



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
H	Ajay Shah	Updated Environmentally Restricted Substances table under page 5. Requested by Ajay Shah per ECO-NBOI-030199.	J. Tandoc	16 Dec 2011
J	Kazuhiko Katase	Add REACH requirement and update the list per ECO-NBOI-032098.	M. Altergott	28 Mar 2012

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K	Kazuhiko Katase	Updated Environmentally Restricted Substances table per ECO-NBOI-039585.	M. Altergott	13 Feb 2013

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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 are mainly “green” which means do not contain antimony trioxide and bromine or chlorine based flame retardant system. To the best of our knowledge, none of the mold compounds that ON SEMICONDUCTOR uses contain RoHS banned Polybrominated Biphenyls (PBB) and their ethers/oxides (PBDE) compounds.

Despite of that some products produced mainly at our subcontractors still contain Bromine and Antimony trioxide above the threshold limit. 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.

Under the “Green Products” initiative, ON Semiconductor plans to eliminate antimony and halogen based flame retardants from all of its packages. For further details, please visit:

<http://www.onsemi.com/PowerSolutions/content.do?id=1336>

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 NiPdAu lead finish and other Pb-free plating options.

Metals in Wire Bonding

Gold, Copper and Aluminum are mainly used in the wire bond process.

Metals in Die Attach Epoxy

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	Trichlorofluoromethane (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
61788-33-8	Polychlorinated Terphenyls (PCTs)
	Tri-substituted organostannic compounds
	Azocolourants and azodyes which form certain aromatic amines
3846-71-7	Phenol, 2-(2H-benzotriazol-2-yl)-4,6-bis(1,1-dimethylethyl)
624-49-7	Dimethyl fumarate
	Dibutyltin (DBT) compounds
	Dioctyltin (DOT) compounds
	Selected Fluorinated greenhouse gases
	Brominated Dioxins/Furans
	Chlorinated Dioxins / Furans
	Perchlorates
	Perfluorooctane sulfonate (PFOS)
	Selected Phthalates Group 2 (DIDP,DINP,DNOP)
	Selected Phthalates Group3 (DMEP, DNHP)
	Radiocative Substances

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 contains 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) in its pure original form at the threshold concentration higher than 0.1% as required under EU REACH regulations:

Substance name	EC No.	CAS No.	Date of Inclusion
4,4'- Diaminodiphenylmethane (MDA)	202-974-4	101-77-9	10/28/2008
5-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene)	201-329-4	81-15-2	10/28/2008
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	287-476-5	85535-84-8	10/28/2008
* Aluminosilicate Refractory Ceramic Fibres			10/28/2008
Anthracene	204-371-1	120-12-7	10/28/2008

Benzyl butyl phthalate (BBP)	201-622-7	85-68-7	10/28/2008
Bis (2-ethylhexyl)phthalate (DEHP)	204-211-0	117-81-7	10/28/2008
Bis(tributyltin)oxide (TBTO)	200-268-0	56-35-9	10/28/2008
Cobalt dichloride	231-589-4	7646-79-9	10/28/2008
Diarsenic pentaoxide	215-116-9	1303-28-2	10/28/2008
Diarsenic trioxide	215-481-4	1327-53-3	10/28/2008
Dibutyl phthalate (DBP)	201-557-4	84-74-2	10/28/2008
Substance name	EC No.	CAS No.	Date of Inclusion
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified:		25637-99-4	10/28/2008
pha-hexabromocyclododecane	247-148-4 and	3194-55-6	10/28/2008
Beta-hexabromocyclododecane	221-695-9	(134237-50-6)	10/28/2008
Gamma-hexabromocyclododecane		(134237-51-7), (134237-52-8)	10/28/2008
Lead hydrogen arsenate	232-064-2	7784-40-9	10/28/2008
Sodium dichromate	234-190-3	7789-12-0/ 10588-01-9	10/28/2008
Triethyl arsenate	427-700-2	15606-95-8	10/28/2008
2,4-Dinitrotoluene	204-450-0	121-14-2	1/13/2010
Anthracene oil	292-602-7	90640-80-5	1/13/2010
Anthracene oil, anthracene paste	292-603-2	90640-81-6	1/13/2010
Anthracene oil, anthracene paste, anthracene fraction	295-275-9	91995-15-2	1/13/2010
Anthracene oil, anthracene paste, distn. lights	295-278-5	91995-17-4	1/13/2010
Anthracene oil, anthracene-low	292-604-8	90640-82-7	1/13/2010
Diisobutyl phthalate	201-553-2	84-69-5	1/13/2010
Lead chromate	231-846-0	7758-97-6	1/13/2010
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	235-759-9	12656-85-8	1/13/2010
Lead sulfochromate yellow (C.I. Pigment Yellow 34)	215-693-7	1344-37-2	1/13/2010
Pitch, coal tar, high temp.	266-028-2	-	1/13/2010
Tris(2-chloroethyl)phosphate	204-118-5	115-96-8	1/13/2010
**Zirconia Aluminosilicate Refractory Ceramic Fibres*		Extracted from Index no. 650-017-00-8	1/13/2010
Acrylamide	201-173-7	79-06-1	3/30/2010

Ammonium dichromate	232-143-1	7789-09-5	6/18/2010
Boric acid	233-139-2 / 234-343-4	10043-35-3 / 11113-50-1	6/18/2010
Disodium tetraborate, anhydrous	215-540-4	1303-96-4/ 1330-43-4/ 12179-04-3	6/18/2010
Potassium chromate	232-140-5	7789-00-6	6/18/2010
Potassium dichromate	231-906-6	7778-50-9	6/18/2010
Sodium chromate	231-889-5	11/3/7775	6/18/2010
Tetraboron Disodium Heptaoxide, hydrate	235-541-3	12267-73-1	6/18/2010
Trichloroethylene	201-167-4	79-01-6	6/18/2010
2-Ethoxyethanol	203-804-1	110-80-5	12/15/2010
2-Methoxyethanol	203-713-7	109-86-4	12/15/2010
Chromic acid,	231-801-5	7738-94-5	12/15/2010
Oligomers of chromic acid and dichromic acid, Dichromic acid	236-881-5	13530-68-2	12/15/2010
Chromium trioxide	215-607-8	1333-82-0	12/15/2010
Cobalt(II) carbonate	208-169-4	513-79-1	12/15/2010
Cobalt(II) diacetate	200-755-8	71-48-7	12/15/2010
Cobalt(II) dinitrate	233-402-1	10141-05-6	12/15/2010
Cobalt(II) sulphate	233-334-2	10124-43-3	12/15/2010
2-Ethoxyethyl acetate	203-839-2	111-15-9	6/20/2011
Strontium chromate	232-142-6	7789-06-2	6/20/2011
1,2-Benzenedicarboxylic acid, di-C7-11- branched and linear alkyl esters	271-084-6	68515-42-4	6/20/2011
Hydrazine	206-114-9	302-01-2 / 7803-57-8	6/20/2011
1-Methyl-2-pyrrolidone	212-828-1	872-50-4	6/20/2011
1,2,3-Trichloropropane	202-486-1	96-18-4	6/20/2011
1,2-Benzenedicarboxylic acid, di-C6-8- branched alkyl esters, C7-rich	276-158-1	71888-89-6	6/20/2011
Zirconia Aluminosilicate Refractory Ceramic Fibres. <i>These fibres are: a) oxides of aluminium, silicon and zirconium are the main components present (in the fibres) within variable concentration ranges b) fibres have a length weighted geometric mean diameter less two standard geometric errors of 6 or less micrometres (µm). c) alkaline oxide and alkali earth oxide (Na2O+K2O+CaO+MgO+BaO) content less or equal to 18% by weight</i>		<i>Covered by index number 650-017- 00-8 in Annex VI, part 3, table 3.1 of Regulation (EC) No 1272/2008</i>	12/19/2011
Calcium arsenate	231-904-5	7778-44-1	12/19/2011

Bis(2-methoxyethyl) ether	203-924-4	111-96-9	12/19/2011
Aluminosilicate Refractory Ceramic Fibres. <i>These fibres are: a) oxides of aluminium, silicon and zirconium are the main components present (in the fibres) within variable concentration ranges b) fibres have a length weighted geometric mean diameter less two standard geometric errors of 6 or less micrometres (µm). c) alkaline oxide and alkali earth oxide (Na₂O+K₂O+CaO+MgO+BaO) content less or equal to 18% by weight</i>			12/19/2011
Potassium hydroxyoctaoxodizincatedichromate	234-329-8	11103-86-9	12/19/2011
Lead dipicrate	229-335-2	6477-64-1	12/19/2011
N,N-dimethylacetamide	204-826-4	127-19-5	12/19/2011
Arsenic acid	231-901-9	7778-39-4	12/19/2011
2-Methoxyaniline; o-Anisidine	201-963-1	90-04-0	12/19/2011
Trilead diarsenate	222-979-5	3687-31-8	12/19/2011
1,2-dichloroethane	203-458-1	107-06-2	12/19/2011
Pentazinc chromate octahydroxide	256-418-0	49663-84-5	12/19/2011
4-(1,1,3,3-tetramethylbutyl)phenol	205-426-2	140-66-9	12/19/2011
Formaldehyde, oligomeric reaction products with aniline	500-036-1	25214-70-4	12/19/2011
Bis(2-methoxyethyl) phthalate	204-212-6	117-82-8	12/19/2011
Lead diazide, Lead azide	236-542-1	13424-46-9	12/19/2011
Lead styphnate	239-290-0	15245-44-0	12/19/2011
2,2'-dichloro-4,4'-methylenedianiline	202-918-9	101-14-4	12/19/2011
Phenolphthalein	201-004-7	77-09-8	12/19/2011
Dichromium tris(chromate)	246-356-2	24613-89-6	12/19/2011
α,α-Bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4)	229-851-8	6786-83-0	06/18/2012
N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base)	202-959-2	101-61-1	06/18/2012
1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione (β-TGIC)	423-400-0	59653-74-6	06/18/2012
Diboron trioxide	215-125-8	1303-86-2	06/18/2012
1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	203-977-3	112-49-2	06/18/2012
4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol [with ≥ 0.1% of Michler's ketone (EC No. 202-027-5) or Michler's base (EC No. 202-959-2)]	209-218-2	561-41-1	06/18/2012

Lead(II) bis(methanesulfonate)	401-750-5	17570-76-2	06/18/2012
Formamide	200-842-0	75-12-7	06/18/2012
[4-[4,4'-bis(dimethylamino)benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3) [with $\geq 0.1\%$ of Michler's ketone (EC No. 202-027-5) or Michler's base (EC No. 202-959-2)]	208-953-6	548-62-9	06/18/2012
1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	203-794-9	110-71-4	06/18/2012
[4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26) [with $\geq 0.1\%$ of Michler's ketone (EC No. 202-027-5) or Michler's base (EC No. 202-959-2)]	219-943-6	2580-56-5	06/18/2012
1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazinane-2,4,6-trione (TGIC)	219-514-3	2451-62-9	06/18/2012
4,4'-bis(dimethylamino)benzophenone (Michler's ketone)	202-027-5	90-94-8	06/18/2012
Pyrochlore, antimony lead yellow	232-382-1	8012-00-8	12/19/2012
6-methoxy-m-toluidine (p-cresidine)	204-419-1	120-71-8	12/19/2012
Henicosafuoroundecanoic acid	218-165-4	2058-94-8	12/19/2012
Hexahydromethylphthalic anhydride [1], Hexahydro-4-methylphthalic anhydride [2], Hexahydro-1-methylphthalic anhydride [3], Hexahydro-3-methylphthalic anhydride [4]	247-094-1, 243-072-0, 256-356-4, 260-566-1	25550-51-0, 19438-60-9, 48122-14-1, 57110-29-9	12/19/2012
Cyclohexane-1,2-dicarboxylic anhydride [1], cis-cyclohexane-1,2-dicarboxylic anhydride [2], trans-cyclohexane-1,2-icarboxylic anhydride [3]	201-604-9, 236-086-3, 238-009-9	85-42-7, 13149-00-3, 14166-21-3	12/19/2012
Dibutyltin dichloride (DBTC)	211-670-0	683-18-1	12/19/2012
Lead bis(tetrafluoroborate)	237-486-0	13814-96-5	12/19/2012
Lead dinitrate	233-245-9	10099-74-8	12/19/2012
Silicic acid, lead salt	234-363-3	11120-22-2	12/19/2012
4-Aminoazobenzene	200-453-6	60-09-3	12/19/2012
Lead titanium zirconium oxide	235-727-4	12626-81-2	12/19/2012
Lead monoxide (lead oxide)	215-267-0	1317-36-8	12/19/2012
o-Toluidine	202-429-0	95-53-4	12/19/2012
3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine	421-150-7	143860-04-2	12/19/2012
Silicic acid (H ₂ SiO ₅), barium salt (1:1), lead-doped	272-271-5	68784-75-8	12/19/2012
Trilead bis(carbonate)dihydroxide	215-290-6	1319-46-6	12/19/2012
Furan	203-727-3	110-00-9	12/19/2012

N,N-dimethylformamide	200-679-5	68-12-2	12/19/2012
4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated [covering well-defined substances and UVCB substances, polymers and homologues]	-	-	12/19/2012
4-Nonylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, covering also UVCB- and well-defined substances]	-	-	12/19/2012
4,4'-methylenedi-o-toluidine	212-658-8	838-88-0	12/19/2012
Diethyl sulphate	200-589-6	64-67-5	12/19/2012
Dimethyl sulphate	201-058-1	77-78-1	12/19/2012
Lead oxide sulfate	234-853-7	12036-76-9	12/19/2012
Lead titanium trioxide	235-038-9	12060-00-3	12/19/2012
Acetic acid, lead salt, basic	257-175-3	51404-69-4	12/19/2012
[Phthalato(2-)]dioxotrilead	273-688-5	69011-06-9	12/19/2012
Bis(pentabromophenyl) ether (decabromodiphenyl ether; DecaBDE)	214-604-9	1163-19-5	12/19/2012
N-methylacetamide	201-182-6	79-16-3	12/19/2012
Dinoseb (6-sec-butyl-2,4-dinitrophenol)	201-861-7	88-85-7	12/19/2012
1,2-Diethoxyethane	211-076-1	629-14-1	12/19/2012
Tetralead trioxide sulphate	235-380-9	12202-17-4	12/19/2012
N-pentyl-isopentylphthalate	-	776297-69-9	12/19/2012
Dioxobis(stearato)trilead	235-702-8	12578-12-0	12/19/2012
Tetraethyllead	201-075-4	78-00-2	12/19/2012
Pentalead tetraoxide sulphate	235-067-7	12065-90-6	12/19/2012
Pentacosafuorotridecanoic acid	276-745-2	72629-94-8	12/19/2012
Tricosafuorododecanoic acid	206-203-2	307-55-1	12/19/2012
Heptacosafuorotetradecanoic acid	206-803-4	376-06-7	12/19/2012
1-bromopropane (n-propyl bromide)	203-445-0	106-94-5	12/19/2012
Methoxyacetic acid	210-894-6	625-45-6	12/19/2012
4-methyl-m-phenylenediamine (toluene-2,4- diamine)	202-453-1	95-80-7	12/19/2012
Methyloxirane (Propylene oxide)	200-879-2	75-56-9	12/19/2012
Trilead dioxide phosphonate	235-252-2	12141-20-7	12/19/2012
o-aminoazotoluene	202-591-2	97-56-3	12/19/2012
1,2-Benzenedicarboxylic acid, dipentylester, branched and linear	284-032-2	84777-06-0	12/19/2012

4,4'-oxydianiline and its salts	202-977-0	101-80-4	12/19/2012
Orange lead (lead tetroxide)	215-235-6	1314-41-6	12/19/2012
Biphenyl-4-ylamine	202-177-1	92-67-1	12/19/2012
Diisopentylphthalate	210-088-4	605-50-5	12/19/2012
Fatty acids, C16-18, lead salts	292-966-7	91031-62-8	12/19/2012
Diazeno-1,2-dicarboxamide (C,C'-azodi(formamide))	204-650-8	123-77-3	12/19/2012
Sulfurous acid, lead salt, dibasic	263-467-1	62229-08-7	12/19/2012
Lead cyanamidate	244-073-9	20837-86-9	12/19/2012
Note:			
<i>* a) Al₂O₃ and SiO₂ are present within the following concentration ranges:</i>			
<i>Al₂O₃: 43.5 – 47 % w/w, and SiO₂: 49.5 – 53.5 % w/w,</i>			
<i>Al₂O₃: 45.5 – 50.5 % w/w, and SiO₂: 48.5 – 54 % w/w,</i>			
<i>**a) Al₂O₃, SiO₂ and ZrO₂ are present within the following concentration ranges:</i>			
<i>Al₂O₃: 35 – 36 % w/w, and</i>			
<i>SiO₂: 47.5 – 50 % w/w, and</i>			
<i>ZrO₂: 15 - 17 % w/w,</i>			
<i>b) fibres have a length weighted geometric mean diameter less two standard geometric errors of 6 or less micrometres (µm).</i>			

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 2011/65/EU](http://www.ee.sgs.com/) 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 polyimide 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 2011/65/EU.
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, PBDE 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

	RoHS Directive 2002/95/EC						Halogen Free		
	Cadmium	Lead	Mercury	Hexavalent Chromium	PBBE	PBDE	Halogen Chlorine	Halogen Bromine	Antimony Trioxide
	Cd	Pb	Hg	CrVI			Cl	Br	Sb ₂ O ₃
Leadframe	0	0	0	0	0	0			
Die attach	0	0	0	0	0	0	0	0	0
Plating anodes/solution	0	0	0	0	0	0			
wire bond	0	0	0	0	0	0			
solder clips	0	0	0	0	0	0			
solder paste	0	0	0	0	0	0	0	0	0
solder balls	0	0	0	0	0	0			
substrates	0	0	0	0	0	0	0	0	0
heat sink/heat spreader	0	0	0	0	0	0			
Mold compound	0	0	0	0	0	0	0	0	0
soldermask	0	0	0	0	0	0	0	0	0
polyimide	0	0	0	0	0	0	0	0	0

representative.

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