The Constituents of Semiconductor Components

Responsible electronic component and equipment manufacturers are already preparing for the time when the lifespan of their products comes to an end by scrutinizing the materials incorporated and their future recyclability. Recycling laws have already come into force in Germany (“Kreislauf-Wirtschaftsgesetz”) and guidelines for electronic scrap are in preparation. The aim is a suitable waste disposal program and – as a preventative measure – a reduction in the content of hazardous damaging materials in such components. In order to conform to this procedure, detailed information about the materials and their quantities is needed.

This present overview answers questions put forward by customers as to the constituents and their function in the most important of Vishay Semiconductor’s semiconductor products. Special significance is given to so-called “Hazardous Substances”. It demonstrates that Vishay Semiconductor products under normal operating conditions do not expose the applier or environment to any hazard. However, most products nevertheless contain small but necessary quantities of “Hazardous Substances” which can – if not treated correctly or through accidents – be released on a small scale into the environment.

The present information was produced with the greatest possible care. Any suggestions for improvement of this brochure are welcome.

Definitions

Vishay Semiconductor offers a wide range of semiconductor components including transistors, diodes and opto-electronic components. These have been manufactured in various standard packages.

On the following pages, these packages are listed together with their materials shown in weight percentages. In order to limit the number of tables, all components whose structure and composition are the same have been compiled in families. In many cases, different lead frames together with chips of different sizes may be used for the one package. This usually means that there may be slight differences in the quantities of the declared material. The weight percent is, however, valid for a representative sample of the relevant family. In order to sensibly reduce the number and quantities of materials contained in the respective components, quantities smaller than 0.1% by weight have been stated in the following list as traces. This is the case unless lower limits are forced by law, e.g. cadmium < 75 ppm and PCDD as well as PCDF (known as dioxin) < 2 ppb. In the lists themselves, details of content and composition are separated into the individual parts of the semiconductor component. The most important of these are:

Active element: The active element is either a silicon chip or for optoelectronic components a chip containing combinations of Ga (Al) (As, P). These are doped with very small amounts of boron, arsenic, phosphorus, zinc and germanium etc. The metallisation consists of thin layers of aluminium, gold or titanium. The chips are generally bonded to the lead frame with a silver epoxy and have gold or aluminium wires bonded to the lead frame.

Lead frame: For electrical connection, a metal lead frame made from alloys such as FeNi (42) or CuFe (2) and partly or totally plated with silver is commonly used. The metal alloys contain traces of silver, zinc and phosphorus. Part of the lead frame is also coated with tin/lead.

Case: The semiconductor chip is protected from the environment by a case of glass, plastic or metal. The glass is composed of oxides of silicon and lead together with boron and aluminium. Plastic cases are composed of an epoxy resin filled with up to 70% by weight of quartz particles. Antimony trioxide and brominated epoxy resin (no TBA) are added as flame retardants. Antimony and bromine amount to about 1.6 and 1.0% respectively.

In use: In use, it is the content of hazardous substances which is of importance. In Germany, there are a series of lists which give the materials which are potentially hazardous to people and the environment, for example:

Appendix II and IV of the “Hazardous Materials Regulations”, the TRGS 900 (“MAK-Wert-Liste”) and the “Catalog of Materials Hazardous to the Water Supply”. These lists, however, are only partially consistent. The names used are often different for materials with the same chemical composition. Furthermore, the use of trivial and trade names often adds to the confusion.

Vishay Semiconductor therefore for their descriptions use that proposed by the Zentralverband Elektrotechnik und Elektronikindustrie e.V. (ZVEI; Central Association of Electrical Engineering and Electronic Industry) for the harmonization of the nomenclature of hazardous substances. Statements are made on the safety precautions to be used during storage and disposal by mechanical, chemical and thermal means of the more important chemicals (so-called “Leitchemikalien”). These are listed in the tables in the order of their potential risk. Their effect upon people and the environment are also listed and any special precautions emphasized.
Notes: The following information has been prepared to be as exact and reliable as possible.
The manufacture of semiconductor components is, however, subject to regular change without special notification.
The publication of this brochure excludes any responsibility resulting from its use.

Explanation of Abbreviations
While the information on weight percent is believed correct, discrepancies depending upon component type may be possible.
1) Material information etc. Material listed as “Material Hazardous in Production”
2) S: Trace material < 0.1% by weight; Cd < 75 ppm; concerning Cd see ***)
   PCDD and PCDF < 2 ppb
   *) Dioxin content – lies below agreed limits
   **) No. 85 “Rules for Hazardous Materials”, to be replaced as soon as a technically suitable alternative material is available
   ***) Traces of cadmium can only be found in lead frames made of copper
CMT: Material containing carcinogens, mutagens or terratogens
Tox: Material is toxic or very toxic
S Material with allergy producing characteristics
HAL Halogen containing material
WKG Material hazardous to the water supply
L Storage, suitable for disposal
D Disposable
M Mechanical disposal
N Chemical disposal
T Thermal disposal
H Handling

Ozone Depleting Substances
The use of Ozone Depleting Substances has been totally eliminated by Vishay Semiconductor and by doing so meets the legal requirements as defined in the following documents.
1. The “Montreal Protocol” together with the “London Amendments” Appendix A, B, and the “List of Transitional Substances”
2. “Clean Air Act”, Amendments 1990, “Environmental Protection Agency” (EPA), USA, Class I and II – Ozone Depleting Substances

Vishay Semiconductor guarantees that its components do not contain and are manufactured without the use of Ozone Depleting Substances.
Contents of a Diode in Package SOD 80 – MiniMelf

<table>
<thead>
<tr>
<th>Leads, tinned (58.6%)</th>
<th>0.7%</th>
<th>Al₂O₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.1% iron</td>
<td>0.6%</td>
<td>BaO</td>
</tr>
<tr>
<td>26.9% copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.6% nickel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9% tin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1% lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3% CuO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Silicon chip (< 0.3%)

| 80.1% silicon         |      |        |
| 16.5% silver          |      |        |
| 1.2% SiO₂             |      |        |
| 1.1% PbO              |      |        |

Package glass (41.1%)

| 62.9% PbO             | 0.3% | B₂O₃   |
| 27.3% SiO₂            | 0.2% | nickel |
| 7.7% K₂O             |      |        |
| 0.7% Na₂O            |      |        |

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C M</th>
<th>H A</th>
<th>W L</th>
<th>K T</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent L D M N T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td>●</td>
<td>●</td>
<td>Package glass, lead</td>
<td>26.5</td>
<td>● ● ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nickel and compounds</td>
<td>●</td>
<td>●</td>
<td>Lead</td>
<td>5.0</td>
<td>●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contents of a Diode in Package SOD 80 – QuadroMelf

<table>
<thead>
<tr>
<th>Leads, tinned (53.5%)</th>
<th>0.7%</th>
<th>Al₂O₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.1% iron</td>
<td>0.6%</td>
<td>BaO</td>
</tr>
<tr>
<td>26.9% copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.6% nickel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9% tin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1% lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3% CuO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Silicon chip (< 0.3%)

| 80.1% silicon         |      |        |
| 16.5% silver          |      |        |
| 1.2% SiO₂             |      |        |
| 1.1% PbO              |      |        |

Package glass (46.2%)

| 62.9% PbO             | 0.3% | B₂O₃   |
| 27.3% SiO₂            | 0.2% | nickel |
| 7.7% K₂O             |      |        |
| 0.7% Na₂O            |      |        |

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C M</th>
<th>H A</th>
<th>W L</th>
<th>K T</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent L D M N T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td>●</td>
<td>●</td>
<td>Package glass, lead</td>
<td>29.6</td>
<td>● ● ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nickel and compounds</td>
<td>●</td>
<td>●</td>
<td>Lead</td>
<td>4.6</td>
<td>●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T
Contents of a Diode in Package MicroMelf

**Leads, tinned (57.7%)**
- 61.8% iron
- 27.7% copper
- 8.7% nickel
- 1.0% tin
- 0.6% lead
- 0.2% CuO

**Silicon chip (< 0.7%)**
- 80.1% silicon
- 16.5% silver
- 1.2% SiO₂
- 1.1% PbO

**Package glass (41.6%)**
- 62.9% PbO
- 27.3% SiO₂
- 7.7% K₂O
- 0.7% Na₂O

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td>Package glass, lead</td>
<td>26.5</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2</td>
<td>Nickel and compounds</td>
<td>Lead</td>
<td>5.0</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Contents of a DH Diode in Package DO35

**Leads, tinned (85.7%)**
- 62.7% iron
- 27.8% copper
- 8.8% nickel
- 0.4% tin
- 0.2% lead
- 0.1% CuO
- Traces of Ag

**Silicon chip (< 0.1%)**
- 80.1% silicon
- 16.5% silver
- 1.2% SiO₂
- 1.1% PbO
- 0.3% B₂O₃

**Package glass (14.3%)**
- 62.9% PbO
- 27.4% SiO₂
- 7.7% K₂O
- 0.7% Na₂O

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Lead and compounds</td>
<td>Package glass, lead</td>
<td>9.2</td>
<td>● ● ●</td>
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<tr>
<td>2</td>
<td>Nickel and compounds</td>
<td>Lead</td>
<td>7.5</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Note: 1), **), ***)}, 1), **), CMT, T
Contents of a DH Diode in Package DO41

**Leads, tinned (85.7%)**

- 62.7% iron
- 27.8% copper
- 8.8% nickel
- 0.4% tin
- 0.2% lead
- 0.1% CuO
- Traces of Ag

**Package glass (14.3%)**

- 62.9% PbO
- 27.4% SiO₂
- 7.7% K₂O
- 0.7% Na₂O

**Silicon chip (< 0.1%)**

- 80.1% silicon
- 16.5% silver
- 1.2% SiO₂
- 1.1% PbO
- 0.3% B₂O₃
- 0.2% nickel
- Traces of Al₂O₃, K₂O, Pd, Si₃N₄, Ti, V
- Traces of As, Au, B, P

**Total weight 310 mg**

**Significant Materials for Disposal**

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group ¹)</th>
<th>Available in the Compound Used for</th>
<th>Part in ²)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td>Package glass, lead</td>
<td>9.2</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2</td>
<td>Nickel and compounds</td>
<td>Lead</td>
<td>7.5</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Contents of a Diode in Sintered Glass Package DOT30B

**Leads, tinned (85.9%)**

- 58.2% copper
- 22.1% iron
- 18.5% molybdenum
- 0.5% tin
- 0.2% lead
- 0.1% silver
- 0.1% carbon
- 0.1% oxygen
- Traces of Mn, P, S

**Package glass (13.8%)**

- 42.0% PbO
- 38.0% SiO₂
- 15.0% B₂O₃
- 5.0% Al₂O₃

**Silicon chip (0.3%)**

- 90.0% silicon
- 10.0% aluminium
- Traces of Mo
- Traces of P, Ga, Pt (dopant)

**Total weight 210 mg**

**Significant Materials for Disposal**

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group ¹)</th>
<th>Available in the Compound Used for</th>
<th>Part in ²)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>Mold</td>
<td>0.8</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2</td>
<td>Halide compounds</td>
<td>Mold</td>
<td>0.5</td>
<td>● ● ●</td>
</tr>
<tr>
<td>3</td>
<td>Lead and compounds</td>
<td>Lead frame, solder dip</td>
<td>1.8</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , ¹) , ²) , CMT , T
# Contents of a Diode in Sintered Glass Package SOD57

**Leads, tinned** (85.9%)
- 58.2% copper
- 22.1% iron
- 18.5% molybdenum
- 0.5% tin
- 0.2% lead
- 0.1% silver
- 0.1% carbon
- 0.1% oxygen
- Traces of Mn, P, S

**Package glass** (13.8%)
- 42.0% PbO
- 38.0% SiO₂
- 15.0% B₂O₃
- 5.0% Al₂O₃

**Silicon chip** (0.3%)
- 90.0% silicon
- 10.0% aluminium
- Traces of Mo
- Traces of P, Ga, Pt (dopant)

Total weight 370 mg

## Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group</th>
<th>C</th>
<th>M</th>
<th>T</th>
<th>H</th>
<th>W</th>
<th>A</th>
<th>G</th>
<th>K</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Package glass, lead</td>
<td>6.0</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2</td>
<td>Molybdenum and compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lead</td>
<td>15.9</td>
<td>●</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T

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# Contents of a Diode in Sintered Glass Package SOD64

**Leads, tinned** (85.9%)
- 58.2% copper
- 22.1% iron
- 18.5% molybdenum
- 0.5% tin
- 0.2% lead
- 0.1% silver
- 0.1% carbon
- 0.1% oxygen
- Traces of Mn, P, S

**Package glass** (13.8%)
- 42.0% PbO
- 38.0% SiO₂
- 15.0% B₂O₃
- 5.0% Al₂O₃

**Silicon chip** (0.3%)
- 90.0% silicon
- 10.0% aluminium
- Traces of Mo
- Traces of P, Ga, Pt (dopant)

Total weight 860 mg

## Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group</th>
<th>C</th>
<th>M</th>
<th>T</th>
<th>H</th>
<th>W</th>
<th>A</th>
<th>G</th>
<th>K</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead and compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Package glass, lead</td>
<td>6.0</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2</td>
<td>Molybdenum and compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lead</td>
<td>15.9</td>
<td>●</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T
Contents of a Diode in DO214AC / SMA Package

**Mold** (50.4%)
- 71.4% SiO₂
- 26.0% epoxy resin
- 1.6% Sb (as antimony trioxide) **)
- 1.0% Br (no TBA) *)
- Traces of N, Fe, C, Cl

**Lead frame, tinned** (46.2%)
- 84.8% copper
- 9.3% iron
- 4.7% tin
- 1.2% lead

**Solder dip** (1.3%)
- 88.0% lead
- 10.0% tin
- 2.0% silver

**Silicon chip** (2.1%)
- 87.0% silicon
- 4.0% aluminium
- 3.6% PbO
- 3.5% SiO₂
- 1.4% B₂O₃
- 0.5% Al₂O₃
- Traces of Mo, Ni
- Traces of P, Ga, Pt (dopant)

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**Significant Materials for Disposal**

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C M T</th>
<th>H A G W</th>
<th>Available in the Compound Used for</th>
<th>Part in 2) L D M N T H</th>
<th>Weight Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>● ●</td>
<td>● ● ●</td>
<td>Mold</td>
<td>● ● ●</td>
<td>0.8</td>
</tr>
<tr>
<td>2</td>
<td>Halide compounds</td>
<td>● ●</td>
<td>● ● ●</td>
<td>Mold</td>
<td>● ● ●</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>Lead and compounds</td>
<td>● ●</td>
<td>● ● ●</td>
<td>Lead frame,solder dip</td>
<td>● ● ●</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T
## Contents of a Power Diode in Package DO220

**Total weight 1.9 g**

**Mold (32.7%)**
- 71.4% SiO₂
- 26.0% epoxy resin
- 1.6% Sb (as antimony trioxide) **)
- 1.0% Br (no TBA) ¹)
- Traces of N, Fe, C, Cl

**Silicon chip (0.2%)**
- 94.3% silicon
- 1.8% aluminium
- 1.3% PbO
- 1.2% SiO₂
- 0.5% nickel
- 0.3% Al₂O₃
- 0.2% gold
- 0.2% B₂O₃
- 0.2% chromium
- Traces of Si₃N₄, Na₂O
- Traces of As, B, P

**Lead frame, tinned (66.9%)**
- 98.8% copper
- 0.4% nickel
- 0.6% tin
- 0.2% lead
- traces of P, Ag

**Bond wire (0.1%)**
- 99.99% aluminium
- Traces of Ni, Mg

**Solder dip (0.1%)**
- 92.5% lead
- 5.0% tin
- 2.5% silver

## Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group ¹)</th>
<th>C M</th>
<th>H A</th>
<th>W G</th>
<th>Available in the Compound</th>
<th>Part in ²) Weight Percent</th>
<th>L D</th>
<th>M N</th>
<th>T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>0.5</td>
<td>● ● ●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Halide compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>0.3</td>
<td>● ● ●</td>
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<td>Lead and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Solder dip, lead frame</td>
<td>0.3</td>
<td>● ● ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Nickel and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Lead frame</td>
<td>0.3</td>
<td>● ●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , ¹) , ²), CMT, T
Contents of an RF Transistor in TO50 Package

TO50 (3) Total weight approx. 112 mg

- Mold (62.7%)
- 71.4% SiO₂
- 26.0% epoxy resin
- 1.6% Sb (as antimony trioxide) **)
- 1.0% Br (no TBA)
- Traces of N, Fe, C, Cl

Lead frame, tinned (37.3%)
- 89.7% copper
- 5.4% silver
- 2.4% iron
- 2.1% tin
- 0.1% phosphorus

TO50 (4) Total weight approx. 124 mg

- Mold (62.7%)
- 71.4% SiO₂
- 26.0% epoxy resin
- 1.6% Sb (as antimony trioxide) **)
- 1.0% Br (no TBA)
- Traces of N, Fe, C, Cl

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C</th>
<th>M</th>
<th>H</th>
<th>A</th>
<th>W</th>
<th>G</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent L D M N T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>1.0</td>
<td>● ● ●</td>
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<tr>
<td>2</td>
<td>Halide compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>0.6</td>
<td>● ● ●</td>
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<tr>
<td>3</td>
<td>Lead and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Lead frame</td>
<td>0.1</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Contents of a SMD Transistor in SOT323/ SOT343/ SOT363 Package

SOT323

SOT343

SOT363

Total weight approx. 6 mg

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C</th>
<th>M</th>
<th>H</th>
<th>A</th>
<th>W</th>
<th>G</th>
<th>Available in the Compound Used for</th>
<th>Part in 2)</th>
<th>Weight Percent L D M N T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>0.9</td>
<td>● ● ●</td>
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<td>2</td>
<td>Halide compounds</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Mold</td>
<td>0.6</td>
<td>● ● ●</td>
</tr>
<tr>
<td>3</td>
<td>Nickel and compounds</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Lead</td>
<td>0.3</td>
<td>● ● ●</td>
</tr>
<tr>
<td>4</td>
<td>Lead and compounds</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Lead frame</td>
<td>0.1</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T
Contents of a SMD Transistor/-Diode in SOT143/ SOT23 Package

Mold (57.1%)
71.4% SiO$_2$
26.0% epoxy resin
1.6% Sb (as antimony trioxide) **)
1.0% Br (no TBA) *)
Traces of N, Fe, C, Cl

Lead frame, tinned (38.7%)
85.1% copper
9.7% silver
2.9% tin
0.9% nickel

Silicon chip (3.9%)
97.9% silicon
1.5% gold
0.3% SiO$_2$
0.3% aluminium
Traces of Sb, Si$_3$N$_4$
Traces of As, B, P (dopant)

Bond wire (< 0.3%)
99.99% gold

Total weight approx. 8 mg

Significant Materials for Disposal

<table>
<thead>
<tr>
<th>No.</th>
<th>Material and/or Group 1)</th>
<th>C M T</th>
<th>H A G S L K</th>
<th>Available in the Compound Used for</th>
<th>Part in Weight Percent L D M N T H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antimony and compounds</td>
<td>● ●</td>
<td>Mold</td>
<td>0.9</td>
<td>● ● ●</td>
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<tr>
<td>2</td>
<td>Halide compounds</td>
<td></td>
<td>● ● ● ●</td>
<td>0.6</td>
<td>● ● ●</td>
</tr>
<tr>
<td>3</td>
<td>Nickel and compounds</td>
<td>● ●</td>
<td>Lead</td>
<td>0.3</td>
<td>● ●</td>
</tr>
<tr>
<td>4</td>
<td>Lead and compounds</td>
<td>● ●</td>
<td>Lead frame</td>
<td>0.1</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Note: *) , **) , ***) , 1) , 2) , CMT , T