

H10D

INORGANIC ELECTRIC SEMICONDUCTOR DEVICES

Definition statement

This place covers:

Electric semiconductor devices having inorganic semiconductor bodies.

This includes the following kinds of devices:

- individual 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;
- integrated devices comprising at least one component covered by this subclass, e.g. CMOS integrated devices.

This place also covers:

- semiconductor bodies, or regions thereof, of devices covered by this subclass;
- electrodes of devices covered by this subclass;
- assemblies of devices comprising at least one device covered by this subclass;
- processes or apparatus specially adapted for the manufacture or treatment of the devices covered by this subclass.

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](#).

References

Limiting references

This place does not cover:

Electronic memory devices	H10B
Semiconductor devices sensitive to infrared radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation	H10F
Light-emitting semiconductor devices having potential barriers	H10H
Thermoelectric, thermomagnetic, piezoelectric, electrostrictive, magnetostrictive, magnetic-effect, superconducting, Ovshinsky-effect, bulk negative resistance effect devices	H10N
Constructional details other than semiconductor bodies or electrodes thereof	H10W 99/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Use of semiconductor devices for measuring	G01
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Conductors or conductive bodies characterised by the conductive materials	H01B 1/00
Printed circuits, hybrid circuits, casings or constructional details of electrical apparatus, manufacture of assemblages of electrical components	H05K
Organic electric solid-state devices	H10K

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

chip	a piece of a wafer or a substrate that has been processed to contain devices therein or thereon. The expression "diced chip" refers to the result of dicing a wafer or a substrate into a plurality of chips, whereas "undiced chip" refers to a chip before dicing or with no dicing.
device	an electric circuit element (e.g. diode, transistor, LED, etc.); (depending on the context) can also refer to an integrated device (e.g. CMOS-IC, DRAM device, etc.). A device may be in the form of a bare or packaged chip.
dopant	the atoms or compounds added to a material during doping
doping	the intentional addition of a small quantity of atoms or compounds into a material to achieve a desired characteristic, e.g. to produce an n-type or p-type material
individual	refers to: an electric circuit element not being an integrated device; or a component of an integrated device. Examples of individual devices include: diodes, transistors, photovoltaic cells, Josephson-junction devices, light-emitting diodes [LED], organic LEDs or a single LED component within an integrated device.
integrated device	a device consisting of a plurality of semiconductor or other solid-state electric circuit elements formed in or on a common substrate
integrated circuit	an integrated device where all the electric circuit elements (e.g. diodes, transistors, LEDs, etc.) are formed in or on a common substrate, including interconnections between the elements
component	an electric circuit element (e.g. diode, transistor, LED, etc.) that is one of a plurality of elements formed in or on a common substrate, e.g. in an integrated device
wafer	it can be one of the following: (a) a slice of semiconductor or electric solid-state active material. For example: a slice of silicon; a slice of a semiconducting compound, e.g. gallium nitride [GaN]; a slice of lithium tantalate [LiTaO ₃] for superconductor applications. (b) A multilayered laminate, having at least one layer of semiconductor or electric solid-state active material, the layer being meant to be processed into devices. For example: silicon-on-insulator [SOI]; silicon-on-glass [SOG]; silicon-on-sapphire [SOS]; a composite wafer comprising silicon carbide [SiC] on polycrystalline silicon [Si] support; a layer of semiconducting nanowires on glass. A wafer is typically processed by (e.g.) deposition, etching, doping or diffusion, and is then typically diced into chips.

body	the region of semiconductor (resp. solid-state) material(s) within which, or at the surface of which, the physical effects that are characteristic of the device occur, and any bordering semiconductor (resp. solid-state) material(s) that are contiguous with this region. Examples: in a field-effect transistor [FET], the physical effects occur in the channel region between the source and the drain. The semiconductor body includes the channel region, the source and drain regions, and any contiguous semiconductor material; in a light-emitting diode [LED], the physical effects occur at a junction of active semiconductor layers. The semiconductor body includes these active semiconductor layers and any contiguous semiconductor layers, such as buffer layers, possibly a growth substrate, etc., that are between the cathode and anode electrodes; in a thermoelectric device, the solid-state body includes all solid-state materials in the path of current between the electrodes.
electrode	a conductive region in or on the semiconductor body or solid-state body of a device (and other than the body itself) which exerts an electrical influence on the body, irrespective of whether or not an external electrical connection is made thereto. The term covers metallic regions which exert electrical influence on the body through an insulating region (e.g. in intentional non-parasitic capacitive coupling), or inductive coupling arrangements. In a capacitive coupling arrangement, the dielectric region is regarded as part of the electrode. The overall conductive wiring may comprise multiple portions. In such a case, only the wiring portions that exert an electrical influence on the body are considered portions of the electrode. Examples: conductive layer(s) in direct physical contact with the body; conductive region(s) exerting an inductive coupling onto the body; a multilayer structure which exerts influence on the body through an insulating region, e.g. in intentional non-parasitic capacitive coupling.
interconnection	a conductive arrangement for conducting electric current from an electrode of a circuit element to another part of the circuit. Examples include metal wirings.
container	a solid construction in which (one or more) devices are placed, or which is formed around the devices, for forming packaged devices. A container requires a partial or total enclosure and it may also comprise a filling.
encapsulation	an enclosure consisting of (one or more) layers, e.g. comprising organic polymers, which at least partially enclose the (one or more) devices, thereby protecting them. An encapsulation is often used to hermetically seal devices.
field-effect	refers to semiconductor technology wherein a voltage applied to a gate electrode creates an electric field that allows for control of current near the interface of the gate and the body, e.g. to create an inversion channel between the source and drain of a MOSFET
package	the collection of all elements, which are external to the chip, that protect the chip or connect it to another object. Package therefore covers encapsulations, containers, package substrates, interposers, heatsinks or the like. Package does not include objects at a higher system level, like circuit boards and beyond, e.g. a housing in which the circuit board is enclosed.

unipolar	refers to semiconductor technology that primarily involves one type only of charge carrier, i.e. it involves either holes or electrons but not both
bipolar	refers to semiconductor technology that involves multi-carrier-type operation, i.e. which simultaneously uses both electrons and holes as charge carriers
MIS	metal-insulator-semiconductor
MOS	metal-oxide-semiconductor
FET	field-effect transistor
MISFET	metal-insulator-semiconductor field-effect transistor
TFT	thin-film transistor
thyristor	device having a control electrode and having regenerative action within four or more alternating P-type and N-type regions
Group IV material	material comprising only Group IV elements, except for dopants or other impurities
Group III-V material	material comprising only Group III and Group V elements, except for dopants or other impurities
Group II-VI material	material comprising only Group II and Group VI elements, except for dopants or other impurities
Group I-VI material	material comprising only comprising Group I or Group VI elements, except for dopants or other impurities
Group I-VII material	material comprising only comprising Group I or Group VII elements, except for dopants or other impurities

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CMIS	complementary MIS
CMOS	complementary MOS
DMOS	double-diffused MOS
LDMOS	lateral DMOS
VDMOS	vertical DMOS
MNOS	metal-nitride-oxide-semiconductor
IMPATT	impact ionization avalanche transit-time
TRAPATT	trapped plasma avalanche triggered transit
BJT	bipolar junction transistor
HEMT	high-electron-mobility transistor
IGFET	insulated-gate FET
IGBT	insulated-gate bipolar transistor
CCD	charge-coupled device
CAD	computer-aided design
LSI	large-scale integration

H10D 1/00

Resistors, capacitors or inductors

Definition statement

This place 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.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Resistors in general	H01C
Inductors in general	H01F
Capacitors in general	H01G
Organic resistors or capacitors having potential barriers	H10K 10/10

H10D 18/00

Thyristors

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

PNPN diodes, e.g. Shockley diodes, break-over diodes or thyristor diodes	H10D 8/80
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H10D 30/00

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

References

Limiting references

This place does not cover:

Insulated-gate bipolar transistors	H10D 12/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Organic transistors	H10K 10/40
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H10D 44/00**Charge transfer devices****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Charge-coupled device [CCD] image sensors	H10F 39/15
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H10D 48/04**of devices having bodies comprising selenium or tellurium in uncombined form****Definition statement**

This place covers:

Manufacture or treatment of individual devices having bodies comprising selenium or tellurium in uncombined form other than as impurities in semiconductor bodies of other materials.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Semiconductor bodies, or regions thereof, of devices having potential barriers and characterised by the materials being selenium or tellurium only	H10D 62/84
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H10D 62/80**characterised by the materials****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Organic materials used in the body or electrodes of organic electric solid-state devices	H10K 85/00
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H10D 62/815

of structures having periodic or quasi-periodic potential variation, e.g. superlattices or multiple quantum wells [MQW]

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Structures with periodic or quasi periodic potential variation for the control of the intensity, phase, polarisation or colour	G02F 1/017
Semiconductor lasers having quantum well or superlattice structures	H01S 5/34
Individual inorganic light-emitting semiconductor devices having quantum effect structures or superlattices	H10H 20/811

H10D 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

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Three-dimensional integrated devices	H10D 88/00
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H10D 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

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Three-dimensional integrated devices	H10D 88/00
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H10D 86/60

wherein the TFTs are in active matrices

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Active matrix addressed cells based on liquid crystals	G02F 1/1362
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Arrangements or circuits for control of indicating devices using static means to present variable information	G09G
Active-matrix LED displays	H10H 29/30
Active-matrix OLED [AMOLED] displays	H10K 59/12

H10D 87/00

Integrated devices comprising both bulk components and either SOI or SOS components on the same substrate

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Three-dimensional integrated devices	H10D 88/00
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H10D 89/10

Integrated device layouts

Definition statement

This place covers:

Integrated device layouts, e.g. top-view representations of integrated circuits using planar geometrical shapes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer-aided design [CAD]	G06F 30/00
Computer-aided circuit design at the physical level	G06F 30/39

H10D 89/60

Integrated devices comprising arrangements for electrical or thermal protection, e.g. protection circuits against electrostatic discharge [ESD]

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structural electrical arrangements for electrical protection	H10W 42/60 , H10W 42/80
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