

Environmental Management

To think about and treat fairly the world we live in ...

1 Environmental Policy

Integrated Silicon Solution Inc. (ISSI), a technology leader, designs, develops and markets high performance semiconductors throughout the world. ISSI acknowledges our responsibility to manage these functions in a responsible manner, endeavoring to preserve, protect and where possible enhance the environment. To achieve these goals, we consider and control all key factors which impact the environment including the sourcing of raw material and manufacturing processes.

Our vision for the environment is C.L.E.A.N.

Continuous Improvement

Undertake actions to prevent pollution and to maintain, review and continuously improve our environmental management system.

Legal Requirements

Comply with all relevant environmental legislation and regulations.

Environment

Develop, regularly review and achieve environmental objectives, targets and improvement plans.

Awareness

Ensure all are trained and aware of the importance of their environmental responsibilities.

Naturalization

Make the commitment to the environment a natural by-product of our processes and business activities.

All worldwide ISSI locations adhere to ISSI Environmental Policy. As prescribed by the ISO 14001:2004 Standard, ISSI Environmental Policy shall be reviewed to ensure that it :

- 1) Remains appropriate to the nature, scale, and environmental impacts of the organization' s activities, products, or services
 - 2) Includes a commitment to continual improvement and prevention of pollution
- 3) Includes a commitment to comply with relevant environmental legislation and regulations, and with other requirements to which the organization subscribes
- 4) Provides the framework for setting and reviewing environmental objectives and targets
 - 5) Is documented, implemented, maintained, and communicated to all employees
 - 6) Is available to the public.

2 Environmental Management Quality Assurance

The Environment Management (EM) System defined in ISSI EM Manual is in compliance with the requirements of ISO 14001: 2004. In addition, we also rely on external subcontractors, such as wafer foundries and assembly houses. All of them are required to be ISO 14001-certified. For your reference, please see Technical Documents in the website (for member, password is needed) or contact us directly for copies of ISSI vender's ISO 14001 certificates.

2.1 ISO14001 Certificate

With the continuous effort in pursuing an environmentally friendly product strategy, ISSI became the first design house in Taiwan that achieved the ISO 14001:1996 standard in January 2004.

2.2 Environmental Management Organization

ISSI Environmental Management organization is outlined as Figure 1.

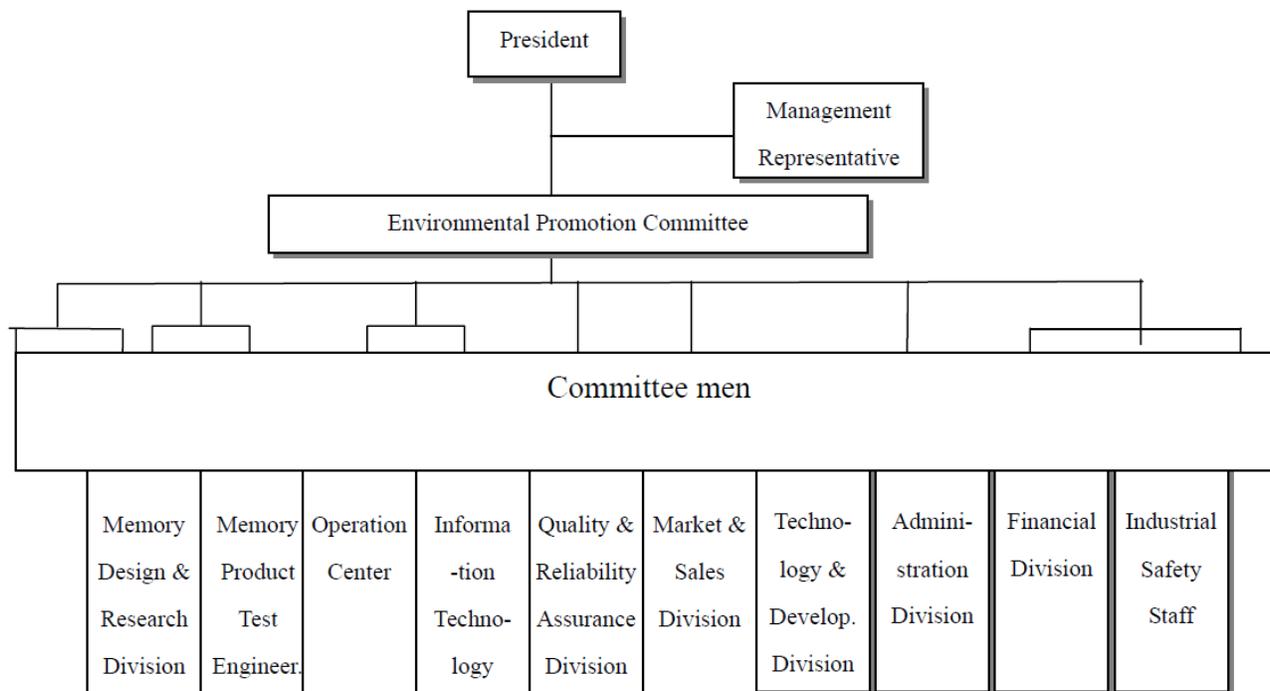


Figure 5-2. ISSI EM Organization

3 Environmental Substances Management

Through continuous improvement, ISSI has positioned itself to be an environmental-friendly enterprise and a green partner of all environment-concerned companies with which ISSI has a business relationship.

3.1 Legislation and SONY Policy

1). Europe – 1 July 2006

Total abolition of Lead, Mercury, Cadmium, Hexavalent Chromium, PFOS, PBB and PBDE has been observed since July 2006, according to the second draft of European Union order (RoHS and WEEE) for the abolishing electrical and electronic equipment.

2). Management Standards for the Restrictively Used Substances (SONY SS-00259)

No	Material/Substance Category		ISSI Threshold
1	Heavy Metals 重金屬	Cadmium(Cd)/Cadmium compounds	5 ppm for Resin (rubber, film), Coatings , inks pigments , dyes. Less than 20ppm for lead free solder -Bar solder -Wire solder -Resin flux cored solder -Solder paste ,Solder ball -Soldered sections of purchased PC boards -Component solder Less than 75 ppm for metals
		Lead (Pb)/Lead compounds	100 ppm or less in plastics/inks Less than 800 ppm of total in homogenous material Less than 500 ppm for lead free solder - Bar solder -Wire solder -Resin flux cored solder -Solder Paste -Solder ball
		Mercury (Hg)/Mercury compounds	Less than 1000 ppm of total in homogenous material
		Hexavalent Chromium(Cr6+) / Hexavalent Chromium compounds	Less than 1000 ppm of total in homogenous material
		Polychlorinated Biphenyls (PCBs)	Non intentionally added
		Polychlorinated naphthalenes (PCNs)	Non intentionally added
2	Chlorinated organic compounds 有機氯化物	Certain Short Chain Chlorinated Paraffins (CP)	Non-detected or intentionally added
		Polychlorinated Terphenyls (PCTs)	50ppm in material
		Short Chain Chlorinated Paraffins (C10-C13)	Non-detected or non Intentionally added,mis,or production of substance in the manufacturing process. Less than 1000ppm of article
		Other Chlorinated organic compounds	Non-detected or intentionally added
		Other Chlorinated organic compounds	Non-detected or intentionally added
		Other Chlorinated organic compounds	Non-detected or intentionally added

3	Brominated organic compounds 有機溴化合物	Polybrominated Biphenyls (PBBs)	<1000ppm or less;Non-detected or intentionally added
		Polybrominated Diphenylethers (PBDEs) Included DecaBDE	<1000ppm or less;Non-detected or intentionally added
		Hexabromocyclododecane (HBCDD)	-Substances, Preparations, articles which used in flame retardants $\leq 100\text{mg/Kg}$ by EC no. 850/2004 (PoPs) -Less than 1000ppm of article
		Other Brominated organic compounds	Non-detected or intentionally added
4	Halogen	Cl, Br.	Must be lower than 900 ppm, respectively, and total amount of PPM must be lower than 1500 ppm (Br + Cl < 1500 ppm).
5	Tributyl Tin compounds, 三丁基錫化合物 Triphenyl Tin compounds(TPT)三苯基錫化合物 Tributyl Tin Oxide (TBTO) DBT 二丁基氧化錫 DOT 氧化二辛基錫		Non intentionally added or 0.1%wt (1000ppm) of the article
6	Phosphorous-based Flame Retardants 磷系阻燃劑	Tris(2-chloroethyl) phosphate (TCEP) 磷酸三(2-氯乙基) 酯 Tris (2-chloro-1-methylethyl) phosphate (TCPP) 磷酸三(1-氯丙基) 酯 Tris(1,3-dichloro-2-propyl) phosphate (TDCPP) 磷酸三(1,3-二氯丙基) 酯	0.1%wt (1000ppm) of the article
7	Asbestos 石棉		Non-detected or intentionally added
8	Specific aze compounds (Certain Azocourants and Azodyes) 特定偶氮化合物		Non-detected or intentionally added
9	Formaldehyde 甲醛		Non-detected or intentionally added
10	Polyvinyl Chloride (PVC) and PVC blends 聚氯乙烯及聚氯乙烯混合物		Non intentionally added or 0.1% by weight (1000ppm) of the product *3 Tube is defined Sony Leve III.
11	Beryllium oxide 氧化鈹 Beryllium copper 鈹青銅		Non-detected or intentionally added.
12	Specific phthalates (DEHP, DBP , BBP , DINP , DIDP , DNOP , DNHP) 特定鄰苯二甲酸鹽		1000 ppm, Non-detected or intentionally added
13	Hydrofluorocarbon (HFC) , Perfluorocarbon (PFC) 氫氟碳化合物(HFC) , 全氟化碳 (PFC)		Non-detected or intentionally added
14	PFOS & PFOA 全氟辛烷硫酸 & 全氟辛酸		Non-detected or intentionally added 0.1%(1000ppm) by weight in material.
15	Ozone Delpting Substances 臭氧危害物質		Banned and must not be used when manufacturing parts and device.
16	Radioactive Substances 放射性物質		Banned and must not be used when manufacturing parts and device.
17	Cobalt dichloride 二氯化鈷	Pneumatic panels to indicate water contamination	0.1% by weight (1000ppm) of the article

18	Specific benzotriazole 特定苯并三氮唑		Non-detected or intentionally added
19	Bisphenol A 雙酚 A		Non-detected or intentionally added
20	Dimethyl fumarate 富馬酸二甲酯		Non-detected or intentionally added
21	PAHs 多環芳香烴		Non-detected (MDL : < 0.2mg/kg) in toy which contact with skin and for the baby. Plastic or contact with skin over 30s (total:10mg/Kg) Plastic or contact with skin less than 30s(total: 200mg/Kg)
22	Benzenamine N-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene (BNST) 苯乙烯和 2,2,4-三甲基戊烯的反應產物 - 二苯胺		intentionally added in material and manufacturing process

Table 5-1 List of “Environment-related Substances to be Controlled ”

Note:

- 1) Due to restrictions in manufacturing technologies, the lead concentration found in the electroplating of IC's outer leads may be exempt from the threshold level (100 PPM). But the lead concentration must still not exceed 1000 PPM. Assembly house must control lead concentration lower than 800 ppm while Plating process and measurement in process monitor to avoid any deviation.
- 2) For Cabolt dichloride must be prohibited from Dec-01st '2008.
- 3) Sony Class III definition: No deadline for banning the use is currently set for the substances classified into this level. They shall be classified into Level 2 to be banned in phases, Depending on the availability of alternative parts and material that satisfy the intended application.
- 4) Non-detected level please follow the MDL(Method Detect Limit) by third party test report.

3.2 Green Partner Certification

The environment-related substances shown in Table 5-1 above are controlled in the Green Partner (GP) rule. These controlled substances will be phased out gradually in ISSI depending on specific schedule in GP rule defined by customer, although the final regulation about environmental conscious substances has not been integrated in the world, like EU, Japan and US yet.

ISSI has been very proactive in the promotion of environmental-friendly products. After much effort on surveying the substance used in our packages, we have learnt the content of these substances quite well and conveyed the information to our customers. As a result, ISSI was first awarded as SONY's Green Partner in June 2003 and got renewed again per two years. Renewal of 2013 version is done. ISSI also was awarded Canon's Certificate of Green Activity. The current SONY certificate number is shown in Table 5-2 and Canon certificate number is shown in Table 5-3.

【Certification No.】	【Factory Name】	【Valid date】
FC005567	Integrated Silicon Solution, Inc. (ISSI)	03/31/2018
FC005569	Integrated Silicon Solution, Inc. (ICSI)	03/31/2018

Table 5-2 SONY Green Partner certificate

【Certification No】	【Partner Code】	【Company Name】	【Valid date】	【Place】
3914	M050 (Marubun)	Integrated Silicon Solution, Inc	Dec-2018	Taiwan/ Headquarters

Table 5-3 Canon Green certificate

3.3 Industry Definition of Lead-free & Halogen-free

1) Lead-free package :

Pb content in individual material must be less than the limited level

- IPC/JEDEC : Pb < 2000 ppm
- EU(ST/Philip/Infineon) Pb < 1000 ppm
- JEITA Pb < 1000 ppm
- **ISSI Pb < 800 ppm**

2) Halogen-free package :

In addition to the requirement of Pb-free package, the Halogen-free package must reduce the content of halogen and antimony trioxide¹ to the minimum level

- Japan Electronic Insulating Material Association :
Br, Cl, Sb < 900 ppm, respectively
- ST/Philip/Infineon Halogen (Br + Cl) < 900 ppm
based on JPCA-ES-01-1999
- **ISSI Br, Cl, Sb < 900 ppm, respectively**
Halogen (Br + Cl) < 1500 ppm

The new 'Green' definition will be followed and updated with the green standard of the environmental concerned substances changing around the world.

3) Future Material declaration requirement at an Article level for EU/REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)

The European Chemicals Agency (ECHA) has published the candidate list of substances of very high concern (SVHC) from 28 October 2008 up to now. The list includes the 181 substances in Table 5-4 which ECHA had proposed. ISSI had identified all of package material is lower threshold level of the presence of SVHC. ISSI will pro-actively notify customer before 45 days in case of ISSI use and exceed threshold level (if

¹ Even though antimony is not a halogen element, it is often used with halogen in the flame retardant of the molding compound. We follow ASE (Advanced Semiconductor Engineering) Group's convention to include antimony trioxide as a "halogen" element in the category of "halogen-free" package.

* All refractory ceramic fibers are covered by index number 650-017-00-8 in Annex VI of the so-called CLP regulation - Regulation No 1272/2008 on the classification, labeling and packaging (CLP) of chemical substances.

>0.1 % w/w) in the future once a new candidate list of REACH which is demanded by ECHA.

No.	Substance Name	CAS No.
1	三乙基砷酸酯 Triethyl arsenate	15606-95-8
2	蔥 Anthracene	120-12-7
3	4,4'- 二氨基二苯甲烷 4,4'- Diaminodiphenylmethane(MDA)	101-77-9
4	鄰苯二甲酸二丁酯 Dibutyl phthalate(DBP)	84-74-2
5	氯化鈷 Cobalt dichloride	7646-79-9
6	五氧化二砷 Diarsenic Pentaoxide	1303-28-2
7	三氧化二砷 Diarsenic trioxide	1327-53-3
8	重鉻酸鈉 · 二倍結晶水 Sodium Dichromate	7789-12-0 10588-01-9
9	5-叔丁基-2,4,6-三硝基間二甲苯 5-tert-butyl-2,4,6-trinitro-m-xylene(musk xylene)	81-15-2
10	鄰苯二甲酸二(2-乙基己基)酯 Bis(2-ethylhexyl) Phthalate (DEHP)	117-81-7
11	六溴環十二烷 Hexabromocyclododecane(HBCDD) and all major diastereois	134237-50-6 134237-52-8 134237-51-7
12	短鏈氯化石蠟 Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	85535-84-8
13	氧化三丁錫 Bis(tributyltin)oxide (TBTO)	56-35-9
14	砷酸氫鉛 Lead hydrogen arsenate	7784-40-9
15	鄰苯二甲酸丁酯苯甲酯 Benzyl butyl phthalate (BBP)	85-68-7
16	蔥油 Anthracene oil	90640-80-5
17	蔥油 · 蔥糊 · 輕油 Anthracene oil, anthracene paste, distn. Lights*	91995-17-4
18	蔥油 · 蔥糊 · 蔥餾分離液 Anthracene oil, anthracene paste, anthracene fraction	91995-15-2
19	蔥油 · 含蔥量少 Anthracene oil, anthracene-low	90640-82-7
20	蔥油 · 蔥糊 Anthracene oil, anthracene paste	90640-81-6
21	煤瀝青 · 高溫 Coal tar pitch, high temperperature	65996-93-2
22	丙烯醯胺 Acrylamide	79-06-1
23	矽酸鋁 · 陶瓷耐火纖維 Aluminosillcate, Refractory Ceramic Fibres	None
24	矽酸鋁氧化鋯 · 陶瓷耐火纖維 Zirconia Aluminosilicate, Refractor Ceramic Fibres	None
25	2,4 二硝基甲苯 2,4-Dinitrotoluene	121-14-2
26	鄰苯二甲酸二異丁酯 Dilsobutyl phthalate	84-69-5
27	鉻酸鉛 Lead chromate	7758-97-6
28	紅色鉬鉻酸硫酸鹽 Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	12656-85-8
29	黃色硫化鉻酸鉛 Lead sulfochromate yellow (C.I. Pigment Yellow 34)	1344-37-2
30	三 2-(氯乙基)磷酸酯 Tris (2-chloroethyl) phosphate	115-96-8
31	三氯乙烯 Trichloroethylene	79-01-6
32	硼酸 Boric acid	10043-35-3 11113-50-1

33	無水四硼酸二鈉 Disodium tetraborate, anhydrous	1303-96-4 1330-43-4 12179-04-3
34	水合七氧四硼酸二鈉 Tetraboron disodium heptaoxide, hydrate	12267-73-1
35	鉻酸鈉 Sodium chromate	7775-11-3
36	鉻酸鉀 Potassium chromate	7789-00-6
37	重鉻酸銨 Ammonium dichromate	7789-09-5
38	重鉻酸鉀 Potassium dichromate	7778-50-9
39	硫酸鈷 Cobalt sulfate	10124-43-3
40	硝酸鈷 Cobalt dinitrate	10141-05-6
41	碳酸鈷 Cobalt carbonate	513-79-1
42	醋酸鈷 Cobalt diacetate	71-48-7
43	2-甲氧基乙醇 2-Methoxyethanol	109-86-4
44	2-乙氧基乙醇 2-Ethoxyethanol	110-80-5
45	三氧化鉻 Chromium trioxide	1333-82-0
46	三氧化二鉻 Chromic acid/重鉻酸 Dichromic acid	7738-94-5 13530-68-2
47	乙酸-2-乙氧基乙酯 2-ethoxyethyl acetate	111-15-9
48	鉻酸銣 Strontium chromate	7789-06-2
49	鄰苯二甲酸二(C7-11 支鏈與直鏈)烷基酯 1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4
50	胼 Hydrazine	302-01-2 7803-57-8
51	N-甲基吡咯烷酮 1-methyl-2-pyrrolidone	872-50-4
52	1,2,3-三氯丙烷 1,2,3-trichloropropane	96-18-4
53	鄰苯二甲酸二 C6-8 支鏈 烷基酯 1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6
54	鉻酸鉻 Dichromium tris(chromate)	24613-89-6
55	氫氧化鉻酸鋅鉀 Potassium hydroxyoctaoxidizincatedi-chromate	11103-86-9
56	C.I.顏料黃 36 Pentazinc chromate octahydroxide	49663-84-5
57	甲醛和苯胺聚合物 Formaldehyde, oligomeric reaction products with aniline (technical MDA)	25214-70-4
58	鄰苯二甲酸二甲氧乙酯 Bis(2-methoxyethyl) phthalate	117-82-8
59	2-Methoxyaniline; o-Anisidine	90-04-0
60	鄰甲氧基苯胺 4-(1,1,3,3-tetramethylbutyl)phenol, (4-tert-Octylphenol)	140-66-9
61	1,2-二氯乙烷 1,2-Dichloroethane	107-06-2
62	二甘醇二甲醚 Bis(2-methoxyethyl) ether	111-96-6
63	砷酸 Arsenic acid	7778-39-4
64	砷酸鈣 Calcium arsenate	7778-44-1
65	砷酸鉛 Trilead diarsenate	3687-31-8
66	N,N-二甲基乙醯胺 N,N-dimethylacetamide (DMAC)	127-19-5
67	4,4'-二氨基-2,2'-二氯二苯甲烷, 2,2'-dichloro-4,4'-methylenedianiline (MOCA)	101-14-4
68	酚酞 Phenolphthalein	77-09-8

69	疊氮化鉛 Lead azide Lead diazide	13424-46-9
70	收斂酸鉛 Lead styphnate	15245-44-0
71	苦味酸鉛 Lead dipicrate	6477-64-1
72	三甘醇二甲醚 1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	112-49-2
73	乙二醇二甲醚 1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
74	α,α -二[(二甲氨基)苯基]-4-氨基苯甲醇 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol	561-41-1
75	4'-二(N,N-二甲氨基)二苯甲酮 4,4'-bis(dimethylamino)benzophenone (Michler's ketone)	90-94-8
76	结晶紫 [4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3)	548-62-9
77	碱性蓝 26; 维多利亚藍 B [4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26)	2580-56-5
78	三氧化二硼 (無水硼酸) Diboron trioxide	1303-86-2
79	氨基甲醛 Formamide	75-12-7
80	甲基磺酸鉛 Lead(II) bis(methanesulfonate)	17570-76-2
81	N,N,N',N'-四甲基-4,4'-二氨基二苯甲烷 N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base)	101-61-1
82	1,3,5-三缩水甘油-S-三嗪三酮 TGIC (1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione)	2451-62-9
83	A,A-二[4-(二甲氨基)苯基]-4-苯基氨基-1-萘甲醇 α,α -Bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4)	6786-83-0
84	β -TGIC (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione) 异氰脲酸 B-三缩水甘油酯	59653-74-6
85	十溴聯苯醚 Bis(pentabromophenyl) ether (DecaBDE)	1163-19-5
86	全氟十三酸 Pentacosafuorotridecanoic acid	72629-94-8
87	全氟十二烷酸 Tricosafuorododecanoic acid	307-55-1
88	全氟十一烷酸 Henicosafuoroundecanoic acid	2058-94-8
89	全氟十四酸 Heptacosafuorotetradecanoic acid	376-06-7
90	辛基酚聚醚-9 · 包括界定明確的物質以及 UVCB 物質、聚合物和同系物 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated - covering well-defined substances and UVCB substances, polymers and homologues	-
91	分支或線性的壬基酚 · 含有線性或分支、共價綁定苯酚的 9 個碳烷基鏈的物質 · 包括 UVCB 物質以及任何含有獨立或組合的界定明確的同分異構體的物質 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 which include any of the individual isomers or a combination thereof	-
92	偶氮二甲醯胺 Diazene-1,2-dicarboxamide (C,C'-azodi(formamide))	123-77-3
93	順環己烷-1,2-二羧酸酐 Cyclohexane-1,2-dicarboxylic anhydride (Hexahydrophthalic anhydride - HHPA)	85-42-7
94	甲基六氫苯酐、4-甲基六氫苯酐、甲基六氫化鄰苯二甲酸酐、3-甲基六氫苯二甲酯酐 Hexahydromethylphthalic anhydride, Hexahydro-4-methylphthalic anhydride, Hexahydro-1-methylphthalic anhydride, Hexahydro-3-methylphthalic anhydride	25550-51-0, 19438-60-9, 48122-14-1, 57110-29-9
95	甲氧基乙酸 Methoxy acetic acid	625-45-6
96	1 · 2-苯二羧二戊酯 (支鏈和直鏈) 1,2-Benzenedicarboxylic acid, dipentylester, branched and linear	84777-06-0
97	鄰苯二甲酸二異戊酯 Diisopentylphthalate (DIPP)	605-50-5
98	鄰苯二甲酸正戊基異戊基酯 N-pentyl-isopentylphthalate	-

99	乙二醇二乙醚 1,2-Diethoxyethane	629-14-1
100	N,N-二甲基甲醯胺 N,N-dimethylformamide; dimethyl formamide	68-12-2
101	二丁基錫 Dibutyltin dichloride (DBT)	683-18-1
102	城式乙酸鉛 Acetic acid, lead salt, basic	51404-69-4
103	城式碳酸鉛 Basic lead carbonate (trilead bis(carbonate)dihydroxide)	1319-46-6
104	城式硫酸鉛 Lead oxide sulfate (basic lead sulfate)	12036-76-9
105	二鹽基鄰苯二甲酸鉛[Phthalato(2-)]dioxotrilead (dibasic lead phthalate)	69011-06-9
106	雙(十八酸基)二氧代三鉛 Dioxobis(stearato)trilead	12578-12-0
107	C16-18-脂肪酸鉛鹽 Fatty acids, C16-18, lead salts	91031-62-8
108	氟硼酸鉛 Lead bis(tetrafluoroborate)	13814-96-5
109	氨基氰鉛鹽 Lead cyanamidate	20837-86-9
110	硝酸鉛 Lead dinitrate	10099-74-8
111	氧化鉛 Lead oxide (lead monoxide)	1317-36-8
112	四氧化三鉛 Lead tetroxide (orange lead)	1314-41-6
113	鈦酸鉛 Lead titanium trioxide	12060-00-3
114	鈦酸鉛鋇 Lead Titanium Zirconium Oxide	12626-81-2
115	氧化鉛與硫酸鉛的複合物 Pentalead tetraoxide sulphate	12065-90-6
116	顏料黃 41 Pyrochlore, antimony lead yellow	8012-00-8
117	摻雜鉛的矽酸鋇 Silicic acid, barium salt, lead-doped	68784-75-8
118	矽酸鉛 Silicic acid, lead salt	11120-22-2
119	亞硫酸鉛 (II) Sulfurous acid, lead salt, dibasic	62229-08-7
120	四乙基鉛 Tetraethyllead	78-00-2
121	三城式硫酸鉛 Tetralead trioxide sulphate	12202-17-4
122	磷酸氧化鉛 Trilead dioxide phosphonate	12141-20-7
123	呋喃 Furan	110-00-9
124	環氧丙烷 Propylene oxide; 1,2-epoxypropane; methyloxirane	75-56-9
125	硫酸二乙酯 Diethyl sulphate	64-67-5
126	硫酸二甲酯 Dimethyl sulphate	77-78-1
127	3-乙基-2-甲基-2-(3-甲基丁基)噁唑烷 3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine	143860-04-2
128	地樂酚 Dinoseb	88-85-7
129	4,4'-二氨基-3,3'-二甲基二苯甲烷 4,4'-methylenedi-o-toluidine	838-88-0
130	4,4'-二氨基二苯醚 4,4'-oxydianiline and its salts	101-80-4
131	4-胺基偶氮苯 4-Aminoazobenzene; 4-Phenylazoaniline	60-09-3
132	2,4-二氨基甲苯 4-methyl-m-phenylenediamine (2,4-toluene-diamine)	95-80-7
133	6-甲氧基 -間-甲苯胺 甲苯胺 6-methoxy-m-toluidine (p-cresidine)	120-71-8
134	4-氨基聯苯 Biphenyl-4-ylamine	92-67-1
135	鄰氨基偶氮甲苯 o-aminoazotoluene	97-56-3
136	鄰甲基苯胺 o-Toluidine; 2-Aminotoluene	95-53-4
137	N-甲基乙酰胺 N-methylacetamide	79-16-3
138	溴代正丙烷 1-bromopropane; n-propyl bromide	106-94-5

139	鎘 Cadmium	7440-43-9
140	氧化鎘 Cadmium oxide	1306-19-0
141	鄰苯二甲酸二戊酯 Dipentyl phthalate (DPP)	131-18-0
142	分支或線性的乙氧基王基酚·包括含有9個碳烷基鏈的所有獨立的同分異構體和所有含有線性或分支9個碳烷基鏈的UVCB物質 4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof]	-
143	全氟辛酸銨 Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
144	全氟辛酸 Pentadecafluorooctanoic acid (PFOA)	335-67-1
145	硫化鎘 Cadmium sulphide	215-147-8
146	鄰苯二甲酸二己酯 Dihexyl phthalate	201-559-5
147	直接紅 28 Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28)	209-358-4
148	直接黑 38 Disodium 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo] -5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38)	217-710-3
149	亞乙基硫脲 Imidazolidine-2-thione; 2-imidazoline-2-thiol	202-506-9
150	醋酸鉛 Lead di (acetate)	206-104-4
151	磷酸三(二甲苯)酯 Trixylyl phosphate	246-677-8
152	鄰苯二甲酸二己酯(支鏈和直鏈) 1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4
153	氯化鎘 Cadmium chloride	10108-64-2
154	過硼酸鈉 Sodium perborate; perboric acid, sodium salt	-
155	過氧偏硼酸鈉 Sodium peroxometaborate	7632-04-4
156	2-(2'-羥基-3',5'-二-叔-戊基苯基)苯並三唑(紫外線吸收劑 328) 2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1
157	2-[2'-羥基-3',5'-二-叔-丁基苯基]-苯並三唑(紫外線吸收劑 320) 2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)	3846-71-7
158	二正辛基-双(2-乙基己基巰基乙酸酯)錫 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE)	15571-58-1
159	氟化鎘 Cadmium fluoride	7790-79-6
160	硫酸鎘 Cadmium sulphate	10124-36-4; 31119-53-6
161	二正辛基-双(2-乙基己基巰基乙酸酯)錫和單辛基-三(2-乙基己基巰基乙酸酯)錫的反應物 Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)	-
162	鄰苯二甲酸二(C6-C6)烷基酯:(癸基·己基·辛基)酯與1·2-鄰苯二甲酸的複合物且鄰苯二甲酸二己酯含量≥0.3% 1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters; 1,2-benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters with ≥ 0.3% of dihexyl phthalate (EC No. 201-559-5)	68515-51-5 68648-93-1
163	5-仲丁基-2-(2,4-二甲基環己-3-烯-1-基)-5-甲基-1,3-二惡烷[1]·5-仲丁基-2-(4,6-二甲基環己-3-烯-1-基)-5-甲基-1,3-二惡烷[2][覆蓋任何[1]和[2]或者其任意組合的單獨的異構體(卡拉花醛及其同分異構物)] 5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [1], 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [2] [covering any of the individual stereoisomers of [1] and [2] or any combination thereof]	-

164	硝苯 Nitrobenzene	98-95-3
165	2,4-貳三級丁基-6-(5-氯苯三唑-2-基)苯酚 (UV-327) 2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV-327)	3864-99-1
166	2-(2H-苯并三唑-2-基)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350) 2-(2H-苯并三唑-2-基)-4-三級丁基-6-二級丁基苯酚(UV-350)	36437-37-3
167	1,3-丙磺內酯 1,3-propanesultone	1120-71-4
168	全氟壬酸及其鈉與銨鹽 Perfluorononan-1-oic-acid and its sodium and ammonium salt	375-95-1 21049-39-8 4149-60-4
169	苯并(a)芘 Benzo[def]chrysene	50-32-8
170	雙酚 A 4,4' -isopropylidenediphenol (bisphenol A)	80-05-7
171	4-庚基苯酚, 支鍊及直鍊 包括含有7 個碳烷基鏈的所有獨立的同分異構體和所有含有線性或分支7 個 碳烷基鏈的UVCB 物質 '4-Heptylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 7 covalently bound predominantly in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof]	-
172	十九氟癸酸及其鈉和銨鹽 Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	3108-42-7 335-76-2 3830-45-3
173	對(1,1-二甲基丙基)苯酚 p-(1,1-dimethylpropyl)phenol	80-46-6
174	全氟己基磺酸及其鹽類 Perfluorohexane-1-sulphonic acid and its salts (PFHxS)	355-46-4
175	1,2-苯并菲;(【++快】) Chrysene	218-01-9
176	苯[a]蔥 Benz[a]anthracene	56-55-3
177	硝酸鎘 Cadmium nitrate	10325-94-7
178	氫氧化鎘 Cadmium hydroxide	21041-95-2
179	碳酸鎘 Cadmium carbonate	513-78-0
180	1,6,7,8,9,14,15,16,17,17,18, 18-十二氯五環 [12.2.1.16,9.02,13.05,10]十八碳-7,15-二烯 ("Dechlorane Plus" TM)[含有其任何單獨的反式和順式異構體或其任何組合] 1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca- 7,15-diene("Dechlorane Plus" TM) [covering any of its individual anti- and syn-isomers or any combination thereof]	-
181	1,3,4-噁二唑-2,5-二硫醇與甲醛和支鍊和直鍊4-庚基酚的反應產物(RP-HP) [含有≥0.1%w/w 支鍊 和直鍊的4-庚基酚] Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) [with ≥0.1%w/w 4-heptylphenol, branched and linear]	-

Table 5-4. The 181 SVHC of the Regulation of Article 5 of (EC)

5.3.4 Product Composition

ISSI products are mainly dedicated to commercial / industrial / medical / mobile and automotive markets. Few selected ones are penetrating some advanced applications. To ensure that our products can comply with the regulations of environmental protection, ISSI has established a database that contains the information of product composition by package families. This database is confirmed with related assembly houses and its information is very important because it allows us to estimate the

effectiveness of re-cycle and re-use rates of products and helps us answer customer's End-Of-Life questions.

Table 5-5 below is an example sheet of material composition for thin small outline package (TSOP) family. The chemical characteristics are specified according to the components such as chip, gold wire or encapsulation. For each component, the material name, mass percentage, element, CAS² number and element weight are carefully calculated. Similar sheets are available for SOP, SOJ or other package families. Please contact us if you need more information.

Material Composition Sheet (for IS prefix P/N)									ISSI
Package family	Thin Small Outline Package(Type II)								
Issue date	2/4/2008								
Package weight(mg)	541.200								
Composition part	Material name	Material composition(%)	Material weight (mg)	Element name	CAS No	Element composition(%)	Element weight(mg)	mg/kg (ppm)	
Die	Silicon Chip	5.50%	29.790	Silicon	7440-21-3	99.400%	29.612	54714.73	
				Aluminum	7429-90-5	0.300%	0.089	165.14	
				Copper	7440-50-8	0.300%	0.089	165.14	
Leadframe	A42	21.26%	115.037	Fe	7439-89-6	58.00%	66.721	123284.22	
				Ni	7440-02-0	42.00%	48.316	89274.78	
				Aromatic polyimide resin	105218-97-1	50.00%	1.068	1973.50	
Die Attach Adhesive	LOC Tape	0.39%	2.136	polyether amideimide	Trade Secret	50.00%	1.068	1973.50	
Bonding Wire	Gold Wire	0.14%	0.768	Au	7440-57-5	100.00%	0.768	1419.00	
Encapsulation	Mold Compound	72.00%	389.673	Epoxy resin	Trade Secret	5.50%	21.432	39600.94	
				Phenol resin	Trade Secret	4.50%	17.535	32400.77	
				Carbon black	1333-86-4	0.20%	0.779	1440.03	
				Silica	60676-86-0	89.80%	349.927	646575.27	
Solder Plating(Pb-free)	Tin	0.70%	3.795	Sn	7440-31-5	100.00%	3.795	7013.00	
Total		100.00%	541.200						

Materials Disclosure Disclaimer

Note: Even though all possible efforts have been made to provide you with 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 that may not have been 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. These estimates do not include trace levels of dopants and metal materials contained within silicon devices in the finished products.

Table 5-5 Material Composition Sheet of 54 TSOP II

3.5 Lead-free Solution

3.5.1 Overview

Lead containing waste, disposed from PCB assembly, in landfills is eluded by acid rain, resulting in contaminated groundwater and rivers. When accumulated in the human body through drinking water or food, it will cause intellectual growth disorder in children.

The use of lead in electronic products is an important issue of global environmental protection. ISSI has received significant amount of requests regarding lead-free package demand from Japanese customers since early 2001. Consequently, ISSI has dedicated its resources to work with suppliers to provide lead-free solutions.

² CAS stands for Chemical Abstracts Service. It is a division of the American Chemical Society. Its registration number is widely used in MSDS (Materials Safety Data Sheet) to designate elements or compounds.

3.5.2 Background

For any alloy to be a worthwhile soldering material used in the electronic industry, it must possess certain specific qualities under the following criteria:

1) Melting Range:

It must have a liquids temperature that is sufficiently low so that components and boards are not damaged during soldering. In practice, this means that it must be usable at 260 degree C, which is the maximum temperature exposure limit for the majority of electronic components. Also, it must have a solidus temperature that is sufficiently high so that during service the solder joints do not lose their mechanical strength.³

2) Metallurgy:

Another crucial attribute of the alloy is that it must wet the common engineering metals and metallizations (silver, copper, nickel, etc). Ideally, new alloys should also be compatible with existing fluxes, stable and non-corrosive that they can withstand the stress/strain/temperature regimes encountered in electronic applications.

3) Environment Health and Safety Issues:

The alloy and its components must be non-toxic. Similar considerations apply to the soldering fluxes and the cleaning agents.

4) Economic and Supply Issues:

For any alloy to be considered as a potential replacement for tin-lead solder, its components must be in sufficient supply that it would not be subject to price constraints.

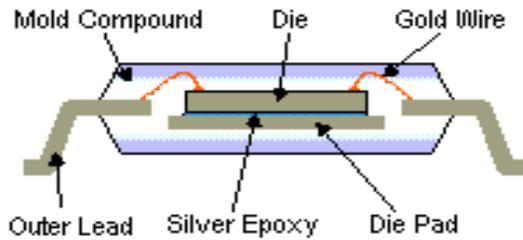
3.5.3 Lead-free Solder Solutions

There are a number of low melting point elements that can be combined to form feasible solder systems. The most practical solder systems are based on tin and bismuth or matte tin. ISSI has already provided millions of devices for memory products with lead-free external terminals. The composition and plating thickness of the lead-free solder solutions follow:

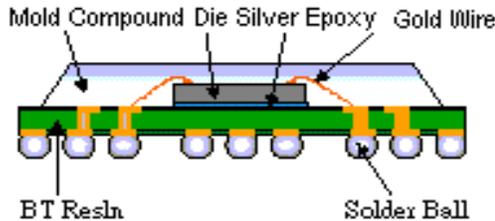
1) Outer lead:

⊕ Plating composition : Pure matte Tin Plating thickness: 300 to 800 micro-inches(7.6 to 20.3 um). The thickness of plating of curved region of shoulder and heel region due to the plating layer is stretched and will be reduce to min 3 um after lead forming.

³ The melting point of tin-lead eutectic at 183 °C provides a useful compromise between these two criteria.



2) Solder ball: Composition : 96.5 Sn 3.0 Ag 0.5 Cu

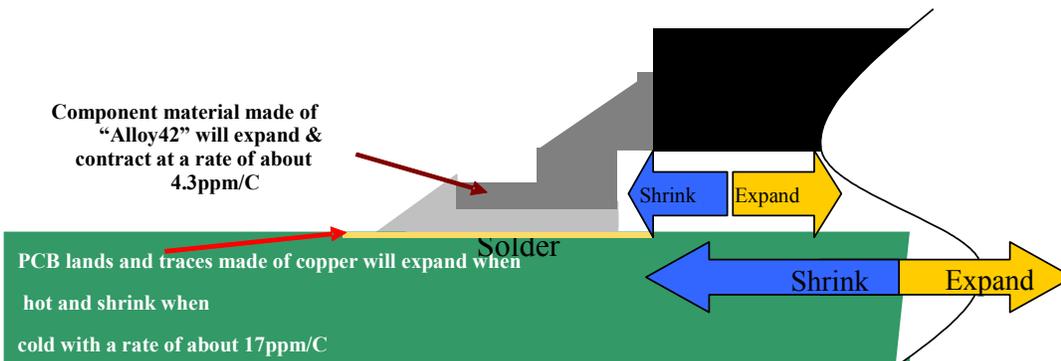


3) A copper lead frame with pure matte tin plating for SDRAM (optional).

ISSI is now offering an additional option for a range of DRAMs made of a copper lead frame with pure matte tin plating. The solution provides several reliability benefits, while reducing total cost of ownership.

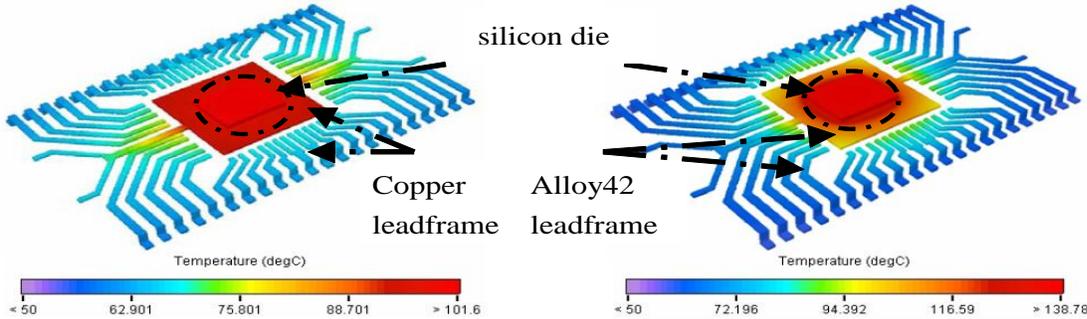
Better Joint Reliability

- ⊕ The circuit boards in many applications will experience repeated temperature changes as time goes on.
- ⊕ A problem can arise because every kind of material on the surface of the board has a different responsiveness to heat, often referred to as its coefficient of thermal expansion (CTE).
- ⊕ Eventually, solder joints can crack from the pulling forces of expansion and contraction. When a part with a conventional Alloy42 lead frame is mounted on a copper surface, there would be approximately a 3-to-1 ratio of expansion /contraction.
- ⊕ Parts made with a copper lead frame expand and contract the same amount as the copper pads, minimizing the stresses at the joints.

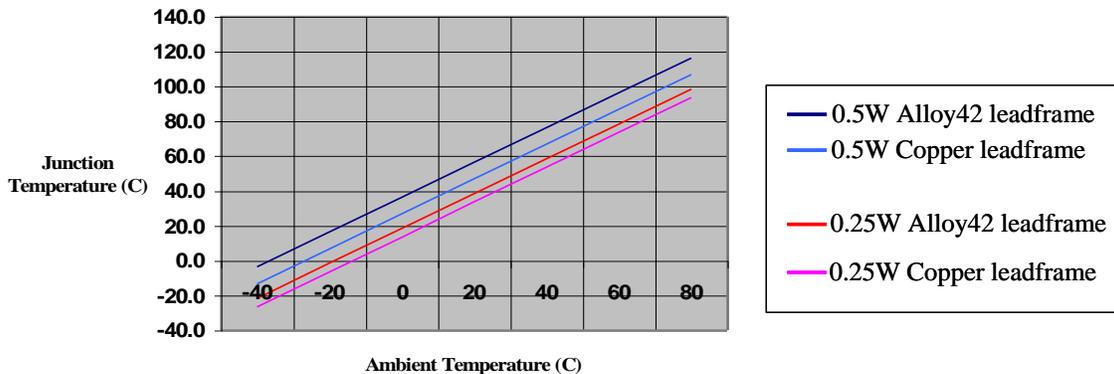


Better Thermal Dissipation

- ⊕ A hypothetical analysis was made of two components that are identical, except for their leadframe materials. Both have the same power draw (1 watt), and sit in the same ambient air temperature (50°C).



- ⊕ Mostly due to the lesser thermal conductance of the Alloy42 metal, the chip on the right reaches a temperature of about 139°C, but the chip on the left sits at a relatively cooler 102°C. With typical power use, the chip in the copper leadframe package would be about 5°C to 10°C cooler than the one in the Alloy42 package.



3.6 Halogen-free Solution

3.6.1 Overview

In epoxy molding compounds and substrates, halogens and antimony trioxide are usually used as flame retardant to meet UL94V-0 requirement. When electronic products contain those substances are disposed and incinerated, it is possible to produce harmful dioxins.

3.6.2 Halogen-free Compound Status

When normal compounds are replaced with phosphorous and inorganic compounds, the moldability and reliability may be lessened. However, several industrial consortia and ISSI assemblers have evaluated halogen-free compound. Safe materials for replacement have been successfully developed with wide molding window and excellent reliability, and are commercially available now. The providers include Hitachi Chemical, Sumitomo Bakelite, ShinEtsu, Kyocera etc... ISSI is currently ready to provide samples or components with halogen-free⁴ compound for lead-free packages upon customer's request.

3.6.3 Halogen-free Substrate Status

Several industry consortia and ISSI assemblers have also evaluated halogen-free substrate. Safe materials for replacement have been successfully developed and are commercially available now. ISSI is currently ready to provide samples with halogen-free substrate for lead-free packages⁵ upon customer's request

3.7 Pb-free/Halogen-free Evaluation/Qualification Information

3.7.1 Commercial / Industrial Grade Products

The evaluation/qualification of products for general purpose is carried out in two stages. One is the standard procedure that includes preconditioning test and environmental tests. The other is the evaluation/qualification of solder plating.

1) Component or Package Level Tests

In this stage, the qualification items and procedures are similar to that of the regular packages as described in chapter 3. The details are shown in Table 5-6 and the major difference is that the IR reflow temperature of preconditioning is higher (260 °C).

Reliability Test Items	Test Method	Test Conditions	S/S	Acc/Rej
Preconditioning MSL 3 (Heat resistance test included)	JESD22-A113 & J-STD-020	30C / 60%RH / 192hrs + 260C IR x 3	240	0/1
TCT (Temp cycling)	JESD22-A104	- 65 to 150 C / 500 cycles	77	0/1
PCT (Autoclave or pressure cooker)	JESD22-A102	121 C / 100 %RH / 15 psi / 168 hrs (Not apply for BGA packages)	77	0/1
HAST (Highly Accelerated Stress Test)	JESD22-A110	130C / 85%RH / 33.3 psi / 96 hrs	77	0/1

Table 5-6 Component level tests

⁴ Halogen-free will cause further cost increment in comparison with lead-free. Material supply chain availability and cost concern in new material will rely on market demand in green product.

⁵ The suitable halogen-free substrate for lead-free package will be available after meeting criteria specified in JEDEC level 3 with triple IR reflows @ 260 degree C.

2) Solder Plating Quality/Reliability Evaluation

The solder paste and solder plating material used in Pb-free package require higher temperature in the SMT process because these materials have higher melting point. To ensure the transition from regular package to Pb-free package will not result in detrimental failure, it is crucial to examine the mechanical properties of the solder joints, which determines the resistance to installation and handling mechanics.

Before the solder joint test, the package will go through the SMT process in which the preheating temperature is ramping up from 130 °C to 170 °C within 45 to 90 seconds. Then the package is heated to 225 °C or more within 20 to 30 seconds. The peak temperature is 230 °C or less at solder joint of terminal. The solder paste is Sn/3.0 Ag/0.5 Cu.

Solder joint strength tests are carried out by two items:

Item 1: lead pull strength

- all the packages will go through the pretreatment of moisture soaking at 105 °C under 100% relative humidity for 4 hours
- perform TCT test under the condition of –35 °C to 85°C with 30 minutes/cycle
- measure lead pull strength at 0, 250, 500 and 1000 cycles.

The pass criterion requires that the final lead pull strength has to exceed half of the initial values.

Item 2: cross-sectional view study

- perform SEM cross-sectional view study after 0, 250, 500 and 1000 cycles.

The pass criterion requires that the final solder joint width has to exceed half of the initial values.

3.7.2 Advanced Electronic Grade Products

For products used in advanced applications, we will either introduce extra test items or tighten the test conditions/criteria.

1) Component or Package Level Tests

For component level test, we add HTSL (High Temperature Storage Life) item to check the resistance of package to the prolonged high temperature storage condition.

For stricter test conditions/criteria, first of all, all the acceptance criteria allow zero failures only. In addition, final test (FT) check before and after the test is a must for all the test items involved. In some cases, FT at various temperatures are also specified such as in the PCT and HTSL tests as shown in Table 5-7.

Reliability Test Items	Reference Doc.	Test Method	Sample size/Lot	Accept Criteria	Notes
Preconditioning (Heat resistance test included)	AEC-Q100#A1	J-STD-020 & JESD22A113	231/ 3 lots	0 fails	MSL3 at least. PC performed prior to TCT, PCT and THB/HAST stresses. F/T checked before and after at room temp. Delamination from die surface is acceptable if the device can pass subsequent qualification tests.
TCT (Temperature Cycling)	AEC-Q100#A4	JESD22A104	77/ 3 lots	0 fails	Grade 1 : -65C~150C, 500 cycles. F/T checked before and after at high temp. Decap procedure on 5 units/ 1 lot after test completed, and perform wire pull test on 2 corner bonds per corner and 1 mid-bond per side.
PCT (Autoclave or Pressure cooker)	AEC-Q100#A3	JESD22A102 or A118	77/ 3 lots	0 fails	121C/15psi/168 hrs (Not apply for BGA packages). F/T checked before and after at room temp.
THB (Temp Humidity Bias) or HAST (Highly Accelerated Stress Test)	AEC-Q100#A2	JESD22A101 or A110	77/ 3 lots	0 fails	THB: 85C/85%RH/1000 hrs with bias or HAST: 130C/85%RH/33.3psi/96 hrs with bias. F/T checked before and after at room and high temp.
HTSL (High Temp Storage Life)	AEC-Q100#A6	JESD22A103	45/ 1 lot	0 fails	Grade 1 : 150C, 1000 hrs. F/T checked before and after at room and high temp.

Table 5-7 Component level tests for advanced applications

2) Solder Plating Quality/Reliability Evaluation

Besides the aforementioned solder joint strength test, three more test items are added for advanced electronic applications. They are: the solderability and wettability test, the tin whisker check, and the electrical continuity check with Daisy Chain.

a) Solderability and wettability test

This test determines the solderability of terminals after transportation and storage. Equilibrium method will be adopted to measure the Meniscus force curve. The acceptance criterion requires the zero cross time to be less than 3 seconds.

b) Tin whisker

The extent of tin whisker growth of Pb-free package is much worse than in the regular package because the built-in stress is quite different. If this reliability issue is not well taken care of, the product might get shorted after prolonged service in the field.

The tin whisker tests will be carried out with three different approaches:

- perform TCT test under the condition of -55 °C to 85 °C with 10 minutes soak ; 3 cycles / hour for 1500 cycles .

- perform THT (Temperature humidity storage) under the condition of 30 ± 2 °C and $60 \pm 3\%$ RH relative humidity for 4,000 hrs.
- perform THT (High temperature humidity storage) under the condition of 55 ± 3 °C and 85 ± 3 % RH relative humidity for 4,000 hrs.

After the tests, the length of any tin whisker will be checked. The acceptance criterion is 45 μ m maximum for TCT testing & 40 μ m for temperature humidity storage (Room Temp & High Temp) by stereoscope at 40X or SEM at 300X above.

ISSI implements annealing process to reduce tin whisker growth, for the pure matte tin of terminal is performed the heat treatment with 1hr @ 150 °C within 24 hrs after plating process.

c) Daisy chain

For this test, we will perform preconditioning test and TCT test for 3000 cycles. The acceptance criterion is that the electrical continuity should be guaranteed after 3000 cycles.

3.8 Current Status

The development work on lead-free solders has been launched by a number of organizations and institutions through either formal partnership or professional alliance in U.S., Europe and Japan. The qualified lead-free and halogen-free packages for mass production.

However, both lead-containing and lead-free packages will be provided in parallel for customers' choice.

3.9 Solder Heat Resistance for PCBA (PC Board Assembly)

Surface Mount devices (SMD) have become popular in recent years due to their advantage in high-density mounting. However, SMD package delamination often occurring between the chip/die pad and the molding compound, caused by thermal stress during mounting, has also become a problem. To assure all ISSI's products not plagued by this problem, all lead-free packages are required to meet JEDEC standard, Level 3. The recommended soldering methods and constraints are described below:

1) Reflow soldering method

Peak temperature: 260 °C maximum, 30 seconds, soldering zone: 217 °C or more, 60 to 150 seconds, number of cycles: 3 cycles

2) Soldering iron method:

Temperature: 380 °C max., application time of soldering iron: 5 seconds maximum, number of cycles: 2 cycles

3.10 Lead Time from Ordering to Delivery

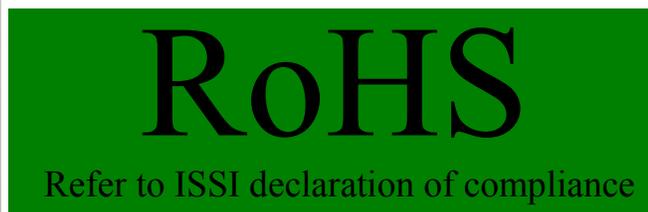
The maximum lead-time from ordering to delivery, for sample evaluation and mass production on unqualified lead-free and halogen-free products, is 2 and 3.5 months respectively. Should you have any comments, suggestions, or questions, please contact ISSI regional Sales office for details.

3.11 Distinguishing Mark of Lead-free and RoHS compliance Package

- 1) Add an "L" or a "G" to the end of the part number. Please refer to the documents of packing and IC top mark.
- 2) Add lead-free discrimination stamp on dry pack, inner box and outer box (Fig. 5-3a)
- 3) Add RoHS label on reel, dry pack, inner box and outer box (Fig. 5-3b).



(a)



(b)

Figure 5-3 Discrimination stamp & RoHS Label

3.12 Re-flow Temperature Profile for Lead-free Package

Pb-free Process – Package Classification Reflow Temperatures

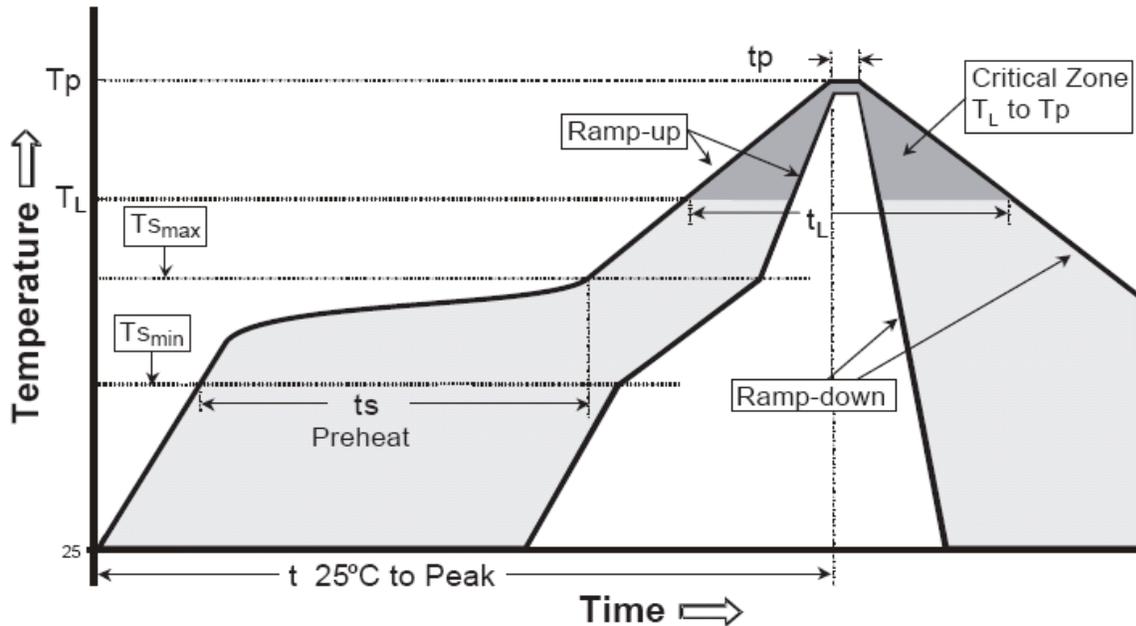
Package Thickness	Volume mm ³ < 350	Volume mm ³ : 350- 2000	Volume mm ³ > 2000
<1.6 mm	260°C	260°C	260°C
1.6 mm - 2.5 mm	260°C	250°C	245°C
>2.5 mm	250°C	245°C	245°C

Profile Feature	Pb-free Assembly
Ramp-Up Rate(TL to Tp)	3 °C/second max.
Preheat– Temperature Min (T _{smin}) to Max (T _{smax})	150~200 °C
– Time (t _{smin} to t _{smax})	60-120 seconds
Time maintained above – Temperature (T _L)	217 °C
– Time (t _L)	60-150 seconds
Peak Temperature (T _p) (Note 2)	See package classification
Time within 5 °C of actual Peak, Temperature (t _p)	30 seconds (Note 3)
Ramp-Down Rate(T _p to T _L)	6 °C/second max.
Time 25 °C to Peak Temperature	8 minutes max.
Number of applicable Temperature cycles	3 cycles max.

Notes: 1. All temperatures refer to top side of the package, measured on the package body surface.

2. The peak temperature (T_p) is defined as package heatproof min. and customer used max.

3. The time at peak temperature (t_p) is defined as package heatproof min. and customer used max.



5.3.13 Recommended Storage Condition



Caution

This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL

3

1. Calculated shelf life in sealed bag: 12 months at <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)
2. Peak package body temperature: $^{\circ}\text{C}$ (If blank, see IPC/JEDEC J-STD-020)
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
 - a) Mounted within: 168 hours of factory conditions <math><30^{\circ}\text{C}/60\%</math> RH, or
 - b) Stored at <math><10\%</math> RH
4. Devices require bake, before mounting, if:
 - a) Humidity Indicator Card is >10% when read at $23 \pm 5^{\circ}\text{C}$
 - b) 3a or 3b not met
5. If baking is required, devices may be baked for 48 hours at $125 \pm 5^{\circ}\text{C}$

Note1: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Note2: If parts packed in T/R and tube, they should be transferred to metal tube or high temp. (150°C) tray for baking process.

Bag Seal Date: _____

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

3.14 ISSI Declaration of Compliance

ISSI issues a letter of declaration to certify that parts are compliant to:

- 1) RoHS (EU Directive entitled “Restriction on the use of certain Hazardous Substances 2011/65/EU, and 2006/122/EC”) requirements and containing none of the following 7 substances: Pb, Hg, Cd, Cr(VI), PBB, PBDE, and PFOS.
- 2) The 181 SVHC (Substance of Very High concern) of EU directive of the Regulation (EC) No 1907/2006 (REACH): the part shall not contain more than the 0.1% of the following SVHC by weight of part as defined in appendix also including annex XVII.
- 3) IEC 61249-2-21, JPCA-ES01 2003 & IPC 4101, the Br, Cl, must be lower than 900 ppm, respectively, and total amount of PPM must be lower than 1500 ppm (Br + Cl <math><1500</math> ppm).
- 4) Conflict Materials and EICC by not using the materials from mines with inferior working conditions, such as DRC (Democratic Republic of the Congo). The suppliers or subcontractors will trace the supply chain for gold (Au), tantalum (Ta), tungsten (W), tin (Sn) and cobalt (Co).



Feb. 21st, 2018

Declaration of RoHS (including PFOS & REACH) Compliance

Dear Customer,

ISSI hereby declares that all our lead free products satisfy the following requirements/conditions:

- 1) Using a “L” or “G” after the package type designating letter in the IS prefix or IC prefix part number for identification respectively.
- 2) Complying with the RoHS 2.0 (2011/65/EU+EU 2015/863) directive including annex XVII & XIV regulation (EC) no. 1907/2006 with none of exemption , China RoHS and Halogen free restricting the use of certain materials in products. The RoHS and Halogen Free restricted substances per the definition below:

Regulations	Substances	Allowable concentration
RoHS directive (2011/65/EU) (EU 2015/863)	Cadmium (Cd)	100 ppm
	Lead (Pb)	1000 ppm
	Mercury (Hg)	1000 ppm
	Hexavalent Chromium (Cr6+)	1000 ppm
	Poly Brominated Biphenyls (PBB)	1000 ppm
	Poly Brominated Diphenyl Ethers (PBDE)	1000 ppm
	PFOS	1000 ppm
	Phthalates (DEHP,BBP,DBP,DIBP)	1000 ppm
Halogen Free (IEC 61249-2-21, JPCA-ES01 2003 & IPC 4101)	Bromine (Br)	< 900 ppm
	Chlorine (Cl)	< 900 ppm
	Total concentration of Chlorine (Cl) +Bromine (Br)	< 1500 ppm

- 3) Complying with the IPC/JEDEC J-STD-020 with regard to the solder profile requirement (Max. reflow temperature 260 deg.C)
- 4) Complying with the 181 SVHC of EU directive of the Regulation (EC) No 1907/2006 (REACH): the part shall not contain more than the 0.1% of the following SVHC by weight of part as defined in appendix. (ECHA Candidate list table : <http://echa.europa.eu/web/guest/candidate-list-table>)

This Declaration is made with ISSI’s best commercial effort to verify the compliance, of its suppliers, with the above requirement, and is given in good faith without any responsibility or liability. The statement here above does not extend to or apply to the procedures subject to unintentional contamination, misuse, neglect, accident, improper installation or any use in violation of instructions furnished by ISSI.

This Declaration contains the entire understanding between you and ISSI with respect to this subject matter and supersedes all prior agreements, understandings and/or representations. Please let us know if there is any further concern.

Sincerely Yours,

Shou-kong Fan
Vice President

Quality & Reliability Assurance Division

No.2, Technology Rd. V, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.

Appendix: Complying with 181 SVHC (substance of very high concern) of the Regulation (EC) No 1907/2006 (REACH)

Revision: Jan. 2018

No.	Substance Name	CAS No.
1	三乙基砷酸酯 Triethyl arsenate	15606-95-8
2	蔥 Anthracene	120-12-7
3	4,4'- 二氨基二苯甲烷 4,4'- Diaminodiphenylmethane(MDA)	101-77-9
4	鄰苯二甲酸二丁酯 Dibutyl phthalate(DBP)	84-74-2
5	氯化鈷 Cobalt dichloride	7646-79-9
6	五氧化二砷 Diarsenic Pentaoxide	1303-28-2
7	三氧化二砷 Diarsenic trioxide	1327-53-3
8	重鉻酸鈉 · 二倍結晶水 Sodium Dichromate	7789-12-0 10588-01-9
9	5-叔丁基-2,4,6-三硝基間二甲苯 5-tert-butyl-2,4,6-trinitro-m-xylene(musk xylene)	81-15-2
10	鄰苯二甲酸二(2-乙基己基)酯 Bis(2-ethylhexyl) Phthalate (DEHP)	117-81-7
11	六溴環十二烷 Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified: Alpha-hexabromocyclododecane Beta-hexabromocyclododecane Gamma-hexabromocyclododecane	25637-99-4 3194-55-6 134237-50-6 134237-51-7 134237-52-8
12	短鏈氯化路蠟 Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	85535-84-8
13	氧化三丁錫 Bis(tributyltin)oxide (TBTO)	56-35-9
14	砷酸氫鉛 Lead hydrogen arsenate	7784-40-9
15	鄰苯二甲酸丁酯苯甲酯 Benzyl butyl phthalate (BBP)	85-68-7
16	蔥油 Anthracene oil	90640-80-5
17	蔥油 · 蔥糊 · 輕油 Anthracene oil, anthracene paste, distn. Lights*	91995-17-4
18	蔥油 · 蔥糊 · 蔥餾分離液 Anthracene oil, anthracene paste, anthracene fraction	91995-15-2
19	蔥油 · 含蔥量少 Anthracene oil, anthracene-low	90640-82-7
20	蔥油 · 蔥糊 Anthracene oil, anthracene paste	90640-81-6
21	煤瀝青 · 高溫 Coal tar pitch, high temperature	65996-93-2
22	丙烯醯胺 Acrylamide	79-06-1
23	矽酸鋁 · 陶瓷耐火纖維 Aluminosilicate Refractory Ceramic Fibres are fibres covered by index number 650-017-00-8 in Annex VI, part 3, table 3.1 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, and fulfil the three following conditions: a) oxides of aluminium and silicon 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 (Na ₂ O+K ₂ O+CaO+MgO+BaO) content less or equal to 18% by weight	None

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24	矽酸鋁氧化鋯·陶瓷耐火纖維 Zirconia Aluminosilicate, Refractor Ceramic Fibres are fibres covered by index number 650-017-00-8 in Annex VI, part 3, table 3.1 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, and fulfil the three following conditions: 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 (Na ₂ O+K ₂ O+CaO+MgO+BaO) content less or equal to 18% by weight	None
25	2,4 二硝基甲苯 2,4-Dinitrotoluene	121-14-2
26	鄰苯二甲酸二異丁酯 Dilsobutyl phthalate	84-69-5
27	鉻酸鉛 Lead chromate	7758-97-6
28	紅色鉻鉬酸硫酸鹽 Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	12656-85-8
29	黃色硫化鉻酸鉛 Lead sulfochromate yellow (C.I. Pigment Yellow 34)	1344-37-2
30	三 2-(氯乙基)磷酸酯 Tris (2-chloroethyl) phosphate	115-96-8
31	三氯乙烯 Trichloroethylene	79-01-6
32	硼酸 Boric acid	10043-35-3 11113-50-1
33	無水四硼酸二鈉 Disodium tetraborate, anhydrous	1303-96-4 1330-43-4 12179-04-3
34	水合七氧四硼酸二鈉 Tetraboron disodium heptaoxide, hydrate	12267-73-1
35	鉻酸鈉 Sodium chromate	7775-11-3
36	鉻酸鉀 Potassium chromate	7789-00-6
37	重鉻酸銨 Ammonium dichromate	7789-09-5
38	重鉻酸 Potassium dichromate	7778-50-9
39	硫酸鈷 Cobalt sulfate	10124-43-3
40	硝酸鈷 Cobalt dinitrate	10141-05-6
41	碳酸鈷 Cobalt carbonate	513-79-1
42	醋酸鈷 Cobalt diacetate	71-48-7
43	2-甲氧基乙醇 2-Methoxyethanol	109-86-4
44	2-乙氧基乙醇 2-Ethoxyethanol	110-80-5
45	三氧化鉻 Chromium trioxide	1333-82-0
46	三氧化二鉻 Chromic acid/重鉻酸 Dichromic acid	7738-94-5 13530-68-2
47	乙酸-2-乙氧基乙酯 2-ethoxyethyl acetate	111-15-9
48	鉻酸鋇 Strontium chromate	7789-06-2
49	鄰苯二甲酸二(C7-11 支鏈與直鏈)烷基酯 1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUF)	68515-42-4
50	胼 Hydrazine	302-01-2 7803-57-8
51	N-甲基吡咯烷酮 1-methyl-2-pyrrolidone	872-50-4
52	1·2·3-三氯丙烷 1,2,3-trichloropropane	96-18-4
53	鄰苯二甲酸二 C6-8 支鏈 烷基酯 1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6

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54	鉻酸鉻 Dichromium tris(chromate)	24613-89-6
55	氫氧化鉻酸鉍鉀 Potassium hydroxyoctaoxidizincatedi-chromate	11103-86-9
56	C.I.顏料黃 36 Pentazinc chromate octahydroxide	49663-84-5
57	甲醛和苯胺聚合物 Formaldehyde, oligomeric reaction products with aniline (technical MDA)	25214-70-4
58	鄰苯二甲酸二甲氧乙酯 Bis(2-methoxyethyl) phthalate	117-82-8
59	鄰-甲氧苯胺 2-Methoxyaniline; o-Anisidine	90-04-0
60	4-三級辛基苯酚 4-(1,1,3,3-tetramethylbutyl)phenol, (4-tert-Octylphenol)	140-66-9
61	1,2-二氯乙烷 1,2-Dichloroethane	107-06-2
62	二甘醇二甲醚 Bis(2-methoxyethyl) ether	111-96-6
63	砷酸 Arsenic acid	7778-39-4
64	砷酸鈣 Calcium arsenate	7778-44-1
65	砷酸鉛 Trilead diarsenate	3687-31-8
66	N,N-二甲基乙醯胺 N,N-dimethylacetamide (DMAC)	127-19-5
67	4,4'-二氨基-2,2'-二氯二苯甲烷, 2,2'-dichloro-4,4'-methylenedianiline (MOCA)	101-14-4
68	酚酞 Phenolphthalein	77-09-8
69	疊氮化鉛 Lead azide Lead diazide	13424-46-9
70	收斂酸鉛 Lead styphnate	15245-44-0
71	苦味酸鉛 Lead dipicrate	6477-64-1
72	三甘醇二甲醚 1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	112-49-2
73	乙二醇二甲醚 1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
74	α,α -二[(二甲氨基)苯基]-4-氨基苯甲醇 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol	561-41-1
75	4'-二(N,N-二甲氨基)二苯甲酮 4,4'-bis(dimethylamino)benzophenone (Michler's ketone)	90-94-8
76	結晶紫 [4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3)	548-62-9
77	鹼性藍 26; 維多利亞藍 B [4-[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26)	2580-56-5
78	三氧化二硼 (無水硼酸) Diboron trioxide	1303-86-2
79	氨基甲醛 Formamide	75-12-7
80	甲基磺酸鉛 Lead(II) bis(methanesulfonate)	17570-76-2
81	N,N,N',N'-四甲基-4,4'-二氨基二苯甲烷 N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base)	101-61-1
82	1,3,5-三縮水甘油-S-三嗪三酮 TGIC (1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione)	2451-62-9
83	A,A-二[4-(二甲氨基)苯基]-4-苯基氨基-1-萘甲醇 α,α -Bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4)	6786-83-0
84	β -TGIC (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione) 異氰脲酸 B-三縮水甘油酯	59653-74-6
85	十溴聯苯醚 Bis(pentabromophenyl) ether (DecaBDE)	1163-19-5
86	全氟十三酸 Pentacosafuorotridecanoic acid	72629-94-8
87	全氟十二烷酸 Tricosafuorododecanoic acid	307-55-1
88	全氟十一烷酸 Henicosafuoroundecanoic acid	2058-94-8
89	全氟代十四酸 Heptacosafuorotetradecanoic acid	376-06-7

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90	辛基酚聚醚-9，包括界定明確的物質以及 UVCB 物質、聚合物和同系物 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated - covering well-defined substances and UVCB substances, polymers and homologues	-
91	分支或線性的壬基酚，含有線性或分支、共價綁定苯酚的 9 個碳烷基鏈的物質，包括 UVCB 物質以及任何含有獨立或組合的界定明確的同分異構體的物質 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 which include any of the individual isomers or a combination thereof	-
92	偶氮二甲醯胺 Diazene-1,2-dicarboxamide (C,C'-azodi(formamide))	123-77-3
93	順環己烷-1,2-二羧酸酐 Cyclohexane-1,2-dicarboxylic anhydride (Hexahydrophthalic anhydride - HHPA)	85-42-7
94	甲基六氫苯酐、4-甲基六氫苯酐、甲基六氫化鄰苯二甲酸酐、3-甲基六氫苯二甲酸酐 Hexahydromethylphthalic anhydride, Hexahydro-4-methylphthalic anhydride, Hexahydro-1-methylphthalic anhydride, Hexahydro-3-methylphthalic anhydride	25550-51-0, 19438-60-9, 48122-14-1, 57110-29-9
95	甲氧基乙酸 Methoxy acetic acid	625-45-6
96	1,2-苯二羧二戊酯 (支鏈和直鏈) 1,2-Benzenedicarboxylic acid, dipentylester, branched and linear	84777-06-0
97	鄰苯二甲酸二異戊酯 Diisopentylphthalate (DIPP)	605-50-5
98	鄰苯二甲酸正戊基異戊基酯 N-pentyl-isopentylphthalate	-
99	乙二醇二乙醚 1,2-Diethoxyethane	629-14-1
100	N,N-二甲基甲醯胺 N,N-dimethylformamide; dimethyl formamide	68-12-2
101	二丁基錫 Dibutyltin dichloride (DBT)	683-18-1
102	城式乙酸鉛 Acetic acid, lead salt, basic	51404-69-4
103	城式碳酸鉛 Basic lead carbonate (trilead bis(carbonate)dihydroxide)	1319-46-6
104	城式硫酸鉛 Lead oxide sulfate (basic lead sulfate)	12036-76-9
105	二鹽基鄰苯二甲酸鉛[Phthalato(2-)]dioxotrilead (dibasic lead phthalate)	69011-06-9
106	雙(十八酸基)二氧化三鉛 Dioxobis(stearato)trilead	12578-12-0
107	C16-18-脂肪酸鉛鹽 Fatty acids, C16-18, lead salts	91031-62-8
108	氟硼酸鉛 Lead bis(tetrafluoroborate)	13814-96-5
109	氨基氰鉛鹽 Lead cyanidate	20837-86-9
110	硝酸鉛 Lead dinitrate	10099-74-8
111	氧化鉛 Lead oxide (lead monoxide)	1317-36-8
112	四氧化三鉛 Lead tetroxide (orange lead)	1314-41-6
113	鈦酸鉛 Lead titanium trioxide	12060-00-3
114	鈦酸鉛鉛 Lead Titanium Zirconium Oxide	12626-81-2
115	氧化鉛與硫酸鉛的複合物 Pentalead tetraoxide sulphate	12065-90-6
116	顏料黃 41 Pyrochlore, antimony lead yellow	8012-00-8
117	摻雜鉛的矽酸鋇 Silicic acid, barium salt, lead-doped	68784-75-8
118	矽酸鉛 Silicic acid, lead salt	11120-22-2
119	亞硫酸鉛 (II) Sulfurous acid, lead salt, dibasic	62229-08-7

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120	四乙基鉛 Tetraethyllead	78-00-2
121	三城式硫酸鉛 Tetralead trioxide sulphate	12202-17-4
122	磷酸氧化鉛 Trilead dioxide phosphonate	12141-20-7
123	呋喃 Furan	110-00-9
124	環氧丙烷 Propylene oxide; 1,2-epoxypropane; methyloxirane	75-56-9
125	硫酸二乙酯 Diethyl sulphate	64-67-5
126	硫酸二甲酯 Dimethyl sulphate	77-78-1
127	3-乙基-2-甲基-2-(3-甲基丁基)噁唑烷 3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine	143860-04-2
128	地樂酚 Dinoseb	88-85-7
129	4,4'-二氨基-3,3'-二甲基二苯甲烷 4,4'-methylenedi-o-toluidine	838-88-0
130	4,4'-二氨基二苯醚 4,4'-oxydianiline and its salts	101-80-4
131	4-胺基偶氮苯 4-Aminoazobenzene; 4-Phenylazoaniline	60-09-3
132	2,4-二氨基甲苯 4-methyl-m-phenylenediamine (2,4-toluene-diamine)	95-80-7
133	6-甲氧基-間-甲苯胺 甲苯胺 6-methoxy-m-toluidine (p-cresidine)	120-71-8
134	4-氨基聯苯 Biphenyl-4-ylamine	92-67-1
135	鄰氨基偶氮甲苯 o-aminoazotoluene	97-56-3
136	鄰甲基苯胺 o-Toluidine; 2-Aminotoluene	95-53-4
137	N-甲基乙酰胺 N-methylacetamide	79-16-3
138	溴代正丙烷 1-bromopropane; n-propyl bromide	106-94-5
139	鎘 Cadmium	7440-43-9
140	氧化鎘 Cadmium oxide	1306-19-0
141	鄰苯二甲酸二戊酯 Dipentyl phthalate (DPP)	131-18-0
142	分支或線性的乙氧基壬基酚，包括含有 9 個碳烷基鏈的所有獨立的同分異構體和所有含有線性或分支 9 個碳烷基鏈的 UVCB 物質 4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof]	-
143	全氟辛酸鈹 Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
144	全氟辛酸 Pentadecafluorooctanoic acid (PFOA)	335-67-1
145	硫化鎘 Cadmium sulphide	1306-23-6
146	鄰苯二甲酸二己酯 Dihexyl phthalate	84-75-3
147	直接紅 28 Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28)	573-58-0
148	直接黑 38 Disodium 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo] -5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38)	1937-37-7
149	亞乙基硫脲 Imidazolidine-2-thione; 2-imidazoline-2-thiol	96-45-7
150	醋酸鉛 Lead di (acetate)	301-04-2
151	磷酸三 (二甲苯) 酯 Trixylyl phosphate	25155-23-1
152	鄰苯二甲酸二己酯 (支鏈和直鏈) 1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4

153	氯化鎘 Cadmium chloride	10108-64-2
154	過硼酸鈉 Sodium perborate; perboric acid, sodium salt	15120-21-5
155	過氧偏硼酸鈉 Sodium peroxometaborate	7632-04-4
156	2-(2'-羥基-3',5'-二-叔-戊基苯基)苯並三唑 (紫外線吸收劑 328) 2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1
157	2-[2-羥基-3',5'-二-叔-丁基苯基]-苯並三唑 (紫外線吸收劑 320) 2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)	3846-71-7
158	二正辛基-双(2-乙基己基巰基乙酸酯)錫 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE)	15571-58-1
159	氟化鎘 Cadmium fluoride	7790-79-6
160	硫酸鎘 Cadmium sulphate	10124-36-4; 31119-53-6
161	二正辛基-双(2-乙基己基巰基乙酸酯)錫和單辛基-三(2-乙基己基巰基乙酸酯)錫的反應物 Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)	-
162	鄰苯二甲酸二(C6-C6)烷基酯：(癸基，己基，辛基)酯與1,2-鄰苯二甲酸的複合物且鄰苯二甲酸二己酯含量≥ 0.3% 1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters; 1,2-benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters with ≥ 0.3% of dihexyl phthalate (EC No. 201-559-5)	68515-51-5 68648-93-1
163	5-仲丁基-2-(2,4-二甲基環己-3-烯-1-基)-5-甲基-1,3-二惡烷[1], 5-仲丁基-2-(4,6-二甲基環己-3-烯-1-基)-5-甲基-1,3-二惡烷[2] [覆蓋任何[1]和[2]或者其任意組合的單獨的異構體 (卡拉花醛及其同分異構物)] 5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [1], 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [2] [covering any of the individual stereoisomers of [1] and [2] or any combination thereof]	-
164	硝苯 Nitrobenzene	98-95-3
165	2,4-貳三級丁基-6-(5-氯苯三唑-2-基)苯酚 (UV-327) 2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV-327)	3864-99-1
166	2-(2H-苯并三唑-2-基)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350) 2-(2H-苯并三唑-2-基)-4-三級丁基-6-二級丁基苯酚(UV-350)	36437-37-3
167	1,3-丙磺內酯 1,3-propanesultone	1120-71-4
168	全氟壬酸及其鈉與銨鹽 Perfluorononan-1-oic-acid and its sodium and ammonium salt	375-95-1 21049-39-8 4149-60-4

169	苯并(a)芘 Benzo[def]chrysene	50-32-8
170	雙酚 A 4,4' -isopropylidenediphenol (bisphenol A)	80-05-7
171	4-庚基苯酚, 支鏈及直鏈 包括含有 7 個碳烷基鏈的所有獨立的同分異構體和所有含有線性或分支 7 個碳烷基鏈的 UVCB 物質 '4-Heptylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 7 covalently bound predominantly in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof]	-
172	十九氟癸酸及其鈉和銨鹽 Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	3108-42-7 335-76-2 3830-45-3
173	對(1,1-二甲基丙基)苯酚 p-(1,1-dimethylpropyl)phenol	80-46-6
174	全氟己基磺酸及其鹽類 Perfluorohexane-1-sulphonic acid and its salts (PFHxS)	355-46-4
175	1,2-苯并菲;(【++快】) Chrysene	218-01-9
176	苯[a]蔥 Benz[a]anthracene	56-55-3
177	硝酸鎘 Cadmium nitrate	10325-94-7
178	氫氧化鎘 Cadmium hydroxide	21041-95-2
179	碳酸鎘 Cadmium carbonate	513-78-0
180	1,6,7,8,9,14,15,16,17,17,18, 18-十二氯五環 [12.2.1.16,9.02,13.05,10]十八碳-7,15-二烯 ("Dechlorane Plus" TM)[含有其任何單獨的反式和順式異構體或其任何組合] 1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene("Dechlorane Plus" TM) [covering any of its individual anti- and syn-isomers or any combination thereof]	-
181	1,3,4-噁二唑-2,5-二硫醇與甲醛和支鏈和直鏈 4-庚基酚的反應產物(RP-HP) [含有≥ 0.1%w/w 支鏈和直鏈的 4-庚基酚] Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) [with ≥ 0.1%w/w 4-heptylphenol, branched and linear]	-



Original issue date: Jan. 15th, 2014

Declaration of Minerals Conflict-Free

Integrated Silicon Solution Inc., for and on behalf of itself and **Integrated Silicon Solution (Cayman), Inc.** (“ISSI Cayman”) and **Integrated Circuit Solution, Inc.**(“ICSI”) Chingis Technology Corporation (“Chingis”) (ISSI, ISSI Cayman, ICSI and Chingis hereinafter collectively referred to as “ISSI Groups”) declare that ISSI Groups do not to purchase and refuse to use conflict minerals, or their derivatives that may directly or indirectly finance or benefit armed groups through mining or mineral trading in the Democratic Republic of Congo (DRC) or an adjoining country.

“Conflict Minerals” are metals such as gold (Au), tantalum (Ta), tungsten (W) and tin (Sn) derived from minerals being sourced from mines in Democratic Republic of Congo (DRC) or an adjoining country (conflict areas) which are controlled by non-government military groups, or unlawful military factions the coverage on human rights violations in the Democratic Republic of the Congo (DRC) and environmental issues resulting from the extraction of minerals.

Integrated Silicon Solution Inc. will take due diligence within our supply chain to assure “DRC Conflict-Free”. Securities and Exchange Commission is adopting a new form and rule pursuant to Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act relating to the use of conflict minerals. Section 1502 added Section 13(p) to the Securities Exchange Act of 1934, which requires the Commission to promulgate rules requiring issuers with conflict minerals that are necessary to the functionality or production of a product manufactured by such person to disclose annually whether any of those minerals originated in the Democratic Republic of the Congo or an adjoining country.

Integrated Silicon Solution Inc. would like to confirm Minerals used in Products sold to customers are “DRC Conflict-Free” and new form and rule pursuant to section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act.

Sincerely Yours,

Shou-kong Fan
Vice President
Quality & Reliability Assurance Division
Date: 2016/3/1

No.2, Technology Rd. V, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.

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Conflict Minerals Reporting Template (CMRT)

English

Revision 5.10
December 1, 2017

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The purpose of this document is to collect sourcing information on tin, tantalum, tungsten and gold used in products

Mandatory fields are noted with an asterisk (*). Consult the instructions tab for guidance on how to answer each question.

Company Information

Company Name (*):	Integrated Silicon Solution Inc.
Declaration Scope or Class (*):	A. Company
Description of Scope:	
Company Unique ID:	60-820-8245
Company Unique ID Authority:	60-820-8245
Address:	1623 Buckeye Drive, Milpitas, California, 95035-7423 USA (Headquarters)
Contact Name (*):	Sales Team
Email - Contact (*):	Sales-US@issi.com
Phone - Contact (*):	408-969-6600
Authorizer (*):	Shou Kong Fan
Title - Authorizer:	Vice President of Q&RA
Email - Authorizer (*):	Sales-US@issi.com
Phone - Authorizer (*):	8863-5780333
Effective Date (*):	21-Feb-2018

Answer the following questions 1 - 7 based on the declaration scope indicated above

1) Is any 3TG intentionally added or used in the product(s) or in the production process? (*)	Answer	Comments
Tantalum (*)	Yes	
Tin (*)	Yes	
Gold (*)	Yes	
Tungsten (*)	Yes	

2) Does any 3TG remain in the product(s)? (*)	Answer	Comments
Tantalum (*)	Yes	
Tin (*)	Yes	
Gold (*)	Yes	
Tungsten (*)	Yes	

3) Do any of the smelters in your supply chain source the 3TG from the covered countries? (SEC term, see definitions tab) (*)	Answer	Comments
Tantalum (*)	Yes	The smelter Ningxia Orient Tantalum Industry Co. Ltd. and Ulba Metallurgical Plant JSC may source from the DRC/covered countries, in addition to other countries but all of these smelters are compliant with the GFS Program.
Tin (*)	Yes	The smelter MSC may source from the DRC/covered countries, in addition to other countries but all of these smelters are compliant with the GFS Program.
Gold (*)	No	
Tungsten (*)	Yes	The smelter Xiamen Tungsten (H.C.) Co. Ltd. may source from the DRC/covered countries, in addition to other countries but all of these smelters are compliant with the GFS Program.

4) Does 100 percent of the 3TG (necessary to the functionality or production of your products) originate from recycled or scrap sources? (*)	Answer	Comments
Tantalum (*)	No	
Tin (*)	No	
Gold (*)	No	
Tungsten (*)	No	

5) What percentage of relevant suppliers have provided a response to your supply chain survey? (*)	Answer	Comments
Tantalum (*)	100%	
Tin (*)	100%	
Gold (*)	100%	
Tungsten (*)	100%	

6) Have you identified all of the smelters supplying the 3TG to your supply chain? (*)	Answer	Comments
Tantalum (*)	Yes	
Tin (*)	Yes	
Gold (*)	Yes	
Tungsten (*)	Yes	

7) Has all applicable smelter information received by your company been reported in this declaration? (*)	Answer	Comments
Tantalum (*)	Yes	
Tin (*)	Yes	
Gold (*)	Yes	
Tungsten (*)	Yes	



An initiative of the EICC and GeSI

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English

Conflict Minerals Reporting Template (CMRT)

Revision 5.10
December 1, 2017

[Link to Terms & Conditions](#)

The purpose of this document is to collect sourcing information on tin, tantalum, tungsten and gold used in products

Mandatory fields are noted with an asterisk (*). Consult the instructions tab for guidance on how to answer each question.

Answer the Following Questions at a Company Level

Question	Answer	Comments
A. Have you established a conflict minerals sourcing policy? (*)	Yes	
B. Is your conflict minerals sourcing policy publicly available on your website? (Note - If yes, the user shall specify the URL in the comment field.) (*)	Yes	http://www.issi.com/US/ROHS-and-Conflict-Minerals.shtml
C. Do you require your direct suppliers to be DRC conflict-free? (*)	Yes	
D. Do you require your direct suppliers to source the 3TG from smelters whose due diligence practices have been validated by an independent third party audit program? (*)	Yes	
E. Have you implemented due diligence measures for conflict-free sourcing? (*)	No	ISSI have managed subcontractors via CFSI conflict minerals reporting template, and asked them must be purchased 3TG metals who are RMAP (Responsible Minerals Assurance Process) conformant smelters, so ISSI will not contact with smelters directly.
F. Does your company conduct Conflict Minerals survey(s) of your relevant supplier(s)? (*)	Yes, in conformance with IPC1755 (e.g., CMRT)	
G. Do you review due diligence information received from your suppliers against your company's expectations? (*)	Yes	
H. Does your review process include corrective action management? (*)	Yes	
I. Is your company required to file an annual conflict minerals disclosure with the SEC? (*)	Yes	