Product Chemical Content Brochure

REVISION HISTORY

Revision	Change Originator	Description of Revision and Reason	Change Analyst	Effective Date
O	Ajay Shah	Initial release of Product Chemical Content Brochure via Agile, Document Repository.	E. Rivas	13 Apr 2009
A	Kazuhiko Katase	Delete the part of SGS submission due date. Per ECO-NBOI-011743	A. Saw	23 Sep 2009
B	Kazuhiko Katase	Add BRD8022/D for Web reference. Update the date. Per ECO-NBOI-016011	A.Saw	12 Apr 2010
C	Kazuhiko Katase	Add Ceramic package. Per ECO-NBOI-017309	A.Saw	19 May 2010
D	Kazuhiko Katase	Add REACH requirement. Per ECO-NBOI-017638	A.Saw	03 Jun 2010
E	Kazuhiko Katase	Add REACH New element, and Update supplier letter to include substrate and other polyimide compound testing for HF and Antimony compounds analyses Add SGS test requirement matrix. Per ECO-NBOI-019379	A.Saw	28 Jul 2010
F	Kazuhiko Katase	Add SGS report retention requirement. Per ECO-NBOI-019824	A.Saw	20 Aug 2010
G	Kazuhiko Katase	Add REACH 9 New elements. Per ECO-NBOI-024015	A.Saw	14 Mar 2011

Aug 2010 Product Chemical Content Brochure

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Dear Customer and Supplier:

ON Semiconductor now provides the detailed material composition, based on the homogenous or piece parts contained in its products. This information is available on the following web site by searching for its orderable part numbers:

http://www.onsemi.com/PowerSolutions/MaterialComposition.do

This brochure provides an explanation of the above information and additional details of the materials contained in its products. It also contains a list of chemicals that are prohibited in our products and in manufacturing. This list is designed to meet ON Semiconductor's compliance with all applicable environmental, health and safety regulations of the countries where it operates and does business. It is also in concert with the needs of our customers for environmentally friendly products and in reduction in use of hazardous materials in the manufacture of these products. To help us meet these objectives, we are requiring our suppliers to restrict the use and content of the listed chemicals in the raw materials and products supplied to ON Semiconductor.

ON Semiconductor has converted the majority of its products for the customers who must meet the requirements of the **European Union Directive on the Restrictions on use of certain Hazardous Substances (RoHS), meets all applicable REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances) requirements and is committed to provide information about substances in its products as required** We are also well prepared to meet the requirements of China's Management Measures on Electronic information Product Pollution Control (China-RoHS) regulation. More information on compliance with "China-RoHS" is available at:

http://www.onsemi.com/PowerSolutions/MaterialCompositionChina.do

ON Semiconductor has embarked on a "Green Products" initiative whereby most of its packages would be made available free of antimony and brominated flame retardants.
Please visit *http://www.onsemi.com/PowerSolutions/content.do?id=1336* for further details.

ON Semiconductor has implemented products Take-back and Recycle Program to provide its customers with an environmentally responsible solution for the return, recycling and disposal of its products. This brochure provides further information on this program.

Through the release of this information, we hope to provide relevant data to help our customers in their evaluation of the potential environmental impact, in the proper end-of –life assessment and management of the products. It is our hope that this information will provide answers to the most frequently asked questions about the use or presence of the banned, restricted or hazardous materials in our products.

We have made all efforts to reasonably estimate amounts of all significant chemicals present in our products. The products may contain trace levels of unintentional impurities.

If you have any questions regarding this document or any of our products, please call your ON Semiconductor Account Manager.

Note: Even though all possible efforts have been made to provide you the most accurate information, we can not guarantee to its completeness and accuracy due to the fact that the data has been compiled based on the ranges provided and some information not provided by the subcontractors and raw material suppliers to protect their business proprietary information.

Based on the above considerations, this information is provided only as estimates of the average weight of these parts and the anticipated significant toxic metals components. Trace levels of dopant and metal materials contained within silicon wafers in the finished product are not included.

Product Material Composition

The material composition table helps readers to find readily the concentrations of the materials, intentionally-added, and present in significant quantities. The matrix does not list the materials or their quantity, present as impurities, normally found in trace levels in the raw materials used in manufacture of the product.

Explanation Of The Table

1. Total Component Weight

This is the actual average weight of the package. Most of these components are miniature in size and hence a small number of finished pieces are obtained at the end of the assembly line and are weighed to obtain an average weight. The average weight will not vary significantly for products associated with a particular package, assembled at various factories.

Weight and composition of some of the newer packages are obtained using engineering calculations. These calculations are based on the geometry of the leadframe, final package and material composition data provided by the suppliers of raw materials such as leadframe, mold compound, ink, die attach epoxy and plating materials used in these packages.

2. Mold Compound and its Weight

The weight of the mold compound provided is the actual weight of the mold compound used in the assembly process.

Composition of Mold Compounds *

Mold compounds used by ON Semiconductor mainly contain a mixture of Ortho Cresol Novolac resin, Phenolic resin, brominated epoxy resin, fused silica and carbon black. Most of these conventional mold compounds use antimony trioxide and bromine based flame retardant system. Bromine is not present in a free state in the finished product as it gets incorporated into epoxy polymer upon curing in the assembly process. To the best of our knowledge, none of the mold compounds that we use contain RoHS banned Polybrominated Biphenyls (PBB) and their ethers/oxides (PBDE) compounds.

Under the “Green Products” initiative, ON Semiconductor plans to eliminate antimony and halogen based flame retardants from most of its packages by the end of year 2009. For further details, please visit: http://www.onsemi.com/PowerSolutions/content.do?id=1336

In fact, most of QFN, DFN packages already use “Green” mold compounds that are free of antimony and brominated epoxy materials.

Flammability Of the Mold Compounds
All epoxy resins used by ON Semiconductor meet the flammability rating UL94 –VO at 1/8 inch class.

3. Metallic Composition

LeadFrames
ON Semiconductor uses leadframes usually composed of Alloy 42 or Copper alloys. The copper alloy mainly consists of copper and a small amount of other alloying elements like zinc, iron and phosphorus. Alloy 42 is composed of Iron and 42% nickel. ON Semiconductor also manufactures packages that use ceramic lids and substrates. Most of these ceramic materials contain aluminum and silicon oxide as major constituents.

Plating
Usually, leadframes are plated with copper, nickel, and silver metals. Most of the devices have now matte tin finish. ON Semiconductor also provides and has capability for supplying other Pb-free plating options.

Metals in Die Attach Epoxy
Gold and aluminum are mainly used in the wire bond process. The wafer substrate or the silicon chip is usually bonded to the leadframe using conductive silver or solder (tin/lead) based epoxy polymers.

High Temperature Die Attach Pb-based Solder Wire/Paste:
Some of our power products contain the above die attach materials that contain 88% -95% lead (Pb). The use of such solder is exempt under European Union Directive of Restrictions on use of certain Hazardous Substances (RoHS).

4. Silicon Chip

It consists of an active part of each device and is made of single crystal silicon. It contains deminimus amounts, usually in parts per billion (ppb) levels, of doped elements such as arsenic, phosphorus and boron.

Environmentally Restricted Substances

ON Semiconductor restricts the intentional use and presence of certain substances, known to be toxic and harmful to the environment, in its manufacturing processes and products. We are providing below a list of these materials, as we are very certain that many of our customers share these concerns:

CAS No.	Chemical Name
110-80-5	2-ethoxy ethanol (Ethylene Glycol Monoethyl Ether Acetate)
111-15-9	2-ethoxyethyl acetate (Ethylene Glycol Monoethyl Ether)
109-86-4	2-methoxy ethanol (Ethylene Glycol Monomethyl Ether)
110-49-6	2-methoxyethyl acetate (Ethylene Glycol Methyl Ether Acetate)
50-00-0	Formaldehyde
71-43-2	Benzene
7440-43-9	Cadmium
12172-73-5	Amosite (Asbestos)
12001-29-5	Chrysotile (Asbestos)
12001-28-4	Crocidolite (Asbestos)
17068-78-9	Anthophyllite
14567-73-8	Tremolite
13768-60-8	Actinolite
75-69-4	Thrichlorofluoromethane (CFC-11)
75-71-8	Dichlorodifluoromethane (CFC-12)
354-58-5	1,1,1-Trichlorotrifluoroethane (CFC-113)
76-13-1	1,1,2-Trichlorotrifluoroethane (CFC-113)
76-14-2	Dichlorotetrafluoroethane (CFC-114)
76-15-3	Monochloropentafluoroethane (CFC-115)
70075-72-9	Chlorotrifluoromethane (CFC-13)
354-56-3	Pentachlorofluoroethane (CFC-111)
76-12-0	Tetrachlorodifluoroethane (CFC-112)
422-78-6	Heptachlorofluoropropane (CFC-211)
3182-26-1	Hexachlorodifluoropropane (CFC-212)
2354-06-5	Pentachlorotrifluoropropane (CFC-213)
29255-31-0	Tetrachlorotetrafluoropropane (CFC-214)
1599-41-3	Trichloropentafluoropropane (CFC-215)
661-97-2	Dichlorohexafluoropropane (CFC-216)
422-86-6	Chloroheptafluoropropane (CFC-217)
353-59-3	Bromochlorodifluoromethane (Halon 1211)
75-63-8	Bromotrifluoromethane (Halon 1301)
124-73-2	Dibromotetrafluoroethane (Halon 2402)
56-23-5	Carbon tetrachloride (CC-14)
71-55-6	1,1,1-Trichloroethane (TCA)
79-01-6	Trichloroethylene (TCE)
127-18-4	Tetrachloroethylene (Perchloroethylene)
60-29-7	Ethyl ether (allowed for lab use only)
302-01-2	Hydrazine
26628-22-8	Sodium azide
88-89-1	Picric Acid
7601-90-3	Perchloric Acid
	Polychlorinated naphthalenes
	Polybrominated diphenylethers and oxides (PBDE)
	Polychlorinated biphenyls (PCB)

CAS No.	Chemical Name
67774-32-7	Polybrominated biphenyls (PBB)
74-83-9	Methyl Bromide
74-97-5	Chlorobromomethane
	Chlorinated paraffins
56-35-9	TBTO
21850-44-2	TBBP-A-Bis
2385-85-5	Mirex
	Cadmium compounds
7439-97-6	Mercury (except for use of articles)
	Mercury compounds
32534-81-9	Pentabromodiphenyl ether
32536-52-0	Octobromodiphenyl ether
1163-19-5	Decabromodiphenyl ether
9002-86-2	Polyvinyl Chloride and Polyvinyl Chloride blends
7646-79-9	Cobalt Chloride

The ON Semiconductor EHS Department may add to this list if the use of a proposed chemical is expected to pose an unreasonable risk.

Please note that none of the ON Semiconductor products contain Hexavalent Chromium. However, silicon crystal manufacturing operation involves use of chromic acid in a test process. But the final products do not contain Hexavalent Chromium.

ON Semiconductor bans the use of lead (Pb) except in the products that are required by the customers. Many applications, e.g. defense etc. allow the use of lead (Pb).
ON Semiconductor restricts the use of the following Substance of Very High Concern (SVHC) at the specified threshold concentration as required under EU REACH regulations:

Effective January 13, 2010:		
Substance name	*EC number*	*CAS number*
2,4-Dinitrotoluene	204-450-0	121-14-2
Aluminosilicate Refractory Ceramic Fibres:	650-017-00-8	
certain Al_2O_3 and SiO_2 concentrations & fiber lengths	classification index	
Anthracene oil	292-602-7	90640-80-5
Effective January 13, 2010:		

Effective October 28, 2008:		
Substance name	*EC number*	*CAS number*
4,4'-Diaminodiphenylmethane (MDA)	202-974-4	101-77-9
5-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene)	201-329-4	81-15-2
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	287-476-5	85535-84-8
Anthracene	204-371-1	120-12-7
Effective October 28, 2008:		

Substance name	*EC number*	*CAS number*
Anthracene oil, anthracene paste, anthracene fraction	295-275-9	91995-15-2
Anthracene oil, anthracene paste, distillation lights	295-278-5	91995-17-4
Anthracene Oil, Anthracene-low	292-604-8	90640-82-7
Anthracene oil, anthracene paste	296-603-2	90640-81-6
Diisobutyl phthalate	201-553-2	84-69-5
Lead chromate	231-846-0	7758-97-6
Lead chromate molybdate sulphate red (Red 104)	235-759-9	12656-85-8
Lead sulfochromate yellow (Yellow 34)	215-693-7	1344-37-2
Pitch, coal tar, high temp	266-028-2	65996-93-2

Substance name	*EC number*	*CAS number*
Bis(tributyltin)oxide (TBTO)	200-268-0	
Cobalt dichloride	231-589-4	7646-79-9
Diarsenic pentaoxide	215-116-9	1303-28-2
Diarsenic trioxide	215-481-4	1327-53-3
Dibutyl phthalate (DBP)	201-557-4	84-74-2
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified:	247-148-4	25637-99-4
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified:	221-695-9	3194-55-6
Alpha-hexabromocyclododecane		134237-50-6
Beta-hexabromocyclododecane		134237-51-7
Gamma-hexabromocyclododecane		134237-52-8
Lead hydrogen arsenate	232-	7784-

Tris(2-chloroethyl)phosphate	204-118-5	115-96-8
Zirconia Aluminosilicate Refractory Ceramic Fibres:	650-017-00-8	

Effective March 30, 2010:

Substance name	*EC number*	*CAS number*
Acrylamide	201-173-7	79-06-1

Effective Jun 18, 2010:

Substance name	*EC number*	*CAS number*
Ammonium dichromate	232-143-1	7789-09-5
Boric acid	233-139-2/ 234-343-4	10043-35-3/ 11113-50-1
Disodium tetraborate, anhydrous	215-540-4	1303-96-4/ 1330-43-4/ 12179-04-3
Potassium chromate	232-140-5	7789-00-6
Potassium dichromate	231-906-6	7778-50-9
Sodium chromate	231-889-5	11/3/7775
Trichloroethylene	201-167-4	79-01-6

	064-2	40-9
		7789-12-0
Sodium dichromate	234-190-3	10588-01-9
Bis (2-ethylhexyl)phthalate DEHP	204-211-0	
Triethyl arsenate	427-700-2	
Benzyl butyl phthalate	201-622-7	

Effective Dec 15, 2010:

Substance name	*EC number*	*CAS number*
2 Ethoxyethanol	203-804-1	110-80-5
2-Methoxyethanol	203-713-7	109-86-4
Chromic acid	231-801-5	7738-94-5
Oligomers of chromic acid and dichromic acid, Dichromic acid	236-881-5	13530-68-2
Chromium trioxide	215-607-8	1333-82-0
Cobalt (II) carbonate	208-169-4	513-79-1
Cobalt (II) diacetate	200-755-8	71-48-7
Cobalt (II) dinitrate	233-402-1	10141-05-6
Cobalt (II) sulphate	233-334-2	10124-43-3

ON Semiconductor being a global manufacturer and supplier of semiconductors, complies with all relevant environmental, safety and health regulations and directives applicable to the country of manufacture and sale.

Most of the ON Semiconductor products are now qualified and available as EU-RoHS compliant. These products normally employ matte tin or NiPdAu materials for external leadfinishing. RoHS compliant products are designated with a “G” suffix at the end of their standard part numbers. These products are in full compliance with EU-RoHS, Waste from Electrical and Electronic Equipment (WEEE) , REACH and End of Vehicle Life (ELV) directives. To the best of our knowledge and belief, ON Semiconductor products do not contain cadmium, mercury, hexavalent chromium, polybrominated biphenyl ethers or their oxides, as intentionally added materials.

If you require additional information, please contact your ON Semiconductor Account Manager.

Take-Back and Recycle Policy

ON Semiconductor Take-back and Recycle Program provides ON Semiconductor customers with an environmentally responsible solution for the return, recycling and disposal of its products, including its evaluation printed circuit boards. This program is designed to ensure compliance with the current and forthcoming regional regulations involving producer responsibility for recycling and proper disposal of electronic waste products.

To return ON Semiconductor products and evaluation printed circuit boards for recycling and disposal, please include the following information and ship the items to return to the shipping address noted.

Please visit ON Semiconductor web site for further details:
http://www.onsemi.com/PowerSolutions/content.do?id=15055

NOTE: *Please be aware this is not a tool to return our products for trade-ins or warranty or other product/ performance related issues.*

1. Information needed when sending back parts:

- Part #s
- Quantities
- Customer address / contact info

2. The parts may be returned to:

ON Semiconductor
Reclamation Center
731 W Fairmont Drive
Tempe, Arizona 85282

Contact: AL Falk
Phone: (480) 967-2879

Email: Al.falk@onsemi.com

To our Value Suppliers:

Restricted Substance Requirements for Suppliers, including Assembly and Test Subcontractors, Foundries, Direct Materials and Shipping Material suppliers

Suppliers to ON Semiconductor must ensure that all materials used in part manufacture and in facility operations satisfy all applicable environmental, health and safety government regulations and directives, including European Union Directive on the Restrictions on use of certain Hazardous Substances (RoHS), on restricted, toxic and hazardous materials. Suppliers must be prepared to provide supporting evidence of conformance.

Product supplied to ON Semiconductor, including recycled materials, must not be processed with or intentionally contain any of the restricted materials listed in this brochure.

Requirement for a Third Party (SGS Lab) Test Report for ROHS and "Halogen-free" Compliance

Recently ON Semiconductor received many requests from our customers to comply with RoHS (Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment) requirements. The RoHS Directive 2002/95/EC restricts the use of certain hazardous substances. We believe that this requirement is not new to your company. Therefore, we request the following cooperation from your company to help ON Semiconductor comply with these requests:

ROHS substance testing and a report requirement: (For Leadframe, Die attach, plating anodes/solution, wire bond, solder clips, solder paste, solder balls, substrates, heat sink/heat spreader, mold compound, soldermask and polymide material suppliers)

1. Suppliers must use a SGS laboratory (http://www.ee.sgs.com/) that is well versed with ROHS compliance and testing protocols to have the samples of materials analyzed annually.
2. Materials must be analyzed for Cadmium (Cd), Lead (Pb), Hexavalent Chromium, Mercury (Hg), and brominated flame retardants; PBBE and PBDE.
3. The test method IEC 62321 must be used for all six ROHS substances
4. Test results must meet ROHS maximum concentration values (MCVs) specified in Directive 2002/95/EC.
5. The report must contain a picture of the specimen tested
6. The test will be repeated annually and a new report will be submitted to ON Semiconductor

The suppliers claiming "halogen-free" materials must provide an analytical test report that will meet the following standards and conditions (For die attach, solder pastes, mold compounds, substrates, soldermask and polyimide materials):

1. Suppliers must use a SGS laboratory (http://www.ee.sgs.com/) that is well versed with "halogen-free" compliance and testing protocols.
2. Materials must be analyzed for total chlorine, total bromine and antimony compounds
3. Ion Chromatograph using a common test method like EN 14582 must be used. The chosen method must capture all chlorine and bromine, regardless of whether it is organic or inorganic etc.
4. Test results must show total chlorine and total bromine below 900 ppm levels each and not exceeding 1500 ppm total.
5. Test results must show total antimony trioxide concentration below 1000 ppm level
6. The report must contain a picture of the specimen tested.
7. The test will be repeated annually and a recent test report will be submitted to ON Semiconductor

Foundries supplying the finished wafers to ON Semiconductor:
These suppliers must provide an annual SGS test report of two representative, by technology type, products that meet the above "ROHS substance testing and a report requirement". The suppliers may choose not to test for banned flame retardants, PBBE and PBDE, but must test for all four ROHS heavy metals elements.

Subcontractors assembling the finished products for ON Semiconductor:

These suppliers must provide an annual SGS test report for all raw materials (Leadframe, Die attach, plating anodes/solution, wire bond, solder clips, solder paste, solder balls, substrates, heat sink/heat spreader, mold compound etc) as defined above in section “ROHS substance testing and a report requirement” including a test report for “halogen-free” materials as described herein.

At the receipt of this letter, please reply back to ON Semiconductor with a name and the contact information of the person who will be responsible to provide these documents and for any follow up.

If you require additional information, please contact your local Supply Management representative.

	RoHs Directive 2002/95/EC						Helogen Free		
	Cadmium	Lead	Mercury	Hexavalent Chromium			Halogen Chlorine	Halogen Bromine	Antimony Trioxide
	Cd	Pb	Hg	CrVI	PBBE	PBDE	Cl	Br	Sb_2O_3
Leadframe	O	O	O	O	O	O			
Die attach	O	O	O	O	O	O	O	O	O
Plating anodes/solution	O	O	O	O	O	O			
wire bond	O	O	O	O	O	O			
solder clips	O	O	O	O	O	O			
solder past	O	O	O	O	O	O	O	O	O
solder balls	O	O	O	O	O	O			
substrates	O	O	O	O	O	O	O	O	O
heat sink/heat spreader	O	O	O	O	O	O			
Mold compound	O	O	O	O	O	O	O	O	O
soldermask	O	O	O	O	O	O	O	O	O
polyimide	O	O	O	O	O	O	O	O	O

The supplier must retain the all the SGS reports for 10 years after product end of life.