(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 December 2007 (13.12.2007)

PCT

(10) International Publication Number
WO 2007/143585 A3

(51) International Patent Classification:
H01L 21/3213 (2006.01) *H01L 21/311* (2006.01)

(21) International Application Number:
PCT/US2007/070270

(22) International Filing Date: 1 June 2007 (01.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/448,246 5 June 2006 (05.06.2006) US

(71) Applicant *(for all designated States except US)*: **LAM RESEARCH CORPORATION** [US/US]; 4650 Cushing Parkway, Fremont, California 94538 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **KAMP, Tom A.** [US/US]; 1693 Goldentree Drive, San Jose, California 95131 (US).

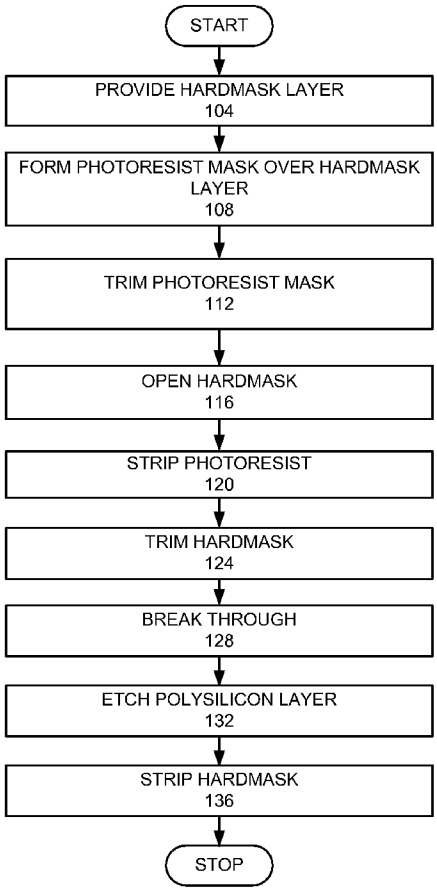
(74) Agents: **LEE, Michael B.K.** et al.; Beyer Weaver LLP, PO Box 70250, Oakland, CA 94612-0250 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: RESIDUE FREE HARDMASK TRIM



(57) Abstract: A method for forming features in a polysilicon layer is provided. A hardmask layer is formed over the polysilicon layer. A photoresist mask is formed over the hardmask layer. The hardmask layer is etched through the photoresist mask to form a patterned hardmask. The patterned hardmask is trimmed by providing a non-carbon containing trim gas comprising oxygen and a fluorine containing compound, forming a plasma from the trim gas, and trimming the hardmask. Features are etched into the polysilicon layer through the hardmask.

WO 2007/143585 A3

FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
28 February 2008

Published:
— *with international search report*