

1032. cont'd.

6. a. 2. Capable of producing a pattern with a minimum resolvable feature size of 0.7 μm or less when calculated by the following formula:

$$\text{MRF} = \frac{(\text{an exposure light source wavelength in } \mu\text{m}) \times (\text{K factor})}{\text{numerical aperture}}$$

where the K factor = 0.7.

MRF = minimum resolvable feature size.

6. b. Equipment specially designed for mask making or semiconductor device processing using deflected focussed electron beam, ion beam or "laser" beam, with any of the following:
1. A spot size smaller than 0.2 μm ;
 2. Capable of producing a pattern with a feature size of less than 1 μm ; or
 3. An overlay accuracy of better than $\pm 0.20 \mu\text{m}$ (3 sigma);
7. Masks or reticles, as follows:
- a. For integrated circuits embargoed by 1031.1.;
 - b. Multi-layer masks with a phase shift layer;
8. "Stored programme controlled" test equipment, specially designed for testing semiconductor devices and unencapsulated dice, as follows:
- a. For testing S-parameters of transistor devices at frequencies exceeding 31 GHz;
 - b. For testing integrated circuits capable of performing functional (truth table) testing at a pattern rate of more than 40 MHz;

Notes

1032.8.b. does not embargo test equipment specially designed for testing:

1. "Assemblies" or a class of "assemblies" for home or entertainment applications;
2. Unembargoed electronic components, "assemblies" or integrated circuits.

- c. For testing microwave integrated circuits at frequencies exceeding 3 GHz;

Note

1032.8.c. does not embargo test equipment specially designed for testing microwave integrated circuits for equipment designed or rated to operate in the Standard Civil Telecommunication Bands at frequencies not exceeding 31 GHz.

- d. Electron beam systems designed for operation at 3 keV or below, or "laser" beam systems, for the non-contactive probing of powered-up semiconductor devices, with both of the following:
 1. Stroboscopic capability with either beam-blanking or detector strobing; and
 2. An electron spectrometer for voltage measurement with a resolution of less than 0.5 V.

Note

1032.8.d. does not embargo scanning electron microscopes, except when specially designed and instrumented for the non-contactive probing of powered-up semiconductor devices.

1033. Materials

1. Hetero-epitaxial materials consisting of a "substrate" with stacked epitaxially grown multiple layers of:
 - a. Silicon;
 - b. Germanium; or
 - c. III/V compounds of gallium or indium;

Technical Note

III/V compounds are polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIIA and VA of Mendeleev's periodic classification table (gallium arsenide, gallium-aluminium arsenide, indium phosphide, etc.).

2. Resist materials, as follows, and "substrates" coated with embargoed resists:
 - a. Positive resists for semiconductor lithography specially adjusted (optimised) for use at wavelengths below 370 nm ;
 - b. All resists, for use with electron beams or ion beams, with a sensitivity of 0.01 $\mu\text{Coulomb}/\text{mm}^2$ or better;
 - c. All resists, for use with X-rays, with a sensitivity of 2.5 mJ/mm^2 or better;
 - d. All resists optimized for surface imaging technologies, including silylated resists;

Technical Note

Silylation techniques are defined as processes incorporating oxidation of the resist surface to enhance performance for both wet and dry developing.

3. Organo-inorganic compounds as follows:
 - a. Organo-metallic compounds of aluminium, gallium or indium having a purity (metal basis) better than 99.999%;
 - b. Organo-arsenic, organo-antimony and organo-phosphorus compounds having a purity (inorganic element basis) better than 99.999%.

Note

1033.3. only embargoes compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.

4. Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999%, even diluted in inert gases or hydrogen.

Note

1033.4. does not embargo hydrides containing 20% molar or more of inert gases or hydrogen.

1034. Software

1. "Software" specially designed for the "development" or "production" of equipment embargoed by 1031.1.b. to 1031.2.h. or 1032.;
2. "Software" specially designed for the "use" of "stored programme controlled" equipment embargoed by 1032.;
3. Computer-aided-design (CAD) "software" for semiconductor devices or integrated circuits, having any of the following:
 - a. Design rules or circuit verification rules;
 - b. Simulation of the physically laid out circuits; or
 - c. Lithographic processing simulators for design.

Technical Note

A lithographic processing simulator is a "software" package used in the design phase to define the sequence of lithographic, etching and deposition steps for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor material.

Note

1034.3. does not embargo "software" specially designed for schematic entry, logic simulation, placing and routing, layout verification or pattern generation tape;

N.B.

Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as technology.

1035. Technology

1. Technology according to the General Technology Note for the "development" or "production" of equipment or materials embargoed by 1031, 1032 or 1033;

Note

1035.1. does not embargo technology for the "development" or "production" of:

- a. Microwave transistors operating at frequencies below 31 GHz;
- b. Integrated circuits embargoed by 1031.1.a.3. to 12., having both of the following:
 1. Using technology of one μm or more, and
 2. Not incorporating multi-layer structures.

N.B.:

This Note does not preclude the export of multilayer technology for devices incorporating a maximum of two metal layers and two polysilicon layers.

2. Other technology for the "development" or "production" of:
 - a. Vacuum microelectronic devices;
 - b. Hetero-structure semiconductor devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well or super lattice devices;
 - c. "Superconductive" electronic devices;
 - d. Substrates of films of diamond for electronic components.