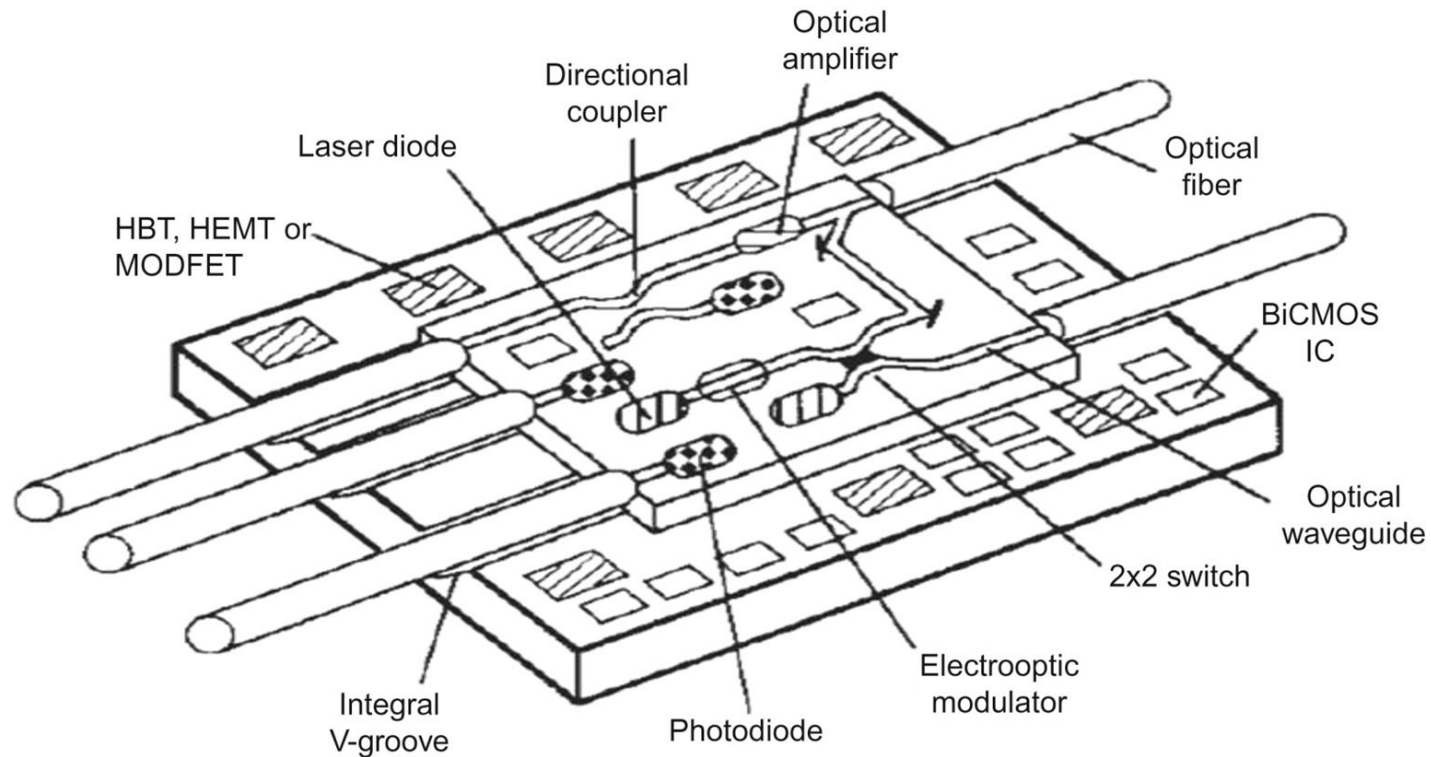


Figure 3.4: A concept optoelectronic integrated circuit superchip. © 2016 IEEE. Reprinted, with permission, from Soref RA. Silicon-based optoelectronics. In: Proceedings of the IEEE, vol. 81, no. 12; December 1993. p. 1687-1706. <http://dx.doi.org/10.1109/5.248958>.

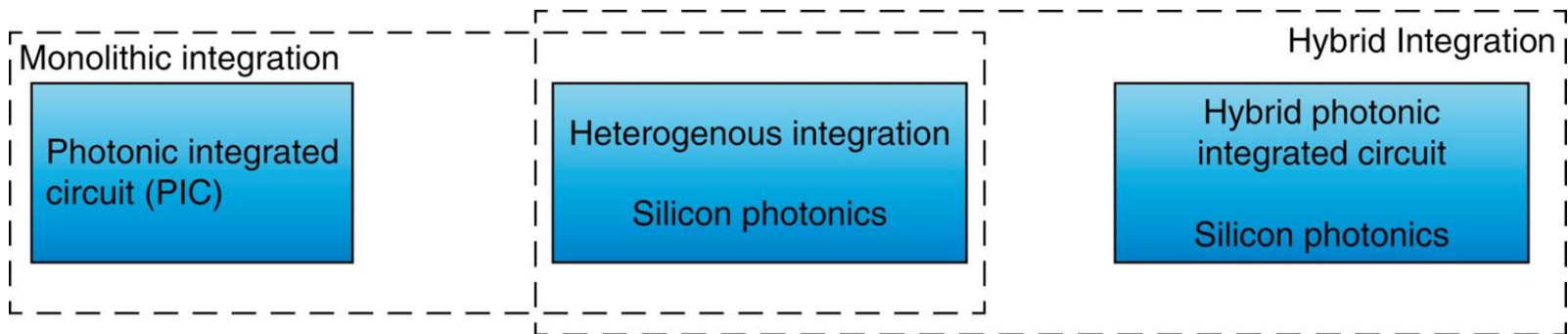


Figure 3.5 : The different approaches to silicon photonics chip design.

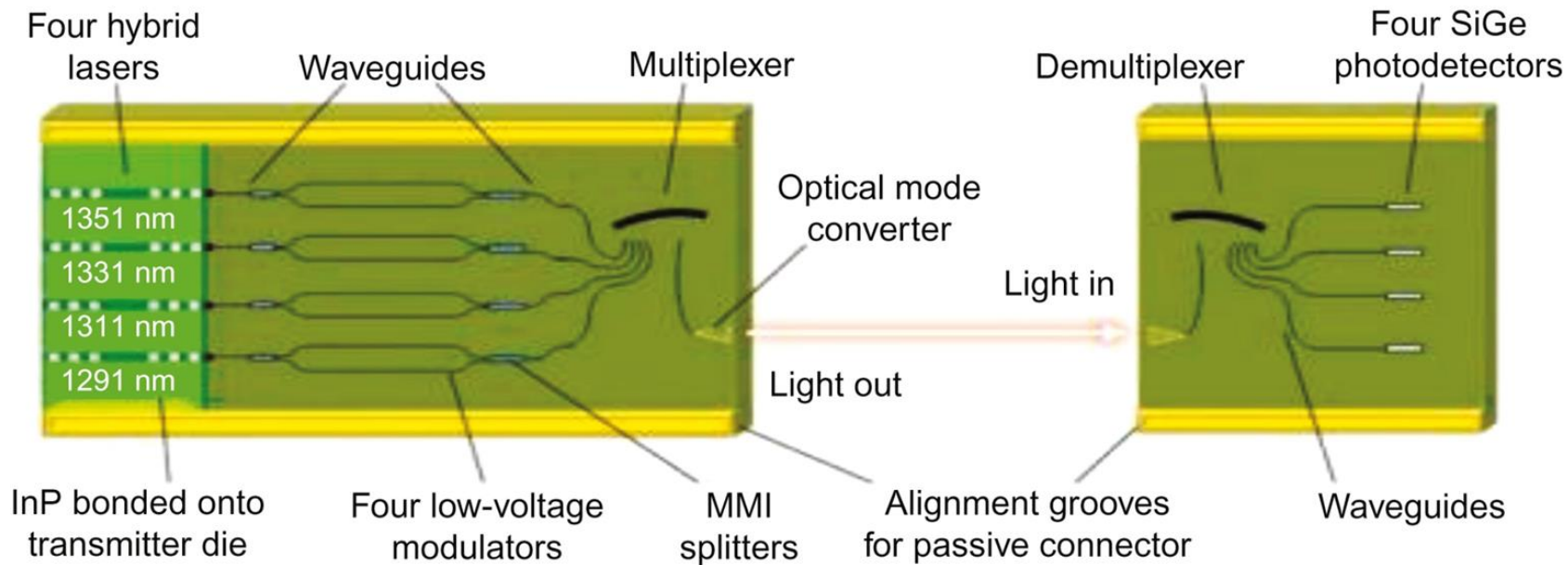


Figure 3.6: The optical building blocks used in a multiwavelength link. MMI, multimode interference. A. Alduino et al., “Demonstration of a high-speed 4-channel integrated silicon photonics WDM link with hybrid silicon lasers,” Optical Society of America Integrated Photonics Research Silicon and Nanophotonics, Monterey, CA, paper PDIWI5 (July 25, 2010); <http://bit.ly/e8zGqi>; courtesy of Intel.

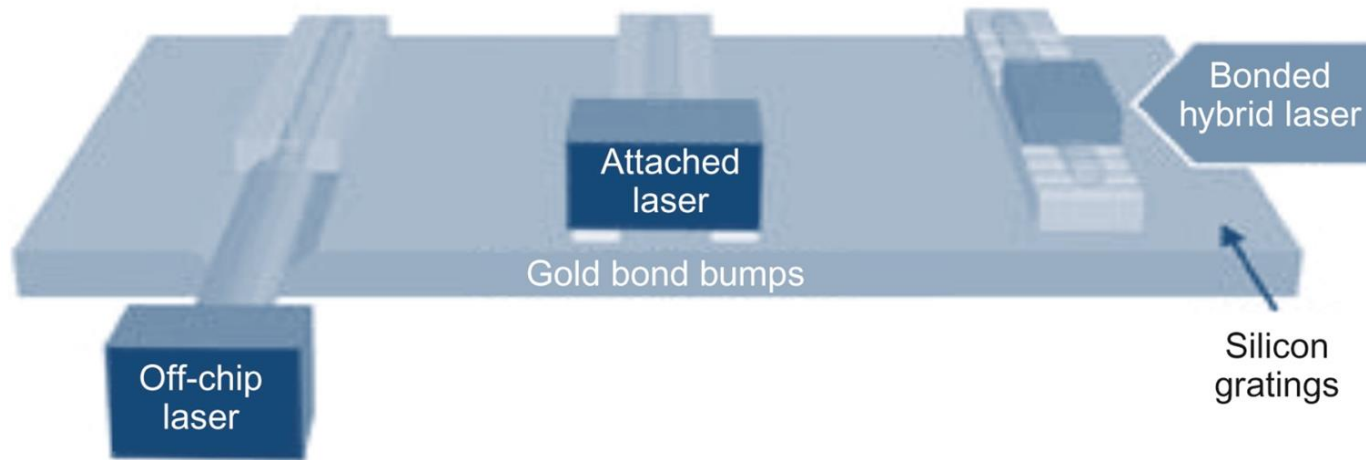


Figure 3.7: Schematic illustrating standalone and hybrid lasers used with silicon photonics chips. From Photonics Spectra (Intel).

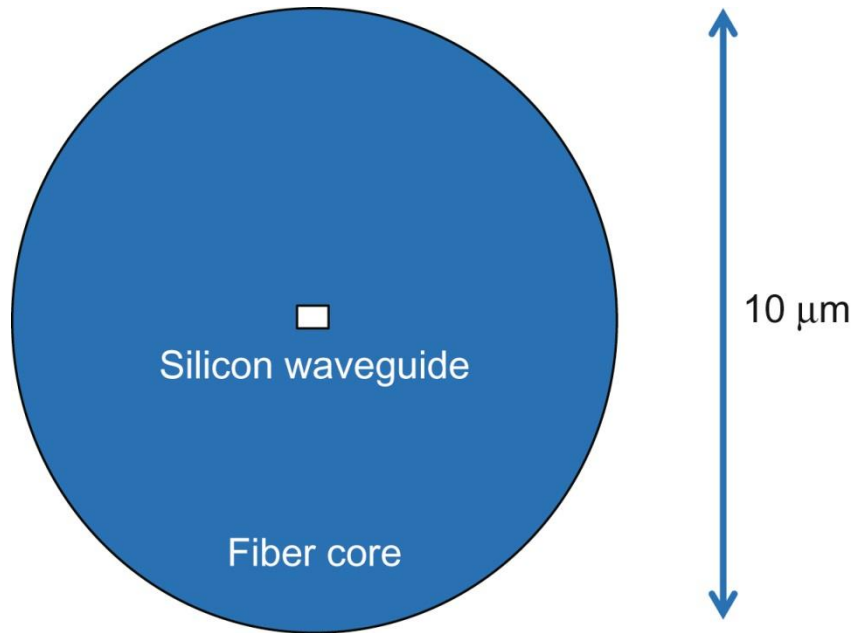


Figure 3.8: Single-mode optical fiber core diameter compared to the tiny silicon waveguide.

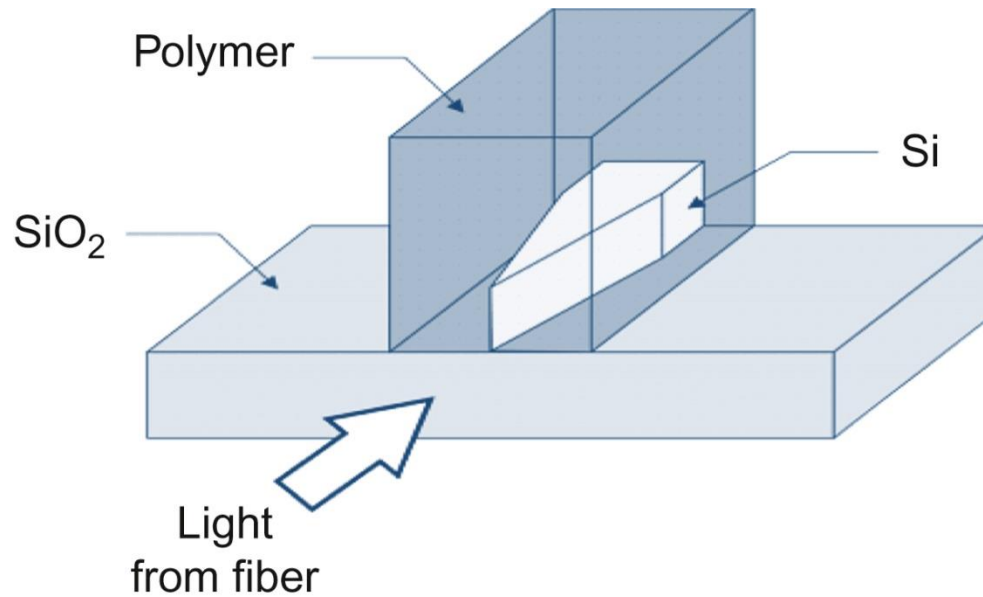


Figure 3.9: An inverse taper structure used to expand the silicon waveguide mode field diameter to match that of the optical fiber. McNab SJ, Moll N, Vlasov YA. Ultra-low loss photonic integrated circuit with membranetype photonic crystal waveguides. Opt Express 2003;11:292739.

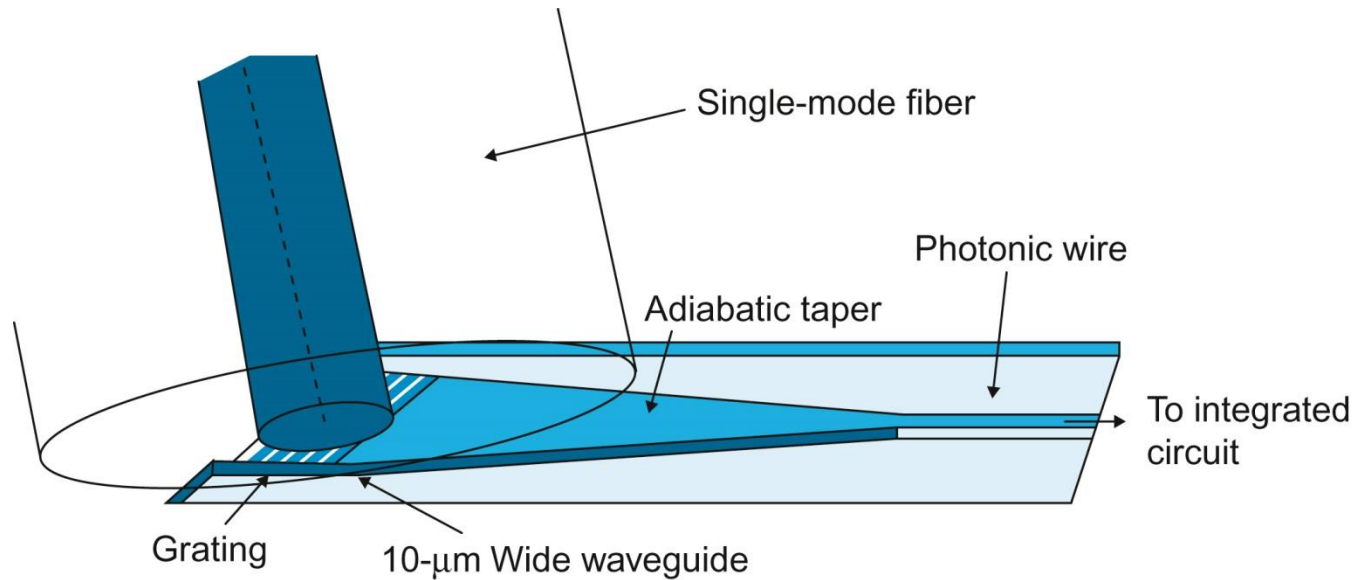


Figure 3.10: The grating coupling approach. Journal of Lightwave Technology [29]. Van Laere F, Bogaerts W, Taillaert D, Dumon P, Van Thourhout D, Baets R. Compact focusing grating couplers between optical fibers and silicon-on-insulator photonic wire waveguides. In: Optical fiber communication conference and exposition and the national fiber optic engineers conference, OSA technical digest series (CD), Optical Society of America Paper OWG1; 2007.