

(57) Abstract: Methods of forming a tapered evanescent coupling region for use with a relatively thin silicon optical waveguide formed with, for example, an SOI structure. A tapered evanescent coupling region (16) is formed in a silicon substrate (20) that is used as a coupling substrate, the coupling substrate thereafter joined to the SOI structure. A gray-scale photolithography process is used to define a tapered region in photoresist, the tapered pattern thereafter transferred into the silicon substrate. A material exhibiting pattern thereafter transferred into the silicon optical waveguide layer is then used to fill the tapered opening in the substrate. Conventional silicon processing steps may be used to form coupling facets in the silicon in an appropriate relation to the tapered evanescent coupling region. The coupling facets may be formed contiguous with the tapered evanescent coupling region, or formed through the opposing side of the silicon substrate.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G02B 6/26; H01L 21/02

US CL : 385/30, 43; 65/386; 438/31, 40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 385/30, 43; 65/386; 438/31, 40 385/30, 43; 65/386; 438/31, 40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

USPTO EAST DATABASE search terms: waveguide, taper photoresist

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,E	US 6,760,529 B2 (CHONG et al) 06 July 2004 (06.07.2004), columns 2-5.	1-20
A	US 5,513,288 A (MAYER) 30 April 1996 (30.04.1996), columns 3-4.	1-20
A	US 5,515,464 A (SHEEM) 07 May 1996 (07.05.1996), columns 3-6.	1-20
A	US 5,910,012 A (TAKEUCHI) 08 June 1999 (08.06.1999, column 4.	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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