

# CPC COOPERATIVE PATENT CLASSIFICATION

## H ELECTRICITY

(NOTE omitted)

## H10 SEMICONDUCTOR DEVICES; ELECTRIC SOLID-STATE DEVICES NOT OTHERWISE PROVIDED FOR

## H10D INORGANIC ELECTRIC SEMICONDUCTOR DEVICES

### NOTES

1. This subclass covers electric semiconductor devices having inorganic semiconductor bodies. This includes the following kind of devices:
  - inorganic semiconductor devices specially adapted for rectifying, amplifying, oscillating or switching, e.g. transistors or diodes;
  - individual inorganic resistors or capacitors having potential barriers;
  - individual resistors, capacitors or inductors having no potential barriers, and specially adapted for integration with other semiconductor components;
  - semiconductor bodies, or regions thereof, of devices covered by this subclass;
  - electrodes of devices covered by this subclass;
  - integrated devices, e.g. CMOS integrated devices;
  - processes or apparatus specially adapted for the manufacture or treatment of such devices.
2. This subclass does not cover:
  - electronic memory devices, which are covered by subclass [H10B](#);
  - semiconductor devices sensitive to infrared radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation, which are covered by subclass [H10F](#);
  - light-emitting semiconductor devices having at least one potential barrier, which are covered by subclass [H10H](#);
  - thermoelectric, thermomagnetic, piezoelectric, electrostrictive, magnetostrictive, magnetic-effect, superconducting or other electric solid-state devices, which are covered by subclass [H10N](#);
  - constructional details other than semiconductor bodies or electrodes, which are covered by group [H01L 23/00](#).
3. In this subclass, the periodic system used is the I to VIII group system indicated in the Periodic Table under Note (3) of section [C](#).

### Individual devices

#### 1/00 Resistors, capacitors or inductors

#### NOTE

This group covers:

- individual inorganic resistors or capacitors having potential barriers;
- individual resistors, capacitors or inductors having no potential barriers, and specially adapted for integration with other semiconductor components.

#### 1/01 . {Manufacture or treatment}

#### WARNING

Group [H10D 1/01](#) is incomplete pending reclassification of documents from group [H10D 8/051](#).

Groups [H10D 8/051](#) and [H10D 1/01](#) should be considered in order to perform a complete search.

#### 1/021 . . {of resistors having no potential barriers}

#### 1/025 . . {of resistors having potential barriers}

#### WARNING

Group [H10D 1/025](#) is incomplete pending reclassification of documents from groups [H10D 8/051](#) and [H10D 48/021](#).

Groups [H10D 8/051](#), [H10D 48/021](#) and [H10D 1/025](#) should be considered in order to perform a complete search.

#### 1/041 . . {of capacitors having no potential barriers}

#### 1/042 . . . {using deposition processes to form electrode extensions}

#### 1/043 . . . {using patterning processes to form electrode extensions, e.g. etching}

#### 1/045 . . {of capacitors having potential barriers, e.g. varactors}

#### WARNING

Groups [H10D 1/045](#) - [H10D 1/048](#) are incomplete pending reclassification of documents from groups [H10D 8/051](#) and [H10D 48/021](#).

All groups listed in this Warning should be considered in order to perform a complete search.

#### 1/047 . . . {of conductor-insulator-semiconductor capacitors, e.g. trench capacitors}

- 1/048 . . . . {having PN junctions, e.g. hybrid capacitors with MOS control}
- 1/20 . Inductors
- 1/40 . Resistors

**WARNING**

Group [H10D 1/40](#) is impacted by reclassification into group [H10D 48/38](#).

Groups [H10D 1/40](#) and [H10D 48/38](#) should be considered in order to perform a complete search.

- 1/43 . . Resistors having PN junctions
- 1/47 . . Resistors having no potential barriers
- 1/472 . . . {having an active material comprising carbon, e.g. diamond or diamond-like carbon [DLC]}
- 1/474 . . . {comprising refractory metals, transition metals, noble metals, metal compounds or metal alloys, e.g. silicides}
- 1/476 . . . {comprising conducting organic materials, e.g. conducting polymers}
- 1/60 . Capacitors
- 1/62 . . Capacitors having potential barriers
- 1/64 . . . Variable-capacitance diodes, e.g. varactors
- 1/66 . . . Conductor-insulator-semiconductor capacitors, e.g. MOS capacitors
- 1/665 . . . . {Trench conductor-insulator-semiconductor capacitors, e.g. trench MOS capacitors}
- 1/68 . . Capacitors having no potential barriers
- 1/682 . . . {having dielectrics comprising perovskite structures}
- 1/684 . . . . {the dielectrics comprising multiple layers, e.g. comprising buffer layers, seed layers or gradient layers}
- 1/688 . . . . {comprising barrier layers to prevent diffusion of hydrogen or oxygen}
- 1/692 . . . {Electrodes}
- 1/694 . . . . {comprising noble metals or noble metal oxides}
- 1/696 . . . . {comprising multiple layers, e.g. comprising a barrier layer and a metal layer (barrier layers to prevent diffusion of hydrogen or oxygen in perovskite based capacitors [H10D 1/688](#))}
- 1/711 . . . . {having non-planar surfaces, e.g. formed by texturisation}
- 1/712 . . . . . {being rough surfaces, e.g. using hemispherical grains}
- 1/714 . . . . . {having horizontal extensions}
- 1/716 . . . . . {having vertical extensions}

**8/00** **Diodes** (variable-capacitance diodes [H10D 1/64](#); gated diodes [H10D 12/00](#))

**NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

**WARNING**

Group [H10D 8/00](#) is impacted by reclassification into group [H10D 8/20](#).

Groups [H10D 8/00](#) and [H10D 8/20](#) should be considered in order to perform a complete search.

- 8/01 . Manufacture or treatment

**WARNING**

Groups [H10D 8/01](#), [H10D 8/021](#), [H10D 8/022](#), [H10D 8/024](#), [H10D 8/041](#), [H10D 8/045](#) and [H10D 8/055](#) are incomplete pending reclassification of documents from groups [H10D 8/043](#), [H10D 8/051](#) and [H10D 48/021](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 8/021 . . {of breakdown diodes}
- 8/022 . . . {of Zener diodes}
- 8/024 . . . {of Avalanche diodes}
- 8/041 . . {of multilayer diodes}
- 8/043 . . {of planar diodes}

**WARNING**

Group [H10D 8/043](#) is incomplete pending reclassification of documents from groups [H10D 8/051](#) and [H10D 48/021](#).

Group [H10D 8/043](#) is also impacted by reclassification into groups [H10D 8/01](#), [H10D 8/021](#) - [H10D 8/024](#), [H10D 8/041](#), [H10D 8/045](#) and [H10D 8/055](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 8/045 . . {of PN junction diodes}
- 8/051 . . {of Schottky diodes}

**WARNING**

Group [H10D 8/051](#) is incomplete pending reclassification of documents from group [H10D 48/021](#).

Group [H10D 8/051](#) is also impacted by reclassification into groups [H10D 1/01](#), [H10D 1/025](#), [H10D 1/045](#) - [H10D 1/048](#), [H10D 8/01](#), [H10D 8/021](#) - [H10D 8/024](#), [H10D 8/041](#), [H10D 8/043](#), [H10D 8/045](#), [H10D 8/053](#), [H10D 8/055](#) and [H10D 48/021](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 8/053 . . {of heterojunction diodes or of tunnel diodes}

**WARNING**

Group [H10D 8/053](#) is incomplete pending reclassification of documents from groups [H10D 8/051](#) and [H10D 48/021](#).

Groups [H10D 8/051](#), [H10D 48/021](#) and [H10D 8/053](#) should be considered in order to perform a complete search.

- 8/055 . . {of transit-time diodes, e.g. IMPATT or TRAPATT diodes}

8/20	<ul style="list-style-type: none"> <li>Breakdown diodes, e.g. avalanche diodes</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 8/20</a> is incomplete pending reclassification of documents from group <a href="#">H10D 8/00</a>.</p> <p>Groups <a href="#">H10D 8/00</a> and <a href="#">H10D 8/20</a> should be considered in order to perform a complete search.</p>	10/031	<ul style="list-style-type: none"> <li>{of Schottky BJTs}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/031</a> is incomplete pending reclassification of documents from group <a href="#">H10D 48/031</a>.</p> <p>Groups <a href="#">H10D 48/031</a> and <a href="#">H10D 10/031</a> should be considered in order to perform a complete search.</p>
8/25	<ul style="list-style-type: none"> <li>Zener diodes</li> </ul>	10/041	<ul style="list-style-type: none"> <li>{of thin-film BJTs (of heterojunction BJTs <a href="#">H10D 10/021</a>)}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/041</a> is incomplete pending reclassification of documents from group <a href="#">H10D 48/031</a>.</p> <p>Groups <a href="#">H10D 48/031</a> and <a href="#">H10D 10/041</a> should be considered in order to perform a complete search.</p>
8/30	<ul style="list-style-type: none"> <li>Point-contact diodes</li> </ul>		
8/40	<ul style="list-style-type: none"> <li>Transit-time diodes, e.g. IMPATT or TRAPATT diodes</li> </ul>		
8/411	<ul style="list-style-type: none"> <li>{PN diodes having planar bodies}</li> </ul>		
8/422	<ul style="list-style-type: none"> <li>{PN diodes having the PN junctions in mesas}</li> </ul>		
8/50	<ul style="list-style-type: none"> <li>PIN diodes</li> </ul>		
8/60	<ul style="list-style-type: none"> <li>Schottky-barrier diodes</li> </ul>		
8/605	<ul style="list-style-type: none"> <li>{of the trench conductor-insulator-semiconductor barrier type, e.g. trench MOS barrier Schottky rectifiers [TMBS]}</li> </ul>	10/051	<ul style="list-style-type: none"> <li>{of vertical BJTs (of heterojunction BJTs <a href="#">H10D 10/021</a>; of Schottky BJTs <a href="#">H10D 10/031</a>; of thin film BJTs <a href="#">H10D 10/041</a>)}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Groups <a href="#">H10D 10/051</a>, <a href="#">H10D 10/056</a> and <a href="#">H10D 10/058</a> are incomplete pending reclassification of documents from groups <a href="#">H10D 10/01</a> and <a href="#">H10D 48/031</a>.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>
8/70	<ul style="list-style-type: none"> <li>Tunnel-effect diodes</li> </ul>		
8/75	<ul style="list-style-type: none"> <li>Tunnel-effect PN diodes, e.g. Esaki diodes</li> </ul>		
8/755	<ul style="list-style-type: none"> <li>{Resonant tunneling diodes [RTD]}</li> </ul>		
8/80	<ul style="list-style-type: none"> <li>PNPN diodes, e.g. Shockley diodes or break-over diodes</li> </ul>		
8/812	<ul style="list-style-type: none"> <li>{Charge-trapping diodes}</li> </ul>		
8/825	<ul style="list-style-type: none"> <li>{Diodes having bulk potential barriers, e.g. Camel diodes, planar doped barrier diodes or graded bandgap diodes}</li> </ul>		
<b>10/00</b>	<p><b>Bipolar junction transistors [BJT]</b></p> <p><b><u>NOTE</u></b></p> <p>In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.</p>	10/052	<ul style="list-style-type: none"> <li>{of inverted vertical BJTs}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/052</a> is incomplete pending reclassification of documents from groups <a href="#">H10D 10/01</a> and <a href="#">H10D 48/031</a>.</p> <p>Group <a href="#">H10D 10/052</a> is also impacted by reclassification into group <a href="#">H10D 10/054</a>.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>
10/01	<ul style="list-style-type: none"> <li>Manufacture or treatment</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/01</a> is incomplete pending reclassification of documents from group <a href="#">H10D 48/031</a>.</p> <p>Group <a href="#">H10D 10/01</a> is also impacted by reclassification into groups <a href="#">H10D 10/051</a> - <a href="#">H10D 10/058</a>.</p> <p>Groups <a href="#">H10D 48/031</a>, <a href="#">H10D 10/01</a> and <a href="#">H10D 10/051</a> - <a href="#">H10D 10/058</a> should be considered in order to perform a complete search.</p>	10/054	<ul style="list-style-type: none"> <li>{Forming extrinsic base regions on silicon substrate after insulating device isolation in vertical BJTs having single crystalline emitter, collector or base regions}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/054</a> is incomplete pending reclassification of documents from groups <a href="#">H10D 10/01</a>, <a href="#">H10D 10/052</a> and <a href="#">H10D 48/031</a>.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>
10/021	<ul style="list-style-type: none"> <li>{of heterojunction BJTs [HBT]}</li> </ul> <p><b><u>WARNING</u></b></p> <p>Group <a href="#">H10D 10/021</a> is incomplete pending reclassification of documents from group <a href="#">H10D 48/031</a>.</p> <p>Groups <a href="#">H10D 48/031</a> and <a href="#">H10D 10/021</a> should be considered in order to perform a complete search.</p>	10/056	<ul style="list-style-type: none"> <li>{of vertical BJTs having the main current going through the whole substrate, e.g. power BJTs}</li> </ul>
		10/058	<ul style="list-style-type: none"> <li>{having multi-emitter structures, e.g. interdigitated, multi-cellular or distributed emitters}</li> </ul>

- 10/061 . . {of lateral BJTs (of heterojunction BJTs [H10D 10/021](#); of thin film BJTs [H10D 10/041](#))}

**WARNING**

Group [H10D 10/061](#) is incomplete pending reclassification of documents from group [H10D 48/031](#).

Groups [H10D 48/031](#) and [H10D 10/061](#) should be considered in order to perform a complete search.

- 10/211 . {Point-contact BJTs}  
 10/221 . {Schottky barrier BJTs}  
 10/231 . {Tunnel BJTs}  
 10/241 . {Avalanche BJTs}  
 10/311 . {Thin-film BJTs}  
 10/40 . Vertical BJTs {(Vertical Heterojunction BJTs [H10D 10/821](#))}  
 10/421 . . {having both emitter-base and base-collector junctions ending at the same surface of the body}  
 10/441 . . {having an emitter-base junction ending at a main surface of the body and a base-collector junction ending at a lateral surface of the body}  
 10/461 . . {Inverted vertical BJTs}  
 10/60 . Lateral BJTs  
 10/80 . Heterojunction BJTs  
 10/821 . . {Vertical heterojunction BJTs}  
 10/841 . . . {having a two-dimensional base, e.g. modulation-doped base, inversion layer base or delta-doped base}  
 10/861 . . . {having an emitter region comprising one or more non-monocrystalline elements of Group IV, e.g. amorphous silicon}  
 10/881 . . . {Resonant tunnelling transistors}  
 10/891 . . . {comprising lattice-mismatched active layers, e.g. SiGe strained-layer transistors}

**12/00 Bipolar devices controlled by the field effect, e.g. insulated-gate bipolar transistors [IGBT]**

**NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

- 12/01 . Manufacture or treatment

**WARNING**

Group [H10D 12/01](#) is incomplete pending reclassification of documents from groups [H10D 12/031](#) and [H10D 48/031](#).

Group [H10D 12/01](#) is also impacted by reclassification into group [H10D 12/031](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 12/021 . . {of gated diodes, e.g. field-controlled diodes [FCD]}

**WARNING**

Group [H10D 12/021](#) is incomplete pending reclassification of documents from group [H10D 48/031](#).

Groups [H10D 48/031](#) and [H10D 12/021](#) should be considered in order to perform a complete search.

- 12/031 . . {of IGBTs}

**WARNING**

Group [H10D 12/031](#) is incomplete pending reclassification of documents from groups [H10D 12/01](#) and [H10D 48/031](#).

Group [H10D 12/031](#) is also impacted by reclassification into groups [H10D 12/01](#), [H10D 12/035](#), [H10D 12/038](#), [H10D 18/01](#) - [H10D 18/031](#) and [H10D 30/028](#) - [H10D 30/0297](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 12/032 . . . {of vertical IGBTs}

**WARNING**

Group [H10D 12/032](#) is incomplete pending reclassification of documents from group [H10D 48/031](#).

Groups [H10D 48/031](#) and [H10D 12/032](#) should be considered in order to perform a complete search.

- 12/035 . . . . {Etching a recess in the emitter region (having a recessed gate [H10D 12/038](#))}

**WARNING**

Group [H10D 12/035](#) is incomplete pending reclassification of documents from groups [H10D 12/031](#) and [H10D 48/031](#).

Groups [H10D 12/031](#), [H10D 48/031](#) and [H10D 12/035](#) should be considered in order to perform a complete search.

- 12/038 . . . . {having a recessed gate, e.g. trench-gate IGBTs}

**WARNING**

Group [H10D 12/038](#) is incomplete pending reclassification of documents from groups [H10D 12/031](#) and [H10D 48/031](#).

Groups [H10D 12/031](#), [H10D 48/031](#) and [H10D 12/038](#) should be considered in order to perform a complete search.

12/211	<ul style="list-style-type: none"> <li>• {Gated diodes}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/211</a> is impacted by reclassification into groups <a href="#">H10D 18/40</a> and <a href="#">H10D 18/60</a> - <a href="#">H10D 18/655</a>.</p> <p>Groups <a href="#">H10D 12/211</a>, <a href="#">H10D 18/40</a> and <a href="#">H10D 18/60</a> - <a href="#">H10D 18/655</a> should be considered in order to perform a complete search.</p>	12/418	<ul style="list-style-type: none"> <li>• • {having a drift region having a doping concentration that is higher at the emitter side relative to other parts of the drift region}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/418</a> is incomplete pending reclassification of documents from group <a href="#">H10D 12/411</a>.</p> <p>Groups <a href="#">H10D 12/411</a> and <a href="#">H10D 12/418</a> should be considered in order to perform a complete search.</p>
12/212	<ul style="list-style-type: none"> <li>• • {having PN junction gates, e.g. field controlled diodes}</li> </ul>	12/421	<ul style="list-style-type: none"> <li>• • {on insulating layers or insulating substrates, e.g. thin-film IGBTs}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/421</a> is incomplete pending reclassification of documents from group <a href="#">H10D 12/491</a>.</p> <p>Groups <a href="#">H10D 12/491</a> and <a href="#">H10D 12/421</a> should be considered in order to perform a complete search.</p>
12/411	<ul style="list-style-type: none"> <li>• {Insulated-gate bipolar transistors [IGBT]}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/411</a> is impacted by reclassification into groups <a href="#">H10D 12/415</a>, <a href="#">H10D 12/416</a>, <a href="#">H10D 12/417</a>, <a href="#">H10D 12/418</a> and <a href="#">H10D 84/161</a>.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>	12/441	<ul style="list-style-type: none"> <li>• • {Vertical IGBTs}</li> </ul>
12/415	<ul style="list-style-type: none"> <li>• • {having edge termination structures}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/415</a> is incomplete pending reclassification of documents from group <a href="#">H10D 12/411</a>.</p> <p>Groups <a href="#">H10D 12/411</a> and <a href="#">H10D 12/415</a> should be considered in order to perform a complete search.</p>	12/461	<ul style="list-style-type: none"> <li>• • • {having non-planar surfaces, e.g. having trenches, recesses or pillars in the surfaces of the emitter, base or collector regions}</li> </ul> <p><b>WARNING</b></p> <p>Groups <a href="#">H10D 12/461</a> and <a href="#">H10D 12/481</a> are incomplete pending reclassification of documents from group <a href="#">H10D 12/491</a>.</p> <p>Groups <a href="#">H10D 12/491</a>, <a href="#">H10D 12/461</a> and <a href="#">H10D 12/481</a> should be considered in order to perform a complete search.</p>
12/416	<ul style="list-style-type: none"> <li>• • {Bidirectional devices, e.g. trench-gate IGBTs having additional gates at the anode side}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/416</a> is incomplete pending reclassification of documents from group <a href="#">H10D 12/411</a>.</p> <p>Groups <a href="#">H10D 12/411</a> and <a href="#">H10D 12/416</a> should be considered in order to perform a complete search.</p>	12/481	<ul style="list-style-type: none"> <li>• • • • {having gate structures on slanted surfaces, on vertical surfaces, or in grooves, e.g. trench gate IGBTs}</li> </ul>
12/417	<ul style="list-style-type: none"> <li>• • {having a drift region having a doping concentration that is higher at the collector side relative to other parts of the drift region}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/417</a> is incomplete pending reclassification of documents from group <a href="#">H10D 12/411</a>.</p> <p>Groups <a href="#">H10D 12/411</a> and <a href="#">H10D 12/417</a> should be considered in order to perform a complete search.</p>	12/491	<ul style="list-style-type: none"> <li>• • • {having both emitter contacts and collector contacts in the same substrate side}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 12/491</a> is impacted by reclassification into groups <a href="#">H10D 12/421</a> and <a href="#">H10D 12/461</a> - <a href="#">H10D 12/481</a>.</p> <p>Groups <a href="#">H10D 12/491</a>, <a href="#">H10D 12/421</a> and <a href="#">H10D 12/461</a> - <a href="#">H10D 12/481</a> should be considered in order to perform a complete search.</p>
		18/00	<p><b>Thyristors</b></p> <p><b>NOTE</b></p> <p>In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.</p>

18/01 . Manufacture or treatment

#### **WARNING**

Groups [H10D 18/01](#) - [H10D 18/031](#) are incomplete pending reclassification of documents from groups [H10D 12/031](#) and [H10D 48/031](#).

All groups listed in this Warning should be considered in order to perform a complete search.

18/021 . . {of bidirectional devices, e.g. triacs}

18/031 . . {of lateral or planar thyristors}

18/211 . {having built-in localised breakdown or breakover regions, e.g. self-protected against destructive spontaneous firing}

18/221 . {having amplifying gate structures, e.g. cascade configurations}

18/241 . {Asymmetrical thyristors}

18/251 . {Lateral thyristors}

18/40 . with turn-on by field effect

#### **WARNING**

Group [H10D 18/40](#) is incomplete pending reclassification of documents from group [H10D 12/211](#).

Groups [H10D 12/211](#) and [H10D 18/40](#) should be considered in order to perform a complete search.

18/60 . Gate-turn-off devices

#### **WARNING**

Groups [H10D 18/60](#) - [H10D 18/655](#) are incomplete pending reclassification of documents from group [H10D 12/211](#).

All groups listed in this Warning should be considered in order to perform a complete search.

18/65 . . with turn-off by field effect

18/655 . . . {produced by insulated gate structures}

18/80 . Bidirectional devices, e.g. triacs

**30/00** **Field-effect transistors [FET] (insulated-gate bipolar transistors [H10D 12/00](#))**

#### **NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

#### **WARNING**

Group [H10D 30/00](#) is impacted by reclassification into group [H10D 30/40](#).

Groups [H10D 30/00](#) and [H10D 30/40](#) should be considered in order to perform a complete search.

30/01 . Manufacture or treatment

#### **WARNING**

Group [H10D 30/01](#) is impacted by reclassification into groups [H10D 30/012](#), [H10D 30/014](#), [H10D 30/015](#), [H10D 30/017](#), [H10D 30/019](#) - [H10D 30/0198](#), [H10D 30/021](#) - [H10D 30/0415](#), [H10D 30/051](#) - [H10D 30/0516](#) and [H10D 30/061](#) - [H10D 30/0618](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/012 . . {of static induction transistors [SIT], e.g. permeable base transistors [PBT]}

#### **WARNING**

Group [H10D 30/012](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Groups [H10D 30/01](#) and [H10D 30/012](#) should be considered in order to perform a complete search.

30/014 . . {of FETs having zero-dimensional [0D] or one-dimensional [1D] channels, e.g. quantum wire FETs, single-electron transistors [SET] or Coulomb blockade transistors}

#### **WARNING**

Group [H10D 30/014](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/014](#) is also impacted by reclassification into groups [H10D 30/019](#) - [H10D 30/0198](#).

Groups [H10D 30/01](#), [H10D 30/014](#) and [H10D 30/019](#) - [H10D 30/0198](#) should be considered in order to perform a complete search.

30/015 . . {of FETs having heterojunction interface channels or heterojunction gate electrodes, e.g. HEMT}

#### **WARNING**

Group [H10D 30/015](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Groups [H10D 30/01](#) and [H10D 30/015](#) should be considered in order to perform a complete search.

30/017 . . {of FETs having two-dimensional material channels, e.g. TMD FETs}

#### **WARNING**

Group [H10D 30/017](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/031](#) and [H10D 30/0323](#).

All groups listed in this Warning should be considered in order to perform a complete search.



- 30/019 . . {of FETs having stacked nanowire, nanosheet or nanoribbon channels}

**WARNING**

Group [H10D 30/019](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/014](#), [H10D 30/024](#), [H10D 30/0241](#), [H10D 30/031](#), [H10D 30/0321](#), [H10D 30/0323](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0191 . . . {forming stacked channels, e.g. changing their shapes or sizes}

**WARNING**

Groups [H10D 30/0191](#) - [H10D 30/0194](#) are incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/014](#), [H10D 30/024](#), [H10D 30/0241](#), [H10D 30/0245](#), [H10D 30/031](#), [H10D 30/0321](#), [H10D 30/0323](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0193 . . . . {by modifying properties of the stacked channels}

- 30/0194 . . . . {the stacked channels having different properties}

- 30/0195 . . . {forming inner spacers between adjacent channels, e.g. changing their shapes or sizes}

**WARNING**

Groups [H10D 30/0195](#) - [H10D 30/0197](#) are incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/014](#), [H10D 30/024](#), [H10D 30/031](#), [H10D 30/0321](#), [H10D 30/0323](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0196 . . . . {by modifying properties of the inner spacers}

- 30/0197 . . . . {the inner spacers having different properties}

- 30/0198 . . . {forming source or drain electrodes wherein semiconductor bodies are replaced by dielectric layers and the source or drain electrodes extend through the dielectric layers}

**WARNING**

Group [H10D 30/0198](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/014](#), [H10D 30/024](#), [H10D 30/031](#), [H10D 30/0321](#), [H10D 30/0323](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/021 . . {of FETs having insulated gates [IGFET]}

**WARNING**

Groups [H10D 30/021](#), [H10D 30/0212](#), [H10D 30/0213](#), [H10D 30/0215](#), [H10D 30/0217](#), [H10D 30/0221](#), [H10D 30/023](#), [H10D 30/0243](#), [H10D 30/025](#), [H10D 30/026](#), [H10D 30/027](#), [H10D 30/0275](#), [H10D 30/0277](#), [H10D 30/0278](#) and [H10D 30/0413](#) are incomplete pending reclassification of documents from group [H10D 30/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0212 . . . {using self-aligned silicidation}

- 30/0213 . . . . {providing different silicide thicknesses on gate electrodes and on source regions or drain regions}

- 30/0215 . . . {using self-aligned selective metal deposition simultaneously on gate electrodes and the source regions or drain regions}

- 30/0217 . . . {forming self-aligned punch-through stoppers or threshold implants under gate regions}

- 30/0218 . . . {having pocket halo regions selectively formed at the sides of the gates}

**WARNING**

Group [H10D 30/0218](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/022](#).

Groups [H10D 30/01](#), [H10D 30/022](#) and [H10D 30/0218](#) should be considered in order to perform a complete search.

- 30/022 . . . {having lightly-doped source or drain extensions selectively formed at the sides of the gates}

**WARNING**

Group [H10D 30/022](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/022](#) is also impacted by reclassification into group [H10D 30/0218](#).

Groups [H10D 30/01](#), [H10D 30/022](#) and [H10D 30/0218](#) should be considered in order to perform a complete search.

- 30/0221 . . . {having asymmetry in the channel direction, e.g. lateral high-voltage MISFETs having drain offset region or extended-drain MOSFETs [EDMOS]}

- 30/0223 . . . {having source and drain regions or source and drain extensions self-aligned to sides of the gate}

**WARNING**

Groups [H10D 30/0223](#) - [H10D 30/0229](#) are incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/0273](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0225 . . . . {using an initial gate mask complementary to the prospective gate location, e.g. using dummy source and drain electrodes}
- 30/0227 . . . . {having both lightly-doped source and drain extensions and source and drain regions self-aligned to the sides of the gate, e.g. lightly-doped drain [LDD] MOSFET or double-diffused drain [DDD] MOSFET}
- 30/0229 . . . . . {forming drain regions and lightly-doped drain [LDD] simultaneously, e.g. using implantation through a T-shaped mask}
- 30/023 . . . {having multiple independently-addressable gate electrodes influencing the same channel (manufacture or treatment of dual gate TFTs [H10D 30/031](#))}
- 30/024 . . . {of fin field-effect transistors [FinFET]}

**WARNING**

Group [H10D 30/024](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/024](#) is also impacted by reclassification into groups [H10D 30/019](#) - [H10D 30/0198](#).

Groups [H10D 30/01](#), [H10D 30/024](#) and [H10D 30/019](#) - [H10D 30/0198](#) should be considered in order to perform a complete search.

- 30/0241 . . . . {doping of vertical sidewalls, e.g. using tilted or multi-angled implants}

**WARNING**

Group [H10D 30/0241](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0241](#) is also impacted by reclassification into groups [H10D 30/019](#) and [H10D 30/0191](#) - [H10D 30/0194](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0243 . . . . {using dummy structures having essentially the same shapes as the semiconductor bodies, e.g. to provide stability}
- 30/0245 . . . . {by further thinning the channel after patterning the channel, e.g. using sacrificial oxidation on fins}

**WARNING**

Group [H10D 30/0245](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0245](#) is also impacted by reclassification into groups [H10D 30/0191](#) - [H10D 30/0194](#).

Groups [H10D 30/01](#), [H10D 30/0245](#) and [H10D 30/0191](#) - [H10D 30/0194](#) should be considered in order to perform a complete search.

- 30/025 . . . {of vertical IGFETs (of VDMOS [H10D 30/0291](#); of vertical TFTs [H10D 30/0318](#))}

- 30/026 . . . {having laterally-coplanar source and drain regions, a gate at the sides of the bulk channel, and both horizontal and vertical current flow (of LDMOS [H10D 30/0289](#))}
- 30/027 . . . {of lateral single-gate IGFETs}
- 30/0273 . . . . {forming final gates or dummy gates after forming source and drain electrodes, e.g. contact first technology}

**WARNING**

Group [H10D 30/0273](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0273](#) is also impacted by reclassification into groups [H10D 30/0223](#) - [H10D 30/0229](#) and [H10D 64/017](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0275 . . . . {forming single crystalline semiconductor source or drain regions resulting in recessed gates, e.g. forming raised source or drain regions}
- 30/0277 . . . . {forming conductor-insulator-semiconductor or Schottky barrier source or drain regions}
- 30/0278 . . . . {forming single crystalline channels on wafers after forming insulating device isolations}
- 30/028 . . . {of double-diffused metal oxide semiconductor [DMOS] FETs}

**WARNING**

Groups [H10D 30/028](#) - [H10D 30/0297](#) are incomplete pending reclassification of documents from groups [H10D 12/031](#) and [H10D 30/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/0281 . . . . {of lateral DMOS [LDMOS] FETs}
- 30/0285 . . . . . {using formation of insulating sidewall spacers}
- 30/0287 . . . . . {using recessing of the source electrodes}
- 30/0289 . . . . . {using recessing of the gate electrodes, e.g. to form trench gate electrodes}
- 30/0291 . . . . {of vertical DMOS [VDMOS] FETs}
- 30/0293 . . . . . {using formation of insulating sidewall spacers}
- 30/0295 . . . . . {using recessing of the source electrodes}
- 30/0297 . . . . . {using recessing of the gate electrodes, e.g. to form trench gate electrodes}



30/031 . . . {of thin-film transistors [TFT]}

#### **WARNING**

Group [H10D 30/031](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/031](#) is also impacted by reclassification into groups [H10D 30/017](#), [H10D 30/019](#) - [H10D 30/0198](#), [H10D 30/0312](#) and [H10D 30/0318](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0312 . . . {characterised by the gate electrodes}

#### **WARNING**

Group [H10D 30/0312](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/031](#), [H10D 30/0321](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0314 . . . {of lateral top-gate TFTs comprising only a single gate}

#### **WARNING**

Group [H10D 30/0314](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/0327](#).

Groups [H10D 30/01](#), [H10D 30/0327](#) and [H10D 30/0314](#) should be considered in order to perform a complete search.

30/0316 . . . {of lateral bottom-gate TFTs comprising only a single gate}

#### **WARNING**

Group [H10D 30/0316](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/0327](#).

Groups [H10D 30/01](#), [H10D 30/0327](#) and [H10D 30/0316](#) should be considered in order to perform a complete search.

30/0318 . . . {of vertical TFTs}

#### **WARNING**

Group [H10D 30/0318](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#), [H10D 30/031](#), [H10D 30/0321](#) and [H10D 30/0327](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0321 . . . {comprising silicon, e.g. amorphous silicon or polysilicon}

#### **WARNING**

Group [H10D 30/0321](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0321](#) is also impacted by reclassification into groups [H10D 30/019](#) - [H10D 30/0198](#), [H10D 30/0312](#) and [H10D 30/0318](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0323 . . . {comprising monocrystalline silicon}

#### **WARNING**

Group [H10D 30/0323](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0323](#) is also impacted by reclassification into groups [H10D 30/017](#) and [H10D 30/019](#) - [H10D 30/0198](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0327 . . . {on sapphire substrates, e.g. of silicon-on-sapphire [SOS] transistor}

#### **WARNING**

Group [H10D 30/0327](#) is incomplete pending reclassification of documents from group [H10D 30/01](#). Group [H10D 30/0327](#) is also impacted by reclassification into groups [H10D 30/019](#) - [H10D 30/0198](#), [H10D 30/0312](#) - [H10D 30/0316](#) and [H10D 30/0318](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0411 . . . {of FETs having floating gates}

#### **WARNING**

Group [H10D 30/0411](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/0415](#).

Groups [H10D 30/01](#), [H10D 30/0415](#) and [H10D 30/0411](#) should be considered in order to perform a complete search.

30/0413 . . . {of FETs having charge-trapping gate insulators, e.g. MNOS transistors}

30/0415 . . . {of FETs having ferroelectric gate insulators}

#### **WARNING**

Group [H10D 30/0415](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/0415](#) is also impacted by reclassification into group [H10D 30/0411](#).

Groups [H10D 30/01](#), [H10D 30/0415](#) and [H10D 30/0411](#) should be considered in order to perform a complete search.

30/051 . . {of FETs having PN junction gates ([H10D 30/015 takes precedence](#))}

#### **WARNING**

Groups [H10D 30/051](#) - [H10D 30/0516](#) are incomplete pending reclassification of documents from group [H10D 30/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0512 . . . {of FETs having PN homojunction gates}

30/0515 . . . {of vertical FETs having PN homojunction gates}

30/0516 . . . {of FETs having PN heterojunction gates}

30/061 . . {of FETs having Schottky gates ([H10D 30/015 takes precedence](#))}

#### **WARNING**

Group [H10D 30/061](#) is incomplete pending reclassification of documents from group [H10D 30/01](#).

Group [H10D 30/061](#) is also impacted by reclassification into groups [H10D 30/0612](#) - [H10D 30/0616](#) and [H10D 30/0618](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0612 . . . {of lateral single-gate Schottky FETs}

#### **WARNING**

Groups [H10D 30/0612](#) - [H10D 30/0616](#) are incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/061](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/0614 . . . {using processes wherein the final gate is made after the completion of the source and drain regions, e.g. gate-last processes using dummy gates}

30/0616 . . . {using processes wherein the final gate is made before the completion of the source and drain regions, e.g. gate-first processes}

30/0618 . . . {of lateral Schottky gate FETs having multiple independently-addressable gate electrodes}

#### **WARNING**

Group [H10D 30/0618](#) is incomplete pending reclassification of documents from groups [H10D 30/01](#) and [H10D 30/061](#).

Groups [H10D 30/01](#), [H10D 30/061](#) and [H10D 30/0618](#) should be considered in order to perform a complete search.

30/202 . {FETs having static field-induced regions, e.g. static-induction transistors [SIT] or permeable base transistors [PBT]}

30/204 . {Velocity modulation transistors [VMT]}

30/40 . FETs having zero-dimensional [0D], one-dimensional [1D] or two-dimensional [2D] charge carrier gas channels

#### **WARNING**

Group [H10D 30/40](#) is incomplete pending reclassification of documents from group [H10D 30/00](#).

Groups [H10D 30/00](#) and [H10D 30/40](#) should be considered in order to perform a complete search.

30/402 . . {Single electron transistors; Coulomb blockade transistors}

30/43 . . having 1D charge carrier gas channels, e.g. quantum wire FETs or transistors having 1D quantum-confined channels

#### **WARNING**

Group [H10D 30/43](#) is impacted by reclassification into groups [H10D 30/435](#) and [H10D 30/501](#) - [H10D 30/509](#).

Groups [H10D 30/43](#), [H10D 30/435](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.

30/435 . . . {having multiple laterally adjacent 1D material channels}

#### **WARNING**

Group [H10D 30/435](#) is incomplete pending reclassification of documents from group [H10D 30/43](#).

Groups [H10D 30/43](#) and [H10D 30/435](#) should be considered in order to perform a complete search.

30/47 . . having 2D charge carrier gas channels, e.g. nanoribbon FETs or high electron mobility transistors [HEMT]

#### **WARNING**

Group [H10D 30/47](#) is impacted by reclassification into groups [H10D 30/471](#), [H10D 30/474](#), [H10D 30/476](#), [H10D 30/481](#) and [H10D 30/501](#) - [H10D 30/509](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/471 . . . {High electron mobility transistors [HEMT] or high hole mobility transistors [HHMT]}

#### **WARNING**

Groups [H10D 30/471](#), [H10D 30/474](#) and [H10D 30/476](#) are incomplete pending reclassification of documents from group [H10D 30/47](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/472 . . . . {having lower bandgap active layer formed on top of wider bandgap layer, e.g. inverted HEMT}

30/473 . . . . {having confinement of carriers by multiple heterojunctions, e.g. quantum well HEMT}

30/4732 . . . . {using Group III-V semiconductor material}

30/4735 . . . . . {having delta-doped or planar-doped donor layers}

#### **WARNING**

Group [H10D 30/4735](#) is incomplete pending reclassification of documents from group [H10D 30/4738](#).

Groups [H10D 30/4738](#) and [H10D 30/4735](#) should be considered in order to perform a complete search.

30/4738 . . . . . {having multiple donor layers}

#### **WARNING**

Group [H10D 30/4738](#) is impacted by reclassification into group [H10D 30/4735](#).

Groups [H10D 30/4738](#) and [H10D 30/4735](#) should be considered in order to perform a complete search.

30/474 . . . . {having multiple parallel 2D charge carrier gas channels}

30/475 . . . . {having wider bandgap layer formed on top of lower bandgap active layer, e.g. undoped barrier HEMTs such as i-AlGaIn/GaN HEMTs}

30/4755 . . . . . {having wide bandgap charge-carrier supplying layers, e.g. modulation doped HEMTs such as n-AlGaAs/GaAs HEMTs}

30/476 . . . . {having gate trenches interrupting the 2D charge carrier gas channels, e.g. hybrid MOS-HEMTs}

30/477 . . . . {Vertical HEMTs or vertical HHMTs}

#### **WARNING**

Group [H10D 30/477](#) is impacted by reclassification into group [H10D 30/485](#).

Groups [H10D 30/477](#) and [H10D 30/485](#) should be considered in order to perform a complete search.

30/481 . . . . {the 2D charge carrier gas being at least partially not parallel to a main surface of the semiconductor body}

#### **WARNING**

Group [H10D 30/478](#) is impacted by reclassification into group [H10D 30/485](#).

Groups [H10D 30/478](#) and [H10D 30/485](#) should be considered in order to perform a complete search.

30/481 . . . . {FETs having two-dimensional material channels, e.g. transition metal dichalcogenide [TMD] FETs}

#### **WARNING**

Group [H10D 30/481](#) is incomplete pending reclassification of documents from groups [H10D 30/47](#) and [H10D 30/6741](#).

Groups [H10D 30/47](#), [H10D 30/6741](#) and [H10D 30/481](#) should be considered in order to perform a complete search.

30/485 . . . . {Vertical FETs having two-dimensional material channels}

#### **WARNING**

Group [H10D 30/485](#) is incomplete pending reclassification of documents from groups [H10D 30/477](#), [H10D 30/478](#) and [H10D 30/6741](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/501 . {FETs having stacked nanowire, nanosheet or nanoribbon channels}

#### **WARNING**

Groups [H10D 30/501](#), [H10D 30/502](#), [H10D 30/507](#), [H10D 30/508](#) and [H10D 30/509](#) are incomplete pending reclassification of documents from groups [H10D 30/43](#), [H10D 30/47](#), [H10D 30/62](#), [H10D 30/6211](#), [H10D 30/6217](#), [H10D 30/6218](#), [H10D 30/6219](#), [H10D 30/6733](#), [H10D 30/6734](#), [H10D 30/6735](#), [H10D 30/6748](#) and [H10D 30/6757](#).

All groups listed in this Warning should be considered in order to perform a complete search.

30/502 . . {characterised by the stacked channels}

- 30/503 . . . {having non-rectangular cross-sections}

#### **WARNING**

Group [H10D 30/503](#) is incomplete pending reclassification of documents from groups [H10D 30/43](#), [H10D 30/47](#), [H10D 30/62](#), [H10D 30/6211](#), [H10D 30/6212](#), [H10D 30/6213](#), [H10D 30/6217](#), [H10D 30/6218](#), [H10D 30/6219](#), [H10D 30/6733](#), [H10D 30/6734](#), [H10D 30/6735](#), [H10D 30/6748](#) and [H10D 30/6757](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/504 . . . {wherein the stacked channels have different properties}

#### **WARNING**

Groups [H10D 30/504](#) and [H10D 30/506](#) are incomplete pending reclassification of documents from groups [H10D 30/43](#), [H10D 30/47](#), [H10D 30/62](#), [H10D 30/6211](#), [H10D 30/6212](#), [H10D 30/6213](#), [H10D 30/6217](#), [H10D 30/6218](#), [H10D 30/6219](#), [H10D 30/6733](#), [H10D 30/6734](#), [H10D 30/6735](#), [H10D 30/6748](#) and [H10D 30/6757](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 30/506 . . . . {having different thicknesses, sizes or shapes}
- 30/507 . . {characterised by inner spacers between adjacent channels}
- 30/508 . . . {characterised by the relative sizes, shapes or dispositions of the inner spacers}
- 30/509 . . . {characterised by the material of the inner spacers}
- 30/60 . Insulated-gate field-effect transistors [IGFET] ([H10D 30/40](#) takes precedence)
- 30/601 . . {having lightly-doped drain or source extensions, e.g. LDD IGFETs or DDD IGFETs (lightly doped source or drain extensions for TFTs [H10D 30/6715](#))}
- 30/603 . . . {having asymmetry in the channel direction, e.g. lateral high-voltage MISFETs having drain offset region or extended drain IGFETs [EDMOS]}

#### **WARNING**

Group [H10D 30/603](#) is impacted by reclassification into group [H10D 30/605](#).

Groups [H10D 30/603](#) and [H10D 30/605](#) should be considered in order to perform a complete search.

- 30/605 . . . {having significant overlap between the lightly-doped extensions and the gate electrode}

#### **WARNING**

Group [H10D 30/605](#) is incomplete pending reclassification of documents from groups [H10D 30/603](#) and [H10D 30/608](#).

Groups [H10D 30/603](#), [H10D 30/608](#) and [H10D 30/605](#) should be considered in order to perform a complete search.

- 30/608 . . . {having non-planar bodies, e.g. having recessed gate electrodes}

#### **WARNING**

Group [H10D 30/608](#) is impacted by reclassification into group [H10D 30/605](#).

Groups [H10D 30/608](#) and [H10D 30/605](#) should be considered in order to perform a complete search.

- 30/611 . . {having multiple independently-addressable gate electrodes influencing the same channel (FinFETs having multiple distinct gate electrodes [H10D 30/6215](#); multi-gate TFT [H10D 30/6733](#))}
- 30/615 . . . {comprising a MOS gate electrode and at least one non-MOS gate electrode}
- 30/62 . . Fin field-effect transistors [FinFET]

#### **WARNING**

Group [H10D 30/62](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).

Groups [H10D 30/62](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.

- 30/6211 . . . {having fin-shaped semiconductor bodies integral with the bulk semiconductor substrates}

#### **WARNING**

Group [H10D 30/6211](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).

Groups [H10D 30/6211](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.

- 30/6212 . . . {having fin-shaped semiconductor bodies having non-rectangular cross-sections}

#### **WARNING**

Group [H10D 30/6212](#) is impacted by reclassification into groups [H10D 30/503](#) and [H10D 30/504](#) - [H10D 30/506](#).

Groups [H10D 30/6212](#), [H10D 30/503](#) and [H10D 30/504](#) - [H10D 30/506](#) should be considered in order to perform a complete search.

- 30/6213 . . . . {having rounded corners}  
**WARNING**  
 Group [H10D 30/6213](#) is impacted by reclassification into groups [H10D 30/503](#) and [H10D 30/504](#) - [H10D 30/506](#).  
 Groups [H10D 30/6213](#), [H10D 30/503](#) and [H10D 30/504](#) - [H10D 30/506](#) should be considered in order to perform a complete search.
- 30/6215 . . . . {having multiple independently-addressable gate electrodes}  
**WARNING**  
 Group [H10D 30/6215](#) is impacted by reclassification into group [H10D 30/6217](#).  
 Groups [H10D 30/6215](#) and [H10D 30/6217](#) should be considered in order to perform a complete search.
- 30/6217 . . . . {having non-uniform gate electrodes, e.g. gate conductors having varying doping}  
**WARNING**  
 Group [H10D 30/6217](#) is incomplete pending reclassification of documents from group [H10D 30/6215](#).  
 Group [H10D 30/6217](#) is also impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).  
 Groups [H10D 30/6215](#), [H10D 30/6217](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.
- 30/6218 . . . . {of the accumulation type}  
**WARNING**  
 Group [H10D 30/6218](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).  
 Groups [H10D 30/6218](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.
- 30/6219 . . . . {characterised by the source or drain electrodes}  
**WARNING**  
 Group [H10D 30/6219](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).  
 Groups [H10D 30/6219](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.
- 30/63 . . . Vertical IGFETs ([H10D 30/66](#) {, [H10D 30/6728](#), [H10D 30/689](#), [H10D 30/693](#)} take precedence)
- 30/635 . . . . {having no inversion channels, e.g. vertical accumulation channel FETs [ACCUFET] or normally-on vertical IGFETs}
- 30/637 . . . {Lateral IGFETs having no inversion channels, e.g. buried channel lateral IGFETs, normally-on lateral IGFETs or depletion-mode lateral IGFETs}
- 30/64 . . . Double-diffused metal-oxide semiconductor [DMOS] FETs  
**WARNING**  
 Group [H10D 30/64](#) is impacted by reclassification into groups [H10D 30/645](#) and [H10D 84/101](#).  
 Groups [H10D 30/64](#), [H10D 30/645](#) and [H10D 84/101](#) should be considered in order to perform a complete search.
- 30/645 . . . . {Bidirectional devices}  
**WARNING**  
 Group [H10D 30/645](#) is incomplete pending reclassification of documents from group [H10D 30/64](#).  
 Groups [H10D 30/64](#) and [H10D 30/645](#) should be considered in order to perform a complete search.
- 30/65 . . . . Lateral DMOS [LDMOS] FETs
- 30/655 . . . . {having edge termination structures}
- 30/657 . . . . {having substrates comprising insulating layers, e.g. SOI-LDMOS transistors}
- 30/658 . . . . {having trench gate electrodes}
- 30/659 . . . . {having voltage-sensing or current-sensing structures, e.g. emulator sections or overcurrent sensing cells}
- 30/66 . . . . Vertical DMOS [VDMOS] FETs  
**WARNING**  
 Group [H10D 30/66](#) is impacted by reclassification into group [H10D 30/662](#).  
 Groups [H10D 30/66](#) and [H10D 30/662](#) should be considered in order to perform a complete search.
- 30/662 . . . . {having a drift region having a doping concentration that is higher between adjacent body regions relative to other parts of the drift region}  
**WARNING**  
 Group [H10D 30/662](#) is incomplete pending reclassification of documents from group [H10D 30/66](#).  
 Groups [H10D 30/66](#) and [H10D 30/662](#) should be considered in order to perform a complete search.
- 30/663 . . . . {having both source contacts and drain contacts on the same surface, i.e. up-drain VDMOS}
- 30/664 . . . . {Inverted VDMOS transistors, i.e. source-down VDMOS transistors}
- 30/665 . . . . {having edge termination structures}
- 30/667 . . . . {having substrates comprising insulating layers, e.g. SOI-VDMOS transistors}
- 30/668 . . . . {having trench gate electrodes, e.g. UMOS transistors}



- 30/669 . . . . {having voltage-sensing or current-sensing structures, e.g. emulator sections or overcurrent sensing cells}
- 30/67 . . Thin-film transistors [TFT] {(Stacked nanowire, nanosheet or nanoribbon FETs [H10D 30/501](#))}
- 30/6704 . . . {having supplementary regions or layers in the thin films or in the insulated bulk substrates for controlling properties of the device}

**WARNING**

Group [H10D 30/6704](#) is incomplete pending reclassification of documents from group [H10D 30/6728](#).

Groups [H10D 30/6728](#) and [H10D 30/6704](#) should be considered in order to perform a complete search.

- 30/6706 . . . . {for preventing leakage current (TFTs characterised by the properties of the source or drain [H10D 30/6713](#))}
- 30/6708 . . . . {for preventing the kink effect or the snapback effect, e.g. discharging the minority carriers of the channel region for preventing bipolar effect}
- 30/6711 . . . . {by using electrodes contacting the supplementary regions or layers}
- 30/6713 . . . . {characterised by the properties of the source or drain regions, e.g. compositions or sectional shapes}
- 30/6715 . . . . {characterised by the doping profiles, e.g. having lightly-doped source or drain extensions}
- 30/6717 . . . . . {the source and the drain regions being asymmetrical}
- 30/6719 . . . . . {having significant overlap between the lightly-doped drains and the gate electrodes, e.g. gate-overlapped LDD [GOLDD] TFTs}
- 30/6721 . . . . . {having lightly-doped extensions consisting of multiple lightly doped zones or having non-homogeneous dopant distributions, e.g. graded LDD}
- 30/6723 . . . . {having light shields}
- 30/6725 . . . . {having supplementary regions or layers for improving the flatness of the device}
- 30/6727 . . . . {having source or drain regions connected to bulk conducting substrates}
- 30/6728 . . . {Vertical TFTs}

**WARNING**

Group [H10D 30/6728](#) is impacted by reclassification into groups [H10D 30/6704](#) and [H10D 30/674](#).

Groups [H10D 30/6728](#), [H10D 30/6704](#) and [H10D 30/674](#) should be considered in order to perform a complete search.

- 30/6729 . . . {characterised by the electrodes}
- 30/673 . . . . {characterised by the shapes, relative sizes or dispositions of the gate electrodes}
- 30/6731 . . . . . {Top-gate only TFTs}
- 30/6732 . . . . . {Bottom-gate only TFTs}

- 30/6733 . . . . . {Multi-gate TFTs}

**WARNING**

Group [H10D 30/6733](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#).

Groups [H10D 30/6733](#), [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#) should be considered in order to perform a complete search.

- 30/6734 . . . . . {having gate electrodes arranged on both top and bottom sides of the channel, e.g. dual-gate TFTs}

**WARNING**

Group [H10D 30/6734](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#).

Groups [H10D 30/6734](#), [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#) should be considered in order to perform a complete search.

- 30/6735 . . . . . {having gates fully surrounding the channels, e.g. gate-all-around}

**WARNING**

Group [H10D 30/6735](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).

Groups [H10D 30/6735](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.

- 30/6736 . . . . . {characterised by the shape of gate insulators}
- 30/6737 . . . . {characterised by the electrode materials}
- 30/6738 . . . . . {Schottky barrier electrodes}
- 30/6739 . . . . . {Conductor-insulator-semiconductor electrodes}
- 30/674 . . . {characterised by the active materials}

**WARNING**

Group [H10D 30/674](#) is incomplete pending reclassification of documents from groups [H10D 30/6728](#), [H10D 30/6733](#), [H10D 30/6734](#) and [H10D 30/6757](#).

All groups listed in this Warning should be considered in order to perform a complete search.



30/6741 . . . . {Group IV materials, e.g. germanium or silicon carbide (TFTs having oxide semiconductors [H10D 30/6755](#))}

#### **WARNING**

Group [H10D 30/6741](#) is impacted by reclassification into groups [H10D 30/481](#) and [H10D 30/485](#).

Groups [H10D 30/6741](#), [H10D 30/481](#) and [H10D 30/485](#) should be considered in order to perform a complete search.

30/6743 . . . . . {Silicon}

30/6744 . . . . . {Monocrystalline silicon}

30/6745 . . . . . {Polycrystalline or microcrystalline silicon}

30/6746 . . . . . {Amorphous silicon}

30/6748 . . . . . {having a multilayer structure or superlattice structure}

#### **WARNING**

Group [H10D 30/6748](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#).

Groups [H10D 30/6748](#) and [H10D 30/501](#) - [H10D 30/509](#) should be considered in order to perform a complete search.

30/675 . . . . . {Group III-V materials, Group II-VI materials, Group IV-VI materials, selenium or tellurium}

30/6755 . . . . . {Oxide semiconductors, e.g. zinc oxide, copper aluminium oxide or cadmium stannate}

30/6756 . . . . . {Amorphous oxide semiconductors}

30/6757 . . . . {characterised by the structure of the channel, e.g. transverse or longitudinal shape or doping profile (TFTs having channel structures for preventing kink or snapback effects [H10D 30/6708](#); TFTs having lightly-doped source or drain extensions [H10D 30/6715](#))}

#### **WARNING**

Group [H10D 30/6757](#) is impacted by reclassification into groups [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#).

Groups [H10D 30/6757](#), [H10D 30/501](#) - [H10D 30/509](#) and [H10D 30/674](#) should be considered in order to perform a complete search.

30/6758 . . . . {characterised by the insulating substrates}

30/6759 . . . . {Silicon-on-sapphire [SOS] substrates}

30/68 . . . Floating-gate IGFETs

#### **WARNING**

Group [H10D 30/68](#) is incomplete pending reclassification of documents from group [H10D 30/701](#).

Groups [H10D 30/701](#) and [H10D 30/68](#) should be considered in order to perform a complete search.

30/681 . . . . {having only two programming levels (Floating gate IGFETs programmable by two single electrons [H10D 30/688](#))}

30/682 . . . . {programmed by injection of carriers through a conductive insulator, e.g. Poole-Frankel conduction}

30/683 . . . . {programmed by tunnelling of carriers, e.g. Fowler-Nordheim tunnelling}

30/684 . . . . {programmed by hot carrier injection}

30/685 . . . . . {from the channel}

30/686 . . . . . {using hot carriers produced by avalanche breakdown of PN junctions, e.g. floating gate avalanche injection MOS [FAMOS]}

30/687 . . . . {having more than two programming levels}

30/688 . . . . {programmed by two single electrons}

30/689 . . . . {Vertical floating-gate IGFETs}

30/6891 . . . . {characterised by the shapes, relative sizes or dispositions of the floating gate electrode}

30/6892 . . . . {having at least one additional gate other than the floating gate and the control gate, e.g. program gate, erase gate or select gate}

30/6893 . . . . {wherein the floating gate has multiple non-connected parts, e.g. multi-particle floating gate}

30/6894 . . . . {having one gate at least partly in a trench}

30/69 . . . IGFETs having charge trapping gate insulators, e.g. MNOS transistors

30/691 . . . . {having more than two programming levels}

30/693 . . . . {Vertical IGFETs having charge trapping gate insulators}

30/694 . . . . {characterised by the shapes, relative sizes or dispositions of the gate electrodes}

30/696 . . . . {having at least one additional gate, e.g. program gate, erase gate or select gate}

30/697 . . . . {having trapping at multiple separated sites, e.g. multi-particles trapping sites}

30/699 . . . . {having the gate at least partly formed in a trench}

30/701 . . . {IGFETs having ferroelectric gate insulators, e.g. ferroelectric FETs}

#### **WARNING**

Group [H10D 30/701](#) is impacted by reclassification into group [H10D 30/68](#).

Groups [H10D 30/701](#) and [H10D 30/68](#) should be considered in order to perform a complete search.

30/711 . . . {having floating bodies}

30/721 . . . {having a gate-to-body connection, i.e. bulk dynamic threshold voltage IGFET (TFTs having gate-to-body connection [H10D 30/6708](#))}

30/751 . . . {having composition variations in the channel regions}

#### **WARNING**

Group [H10D 30/751](#) is impacted by reclassification into group [H10D 30/798](#).

Groups [H10D 30/751](#) and [H10D 30/798](#) should be considered in order to perform a complete search.

30/791 . . . {Arrangements for exerting mechanical stress on the crystal lattice of the channel regions}

- 30/792 . . . {comprising applied insulating layers, e.g. stress liners}
- 30/794 . . . {comprising conductive materials, e.g. silicided source, drain or gate electrodes}
- 30/795 . . . {being in lateral device isolation regions, e.g. STI}
- 30/796 . . . {having memorised stress for introducing strain in the channel regions, e.g. recrystallised polysilicon gates}
- 30/797 . . . {being in source or drain regions, e.g. SiGe source or drain}
- 30/798 . . . {being provided in or under the channel regions}

**WARNING**

Group [H10D 30/798](#) is incomplete pending reclassification of documents from group [H10D 30/751](#).

Groups [H10D 30/751](#) and [H10D 30/798](#) should be considered in order to perform a complete search.

- 30/80 . FETs having rectifying junction gate electrodes ([H10D 30/40](#) takes precedence)
- 30/801 . . {FETs having heterojunction gate electrodes}
- 30/803 . . . {Programmable transistors, e.g. having charge-trapping quantum well}
- 30/83 . . FETs having PN junction gate electrodes
- 30/831 . . . {Vertical FETs having PN junction gate electrodes ([Vertical SIT H10D 30/202](#))}
- 30/832 . . . {Thin-film junction FETs [JFET]}
- 30/87 . . FETs having Schottky gate electrodes, e.g. metal-semiconductor FETs [MESFET] {([FETs having Schottky contact on top of heterojunction gate H10D 30/801](#))}
- 30/871 . . . {Vertical FETs having Schottky gate electrodes ([Vertical SIT or PBT H10D 30/202](#))}
- 30/873 . . . {having multiple gate electrodes}
- 30/875 . . . {having thin-film semiconductor bodies}
- 30/877 . . . {having recessed gate electrodes}

**44/00 Charge transfer devices****NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

- 44/01 . Manufacture or treatment
- 44/041 . . {having insulated gates}
- 44/061 . . {having Schottky gates}
- 44/40 . Charge-coupled devices [CCD]
- 44/45 . . having field effect produced by insulated gate electrodes
- 44/452 . . . {Input structures}
- 44/454 . . . {Output structures}
- 44/456 . . . {Structures for regeneration, refreshing or leakage compensation}
- 44/462 . . . {Buried-channel CCD}
- 44/464 . . . . {Two-phase CCD}
- 44/466 . . . . {Three-phase CCD}
- 44/468 . . . . {Four-phase CCD}
- 44/472 . . . {Surface-channel CCD}
- 44/474 . . . . {Two-phase CCD}
- 44/476 . . . . {Three-phase CCD}

- 44/478 . . . . {Four-phase CCD}

**48/00****Individual devices not covered by groups**

[H10D 1/00](#) - [H10D 44/00](#)

**NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

**WARNING**

Group [H10D 48/00](#) is incomplete pending reclassification of documents from group [H10D 48/30](#).

Groups [H10D 48/30](#) and [H10D 48/00](#) should be considered in order to perform a complete search.

- 48/01 . Manufacture or treatment
- 48/021 . . {of two-electrode devices}

**WARNING**

Group [H10D 48/021](#) is incomplete pending reclassification of documents from group [H10D 8/051](#).

Group [H10D 48/021](#) is also impacted by reclassification into groups [H10D 1/025](#), [H10D 1/045](#) - [H10D 1/048](#) and [H10D 8/01](#) - [H10D 8/055](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 48/031 . . {of three-or-more electrode devices}

**WARNING**

Group [H10D 48/031](#) is impacted by reclassification into groups [H10D 10/01](#) - [H10D 10/061](#), [H10D 12/01](#) - [H10D 12/038](#) and [H10D 18/01](#) - [H10D 18/031](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 48/032 . . . {of unipolar transistors having ohmic electrodes on emitter-like, base-like, and collector-like regions, e.g. hot electron transistors [HET], metal base transistors [MBT], resonant tunneling transistors [RTT], bulk barrier transistors [BBT], planar doped barrier transistors [PDBT] or charge injection transistors [CHINT]}

- 48/04 . . of devices having bodies comprising selenium or tellurium in uncombined form

- 48/042 . . . Preparation of foundation plates

- 48/043 . . . Preliminary treatment of the selenium or tellurium, its application to foundation plates or the subsequent treatment of the combination

- 48/0431 . . . . {Application of the selenium or tellurium to the foundation plate}

- 48/044 . . . . Conversion of the selenium or tellurium to the conductive state

- 48/045 . . . . Treatment of the surface of the selenium or tellurium layer after having been made conductive

- 48/046 . . . . Provision of discrete insulating layers

- 48/047 . . . Application of an electrode to the exposed surface of the selenium or tellurium after the selenium or tellurium has been applied to foundation plates
- 48/048 . . . Treatment of the complete device, e.g. by electroforming to form a barrier
- 48/049 . . . . Ageing
- 48/07 . . of devices having bodies comprising cuprous oxide [Cu<sub>2</sub>O] or cuprous iodide [CuI]
- 48/071 . . . {Preparation of the foundation plate, preliminary treatment oxidation of the foundation plate or reduction treatment}
- 48/073 . . . . {Preliminary treatment of the foundation plate}
- 48/074 . . . . {Oxidation and subsequent heat treatment of the foundation plate (Reduction of copper oxide [H10D 48/075](#))}
- 48/075 . . . . {Reduction of the copper oxide or treatment of the oxide layer}
- 48/076 . . . . {Application of a non-genetic conductive layer}
- 48/078 . . . {Treatment of the complete device, e.g. electroforming or ageing}
- 48/30 . Devices controlled by electric currents or voltages

**WARNING**

Group [H10D 48/30](#) is impacted by reclassification into group [H10D 48/00](#).

Groups [H10D 48/30](#) and [H10D 48/00](#) should be considered in order to perform a complete search.

- 48/32 . . Devices controlled by only the electric current supplied, or only the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched
- 48/34 . . . Bipolar devices
- 48/341 . . . . {Unijunction transistors, i.e. double base diodes}
- 48/345 . . . . {Bipolar transistors having ohmic electrodes on emitter-like, base-like, and collector-like regions}
- 48/36 . . . Unipolar devices
- 48/362 . . . . {Unipolar transistors having ohmic electrodes on emitter-like, base-like, and collector-like regions, e.g. hot electron transistors [HET], metal base transistors [MBT], resonant tunnelling transistors [RTT], bulk barrier transistors [BBT], planar doped barrier transistors [PDBT] or charge injection transistors [CHINT]}
- 48/366 . . . {Multistable devices; Devices having two or more distinct operating states}

- 48/38 . . Devices controlled only by variation of the electric current supplied, or only the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched

**WARNING**

Group [H10D 48/38](#) is incomplete pending reclassification of documents from group [H10D 1/40](#).

Groups [H10D 1/40](#) and [H10D 48/38](#) should be considered in order to perform a complete search.

- 48/381 . . . {Multistable devices; Devices having two or more distinct operating states}
- 48/383 . {Quantum effect devices, e.g. of devices using quantum reflection, diffraction or interference effects}

**WARNING**

Group [H10D 48/383](#) is impacted by reclassification into group [H10D 48/3835](#).

Groups [H10D 48/383](#) and [H10D 48/3835](#) should be considered in order to perform a complete search.

- 48/3835 . . {Semiconductor qubit devices comprising a plurality of quantum mechanically interacting semiconductor quantum dots, e.g. Loss-DiVincenzo spin qubits}

**WARNING**

Group [H10D 48/3835](#) is incomplete pending reclassification of documents from group [H10D 48/383](#).

Groups [H10D 48/383](#) and [H10D 48/3835](#) should be considered in order to perform a complete search.

- 48/385 . {Devices using spin-polarised carriers}
- 48/387 . {Devices controllable only by the variation of applied heat}
- 48/40 . Devices controlled by magnetic fields
- 48/50 . Devices controlled by mechanical forces, e.g. pressure

**Constructional details**

- 62/00 **Semiconductor bodies, or regions thereof, of devices having potential barriers**

**WARNING**

Group [H10D 62/00](#) is impacted by reclassification into group [H10D 62/01](#).

Groups [H10D 62/00](#) and [H10D 62/01](#) should be considered in order to perform a complete search.

62/01	<ul style="list-style-type: none"> <li>• {Manufacture or treatment}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 62/01</a> is incomplete pending reclassification of documents from group <a href="#">H10D 62/00</a>.</p> <p>Groups <a href="#">H10D 62/00</a> and <a href="#">H10D 62/01</a> should be considered in order to perform a complete search.</p>	62/109	<ul style="list-style-type: none"> <li>• . . . . {Reduced surface field [RESURF] PN junction structures}</li> </ul>
62/021	<ul style="list-style-type: none"> <li>• . {Forming source or drain recesses by etching e.g. recessing by etching and then refilling}</li> </ul>	62/111	<ul style="list-style-type: none"> <li>• . . . . {Multiple RESURF structures, e.g. double RESURF or 3D-RESURF structures}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 62/111</a> is impacted by reclassification into groups <a href="#">H10D 62/051</a> - <a href="#">H10D 62/058</a>.</p> <p>Groups <a href="#">H10D 62/111</a> and <a href="#">H10D 62/051</a> - <a href="#">H10D 62/058</a> should be considered in order to perform a complete search.</p>
62/051	<ul style="list-style-type: none"> <li>• . {Forming charge compensation regions, e.g. superjunctions}</li> </ul> <p><b>WARNING</b></p> <p>Groups <a href="#">H10D 62/051</a> - <a href="#">H10D 62/058</a> are incomplete pending reclassification of documents from group <a href="#">H10D 62/111</a>.</p> <p>All groups listed in this Warning should be considered in order to perform a complete search.</p>	62/112	<ul style="list-style-type: none"> <li>• . . {for preventing surface leakage due to surface inversion layers, e.g. by using channel stoppers}</li> </ul>
62/052	<ul style="list-style-type: none"> <li>• . . {by forming stacked epitaxial layers}</li> </ul>	62/113	<ul style="list-style-type: none"> <li>• . {Isolations within a component, i.e. internal isolations}</li> </ul>
62/054	<ul style="list-style-type: none"> <li>• . . {by high energy implantations in bulk semiconductor bodies, e.g. forming pillars}</li> </ul>	62/114	<ul style="list-style-type: none"> <li>• . . {PN junction isolations}</li> </ul>
62/056	<ul style="list-style-type: none"> <li>• . . {by out-diffusing dopants from applied layers}</li> </ul>	62/115	<ul style="list-style-type: none"> <li>• . . {Dielectric isolations, e.g. air gaps}</li> </ul>
62/058	<ul style="list-style-type: none"> <li>• . . {by using trenches, e.g. implanting into sidewalls of trenches or refilling trenches}</li> </ul>	62/116	<ul style="list-style-type: none"> <li>• . . . {adjoining the input or output regions of field-effect devices, e.g. adjoining source or drain regions}</li> </ul>
62/10	<ul style="list-style-type: none"> <li>• Shapes, relative sizes or dispositions of the regions of the semiconductor bodies; Shapes of the semiconductor bodies</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 62/10</a> is impacted by reclassification into groups <a href="#">H10D 62/128</a> and <a href="#">H10D 62/129</a>.</p> <p>Groups <a href="#">H10D 62/10</a>, <a href="#">H10D 62/128</a> and <a href="#">H10D 62/129</a> should be considered in order to perform a complete search.</p>	62/117	<ul style="list-style-type: none"> <li>• . {Shapes of semiconductor bodies}</li> </ul>
62/102	<ul style="list-style-type: none"> <li>• . {Constructional design considerations for preventing surface leakage or controlling electric field concentration}</li> </ul>	62/118	<ul style="list-style-type: none"> <li>• . . {Nanostructure semiconductor bodies}</li> </ul>
62/103	<ul style="list-style-type: none"> <li>• . . {for increasing or controlling the breakdown voltage of reverse-biased devices}</li> </ul>	62/119	<ul style="list-style-type: none"> <li>• . . . {Nanowire, nanosheet or nanotube semiconductor bodies}</li> </ul>
62/104	<ul style="list-style-type: none"> <li>• . . . {having particular shapes of the bodies at or near reverse-biased junctions, e.g. having bevels or moats}</li> </ul>	62/121	<ul style="list-style-type: none"> <li>• . . . . {oriented parallel to substrates}</li> </ul>
62/105	<ul style="list-style-type: none"> <li>• . . . {by having particular doping profiles, shapes or arrangements of PN junctions; by having supplementary regions, e.g. junction termination extension [JTE] (IGFETs having LDD or drain extension regions <a href="#">H10D 30/601</a>)}</li> </ul>	62/122	<ul style="list-style-type: none"> <li>• . . . . {oriented at angles to substrates, e.g. perpendicular to substrates}</li> </ul>
62/106	<ul style="list-style-type: none"> <li>• . . . . {having supplementary regions doped oppositely to or in rectifying contact with regions of the semiconductor bodies, e.g. guard rings with PN or Schottky junctions}</li> </ul>	62/123	<ul style="list-style-type: none"> <li>• . . . . {comprising junctions}</li> </ul>
62/107	<ul style="list-style-type: none"> <li>• . . . . {Buried supplementary regions, e.g. buried guard rings (multi-RESURF <a href="#">H10D 62/111</a>)}</li> </ul>	62/124	<ul style="list-style-type: none"> <li>• . {Shapes, relative sizes or dispositions of the regions of semiconductor bodies or of junctions between the regions}</li> </ul>
62/108	<ul style="list-style-type: none"> <li>• . . . . {having localised breakdown regions, e.g. built-in avalanching regions (in self-protected thyristors <a href="#">H10D 18/211</a>)}</li> </ul>	62/125	<ul style="list-style-type: none"> <li>• . . {Shapes of junctions between the regions}</li> </ul>
		62/126	<ul style="list-style-type: none"> <li>• . . {Top-view geometrical layouts of the regions or the junctions}</li> </ul>
		62/127	<ul style="list-style-type: none"> <li>• . . . {of cellular field-effect devices, e.g. multicellular DMOS transistors or IGBTs}</li> </ul>
		62/128	<ul style="list-style-type: none"> <li>• . {Anode regions of diodes}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 62/128</a> is incomplete pending reclassification of documents from group <a href="#">H10D 62/10</a>.</p> <p>Groups <a href="#">H10D 62/10</a> and <a href="#">H10D 62/128</a> should be considered in order to perform a complete search.</p>
		62/129	<ul style="list-style-type: none"> <li>• . {Cathode regions of diodes}</li> </ul> <p><b>WARNING</b></p> <p>Group <a href="#">H10D 62/129</a> is incomplete pending reclassification of documents from group <a href="#">H10D 62/10</a>.</p> <p>Groups <a href="#">H10D 62/10</a> and <a href="#">H10D 62/129</a> should be considered in order to perform a complete search.</p>

- 62/13 . . . Semiconductor regions connected to electrodes carrying current to be rectified, amplified or switched, e.g. source or drain regions

**NOTE**

This group covers only semiconductor regions for devices that comprise three or more electrodes.

- 62/133 . . . {Emitter regions of BJTs}  
 62/134 . . . . {of lateral BJTs}  
 62/135 . . . . {Non-interconnected multi-emitter structures}  
 62/136 . . . . {of heterojunction BJTs (vertical heterojunction BJTs having one or more non-monocrystalline Group IV elements [H10D 10/861](#))}  
 62/137 . . . {Collector regions of BJTs}  
 62/138 . . . . {Pedestal collectors}  
 62/141 . . . {Anode or cathode regions of thyristors; Collector or emitter regions of gated bipolar-mode devices, e.g. of IGBTs}

**WARNING**

Group [H10D 62/141](#) is impacted by reclassification into group [H10D 62/145](#).

Groups [H10D 62/141](#) and [H10D 62/145](#) should be considered in order to perform a complete search.

- 62/142 . . . . {Anode regions of thyristors or collector regions of gated bipolar-mode devices}  
 62/145 . . . . {Emitter regions of IGBTs}

**WARNING**

Group [H10D 62/145](#) is incomplete pending reclassification of documents from group [H10D 62/141](#).

Groups [H10D 62/141](#) and [H10D 62/145](#) should be considered in order to perform a complete search.

- 62/148 . . . . {Cathode regions of thyristors}  
 62/149 . . . {Source or drain regions of field-effect devices}  
 62/151 . . . . {of IGFETs (of IGFETs having LDD or DDD structure [H10D 30/601](#); of thin film transistors [H10D 30/6713](#))}  
 62/152 . . . . {Source regions of DMOS transistors}

**WARNING**

Group [H10D 62/152](#) is impacted by reclassification into group [H10D 62/156](#).

Groups [H10D 62/152](#) and [H10D 62/156](#) should be considered in order to perform a complete search.

- 62/153 . . . . . {Impurity concentrations or distributions}  
 62/154 . . . . . {Dispositions}  
 62/155 . . . . . {Shapes (cell layout of DMOS [H10D 62/127](#))}

- 62/156 . . . . . {Drain regions of DMOS transistors}

**WARNING**

Group [H10D 62/156](#) is incomplete pending reclassification of documents from group [H10D 62/152](#).

Groups [H10D 62/152](#) and [H10D 62/156](#) should be considered in order to perform a complete search.

- 62/157 . . . . . {Impurity concentrations or distributions}  
 62/158 . . . . . {Dispositions}  
 62/159 . . . . . {Shapes}  
 62/161 . . . . {of FETs having Schottky gates}  
 62/165 . . . {Tunnel injectors}  
 62/17 . . . Semiconductor regions connected to electrodes not carrying current to be rectified, amplified or switched, e.g. channel regions  
 62/177 . . . {Base regions of bipolar transistors, e.g. BJTs or IGBTs}  
 62/184 . . . . {of lateral BJTs}  
 62/192 . . . {Base regions of thyristors}  
 62/199 . . . . {Anode base regions of thyristors}  
 62/206 . . . . {Cathode base regions of thyristors}  
 62/213 . . . {Channel regions of field-effect devices}  
 62/221 . . . . {of FETs}  
 62/228 . . . . . {having delta-doped channels}  
 62/235 . . . . . {of IGFETs (IGFETs having buried channels [H10D 30/637](#))}  
 62/292 . . . . . {Non-planar channels of IGFETs (resulting from the gate electrode dispositions, e.g. within trenches [H10D 64/512](#))}  
 62/299 . . . . . {having lateral doping variations (IGFETs having lightly doped source or drain extensions [H10D 30/601](#))}

**WARNING**

Group [H10D 62/299](#) is incomplete pending reclassification of documents from groups [H10D 62/314](#) and [H10D 84/0156](#).

Groups [H10D 62/314](#), [H10D 84/0156](#) and [H10D 62/299](#) should be considered in order to perform a complete search.

- 62/307 . . . . . {the doping variations being parallel to the channel lengths}  
 62/314 . . . . . {having vertical doping variations (vertical IGFETs [H10D 30/63](#))}

**WARNING**

Group [H10D 62/314](#) is impacted by reclassification into group [H10D 62/299](#).

Groups [H10D 62/314](#) and [H10D 62/299](#) should be considered in order to perform a complete search.

- 62/328 . . . . . {having PN junction gates}  
 62/335 . . . . {of charge-coupled devices}



- 62/343 . . . {Gate regions of field-effect devices having PN junction gates}
- 62/351 . . . {Substrate regions of field-effect devices}
- 62/357 . . . . {of FETs}
- 62/364 . . . . . {of IGFETs}
- 62/371 . . . . . {Inactive supplementary semiconductor regions, e.g. for preventing punch-through, improving capacity effect or leakage current}
- 62/378 . . . . . {Contact regions to the substrate regions}

**WARNING**

Group [H10D 62/378](#) is impacted by reclassification into group [H10D 64/529](#).

Groups [H10D 62/378](#) and [H10D 64/529](#) should be considered in order to perform a complete search.

- 62/386 . . . . {of charge-coupled devices}
- 62/393 . . . {Body regions of DMOS transistors or IGBTs (cell layout of DMOS [H10D 62/127](#))}
- 62/40 . Crystalline structures
- 62/402 . . {Amorphous materials}
- 62/405 . . {Orientations of crystalline planes}
- 62/50 . Physical imperfections
- 62/53 . . the imperfections being within the semiconductor body
- 62/57 . . the imperfections being on the surface of the semiconductor body, e.g. the body having a roughened surface
- 62/60 . Impurity distributions or concentrations
- 62/605 . . {Planar doped, e.g. atomic-plane doped or delta-doped}
- 62/80 . characterised by the materials

**NOTES**

1. When classifying in this group, constituents of a material are considered irrespective of any dopants or other impurities.
2. In this group:
  - groups [H10D 62/81](#) - {[H10D 62/8181](#)}, covering quantum or superlattice structures, take precedence over groups [H10D 62/82](#) - {[H10D 62/8281](#)}, covering heterojunctions;
  - groups [H10D 62/82](#) - {[H10D 62/8281](#)}, covering heterojunctions, take precedence over groups [H10D 62/83](#) - {[H10D 62/883](#)}, covering other materials;
  - {groups [H10D 62/881](#) - [H10D 62/883](#), covering two-dimensional materials, take precedence over groups [H10D 62/83](#) - [H10D 62/875](#), covering other materials.}

**WARNING**

Group [H10D 62/80](#) is incomplete pending reclassification of documents from group [H10D 62/81](#).

Group [H10D 62/80](#) is also impacted by reclassification into groups [H10D 62/82](#), [H10D 62/8271](#), [H10D 62/8281](#), [H10D 62/871](#), [H10D 62/874](#), [H10D 62/875](#), [H10D 62/881](#) and [H10D 62/883](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 62/81 . . of structures exhibiting quantum-confinement effects, e.g. single quantum wells; of structures having periodic or quasi-periodic potential variation

**WARNING**

Group [H10D 62/81](#) is impacted by reclassification into group [H10D 62/80](#).

Groups [H10D 62/81](#) and [H10D 62/80](#) should be considered in order to perform a complete search.

- 62/812 . . . {Single quantum well structures}
- 62/813 . . . . {Quantum wire structures}
- 62/814 . . . . {Quantum box structures}
- 62/815 . . . of structures having periodic or quasi-periodic potential variation, e.g. superlattices or multiple quantum wells [MQW]
- 62/8161 . . . . {potential variation due to variations in composition or crystallinity, e.g. heterojunction superlattices (lateral superlattices, lateral surface superlattices [H10D 62/8181](#))}
- 62/8162 . . . . . {having quantum effects only in the vertical direction, i.e. layered structures having quantum effects solely resulting from vertical potential variation}
- 62/8163 . . . . . {comprising long-range structurally-disordered materials, e.g. one-dimensional vertical amorphous superlattices}
- 62/8164 . . . . . {comprising only semiconductor materials (potential variation in long-range structurally-disordered materials [H10D 62/8163](#))}
- 62/8171 . . . . {Doping structures, e.g. doping superlattices or nipi superlattices}
- 62/8181 . . . . {Structures having no potential periodicity in the vertical direction, e.g. lateral superlattices or lateral surface superlattices [LSS]}



62/82 . . Heterojunctions

### **WARNING**

Group [H10D 62/82](#) is incomplete pending reclassification of documents from groups [H10D 62/80](#), [H10D 62/871](#) and [H10D 62/874](#).

Group [H10D 62/82](#) is also impacted by reclassification into groups [H10D 62/8271](#) and [H10D 62/8281](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/822 . . . comprising only Group IV materials heterojunctions, e.g. Si/Ge heterojunctions

### **WARNING**

Group [H10D 62/822](#) is incomplete pending reclassification of documents from group [H10D 62/83](#).

Groups [H10D 62/83](#) and [H10D 62/822](#) should be considered in order to perform a complete search.

62/824 . . . comprising only Group III-V materials heterojunctions, e.g. GaN/AlGaIn heterojunctions

### **WARNING**

Group [H10D 62/824](#) is incomplete pending reclassification of documents from group [H10D 62/85](#).

Groups [H10D 62/85](#) and [H10D 62/824](#) should be considered in order to perform a complete search.

62/826 . . . comprising only Group II-VI materials heterojunctions, e.g. CdTe/HgTe heterojunctions

### **WARNING**

Group [H10D 62/826](#) is incomplete pending reclassification of documents from group [H10D 62/86](#).

Groups [H10D 62/86](#) and [H10D 62/826](#) should be considered in order to perform a complete search.

62/8271 . . . {comprising only oxide semiconductor materials heterojunctions, e.g. IGZO/IZO}

### **WARNING**

Group [H10D 62/8271](#) is incomplete pending reclassification of documents from groups [H10D 62/80](#) and [H10D 62/82](#).

Groups [H10D 62/80](#), [H10D 62/82](#) and [H10D 62/8271](#) should be considered in order to perform a complete search.

62/8281 . . . {comprising only transition metal dichalcogenide materials heterojunctions, e.g. MoS<sub>2</sub>/WSe<sub>2</sub>}

### **WARNING**

Group [H10D 62/8281](#) is incomplete pending reclassification of documents from groups [H10D 62/80](#), [H10D 62/82](#), [H10D 62/871](#) and [H10D 62/874](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/83 . . being Group IV materials, e.g. B-doped Si or undoped Ge

### **WARNING**

Group [H10D 62/83](#) is impacted by reclassification into groups [H10D 62/822](#), [H10D 62/832](#), [H10D 62/834](#) and [H10D 62/881](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/8303 . . . {Diamond}

### **WARNING**

Group [H10D 62/8303](#) is impacted by reclassification into group [H10D 62/882](#).

Groups [H10D 62/8303](#) and [H10D 62/882](#) should be considered in order to perform a complete search.

62/832 . . . being Group IV materials comprising two or more elements, e.g. SiGe

### **WARNING**

Group [H10D 62/832](#) is incomplete pending reclassification of documents from group [H10D 62/83](#).

Groups [H10D 62/83](#) and [H10D 62/832](#) should be considered in order to perform a complete search.

62/8325 . . . . {Silicon carbide}

62/834 . . . further characterised by the dopants

### **WARNING**

Group [H10D 62/834](#) is incomplete pending reclassification of documents from group [H10D 62/83](#).

Groups [H10D 62/83](#) and [H10D 62/834](#) should be considered in order to perform a complete search.

62/84 . . being selenium or tellurium only

### **NOTE**

This group does not cover chemical compounds of selenium or tellurium.

62/85 . . . being Group III-V materials, e.g. GaAs

#### **WARNING**

Group [H10D 62/85](#) is impacted by reclassification into groups [H10D 62/824](#), [H10D 62/852](#) and [H10D 62/854](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/8503 . . . {Nitride Group III-V materials, e.g. AlN or GaN}

#### **WARNING**

Group [H10D 62/8503](#) is impacted by reclassification into group [H10D 62/881](#).

Groups [H10D 62/8503](#) and [H10D 62/881](#) should be considered in order to perform a complete search.

62/852 . . . being Group III-V materials comprising three or more elements, e.g. AlGaIn or InAsSbP

#### **WARNING**

Group [H10D 62/852](#) is incomplete pending reclassification of documents from group [H10D 62/85](#).

Groups [H10D 62/85](#) and [H10D 62/852](#) should be considered in order to perform a complete search.

62/854 . . . further characterised by the dopants

#### **WARNING**

Group [H10D 62/854](#) is incomplete pending reclassification of documents from group [H10D 62/85](#).

Groups [H10D 62/85](#) and [H10D 62/854](#) should be considered in order to perform a complete search.

62/86 . . . being Group II-VI materials, e.g. ZnO

#### **WARNING**

Group [H10D 62/86](#) is impacted by reclassification into groups [H10D 62/826](#), [H10D 62/8603](#), [H10D 62/862](#) and [H10D 62/864](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/8603 . . . {Binary Group II-VI materials wherein cadmium is the Group II element, e.g. CdTe}

#### **WARNING**

Group [H10D 62/8603](#) is incomplete pending reclassification of documents from group [H10D 62/86](#).

Groups [H10D 62/86](#) and [H10D 62/8603](#) should be considered in order to perform a complete search.

62/862 . . . being Group II-VI materials comprising three or more elements, e.g. CdZnTe

#### **WARNING**

Group [H10D 62/862](#) is incomplete pending reclassification of documents from group [H10D 62/86](#).

Groups [H10D 62/86](#) and [H10D 62/862](#) should be considered in order to perform a complete search.

62/864 . . . further characterised by the dopants

#### **WARNING**

Group [H10D 62/864](#) is incomplete pending reclassification of documents from group [H10D 62/86](#).

Groups [H10D 62/86](#) and [H10D 62/864](#) should be considered in order to perform a complete search.

62/871 . . {being Group I-VI materials, e.g. Cu<sub>2</sub>O; being Group I-VII materials, e.g. CuI}

#### **WARNING**

Group [H10D 62/871](#) is incomplete pending reclassification of documents from group [H10D 62/80](#).

Group [H10D 62/871](#) is also impacted by reclassification into groups [H10D 62/82](#), [H10D 62/8281](#) and [H10D 62/883](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/874 . . {being Pb compounds or alloys, e.g. PbO}

#### **WARNING**

Group [H10D 62/874](#) is incomplete pending reclassification of documents from group [H10D 62/80](#).

Group [H10D 62/874](#) is also impacted by reclassification into groups [H10D 62/82](#), [H10D 62/8281](#) and [H10D 62/883](#).

All groups listed in this Warning should be considered in order to perform a complete search.

62/875 . . {being semiconductor metal oxide, e.g. InGaZnO (Group II-VI materials [H10D 62/86](#); Group I-VI materials [H10D 62/871](#); Pb compounds or alloys [H10D 62/874](#))}

#### **WARNING**

Group [H10D 62/875](#) is incomplete pending reclassification of documents from group [H10D 62/80](#).

Groups [H10D 62/80](#) and [H10D 62/875](#) should be considered in order to perform a complete search.

- 62/881 . . {being a two-dimensional material}
- WARNING**
- Group [H10D 62/881](#) is incomplete pending reclassification of documents from groups [H10D 62/80](#), [H10D 62/83](#) and [H10D 62/8503](#).
- All groups listed in this Warning should be considered in order to perform a complete search.
- 62/882 . . . {Graphene}
- WARNING**
- Group [H10D 62/882](#) is incomplete pending reclassification of documents from group [H10D 62/8303](#).
- Groups [H10D 62/8303](#) and [H10D 62/882](#) should be considered in order to perform a complete search.
- 62/883 . . . {Transition metal dichalcogenides, e.g. MoSe<sub>2</sub>}
- WARNING**
- Group [H10D 62/883](#) is incomplete pending reclassification of documents from groups [H10D 62/80](#), [H10D 62/871](#) and [H10D 62/874](#).
- All groups listed in this Warning should be considered in order to perform a complete search.
- 64/00 Electrodes of devices having potential barriers**
- 64/01 . Manufacture or treatment
- 64/015 . . {removing at least parts of gate spacers, e.g. disposable spacers}
- 64/017 . . {using dummy gates in processes wherein at least parts of the final gates are self-aligned to the dummy gates, i.e. replacement gate processes}
- WARNING**
- Group [H10D 64/017](#) is incomplete pending reclassification of documents from group [H10D 30/0273](#).
- Groups [H10D 30/0273](#) and [H10D 64/017](#) should be considered in order to perform a complete search.
- 64/018 . . {Spacers formed inside holes at the prospective gate locations, e.g. holes left by removing dummy gates}
- 64/021 . . {using multiple gate spacer layers, e.g. bilayered sidewall spacers}
- 64/025 . . {forming recessed gates, e.g. by using local oxidation}
- 64/027 . . . {by etching at gate locations}
- 64/031 . . {of data-storage electrodes}
- 64/033 . . . {comprising ferroelectric layers}
- 64/035 . . . {comprising conductor-insulator-conductor-insulator-semiconductor structures}
- 64/037 . . . {comprising charge-trapping insulators}
- 64/111 . {Field plates}
- 64/112 . . {comprising multiple field plate segments}
- 64/115 . . {Resistive field plates, e.g. semi-insulating field plates}
- 64/117 . . {Recessed field plates, e.g. trench field plates or buried field plates}

- 64/118 . {Electrodes comprising insulating layers having particular dielectric or electrostatic properties, e.g. having static charges}
- 64/20 . Electrodes characterised by their shapes, relative sizes or dispositions
- 64/205 . . {Nanosized electrodes, e.g. nanowire electrodes}
- 64/23 . . Electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. sources, drains, anodes or cathodes

**WARNING**

Group [H10D 64/23](#) is impacted by reclassification into group [H10D 64/232](#).

Groups [H10D 64/23](#) and [H10D 64/232](#) should be considered in order to perform a complete search.

- 64/231 . . . {Emitter or collector electrodes for bipolar transistors}
- 64/232 . . . {Emitter electrodes for IGBTs}

**WARNING**

Group [H10D 64/232](#) is incomplete pending reclassification of documents from group [H10D 64/23](#).

Groups [H10D 64/23](#) and [H10D 64/232](#) should be considered in order to perform a complete search.

- 64/233 . . . {Cathode or anode electrodes for thyristors}
- 64/251 . . . {Source or drain electrodes for field-effect devices}
- 64/252 . . . . {for vertical or pseudo-vertical devices}

**WARNING**

Group [H10D 64/252](#) is impacted by reclassification into groups [H10D 64/2523](#) and [H10D 64/2527](#).

Groups [H10D 64/252](#), [H10D 64/2523](#) and [H10D 64/2527](#) should be considered in order to perform a complete search.

- 64/2523 . . . . . {for vertical devices wherein the source or drain electrodes extend entirely through semiconductor bodies}

**WARNING**

Group [H10D 64/2523](#) is incomplete pending reclassification of documents from group [H10D 64/252](#).

Groups [H10D 64/252](#) and [H10D 64/2523](#) should be considered in order to perform a complete search.

64/2527 . . . . . {for vertical devices wherein the source or drain electrodes are recessed in semiconductor bodies}

#### **WARNING**

Group [H10D 64/2527](#) is incomplete pending reclassification of documents from groups [H10D 64/252](#) and [H10D 64/256](#).

Groups [H10D 64/252](#), [H10D 64/256](#) and [H10D 64/2527](#) should be considered in order to perform a complete search.

64/254 . . . . . {for lateral devices wherein the source or drain electrodes extend entirely through the semiconductor bodies, e.g. via-holes for back side contacts}

#### **WARNING**

Group [H10D 64/254](#) is impacted by reclassification into groups [H10D 64/256](#) - [H10D 64/2565](#) and [H10D 64/257](#).

Groups [H10D 64/254](#), [H10D 64/256](#) - [H10D 64/2565](#) and [H10D 64/257](#) should be considered in order to perform a complete search.

64/256 . . . . . {for lateral devices wherein the source or drain electrodes are recessed in semiconductor bodies (source or drain electrodes of TFTs [H10D 30/673](#))}

#### **WARNING**

Group [H10D 64/256](#) is incomplete pending reclassification of documents from groups [H10D 64/254](#) and [H10D 64/257](#).

Group [H10D 64/256](#) is also impacted by reclassification into group [H10D 64/2527](#).

All groups listed in this Warning should be considered in order to perform a complete search.

64/2565 . . . . . {wherein the source or drain regions are on a top side of the semiconductor bodies and the recessed source or drain electrodes are on a bottom side of the semiconductor bodies}

#### **WARNING**

Group [H10D 64/2565](#) is incomplete pending reclassification of documents from group [H10D 64/254](#).

Groups [H10D 64/254](#) and [H10D 64/2565](#) should be considered in order to perform a complete search.

64/257 . . . . . {for lateral devices wherein the source or drain electrodes are characterised by top-view geometrical layouts, e.g. interdigitated, semi-circular, annular or L-shaped electrodes (source or drain electrodes of TFTs [H10D 30/673](#))}

#### **WARNING**

Group [H10D 64/257](#) is incomplete pending reclassification of documents from group [H10D 64/254](#).

Group [H10D 64/257](#) is also impacted by reclassification into group [H10D 64/256](#).

Groups [H10D 64/254](#), [H10D 64/257](#) and [H10D 64/256](#) should be considered in order to perform a complete search.

64/258 . . . . . {characterised by the relative positions of the source or drain electrodes with respect to the gate electrode}

64/259 . . . . . {Source or drain electrodes being self-aligned with the gate electrode and having bottom surfaces higher than the interface between the channel and the gate dielectric}

64/27 . . . Electrodes not carrying the current to be rectified, amplified, oscillated or switched, e.g. gates

64/281 . . . {Base electrodes for bipolar transistors}

64/291 . . . {Gate electrodes for thyristors}

64/311 . . . {Gate electrodes for field-effect devices}

64/411 . . . . . {for FETs}

64/511 . . . . . {for IGFETs}

64/512 . . . . . {Disposition of the gate electrodes, e.g. buried gates}

64/513 . . . . . {within recesses in the substrate, e.g. trench gates, groove gates or buried gates}

64/514 . . . . . {characterised by the insulating layers}

64/516 . . . . . {the thicknesses being non-uniform}

64/517 . . . . . {characterised by the conducting layers}

64/518 . . . . . {characterised by their lengths or sectional shapes}

64/519 . . . . . {characterised by their top-view geometrical layouts}

64/529 . . . {Electrodes for IGFETs contacting substrate regions, e.g. for grounding or preventing parasitic effects}

#### **WARNING**

Group [H10D 64/529](#) is incomplete pending reclassification of documents from group [H10D 62/378](#).

Groups [H10D 62/378](#) and [H10D 64/529](#) should be considered in order to perform a complete search.

64/60 . . . Electrodes characterised by their materials

64/602 . . {Heterojunction gate electrodes for FETs}

64/605 . . {Source, drain, or gate electrodes for FETs comprising highly resistive materials}

64/608 . . {being superconducting}

64/62 . . Electrodes ohmically coupled to a semiconductor

64/64 . . Electrodes comprising a Schottky barrier to a semiconductor

- 64/647 . . . {Schottky drain or source electrodes for IGFETs}
- 64/649 . . . {Schottky drain or source electrodes for FETs having rectifying junction gate electrodes}
- 64/66 . . Electrodes having a conductor capacitively coupled to a semiconductor by an insulator, e.g. MIS electrodes
- 64/661 . . . {the conductor comprising a layer of silicon contacting the insulator, e.g. polysilicon having vertical doping variation (having lateral variation in the gate structure [H10D 64/671](#))}
- 64/662 . . . . {the conductor further comprising additional layers, e.g. multiple silicon layers having different crystal structures}
- 64/663 . . . . . {the additional layers comprising a silicide layer contacting the layer of silicon, e.g. polycide gates}
- 64/664 . . . . . {the additional layers comprising a barrier layer between the layer of silicon and an upper metal or metal silicide layer}
- 64/665 . . . {the conductor comprising a layer of elemental metal contacting the insulator, e.g. tungsten or molybdenum (having lateral variation [H10D 64/671](#))}
- 64/666 . . . . {the conductor further comprising additional layers}
- 64/667 . . . {the conductor comprising a layer of alloy material, compound material or organic material contacting the insulator, e.g. TiN workfunction layers (having lateral variation [H10D 64/671](#))}

**WARNING**

Group [H10D 64/667](#) is impacted by reclassification into group [H10D 64/669](#). Groups [H10D 64/667](#) and [H10D 64/669](#) should be considered in order to perform a complete search.

- 64/668 . . . . {the layer being a silicide, e.g.  $\text{TiSi}_2$ }

**WARNING**

Group [H10D 64/668](#) is impacted by reclassification into group [H10D 64/669](#). Groups [H10D 64/668](#) and [H10D 64/669](#) should be considered in order to perform a complete search.

- 64/669 . . . . {the conductor further comprising additional layers of alloy material, compound material or organic material, e.g. TaN/TiAlN}

**WARNING**

Group [H10D 64/669](#) is incomplete pending reclassification of documents from groups [H10D 64/667](#) and [H10D 64/668](#). Groups [H10D 64/667](#), [H10D 64/668](#) and [H10D 64/669](#) should be considered in order to perform a complete search.

- 64/671 . . . {the conductor having lateral variation in doping or structure}

**WARNING**

Group [H10D 64/671](#) is impacted by reclassification into group [H10D 64/675](#).

Groups [H10D 64/671](#) and [H10D 64/675](#) should be considered in order to perform a complete search.

- 64/675 . . . {Gate sidewall spacers}

**WARNING**

Group [H10D 64/675](#) is incomplete pending reclassification of documents from group [H10D 64/671](#).

Groups [H10D 64/671](#) and [H10D 64/675](#) should be considered in order to perform a complete search.

- 64/679 . . . . {comprising air gaps}
- 64/68 . . . characterised by the insulator, e.g. by the gate insulator
- 64/681 . . . . {having a compositional variation, e.g. multilayered}
- 64/683 . . . . . {being parallel to the channel plane}
- 64/685 . . . . . {being perpendicular to the channel plane}
- 64/687 . . . . {having cavities, e.g. porous gate dielectrics having gasses therein}
- 64/689 . . . . {having ferroelectric layers}
- 64/691 . . . . {comprising metallic compounds, e.g. metal oxides or metal silicates (insulators comprising nitrogen [H10D 64/693](#))}
- 64/693 . . . . {the insulator comprising nitrogen, e.g. nitrides, oxynitrides or nitrogen-doped materials}

**Integrated devices; Assemblies of multiple devices**

- 80/00** Assemblies of multiple devices comprising at least one device covered by this subclass
- 80/20 . the at least one device being covered by groups [H10D 1/00](#) - [H10D 48/00](#), e.g. assemblies comprising capacitors, power FETs or Schottky diodes
- 80/211 . . {Resistors, capacitors or inductors covered by [H10D 1/00](#)}
- 80/213 . . . {Resistors}
- 80/215 . . . {Capacitors}
- 80/231 . . {Diodes covered by [H10D 8/00](#)}
- 80/251 . . {FETs covered by [H10D 30/00](#), e.g. power FETs}
- 80/30 . the at least one device being covered by groups [H10D 84/00](#) - [H10D 86/00](#), e.g. assemblies comprising integrated circuit processor chips
- 84/00** Integrated devices formed in or on semiconductor substrates that comprise only semiconducting layers, e.g. on Si wafers or on GaAs-on-Si wafers

**NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.



84/01 . . Manufacture or treatment

**WARNING**

Group [H10D 84/01](#) is impacted by reclassification into groups [H10D 84/02](#), [H10D 84/03](#), [H10D 84/035](#), [H10D 84/038](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0102 . . { of thyristors having built-in components, e.g. thyristor having built-in diode }

84/0105 . . . { the built-in components being field-effect devices }

84/0107 . . { Integrating at least one component covered by [H10D 12/00](#) or [H10D 30/00](#) with at least one component covered by [H10D 8/00](#), [H10D 10/00](#) or [H10D 18/00](#), e.g. integrating IGFETs with BJTs }

**WARNING**

Groups [H10D 84/0107](#) and [H10D 84/0109](#) are incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0109 . . . { the at least one component covered by [H10D 12/00](#) or [H10D 30/00](#) being a MOS device }

84/0112 . . { Integrating together multiple components covered by [H10D 8/00](#), [H10D 10/00](#) or [H10D 18/00](#), e.g. integrating multiple BJTs }

**WARNING**

Groups [H10D 84/0112](#) - [H10D 84/0121](#) are incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0114 . . . { the components including vertical BJTs and lateral BJTs }

84/0116 . . . { the components including integrated injection logic [I2L] }

84/0119 . . . { the components including complementary BJTs }

84/0121 . . . . { the complementary BJTs being vertical BJTs }

84/0123 . . { Integrating together multiple components covered by [H10D 12/00](#) or [H10D 30/00](#), e.g. integrating multiple IGBTs }

**WARNING**

Groups [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#), [H10D 84/0133](#), [H10D 84/0135](#), [H10D 84/0137](#), [H10D 84/014](#), [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#), [H10D 84/0167](#), [H10D 84/017](#), [H10D 84/0172](#), [H10D 84/0174](#), [H10D 84/0177](#), [H10D 84/0179](#), [H10D 84/0181](#), [H10D 84/0184](#), [H10D 84/0186](#), [H10D 84/0188](#), [H10D 84/0191](#), [H10D 84/0193](#) and [H10D 84/0195](#) are incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0126 . . . { the components including insulated gates, e.g. IGFETs }

84/0128 . . . . { Manufacturing their channels }

84/013 . . . . { Manufacturing their source or drain regions, e.g. silicided source or drain regions }

84/0133 . . . . . { Manufacturing common source or drain regions between multiple IGFETs }

84/0135 . . . . . { Manufacturing their gate conductors }

84/0137 . . . . . { the gate conductors being silicided }

84/014 . . . . . { the gate conductors having different materials or different implants }

84/0142 . . . . . { the gate conductors having different shapes or dimensions }

84/0144 . . . . . { Manufacturing their gate insulating layers }

84/0147 . . . . . { Manufacturing their gate sidewall spacers }

84/0149 . . . . . { Manufacturing their interconnections or electrodes, e.g. source or drain electrodes }

84/0151 . . . . . { Manufacturing their isolation regions }

**WARNING**

Group [H10D 84/0151](#) is incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

Group [H10D 84/0151](#) is also impacted by reclassification into group [H10D 84/0153](#).

All groups listed in this Warning should be considered in order to perform a complete search.



84/0153 . . . . . {using gate cut processes}

**WARNING**

Group [H10D 84/0153](#) is incomplete pending reclassification of documents from groups [H10D 84/0151](#), [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0156 . . . . . {Manufacturing their doped wells}

**WARNING**

Group [H10D 84/0156](#) is incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

Group [H10D 84/0156](#) is also impacted by reclassification into group [H10D 62/299](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/0158 . . . . . {the components including FinFETs}

84/016 . . . . . {the components including vertical IGFETs}

84/0163 . . . . . {the components including enhancement-mode IGFETs and depletion-mode IGFETs}

84/0165 . . . . . {the components including complementary IGFETs, e.g. CMOS devices}

84/0167 . . . . . {Manufacturing their channels}

84/017 . . . . . {Manufacturing their source or drain regions, e.g. silicided source or drain regions}

84/0172 . . . . . {Manufacturing their gate conductors}

84/0174 . . . . . {the gate conductors being silicided}

84/0177 . . . . . {the gate conductors having different materials or different implants}

84/0179 . . . . . {the gate conductors having different shapes or dimensions}

84/0181 . . . . . {Manufacturing their gate insulating layers}

84/0184 . . . . . {Manufacturing their gate sidewall spacers}

84/0186 . . . . . {Manufacturing their interconnections or electrodes, e.g. source or drain electrodes}

84/0188 . . . . . {Manufacturing their isolation regions}

84/0191 . . . . . {Manufacturing their doped wells}

84/0193 . . . . . {the components including FinFETs}

84/0195 . . . . . {the components including vertical IGFETs}

84/0198 . . . {Integrating together multiple components covered by [H10D 44/00](#), e.g. integrating charge coupled devices}

**WARNING**

Group [H10D 84/0198](#) is incomplete pending reclassification of documents from groups [H10D 84/02](#), [H10D 84/032](#), [H10D 84/035](#), [H10D 84/05](#), [H10D 84/07](#) and [H10D 84/08](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/02 . . . characterised by using material-based technologies

**WARNING**

Group [H10D 84/02](#) is incomplete pending reclassification of documents from group [H10D 84/01](#).

Group [H10D 84/02](#) is also impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#), [H10D 84/03](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/03 . . . using Group IV technology, e.g. silicon technology or silicon-carbide [SiC] technology

**WARNING**

Group [H10D 84/03](#) is incomplete pending reclassification of documents from groups [H10D 84/01](#) and [H10D 84/02](#).

Groups [H10D 84/01](#), [H10D 84/02](#) and [H10D 84/03](#) should be considered in order to perform a complete search.

84/032 . . . . {using diamond technology}

**WARNING**

Group [H10D 84/032](#) is impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/035 . . . . {using silicon carbide [SiC] technology}

**WARNING**

Group [H10D 84/035](#) is incomplete pending reclassification of documents from group [H10D 84/01](#).

Group [H10D 84/035](#) is also impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/038 . . . . {using silicon technology, e.g. SiGe}

**WARNING**

Group [H10D 84/038](#) is incomplete pending reclassification of documents from group [H10D 84/01](#).

Groups [H10D 84/01](#) and [H10D 84/038](#) should be considered in order to perform a complete search.

84/05 . . . . using Group III-V technology

**WARNING**

Group [H10D 84/05](#) is incomplete pending reclassification of documents from group [H10D 84/01](#). Group [H10D 84/05](#) is also impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/07 . . . . using Group II-VI technology

**WARNING**

Group [H10D 84/07](#) is incomplete pending reclassification of documents from group [H10D 84/01](#).

Group [H10D 84/07](#) is also impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 84/08 . . . using combinations of technologies, e.g. using both Si and SiC technologies or using both Si and Group III-V technologies

**WARNING**

Group [H10D 84/08](#) is incomplete pending reclassification of documents from group [H10D 84/01](#).

Group [H10D 84/08](#) is also impacted by reclassification into groups [H10D 84/0107](#) - [H10D 84/0109](#), [H10D 84/0112](#) - [H10D 84/0121](#), [H10D 84/0123](#), [H10D 84/0126](#), [H10D 84/0128](#), [H10D 84/013](#) - [H10D 84/0133](#), [H10D 84/0135](#) - [H10D 84/0142](#), [H10D 84/0144](#), [H10D 84/0147](#), [H10D 84/0151](#) - [H10D 84/0153](#), [H10D 84/0156](#), [H10D 84/0158](#), [H10D 84/016](#), [H10D 84/0163](#), [H10D 84/0165](#) - [H10D 84/0195](#), [H10D 84/0198](#) and [H10D 88/01](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 84/101 . {Integrated devices comprising main components and built-in components, e.g. IGBT having built-in freewheel diode}

**WARNING**

Group [H10D 84/101](#) is incomplete pending reclassification of documents from group [H10D 30/64](#).

Groups [H10D 30/64](#) and [H10D 84/101](#) should be considered in order to perform a complete search.

- 84/121 . . {BJTs having built-in components}
- 84/125 . . . {the built-in components being resistive elements, e.g. BJT having a built-in ballasting resistor}
- 84/131 . . {Thyristors having built-in components}
- 84/133 . . . {the built-in components being capacitors or resistors}
- 84/135 . . . {the built-in components being diodes}
- 84/136 . . . . {in anti-parallel configurations, e.g. reverse current thyristor [RCT]}
- 84/138 . . . {the built-in components being FETs}
- 84/141 . . {VDMOS having built-in components}
- 84/143 . . . {the built-in components being PN junction diodes}
- 84/144 . . . . {in antiparallel diode configurations}
- 84/146 . . . {the built-in components being Schottky barrier diodes}
- 84/148 . . . {the built-in components being breakdown diodes, e.g. Zener diodes}
- 84/151 . . {LDMOS having built-in components}
- 84/153 . . . {the built-in component being PN junction diodes}
- 84/154 . . . . {in antiparallel diode configurations}
- 84/156 . . . {the built-in components being Schottky barrier diodes}
- 84/158 . . . {the built-in components being breakdown diodes, e.g. Zener diodes}

- 84/161 . . {IGBT having built-in components}

**WARNING**

Group [H10D 84/161](#) is incomplete pending reclassification of documents from group [H10D 12/411](#).

Groups [H10D 12/411](#) and [H10D 84/161](#) should be considered in order to perform a complete search.

- 84/201 . {characterised by the integration of only components covered by [H10D 1/00](#) or [H10D 8/00](#), e.g. RLC circuits}

**WARNING**

Group [H10D 84/201](#) is incomplete pending reclassification of documents from group [H10D 86/85](#).

Groups [H10D 86/85](#) and [H10D 84/201](#) should be considered in order to perform a complete search.

- 84/204 . . {of combinations of diodes or capacitors or resistors}
- 84/206 . . . {of combinations of capacitors and resistors}

**WARNING**

Group [H10D 84/206](#) is incomplete pending reclassification of documents from group [H10D 86/85](#).

Group [H10D 84/206](#) is also impacted by reclassification into groups [H10D 84/209](#) and [H10D 84/212](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 84/209 . . . {of only resistors}

**WARNING**

Group [H10D 84/209](#) is incomplete pending reclassification of documents from groups [H10D 84/206](#) and [H10D 86/85](#).

Groups [H10D 84/206](#), [H10D 86/85](#) and [H10D 84/209](#) should be considered in order to perform a complete search.

- 84/212 . . . {of only capacitors}

**WARNING**

Group [H10D 84/212](#) is incomplete pending reclassification of documents from groups [H10D 84/206](#) and [H10D 86/85](#).

Groups [H10D 84/206](#), [H10D 86/85](#) and [H10D 84/212](#) should be considered in order to perform a complete search.

- 84/215 . . . . {of only varactors}
- 84/217 . . . . {of only conductor-insulator-semiconductor capacitors}
- 84/221 . . . {of only diodes}

- 84/40 . . characterised by the integration of at least one component covered by groups [H10D 12/00](#) or [H10D 30/00](#) with at least one component covered by groups [H10D 10/00](#) or [H10D 18/00](#), e.g. integration of IGFETs with BJTs

**WARNING**

Group [H10D 84/40](#) is incomplete pending reclassification of documents from group [H10D 84/401](#).

Group [H10D 84/40](#) is also impacted by reclassification into group [H10D 84/80](#).

Groups [H10D 84/401](#), [H10D 84/40](#) and [H10D 84/80](#) should be considered in order to perform a complete search.

- 84/401 . . {Combinations of FETs or IGBTs with BJTs}

**WARNING**

Group [H10D 84/401](#) is impacted by reclassification into group [H10D 84/40](#).

Groups [H10D 84/401](#) and [H10D 84/40](#) should be considered in order to perform a complete search.

- 84/403 . . . {Combinations of FETs or IGBTs with BJTs and with one or more of diodes, resistors or capacitors}

- 84/406 . . . . {Combinations of FETs or IGBTs with vertical BJTs and with one or more of diodes, resistors or capacitors}

- 84/409 . . . . {Combinations of FETs or IGBTs with lateral BJTs and with one or more of diodes, resistors or capacitors}

- 84/60 . . characterised by the integration of at least one component covered by groups [H10D 10/00](#) or [H10D 18/00](#), e.g. integration of BJTs ([H10D 84/40](#) takes precedence)

- 84/611 . . {Combinations of BJTs and one or more of diodes, resistors or capacitors}

- 84/613 . . . {Combinations of vertical BJTs and one or more of diodes, resistors or capacitors}

- 84/615 . . . . {Combinations of vertical BJTs and one or more of resistors or capacitors}

- 84/617 . . . . {Combinations of vertical BJTs and only diodes}

- 84/619 . . . {Combinations of lateral BJTs and one or more of diodes, resistors or capacitors}

- 84/63 . . Combinations of vertical and lateral BJTs

- 84/641 . . {Combinations of only vertical BJTs (vertical complementary BJTs [H10D 84/673](#))}

- 84/642 . . . {Combinations of non-inverted vertical BJTs of the same conductivity type having different characteristics, e.g. Darlington transistors}

- 84/643 . . . {Combinations of non-inverted vertical BJTs and inverted vertical BJTs}

- 84/645 . . {Combinations of only lateral BJTs}

**WARNING**

Group [H10D 84/645](#) is impacted by reclassification into group [H10D 84/67](#).

Groups [H10D 84/645](#) and [H10D 84/67](#) should be considered in order to perform a complete search.

- 84/65 . . Integrated injection logic

- 84/652 . . . {using vertical injector structures}

- 84/655 . . . {using field effect injector structures}

- 84/658 . . . {integrated in combination with analog structures}

- 84/67 . . Complementary BJTs

**WARNING**

Group [H10D 84/67](#) is incomplete pending reclassification of documents from group [H10D 84/645](#).

Groups [H10D 84/645](#) and [H10D 84/67](#) should be considered in order to perform a complete search.

- 84/673 . . . {Vertical complementary BJTs}

- 84/676 . . {Combinations of only thyristors}

- 84/80 . . characterised by the integration of at least one component covered by groups [H10D 12/00](#) or [H10D 30/00](#), e.g. integration of IGFETs ([H10D 84/40](#) takes precedence)

**WARNING**

Group [H10D 84/80](#) is incomplete pending reclassification of documents from group [H10D 84/40](#).

Groups [H10D 84/40](#) and [H10D 84/80](#) should be considered in order to perform a complete search.

- 84/811 . . {Combinations of field-effect devices and one or more diodes, capacitors or resistors}

**WARNING**

Group [H10D 84/811](#) is impacted by reclassification into groups [H10D 84/813](#) and [H10D 84/817](#).

Groups [H10D 84/811](#), [H10D 84/813](#) and [H10D 84/817](#) should be considered in order to perform a complete search.

- 84/813 . . . {Combinations of field-effect devices and capacitor only}

**WARNING**

Group [H10D 84/813](#) is incomplete pending reclassification of documents from group [H10D 84/811](#).

Groups [H10D 84/811](#) and [H10D 84/813](#) should be considered in order to perform a complete search.

- 84/817 . . . {Combinations of field-effect devices and resistors only}

**WARNING**

Group [H10D 84/817](#) is incomplete pending reclassification of documents from group [H10D 84/811](#).

Groups [H10D 84/811](#) and [H10D 84/817](#) should be considered in order to perform a complete search.

- 84/82 . . of only field-effect components

84/83 . . . of only insulated-gate FETs [IGFET]

#### **WARNING**

Group [H10D 84/83](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83125](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#), [H10D 84/832](#) - [H10D 84/833](#), [H10D 84/835](#), [H10D 84/836](#) and [H10D 84/837](#) - [H10D 84/839](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/8311 . . . . {the IGFETs characterised by having different channel structures}

#### **WARNING**

Group [H10D 84/8311](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/8312 . . . . {the IGFETs characterised by having different source or drain region structures, e.g. IGFETs having symmetrical source or drain regions integrated with IGFETs having asymmetrical source or drain regions}

#### **WARNING**

Group [H10D 84/8312](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/83125 . . . . {the IGFETs characterised by having shared source or drain regions}

#### **WARNING**

Group [H10D 84/83125](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#) and [H10D 84/84](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/83135 . . . . {the IGFETs characterised by having different gate conductor materials or different gate conductor implants}

#### **WARNING**

Group [H10D 84/83135](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/83138 . . . . {the IGFETs characterised by having different shapes or dimensions of their gate conductors}

#### **WARNING**

Group [H10D 84/83138](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/8314 . . . . {the IGFETs characterised by having gate insulating layers with different properties}

#### **WARNING**

Group [H10D 84/8314](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/8316 . . . . {the IGFETs characterised by having gate sidewall spacers specially adapted for integration}

#### **WARNING**

Group [H10D 84/8316](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/85](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.



84/832 . . . . {comprising IGFETs having stacked nanowire, nanosheet or nanoribbon channels}

#### **WARNING**

Groups [H10D 84/832](#) and [H10D 84/833](#) are incomplete pending reclassification of documents from groups [H10D 84/83](#) and [H10D 84/834](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/833 . . . . . {comprising forksheet IGFETs}

84/834 . . . . . {comprising FinFETs}

#### **WARNING**

Group [H10D 84/834](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83125](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#), [H10D 84/832](#) - [H10D 84/833](#), [H10D 84/835](#), [H10D 84/836](#) and [H10D 84/837](#) - [H10D 84/839](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/835 . . . . . {comprising LDMOS}

#### **WARNING**

Group [H10D 84/835](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/836 . . . . . {comprising EDMOS}

#### **WARNING**

Group [H10D 84/836](#) is incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/837 . . . . . {comprising vertical IGFETs}

#### **WARNING**

Groups [H10D 84/837](#) and [H10D 84/839](#) are incomplete pending reclassification of documents from groups [H10D 84/83](#), [H10D 84/834](#), [H10D 84/84](#), [H10D 84/853](#) and [H10D 84/856](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/839 . . . . . {comprising VDMOS}

84/84 . . . . . Combinations of enhancement-mode IGFETs and depletion-mode IGFETs

#### **WARNING**

Group [H10D 84/84](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83125](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#), [H10D 84/835](#), [H10D 84/836](#) and [H10D 84/837](#) - [H10D 84/839](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/85 . . . . . Complementary IGFETs, e.g. CMOS

#### **WARNING**

Group [H10D 84/85](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#) and [H10D 84/851](#) - [H10D 84/852](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/851 . . . . . {comprising IGFETs having stacked nanowire, nanosheet or nanoribbon channels}

#### **WARNING**

Groups [H10D 84/851](#) and [H10D 84/852](#) are incomplete pending reclassification of documents from groups [H10D 84/85](#) and [H10D 84/853](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/852 . . . . . {comprising forksheet IGFETs}

84/853 . . . . . {comprising FinFETs}

#### **WARNING**

Group [H10D 84/853](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#), [H10D 84/835](#), [H10D 84/836](#), [H10D 84/837](#) - [H10D 84/839](#) and [H10D 84/851](#) - [H10D 84/852](#).

All groups listed in this Warning should be considered in order to perform a complete search.

84/854 . . . . . {comprising arrangements for preventing bipolar actions between the different IGFET regions, e.g. arrangements for latchup prevention}

- 84/856 . . . . . {the complementary IGFETs having different architectures than each other, e.g. high-voltage and low-voltage CMOS}

**WARNING**

Group [H10D 84/856](#) is impacted by reclassification into groups [H10D 84/8311](#), [H10D 84/8312](#), [H10D 84/83135](#), [H10D 84/83138](#), [H10D 84/8314](#), [H10D 84/8316](#), [H10D 84/835](#), [H10D 84/836](#) and [H10D 84/837](#) - [H10D 84/839](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 84/857 . . . . . {comprising an N-type well but not a P-type well}
- 84/858 . . . . . {comprising a P-type well but not an N-type well}
- 84/859 . . . . . {comprising both N-type and P-type wells, e.g. twin-tub}
- 84/86 . . of Schottky-barrier gate FETs
- 84/87 . . of PN-junction gate FETs
- 84/891 . {characterised by the integration of only components covered by [H10D 44/00](#), e.g. integration of charge-coupled devices [CCD] or charge injection devices [CID]}
- 84/895 . . {comprising bucket-brigade charge-coupled devices}
- 84/90 . Masterslice integrated circuits
- 84/901 . . {comprising bipolar technology}
- 84/903 . . {comprising field effect technology}
- 84/905 . . . {A3B5 or A3B6 gate arrays}
- 84/907 . . . {CMOS gate arrays}
- 84/909 . . . . {Microarchitecture}
- 84/911 . . . . . {Basic cell P to N transistor counts}
- 84/912 . . . . . {4-T CMOS basic cells}
- 84/914 . . . . . {5-T CMOS basic cells}
- 84/916 . . . . . {6-T CMOS basic cells}
- 84/918 . . . . . {7-T CMOS basic cells}
- 84/921 . . . . . {8-T CMOS basic cells}
- 84/922 . . . . . {relative P to N transistor sizes}
- 84/924 . . . . . {for current drive capability}
- 84/925 . . . . . {for delay time adaptation}
- 84/927 . . . . . {for capacitive loading}
- 84/929 . . . . . {Isolations}
- 84/931 . . . . . {FET isolation}
- 84/933 . . . . . {LOCOS}
- 84/935 . . . . . {Degree of specialisation for implementing specific functions}
- 84/937 . . . . . {Implementation of digital circuits}
- 84/938 . . . . . {Implementation of memory functions}
- 84/941 . . . . . {Implementation of analog circuits}
- 84/942 . . . . . {Resistors and capacitors}
- 84/944 . . . . . {Hybrid analog or digital}
- 84/946 . . . . . {Embedded IO cells}
- 84/948 . . . . . {Transmission gates}
- 84/949 . . . . . {Porous cells, i.e. pass-through elements}
- 84/951 . . . . . {Technology used, i.e. design rules}
- 84/953 . . . . . {Sub-micron technology}
- 84/955 . . . . . {Twin-tub technology}

- 84/957 . . . . . {SOS or SOI technology}
- 84/959 . . . . . {Connectability characteristics, i.e. diffusion and polysilicon geometries}
- 84/961 . . . . . {Substrate and well contacts}
- 84/962 . . . . . {Horizontal or vertical grid line density}
- 84/964 . . . . . {Yield or reliability}
- 84/966 . . . . . {Gate electrode terminals or contacts}
- 84/968 . . . . . {Macro-architecture}
- 84/971 . . . . . {Number of core or basic cells in the macro (RAM or ROM)}
- 84/972 . . . . . {Distribution functions, e.g. sea of gates}
- 84/974 . . . . . {Layout specifications, i.e. inner core regions}
- 84/975 . . . . . {Wiring regions or routing}
- 84/977 . . . . . {Avoiding clock-skew or clock-delays}
- 84/979 . . . . . {Data lines, e.g. buses}
- 84/981 . . . . . {Power supply lines}
- 84/983 . . . . . {Levels of metallisation}
- 84/985 . . . . . {Two levels of metal}
- 84/987 . . . . . {Three levels of metal}
- 84/988 . . . . . {Four or more levels of metal}
- 84/991 . . . . . {Latch-up prevention}
- 84/992 . . . . . {Noise prevention, e.g. preventing crosstalk}
- 84/994 . . . . . {Radiation hardened circuits}
- 84/996 . . {using combined field effect technology and bipolar technology}
- 84/998 . . {Input and output buffer/driver structures}

**86/00 Integrated devices formed in or on insulating or conducting substrates, e.g. formed in silicon-on-insulator [SOI] substrates or on stainless steel or glass substrates**

**NOTE**

In this group, when the manufacture or treatment of a device is determined to be novel and non-obvious, the device itself is also classified.

- 86/01 . Manufacture or treatment
- 86/011 . . {comprising FinFETs}
- 86/021 . . {of multiple TFTs}
- 86/0212 . . . {comprising manufacture, treatment or coating of substrates}
- 86/0214 . . . {using temporary substrates}
- 86/0221 . . . {comprising manufacture, treatment or patterning of TFT semiconductor bodies}
- 86/0223 . . . . {comprising crystallisation of amorphous, microcrystalline or polycrystalline semiconductor materials}
- 86/0225 . . . . . {using crystallisation-promoting species, e.g. using a Ni catalyst}
- 86/0227 . . . . . {using structural arrangements to control crystal growth, e.g. placement of grain filters}
- 86/0229 . . . . . {characterised by control of the annealing or irradiation parameters}
- 86/0231 . . . {using masks, e.g. half-tone masks}
- 86/0241 . . . {using liquid deposition, e.g. printing}
- 86/0251 . . . {characterised by increasing the uniformity of device parameters}
- 86/03 . . wherein the substrate comprises sapphire, e.g. silicon-on-sapphire [SOS]

86/201	. {the substrates comprising an insulating layer on a semiconductor body, e.g. SOI ( <a href="#">H10D 86/40</a> take precedence)}	89/015	. . {the wafers or substrates being other than semiconductor bodies, e.g. insulating bodies}
86/215	. . {comprising FinFETs}	89/10	. Integrated device layouts
86/40	. characterised by multiple TFTs	89/105	. . {adapted for thermal considerations}
86/411	. . {characterised by materials, geometry or structure of the substrates}	89/211	. {Design considerations for internal polarisation ( <a href="#">integrated injection logic H10D 84/65</a> )}
86/421	. . {having a particular composition, shape or crystalline structure of the active layer}	89/213	. . {in field-effect devices}
86/423	. . . {comprising semiconductor materials not belonging to the Group IV, e.g. InGaZnO}	89/215	. . . {comprising arrangements for charge pumping or biasing substrates}
86/425	. . . {having different crystal properties in different TFTs or within an individual TFT}	89/217	. . . {comprising arrangements for charge injection in static induction transistor logic [SITL] devices}
86/427	. . . {having different thicknesses of the semiconductor bodies in different TFTs}	89/311	. . {in bipolar devices}
86/431	. . {having different compositions, shapes, layouts or thicknesses of gate insulators in different TFTs}	89/60	. Integrated devices comprising arrangements for electrical or thermal protection, e.g. protection circuits against electrostatic discharge [ESD]
86/441	. . {Interconnections, e.g. scanning lines}	89/601	. . {for devices having insulated gate electrodes, e.g. for IGFETs or IGBTs}
86/443	. . . {adapted for preventing breakage, peeling or short circuiting}	89/611	. . . {using diodes as protective elements}
86/451	. . {characterised by the compositions or shapes of the interlayer dielectrics}	89/711	. . . {using bipolar transistors as protective elements}
86/471	. . {having different architectures, e.g. having both top-gate and bottom-gate TFTs}	89/713	. . . . {including a PNP transistor and a NPN transistor, wherein each of said transistors has its base region coupled to the collector region of the other transistor, e.g. silicon controlled rectifier [SCR] devices}
86/481	. . {integrated with passive devices, e.g. auxiliary capacitors}	89/811	. . . . {using FETs as protective elements}
86/60	. . wherein the TFTs are in active matrices	89/813	. . . . {specially adapted to provide an electrical current path other than the field-effect induced current path}
86/80	. characterised by multiple passive components, e.g. resistors, capacitors or inductors	89/814	. . . . . {involving a parasitic bipolar transistor triggered by the electrical biasing of the gate electrode of the FET, e.g. gate coupled transistors}
86/85	. . characterised by only passive components	89/815	. . . . . {involving a parasitic bipolar transistor triggered by the local electrical biasing of the layer acting as base region of said parasitic bipolar transistor}
<b>WARNING</b> Group <a href="#">H10D 86/85</a> is impacted by reclassification into groups <a href="#">H10D 84/201</a> , <a href="#">H10D 84/206</a> , <a href="#">H10D 84/209</a> and <a href="#">H10D 84/212</a> . All groups listed in this Warning should be considered in order to perform a complete search.		89/817	. . . . . {FETs in a Darlington configuration}
<b>87/00</b>	<b>Integrated devices comprising both bulk components and either SOI or SOS components on the same substrate</b>	89/819	. . . . . {Bias arrangements for gate electrodes of FETs, e.g. RC networks or voltage partitioning circuits ( <a href="#">FETs in a Darlington configuration H10D 89/817</a> )}
<b>88/00</b>	<b>Three-dimensional [3D] integrated devices</b>	89/911	. . . . {using passive elements as protective elements}
88/01	. {Manufacture or treatment}	89/921	. . . . {characterised by the configuration of the interconnections connecting the protective arrangements, e.g. ESD buses}
<b>WARNING</b> Group <a href="#">H10D 88/01</a> is incomplete pending reclassification of documents from groups <a href="#">H10D 84/02</a> , <a href="#">H10D 84/032</a> , <a href="#">H10D 84/035</a> , <a href="#">H10D 84/05</a> , <a href="#">H10D 84/07</a> and <a href="#">H10D 84/08</a> . All groups listed in this Warning should be considered in order to perform a complete search.		89/931	. . . . {characterised by the dispositions of the protective arrangements}
		<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b>
88/101	. {comprising components on opposite major surfaces of semiconductor substrates}		
<b>89/00</b>	<b>Aspects of integrated devices not covered by groups <a href="#">H10D 84/00</a> - <a href="#">H10D 88/00</a></b>		
89/011	. {Division of wafers or substrates to produce devices, each consisting of a single electric circuit element}		
89/013	. . {the wafers or substrates being semiconductor bodies}		