



PRODUCT / PROCESS CHANGE NOTIFICATION

PCN-000985

Date: NOV-05-2024

| Change Details | | |
|---|---|---|
| Part Number(s) Affected: GV7700-INE3 GS6150-INE3 GS6150-INTE3 GS6150-INTE3Z | Customer Part Number(s) Affected: <input checked="" type="checkbox"/> N/A | |
| Description, Purpose and Effect of Change: Chemical compound change in the anti-EBO (epoxy bleed out) agent used on lead frame: Mitsui, Semtech's tier-2 supplier, will stop using C8 fluorine compound as an anti-EBO agent or in the surface activation process for lead frames, as it will be subject to self-regulated environmental hormone-like substance and will no longer be available beginning April 1, 2025. Semtech has approved a new compound, Type-8, to ensure a steady supply of lead frames and prevent any line down situations. | | |
| | CURRENT | NEW |
| Name or type of compound | Type-3 | Type-8 |
| Surface activation process 1 (pre-treatment) | Chemical A | Chemical C - Same components as chemical A, but molecular weight is different. It contains more nitrogen (N) than chemical A. |
| Surface activation process 2 (anti-EBO function) | Chemical B - C6 fluorine compound (main component) - C8 fluorine compound (accessory component) | Chemical B' - C6 fluorine compound (main component) |
| NOTE: The chemicals are not disclosed due to the supplier's proprietary information. | | |
| The current compound, Type-3, weakens its anti-EBO performance without the use of C8 fluorine compound. Chemical C in the new compound, Type-8, will maintain the same anti-EBO performance. | | |




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| | | | |
|--|--|--|---|
| Change Classification | <input type="checkbox"/> Major <input checked="" type="checkbox"/> Minor | Impact to Form, Fit, Function | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Impact to Data Sheet | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | New Revision or Date | <input checked="" type="checkbox"/> N/A |
| Impact to Performance, Characteristics or Reliability: <ul style="list-style-type: none">Overall qualification meets the requirements for assembly, testing, and reliability. | | | |
| Implementation Date | FEB-05-2025 | Work Week | 05 |
| Last Time Ship (LTS) Of unchanged product | N/A | Affecting Lot No. / Serial No. (SN) | N/A |
| Sample Availability | NOV-05-2024 GV7700-INE3 | Qualification Report Availability | NOV-05-2024 |
| Supporting Documents for Change Validation/Attachments: <ul style="list-style-type: none">Assembly Qualification Results SummaryPRODDOC032204 Rev 0 - Reliability Qualification ReportWarranty letter certifying that the new chemicals meet the applicable regulations for hazardous and banned substances | | | |

| Quality Assurance | | |
|---|---|---|
| Semtech Business Unit | Signal Integrity Product Group (SIP) | |
| Semtech Contact Info: | Pedro Jr. Bernas Staff Engineer, Product Quality Engineering pbernas@semtech.com (289) 856-9326 x 1162 |  |
| FOR FURTHER INFORMATION & WORLDWIDE SALES COVERAGE: http://www.semtech.com/contact/index.html#support | | |



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- Assembly Qualification Results Summary

| Lot # | Input | Output | Yield |
|-------------|-------|--------|--------|
| Qual lot #1 | 300 | 277 | 92.33% |
| Qual lot #2 | 300 | 293 | 97.67% |
| Qual lot #3 | 300 | 287 | 95.67% |
| Control lot | 300 | 297 | 99.25% |

| Process | Characteristics | Spec. | Average data |
|------------|---------------------|--------------------|-----------------|
| Die attach | Die shear | Min. 5kg | 11.41 kg |
| | Bond line thickness | 0.5-2.0 mil | 1.13 mil |
| | Epoxy void | Max. 10% | 0% |
| | Epoxy coverage | 100% | 100% |
| Wire bond | Ball shear | Min. 12g | 22.95 g |
| | Wire pull | Min. 4g | 8.19 g |
| | Stitch pull | Min. 4g | 6.78 g |
| Mold | Wire sweep | Max. 15% | 7% |
| | CSAM | No delamination | 0 |
| Plating | Thickness | 400 - 800 μ in | 516.44 μ in |
| | Composition | 100% Sn | 100% |

- Assembly yield for all the qualification lots met Sentech's requirement.
- Process characteristic data passed the assembly requirement.
- Overall, no package assembly issues found using the Type-8 compound.



Reliability Qualification Report for Anti- EBO Agent Change on GV7700 and GS6150 at ASEM

Revision History

| Version | ECO | Date | Modifications |
|---------|------------|----------|---------------|
| 0 | ECO-072545 | Oct 2024 | New Release |

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1 Background

Semtech's GV7700 and GS6150 are currently being assembled at ASEM. The Leadframe supplier, Mitsui High-Tec, Inc has announced that they will discontinue the C8 Fluorine Compound as anti-EBO agent since it is subject to self-regulated substance. Thus, to ensure continuous supply of leadframe and to avoid any line down situation, ASEM has proposed to use leadframe from Mitsui with new chemical for anti-EBO (surface activation) process (from type 3 process to type 8 process). This qualification intends to qualify the change in the anti-EBO process at ASEM.

2 Product Scope

A total of two Semtech products will be affected by this process change. Please see table below for more information about the affected products and their part numbers.

Table 1: Semtech products affected by this process change

| Products | Package type | Qualification Vehicle |
|---------------|---------------|-----------------------|
| GV7700-INE3 | 7x7mm 84L QFN | GV7700 |
| GS6150-INTE3Z | 6x6mm 48L QFN | |
| GS6150-INTE3 | 6x6mm 48L QFN | |
| GS6150-INE3 | 6x6mm 48L QFN | |

3 Qualification Approach

Semtech's GV7700 and GS6150 have already been fully qualified previously. The product qualification reports are available upon request (PRODDOC010275 and PRODDOC009543). Between the two products, GV7700 is selected to be the qual vehicle because of its larger package size, and hence larger form factor in reliability stress. This qualification only intends to qualify the process change related to anti-EBO agent. Thus, die-level reliability stresses (HTOL, ESD and LU) were not planned.

3 lots of GV7700 using the new type-8 process flow and 1 lot of GV7700 using the existing type-3 process flow were built for this qualification. Assembly characterization (wire pull and solderball shear) as well as MSL characterization will be performed on all 4 lots. The lot using existing process flow serves as control lot. For more information about the conditions of reliability stresses, please refer to table 2 in section 4.

4 Reliability Qualification Stresses

Table 2: Reliability qualification stresses for GN1444S-IE3 assembled at Greatek

| Stress | Conditions | Duration | Qualification Vehicle | Sample Size | Result |
|------------------|---|-------------|-----------------------|--|--------|
| Bond Pull | M2011 | N/A | GV7700 | 2 pcs/lot x 3 lots from new process (25 bonds from each) 2 pcs from existing process (25 bonds) | Pass |
| Solderball Shear | JESD22-B117 | N/A | GV7700 | 2 pcs/lot x 3 lots from new process (25 bonds from each) 2 pcs from existing process (25 bonds) | Pass |
| MSL | JESD22-A113 MSL 3 Pre and post MSL CSAM | JESD22-A113 | GV7700 | 45 pcs/lot x 3 lots from new process 45 pcs from existing process | Pass |

5 Conclusion

In conclusion, GV7700 using type 8 anti-EBO process assembled at ASEM successfully passed required reliability stresses. Thus, this process change can be considered qualified on GV7700 and GS6150.

Letter of Warranty for Direct Material

TO: **ASE Electronics (M) Sdn. Bhd.** (hereinafter referred to as "ASE")

1. **Mitsui High-tec, Inc.** (hereinafter referred to as "SUPPLIER") hereby represents and warrants that all the products or parts provided by our company (including the subsidiaries and/or affiliates of our company) to ASE shall strictly comply with the threshold requirements of ASE Green (Details defined in "Specification 1 and 2" attached hereto below, hereinafter collectively referred to as "REQUIREMENT") concerning hazardous substances and the applicable modifications thereon as the case may be.
2. SUPPLIER shall not make any changes of the REQUIREMENT without prior written permission of ASE and shall notify ASE immediately when becoming aware of any change of the REQUIREMENT that may or will affect the nature of the products or parts and shall follow the instruction of ASE to take effective preventive / remedial actions.
3. SUPPLIER shall provide ASE the data sheets and report(s), including without limitation, the MSDS and analysis report at the request of ASE, and all data sheet and report(s) provided by SUPPLIER to ASE shall be certified and approved by a Certified Independent Third Party with ISO/IEC17025 certificate to demonstrate the genuineness and accuracy.
4. SUPPLIER agrees that ASE shall have the right to audit SUPPLIER's factories and/or its manufacturing process of the products or parts. SUPPLIER also agrees to follow ASE's instruction to change if ASE, at its sole discretion, deems SUPPLIER's factories and/or its manufacturing process of the products or parts fail to satisfy the REQUIREMENT.
5. SUPPLIER shall, at its sole expense defend, hold harmless, and indemnify ASE and its respective directors, employees and agents against any and all claims, demands, liabilities, judgments, authorized settlements, legal proceedings, losses, damages, costs and expenses, including without limitation the attorney's fees and costs of suit, arising out of or in connection with SUPPLIER's failure to comply with the REQUIREMENT.
6. In the event any provision of this Letter is determined to be invalid or unenforceable, the remainder of this Letter shall remain in full force and effect.
7. If there is any conflict between the terms of this Letter and the terms of other agreements entered into between ASE and SUPPLIER ("Other Agreements"), including without limitation, the purchase agreement related to ASE's purchase or procurement of the products, the terms of this Letter shall prevail unless the terms of the Other Agreements are more advantageous to ASE.
8. Any disputes arising out of or in connection with this Letter shall be governed by Kaohsiung District Court, Taiwan, R.O.C. and construed by the laws of R.O.C., excluding the conflict of laws and rules.

Supplier Declaration

Put ☒ in applicable box. Please complete Appendix A "Substances Information" if products or parts contain substance(s) listed in specification or under RoHS exemption criteria.

☒ All the products or parts supply to ASE do not contain any of the substance(s) listed in specification.

☐ All the products or parts supply to ASE contain substance(s) listed in specification.

☐ All the products or parts supply to ASE is under RoHS exemption criteria.

Supplier : Mitsui High-tec, Inc. (COMPANY NAME)

Address : 2-10-1 Komine, Yahatanishi-ku, Kitakyushu-shi, Fukuoka, Japan

Signature : S. Hatano

Print Name : '+81-93-614-1152

Title : Manager





ASE GROUP
日月光集團

Date : 21.Mar.2024

Company Seal



Mitsui
High-tec
Inc.

Group Standard Warranty

Specification 1: Requirement and Standard for Control of Hazardous Substances of ASE Green level 1 based on homogeneous material definition.

| Item | Substances | Criteria/ Threshold Level | Description |
|------|---|---|---|
| 1 | 鎘及鎘化合物 Cadmium & it's compounds | Organic Materials: 5 ppm maximum Inorganic Materials: 80 ppm maximum | |
| 2 | 鉛及鉛化合物 Lead & it's compounds | Organic Materials: 100 ppm maximum Inorganic Materials: 800 ppm maximum | |
| 3 | 汞及汞化合物 Mercury & it's compounds | Organic Materials: 800 ppm maximum Inorganic Materials: 800 ppm maximum | |
| 4 | 六價鉻化合物 Hexavalent - Chromium Compounds (Cr ⁶⁺) | Organic Materials: 800 ppm maximum Inorganic Materials: 800 ppm maximum | |
| 5 | 有機溴化合物 Brominated | 多溴聯苯 Polybrominated Biphenyls (PBB) | |
| 6 | Organic Compounds | 多溴聯苯醚 (含 DecaBDE) Polybrominated Diphenylethers (PBDE) (including DecaBDE) | |
| 7 | 特定鄰苯二甲酸鹽 Specific phthalates (DEHP, DBP, BBP, DIBP, DINP, DIDP, DNOP, DNHP, DIHP, DHNUP, DMEP) | 800 ppm maximum | DBP/DEHP/BBP/DIBP must be tested. |
| 8 | 有機氯化合物 (多氯聯苯/多氯化萘/多氯三聯苯/短鍊氯氯化石蠟) Chlorinated Organic Compounds-Polychlorinated Biphenyls (PCB) / Polychlorinated Naphthalenes (PCN) / Polychlorinated Terphenyls (PCT) / Short-Chain Chlorinated Paraffins (SCCP), C10~C13 | PCBs/ PCTs/ PCNs: Banned for intentionally added SCCPs : 1000 ppm maximum | |
| 9 | 有機錫化合物 (三丁基錫化合物/三苯基錫化合物/三丁基氧化錫/二丁基錫/二辛基錫) Organic Tin Compounds(TBT/TPT/ TBTO/DBT/DOT) | Paints, inks, preservatives & fungicides: Banned for intentionally added Others: 1000 ppm maximum | |
| 10 | 鹵素(耐燃鹵化物) Halogen (Cl, Br) | Cl < 900ppm Br < 900ppm Cl+Br < 1500ppm | |
| 11 | 銻及其化合物 Antimony and its compounds | Sb : 700 ppm maximum Sb ₂ O ₃ : Banned for intentionally added | If test result not shown N.D, supplier need to provide warranty letter to prove that does not has Sb ₂ O ₃ |
| 12 | 鈹及其化合物 Beryllium and its compounds | All : 1000 ppm maximum BeO/ BeCu: Banned for intentionally added | Some gold wire may contain Beryllium (about <15 ppm), supplier need to provide warranty letter to declare that does not has Beryllium Oxide & Beryllium Copper. |
| 13 | 全氟辛烷磺酸(及其鹽) Perfluorooctane Sulfonates (PFOS) and its salts and other derivatives (including polymers) | 1000 ppm maximum | |
| 14 | 全氟辛酸鈹 Perfluorooctanoic Acid (PFOA)) and its salts and other derivatives (including polymers) | 10 ppm maximum | |
| 15 | 聚氯乙烯以及聚氯乙烯混合物 Polyvinyl chloride (PVC) and PVC blends | Banned for intentionally added | |
| 16 | 六溴環十二烷 Hexabromocyclododecane (HBCDD) | Solder paste < 500 ppm Others: 1000 ppm maximum | |

Note 1: Supplier shall provide test report for substances listed in Specification 1

Note 2: Unless otherwise mutually agreed by the parties in writing, the sample preparation method and the analytical method will be performed or provided by an independent third party with ISO/IEC17025 accreditation.

Note 3(a): "Organic Materials" are a general term of organic compounds which are chemical compounds whose molecules contain carbon. It covers plastic, rubber, ink and so on.

Note 3(b): "Inorganic Materials" are a general term of inorganic compounds which are chemical compounds except organic compounds.

[3]

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It covers metal, alloy, ceramic, and so on.

Specification 2: Requirement and Standard for Control of Hazardous Substances of ASE Green level 2 based on homogeneous material definition.

| Item | Substances | Criteria/ Threshold Level | Description |
|------|--|---|--|
| 1 | 石棉 Asbestos | Banned for intentionally added | |
| 2 | 偶氮化合物 Azo compounds | Banned for intentionally added | |
| 3 | 臭氧層破壞物質 & 溫室氣體 Ozone Depleting Substance & Greenhouse Gases | Banned for intentionally added | |
| 4 | 特定苯駢三氮唑 Specific Benzotriazole 2-(3',5'-Di-tert-butyl-2'-hydroxyphenyl)benzotriazole | Banned for intentionally added | |
| 5 | 砷及其化合物 Arsenic and its compounds | As in Cu foil < 1000ppm Banned for intentionally added | |
| 6 | 14~17 碳氯化石蠟 Medium-chained chlorinated paraffins, C14-C17 MCCP | 1000 ppm maximum | |
| 7 | 合成麝香 (含二甲苯麝香/酮麝香) Synthetic musks (Including musk xylene / Musk ketone) | 500 ppm maximum | |
| 8 | 五氯苯酚 Pentachlorophenol (PCP) and its salts and esters | 5 ppm maximum | |
| 9 | 放射性物質 Radioactive substances | Banned for intentionally added | |
| 10 | 紅磷 Red Phosphorus | Banned for intentionally added | |
| 11 | 雙酚 A(二酚基丙烷) Bisphenol A | Banned for intentionally added | Except in substrate MGC core / PP of substrate: <0.3wt% (SGS RSTS CHEM-239-1 method) <1wt% (MGC internal method) |
| 12 | 滅蟻靈 Mirex (Perchlorodecone) | Banned for intentionally added | |
| 13 | 三氯沙 Triclosan | 10 ppm maximum | |
| 14 | 四溴雙酚-A Tetrabromobisphenol - A (TBBP-A) | Banned for intentionally added | |
| 15 | 甲醛 Formaldehyde | Banned for intentionally added | For the wooden product made from fiberboard, particleboard, or plywood, which are employed in products |
| 16 | 介面活性劑 (二牛油基二甲基氯化銨/雙十八烷基二甲基氯化銨/二(硬牛油)二甲基氯化銨) Surfactants (DTDMAC/ DODMAC/DSDMAC/ DHTDMAC) | 1000 ppm in total (maximum) | |
| 17 | 二氯化鈷 Cobalt dichloride (CoCl ₂) | Banned for intentionally added | |
| 18 | 富馬酸二甲酯 Dimethyl fumarate (DMF) | 0.1 ppm maximum | |
| 19 | 磷酸三(2-氯乙基)酯 Tris (2-chloroethyl) phosphate (TCEP) Tris(2-chloro-1-methylethyl) phosphate (TCPP) Tris(1,3-dichloro-2-propyl) phosphate (TDCPP) | 1000 ppm maximum | |
| 20 | 硼酸 Boric acid | 1000 ppm maximum | |
| 21 | 對特辛基苯酚 4-(1,1,3,3-tetramethylbutyl) phenol | 1000 ppm maximum | |
| 22 | 二甘醇二甲醚 Bis(2-methoxyethyl) ether | 1000 ppm maximum | |
| 23 | N,N-二甲基乙醯胺 N,N-dimethylacetamide (DMAC) | 1000 ppm maximum | |
| 24 | 多環芳香 PAHs | For Solder mask < 1000ppm Others: 0.5 ppm maximum | |
| 25 | 高氯酸鹽 Perchlorates | <0.006ppm | |
| 26 | 乙二醇二甲醚 Ethylene glycol dimethyl ether (EGDME) | <1000ppm | |
| 27 | 磷酸三(二甲苯)酯 Trixylyl phosphate (TXP) | <1000ppm | |

[4]

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