TEST REPORT
(测试报告件)

申请公司(APPLICANT)：SAMSUNG ELECTRO-MECHANICS

公司住所(ADDRESS)：150, Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea

报告号(REPORT NO.)：RT19R-S4740-042-C
日期(DATE)：2019年11月06日

样品描述(SAMPLE DESCRIPTION)：

样品名称：MLCC C0G Cu TYPE
样品编号：RT19R-S4740-042
生产商/贸易商：SAMSUNG ELECTRO-MECHANICS
样品收到日期：2019年10月23日
测试进行日期：2019年10月23日至2019年11月05日

测试方法：参见续页。
测试结果：请见续页。

注1：检测结果仅针对来样所做的测试。
(Note 1: The test results presented in this report relate only to the object tested.)

注2：未经测试实验室书面允许，报告不能被部分复制。
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注3：此报告所测试项目并不属于KOLAS认证范围内。
(Note 3: This report is not related to the scope of Korea laboratory accreditation scheme.)

测试(Approved by)：
Jade Jang / 测试负责人

批准(Authorized by)：
Bo Park / 实验室经理

Intertek Testing Services Korea Ltd.
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<th>结果 (RESULT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>镉 (Cadmium, Cd)</td>
<td>mg/kg</td>
<td>参照 IEC 62321-5 Edition 1.0 : 2013, 用 ICP-OES 进行的分析</td>
<td>0.5</td>
<td>N.D.</td>
</tr>
<tr>
<td>铅 (Lead, Pb)</td>
<td>mg/kg</td>
<td>用 ICP-OES 进行的分析</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>汞 (Mercury, Hg)</td>
<td>mg/kg</td>
<td>参照 IEC 62321-4 Edition 1.0 : 2013, 用 ICP-OES 进行的分析</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>六价铬 (Hexavalent Chromium, Cr⁶⁺)</td>
<td>mg/kg</td>
<td>参照 IEC 62321-7-2 Edition 1.0 : 2017, 用 alkaline/toluene digestion 用 UV-VIS Spectrophotometer 进行的分析</td>
<td>8</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

多溴联苯 (Polybrominated Biphenyl, PBBs)
- 一溴联苯 (Monobromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 二溴联苯 (Dibromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 三溴联苯 (Tribromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 四溴联苯 (Tetrabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 五溴联苯 (Pentabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 六溴联苯 (Hexabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 七溴联苯 (Heptabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 八溴联苯 (Octabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 九溴联苯 (Nonabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 十溴联苯 (Decabromobiphenyl) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |

多溴联苯醚 (Polybrominated Diphenyl Ether, PBDEs)
- 一溴联苯醚 (Monobromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 二溴联苯醚 (Dibromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 三溴联苯醚 (Tribromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 四溴联苯醚 (Tetrabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 五溴联苯醚 (Pentabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 六溴联苯醚 (Hexabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 七溴联苯醚 (Heptabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 八溴联苯醚 (Octabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 九溴联苯醚 (Nonabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |
- 十溴联苯醚 (Decabromodiphenyl ether) | mg/kg | 用 GC/MS 进行的分析 | 5 | N.D. |

Tested by: Jooyeon Lee, Seulgi Park, Miseon Lee

注释 (Notes): mg/kg = ppm = 百万分之一 (parts per million)

< = 小于 (Less than)

N.D. = 未检出 (Not detected (<MDL))

MDL = 报告限量值 (Method detection limit)

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<th>结果 (RESULT)</th>
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<tbody>
<tr>
<td>溴 (Bromine, Br)</td>
<td>mg/kg</td>
<td>参考 EN 14582, IC 测试定量</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>氯 (Chlorine, Cl)</td>
<td>mg/kg</td>
<td>参考 EN 14582, IC 测试定量</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>砷 (Arsenic, As)</td>
<td>mg/kg</td>
<td>参考 US EPA 3052, 酸消化法处理样品，ICP-OES 测试定量</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>铍 (Beryllium, Be)</td>
<td>mg/kg</td>
<td>参考 US EPA 3052, 酸消化法处理样品，ICP-OES 测试定量</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>锑 (Antimony, Sb)</td>
<td>mg/kg</td>
<td>参考 US EPA 3052, 酸消化法处理样品，ICP-OES 测试定量</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>聚氯乙烯 (Polyvinyl chloride, PVC)</td>
<td>-</td>
<td>参考 KS K 0210-1, FT-IR 测试定量</td>
<td>N.A.</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Tested by: Hyojoo Kim, Jooyeon Lee

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<= = 小于 (Less than)
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N.A. = 不适用 (Not applicable)
Negative = Undetectable
Positive = Detectable
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</thead>
<tbody>
<tr>
<td>六溴环十二烷 (Hexabromocyclododecane, HBCDD)</td>
<td>mg/kg</td>
<td>参考 IEC 62321-9(111/409/CD), 溶剂萃取法, LC/MS 和 GC/MS 测试定量</td>
<td>10</td>
<td>N.D.</td>
</tr>
<tr>
<td>SCCP (Short-chain chlorinated paraffin)</td>
<td>mg/kg</td>
<td>参考 US EPA 3540C, 溶剂萃取法, LC/MS/MS 和/或 GC/ECD 测试定量</td>
<td>100</td>
<td>N.D.</td>
</tr>
<tr>
<td>PCBs (Polychlorinated biphenyls)</td>
<td>mg/kg</td>
<td>参考 US EPA 3540C/8082, 溶剂萃取法, GC/MS 测试定量</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>PCTs (Polychlorinated terphenyls)</td>
<td>mg/kg</td>
<td>参考 US EPA 3540C, 溶剂萃取法, GC/MS 测试定量</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>PCNs (Polychlorinated naphthalenes)</td>
<td>mg/kg</td>
<td>参考 US EPA 3540C, 溶剂萃取法, GC/MS 测试定量</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>PCP (Pentachlorophenol)</td>
<td>mg/kg</td>
<td>参考 ISO 17070, GC/MS 测试定量</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>PFOA (Perfluorooctanoic acid)</td>
<td>mg/kg</td>
<td>参考 US EPA 3550C/8321B, 超声萃取法, LC/MS 或 LC/MS/MS 测试定量</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
<tr>
<td>PFOS (Perfluorooctane sulfonate)</td>
<td>mg/kg</td>
<td>参考 US EPA 3550C/8321B, 超声萃取法, LC/MS 或 LC/MS/MS 测试定量</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
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<tbody>
<tr>
<td>邻苯二甲酸二丁酯 (Phthalates)</td>
<td>84-74-2</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二(2-乙基己酯)酯 (Di(2-ethyl hexyl)phthalate, DEHP)</td>
<td>117-81-7</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二辛酯 (Di-n-octyl phthalate, DNOP)</td>
<td>117-84-0</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二异壬酯 (Diisononyl phthalate, DINP)</td>
<td>28553-12-0 68515-48-0</td>
<td>mg/kg</td>
<td></td>
<td>100</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二异癸酯 (Diisodecyl phthalate, DIDP)</td>
<td>26761-40-0 68515-49-1</td>
<td>mg/kg</td>
<td></td>
<td>100</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二苯甲酯 (Benzyl butyl phthalate, BBP)</td>
<td>85-68-7</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二异癸酯 (Diisobutyl phthalate, DIBP)</td>
<td>84-69-5</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>醇酸二甲酯 (Dimethyl phthalate, DMP)</td>
<td>131-11-3</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>醇酸二乙酯 (Diethyl phthalate, DEP)</td>
<td>84-66-2</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二戊酯 (Di-n-pentyl phthalate, DPP)</td>
<td>131-18-0</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二己酯 (Di-n-hexyl phthalate, DNHP)</td>
<td>84-75-3</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>邻苯二甲酸二 C6-8 支链烷基酯(富 C7) (1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich, DHP)</td>
<td>71888-89-6</td>
<td>mg/kg</td>
<td></td>
<td>50</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

测试由：Miseon Lee

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<tr>
<td>1,2-邻苯二酸二(C7-11支链与直链)烷酯 (1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters, DHNUP)</td>
<td>68515-42-4</td>
<td>mg/kg</td>
<td>参考 IEC 62321-8 Edition 1.0 : 2017, 溶剂萃取法,气相色谱/质谱联用仪 测试定量</td>
<td>50 N.D.</td>
<td></td>
</tr>
<tr>
<td>邻苯二甲酸二甲氧乙酯 (Di(2-methoxyethyl) phthalate, DMEP)</td>
<td>117-82-8</td>
<td>mg/kg</td>
<td></td>
<td>50 N.D.</td>
<td></td>
</tr>
<tr>
<td>邻苯二甲酸二异戊酯 (Disopentylphthalate, DIPP)</td>
<td>605-50-5</td>
<td>mg/kg</td>
<td></td>
<td>50 N.D.</td>
<td></td>
</tr>
<tr>
<td>邻苯二甲酸正戊基异戊基酯 (N-pentyl-isopentylphthalate, NPIP)</td>
<td>776297-69-9</td>
<td>mg/kg</td>
<td></td>
<td>50 N.D.</td>
<td></td>
</tr>
</tbody>
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* 样品相片; -
(View of sample as received;-)

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Flow Chart (IEC 62321 Edition 1.0)

Receipt

Sampling/ Grinding or Cutting

For different material, digest the sample with appropriate acid*1

Confirm the tested samples are totally dissolved*2

Make up with deionized water

Analyzed by ICP-OES

Analyzed by UV-VIS

PBBs/PBDEs

Weigh sample and add organic solvent

Soxhlet extraction or solvent extraction

Concentrate the extract and make up with organic solvent

Analyzed by GC-MS

Polymers / Electronics

Weigh sample

Boiling water extraction

Get 50cm² sample

Cr³⁺

Wet-ashing

Acid added for digestion

HN₃O₃, HCl, HF, H₂O₂, H₃BO₃

HN₃O₅, HCl, H₂O₂, HBF₄

Metal

HN₃O₅, HCl, HF

Electronics

HN₃O₅, HCl, H₂O₂, HBF₄

Polymers

HN₃O₅, HCl, HF, H₂O₂, H₃BO₃

*1: List of appropriate acid:

*2: The samples were dissolved totally by pre-conditioning method according to above flow chart.
Flow Chart (EN14582)

Receipt

Sample preparation

Sample weighing

Bomb preparation

Oxygen bomb combustion

Absorption solvent preparation of absorption solution

Collection of halides make up Vol. 100mL

Analyzed by IC

Data

Report

Cooling, for 1hr
** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart.
Flow Chart (PVC)

Receipt

Sample preparation

Analyzed by FT-IR

PVC Characteristic peaks

A. Broad band : 600~700 cm\(^{-1}\)
B. Strong peak : 1250 cm\(^{-1}\)
\hspace{1cm}1330 cm\(^{-1}\)
C. Strong peak : 1430 cm\(^{-1}\)
D. Strong peak : 2900 cm\(^{-1}\)

Data

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样品名称(SAMPLE DESCRIPTION) : MLCC C0G Cu TYPE

Flow Chart (HBCDD)

1. Receipt
2. Sample preparation
3. Extraction
4. Concentration
5. Clean up
6. Concentration
7. Analyzed by LC/MS and/or GC-MS
8. Data
9. Report
Flow Chart (EPA 3540C)

- Receipt
- Sample preparation
  - Extraction
  - Concentration
  - Clean up
  - Concentration
  - Analyzed by GC-ECD or GC-MS or LC/MS or LC/MS/MS
- Data
- Report

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Flow Chart (PCB, PCT, PCN)

1. Receipt
2. Sample preparation
3. Extraction
4. Concentration
5. Clean up
6. Concentration
7. Analyzed by GC-MS
8. Data
9. Report

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Flow Chart (PCP)

1. Receipt
2. Sample preparation
3. Extraction
4. Concentration
5. Clean up
6. Concentration
7. Analyzed by GC-MS
8. Data
9. Report

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Flow Chart (PFOS, PFOA)

- Receipt
- Sample preparation
  - Loading in a vial
  - Methanol loading
  - Ultrasonication
  - Filtering & Cleaning
  - Make up (Methanol)
  - Analyzed by LC/MS or LC/MS/MS
- Data
- Report
TEST REPORT
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样品编号(SAMPLE ID NO.)    : RT19R-S4740-042
样品名称(SAMPLE DESCRIPTION) : MLCC C0G Cu TYPE

Flow Chart (Phthalates)

Received

Sample preparation

Extraction

Concentration

Clean-up

Concentration

Analyzed by GC-MS

Data

Report

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