**TEST REPORT**

Lab No. : (6221)050-0147  
Date : March 02, 2021  
Page : 1 of 10

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**APPLICATION**

申請人: Macronix International Co., Ltd  
No. 16, Lixing Rd., Hsinchu Science Park, Hsinchu City 300, Taiwan  
(R.O.C.)

旺宏電子股份有限公司  
300 新竹科學園區力行路十六號

**CONTACT PERSON**

聯絡人: —

**DATE OF SUBMISSION**

送樣日期: February 19, 2021  
2021 年 02 月 19 日

**PERFORMANCE PERIOD**

測試日期: February 19, 2021 to March 02, 2021  
2021 年 02 月 19 日 至 2021 年 03 月 02 日

**SAMPLE DESCRIPTION**

樣品描述: IC

**ITEM NO.**

產品型號: 8SON

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### SUMMARY OF TEST RESULTS 測試結果摘要

<table>
<thead>
<tr>
<th>TEST REQUESTED 测試要求</th>
<th>CONCLUSION 結論</th>
<th>REMARK 備註</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>TEST REQUESTED 測試要求</th>
<th>CONCLUSION 結論</th>
<th>REMARK 備註</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phthalates Test 邻苯二甲酸鹽測試</td>
<td>DATA 數據</td>
<td>Test result in page 4 測試結果請見第 4 頁</td>
</tr>
<tr>
<td>Halogenated compounds – F, Cl, Br &amp; I 含鹵素物質檢測－氟, 氯, 溴 和 碘</td>
<td>DATA 數據</td>
<td>Test result in page 5 測試結果請見第 5 頁</td>
</tr>
</tbody>
</table>

**REMARK**

If there are questions or concerns on this report, please contact:

若有任何疑問或諮詢，請以 email 與我們聯絡

chemical.inquiry@bureauveritas.com/
vico.lin@bureauveritas.com

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PREPARED BY: Tiffany Chin

VICO LIN
MANAGER
ANALYTICAL DEPARTMENT

C/N /TC/JK
**TEST RESULT 測試結果**

<table>
<thead>
<tr>
<th>Tested item</th>
<th>测试部件</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Black mixed material</td>
<td>黑色混合材料</td>
</tr>
<tr>
<td>2. Silvery metal</td>
<td>銀色金属</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Compounds</th>
<th>化合物</th>
<th>Unit</th>
<th>测试部件</th>
<th>RoHS’ Limits 限用有害物質指令限值</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead [Pb]</td>
<td>鉛</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Cadmium [Cd]</td>
<td>鍍</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Mercury [Hg]</td>
<td>水銀</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Chromium (VI) [Cr(VI)]</td>
<td>六價鉻</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>—</td>
</tr>
<tr>
<td>Chromium (VI) [Cr(VI)]</td>
<td>六價鉻</td>
<td>µg/cm²</td>
<td>—</td>
<td>N.D.</td>
</tr>
<tr>
<td>Polybrominated Biphenyls [PBBs]</td>
<td>多溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Bromobiphenyls / 一溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Dibromobiphenyls / 二溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Tribromobiphenyls / 三溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Tetrabromobiphenyls / 四溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Pentabromobiphenyls / 五溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Hexabromobiphenyls / 六溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Heptabromobiphenyls / 七溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Octabromobiphenyls / 八溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Nonabromobiphenyls / 九溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Decabromobiphenyl / 十溴聯苯</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Sum of PBBs / 多溴聯苯總和</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td>1000</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers [PBDEs]</td>
<td>多溴聯苯醚</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bromodiphenyl ethers / 一溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Dibromodiphenyl ethers / 二溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Tribromodiphenyl ethers / 三溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Tetrabromodiphenyl ethers / 四溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Pentabromodiphenyl ethers / 五溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Hexabromodiphenyl ethers / 六溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Heptabromodiphenyl ethers / 七溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Octabromodiphenyl ethers / 八溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Nonabromodiphenyl ethers / 九溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Decabromodiphenyl ether / 十溴聯苯醚</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td></td>
</tr>
<tr>
<td>Sum of PBDEs / 多溴聯苯醚總和</td>
<td>mg/kg</td>
<td>N.D.</td>
<td>N.D.</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Conclusion 結論**

|  |  | PASS 通過 | PASS 通過 |  |
|  | — |  |  | — |

C/N /TC/JK
### TEST RESULT 測試結果


鄰苯二甲酸鹽測試 - 指令 2011/65/EU 歐洲議會和理事會關於電子電氣設備中限制使用某些有害物質 (RoHS) 的修正案指令(EU)2015/863。

<table>
<thead>
<tr>
<th>Test Parameter 測試項目</th>
<th>CAS No. CAS 編號</th>
<th>Unit 單位</th>
<th>Tested item 測試部件</th>
<th>Maximum Allowable Limit: 最大允許限值</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dibutyl phthalate (DBP) 鄰苯二甲酸二丁酯</td>
<td>84-74-2</td>
<td>%</td>
<td>N.D.</td>
<td>0.1</td>
</tr>
<tr>
<td>Butyl benzyl phthalate (BBP) 鄰苯二甲酸丁苄酯</td>
<td>85-68-7</td>
<td>%</td>
<td>N.D.</td>
<td>0.1</td>
</tr>
<tr>
<td>Bis(2-ethylhexyl) phthalate (DEHP) 鄰苯二甲酸二異辛酯</td>
<td>117-81-7</td>
<td>%</td>
<td>N.D.</td>
<td>0.1</td>
</tr>
<tr>
<td>Diisobutyl phthalate (DIBP) 鄰苯二甲酸二異丁酯</td>
<td>84-69-5</td>
<td>%</td>
<td>N.D.</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Conclusion 結論**

PASS 通過

<table>
<thead>
<tr>
<th>Test Item 測試項目</th>
<th>CAS No. CAS 編號</th>
<th>Unit 單位</th>
<th>Tested item 測試部件</th>
</tr>
</thead>
<tbody>
<tr>
<td>Di-n-hexyl phthalate (DNHP) 鄰苯二甲酸二己酯 (DNHP)</td>
<td>84-75-3</td>
<td>%</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-n-octyl phthalate (DNOP) 鄰苯二甲酸二正辛酯 (DNOP)</td>
<td>117-84-0</td>
<td>%</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-isodecyl phthalate (DIDP) 鄰苯二甲酸二異癸酯 (DIDP)</td>
<td>26761-40-0</td>
<td>%</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-isononyl phthalate (DINP) 鄰苯二甲酸二異壬酯 (DINP)</td>
<td>28553-12-0</td>
<td>%</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

Sum of Phthalates / 鄰苯二甲酸鹽總和 — % | N.D. |
TEST RESULT 測試結果

Halogen Content - Fluorine, Chlorine, Bromine and Iodine
鹵素含量－氟、氯、溴和碘

<table>
<thead>
<tr>
<th>Compounds 化合物</th>
<th>Unit 單位</th>
<th>Tested item 測試部件</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halogenated Compounds / 鹵素:</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Fluorine [F] / 氟</td>
<td>mg/kg</td>
<td>N.D.</td>
</tr>
<tr>
<td>Chlorine [Cl] / 氯</td>
<td>mg/kg</td>
<td>N.D.</td>
</tr>
<tr>
<td>Bromine [Br] / 溴</td>
<td>mg/kg</td>
<td>N.D.</td>
</tr>
<tr>
<td>Iodine [I] / 碘</td>
<td>mg/kg</td>
<td>N.D.</td>
</tr>
<tr>
<td>Sum of Halogenated Compounds / 鹵素總和</td>
<td>mg/kg</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

Note 註解:
N.D. = Not Detected (低於偵測極限)  − = Empty (空白)  
Negative = (陰性)  Positive = (陽性)  
% = percent (百分率)  10 000 mg/kg = 1 %  
mg/kg = milligram per kilogram = ppm (毫克/公斤, 百萬分之一)  
Detection Limit / 偵測極限:  
Pb, Cd, Hg: 2 mg/kg  
Cr(VI) (非金屬，Non-metal): 8 mg/kg  
Cr(VI) (金屬，Metal): 0.1 µg/cm²  
Metal 金屬  
Cr(VI): 0.1 µg/cm²  
#The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 µg/cm². The coating is considered to contain Cr(VI).  
當六價鉻結果大於 0.13 µg/cm²，表示樣品表層含有六價鉻。  
#The sample is negative for Cr(VI) if the Cr(VI) concentration is less than 0.10 µg/cm². The coating is considered a non-Cr(VI) based coating.  
當六價鉻結果小於 0.10 µg/cm²，表示樣品表層不含六價鉻。  
#The result between 0.10 µg/cm² and 0.13 µg/cm² is considered to be inconclusive – unavoidable coating variations may influence the determination.  
當六價鉻結果介於 0.10 µg/cm² 和 0.13 µg/cm²之間，表示樣品表層不確定含有六價鉻–不可避免塗料的變化性可能影響結果判定。  
PBBs & PBDEs: Each 5 mg/kg  
Phthalates Content: Each 0.005%  
F, I: 100 mg/kg  
Cl, Br: 50 mg/kg  

C/N /TC/JK
<table>
<thead>
<tr>
<th>Test Parameter</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury [Hg]</td>
<td>With reference to IEC 62321-4: 2013+AMD 1:2017 CSV.</td>
</tr>
</tbody>
</table>
| Chromium (VI) [Cr(VI)] | Metal 金屬：  
With reference to IEC 62321-7-1:2015.[a]  
參照 IEC 62321-7-1:2015.[a]  
Polymers & Electronics 聚合物及電子：  
參照 IEC 62321-7-2:2017. |
參照 IEC 62321-6: 2015. |
參照 EN14582:2016(E). |

[a] The principle of this method was evaluated and supported by two studies organized by IEC TC 111 WG3. These studies were focused on detecting the presence of Cr VI in the corrosion protection coatings on metallic samples. 該方法的原理是在由 IEC TC111 WG3 組織的兩次研究中得到充分評估並獲得了認可。這些研究著重於對金屬樣品上的防腐塗層中六價鉻的存在檢測(定性測試)。

Remark 備註：
1. The result only relates to the tested item. The report shall not be reproduced except full without the written approval of the testing laboratory. Parameters which are not covered by the lab’s testing scope are subcontracted to laboratories with government approval. The accreditation relates to competences given in the accreditation certificate. 測試結果僅代表經測試部件。本報告未經測試實驗室認可不得複製。未在本實驗室測試範疇之測試均委外至經官方核可之實驗室。委外實驗室之能力經認證許可。
2. Samples test were conducted as per applicant’s request. 樣品測試進行為依照申請人的要求。
Photo of the Submitted Sample
委送樣品照片

(6221)050-0147
APPENDIX (附錄)

重金屬和阻燃劑的測試流程圖 [ 歐盟委員會指令 2011/65/EU ]:

1. **Sample Preparation** (樣品制備):
   - Cutting 切割/
   - Grinding 研磨/
   - Weigh 秤重

2. **Acid digestion by microwave to complete digestion**
   - 微波酸性消化至完全溶解

3. **Clean up sample surface**
   - 處理樣品表面

4. **Sample Preparation (樣品制備):
   - Cutting 切割/
   - Grinding 研磨/
   - Weigh 秤重

5. **Metal**
   - 金屬

6. **Filtration**
   - 過濾

7. **Transfer the extract into volumetric flask**
   - 轉移萃取液到定量瓶

8. **Make up to the known volume**
   - 定量到已知的體積

9. **GC-MS analysis**
   - 氣相層析質譜分析儀

10. **UV-Vis analysis**
    - 紫外光-可見光光譜分析

11. **Boiling water extraction**
    - 沸水萃取

12. **Add color development reagent**
    - 加入顯色劑

13. **Transfer the extract into volumetric flask**
    - 轉移萃取液到定量瓶

14. **Adjust pH value of the extract**
    - 調節萃取液酸鹼值

15. **Filtration & Concentrate the extract**
    - 過濾及濃縮

16. **Digested in Toluene/Alkaline solution**
    - 利用混和鹼液消化

17. **Extracted by Alkaline solution**
    - 利用鹼液萃取

18. **ABS - PC - PVC**
    - 未知聚合物及電子材料

19. **Dissolved in organic solvent**
    - 利用有機溶劑溶解

20. **Extracted by Alkaline solution**
    - 利用鹼液萃取

21. **Unclear**
    - 不能判斷

22. **Scratch sample surface & Repeat Step 1 for two times**
    - 刮取樣品表面及重複步驟1兩次

23. **Unable to judge**
    - 不能夠判定

24. **Compares with the standard solution**
    - 與標準溶液比對

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C/N / TCJK
APPENDIX(附錄)

Test Flowchart of Phthalates test:
鄰苯二甲酸鹽的測試流程圖:

1. Cutting & weight sample / 剪裁樣品並秤重
2. Solvent extraction by ultrasonic bath / 超音波浴加熱萃取
3. Filter/cleanup the extract / 過濾 / 澄清萃取液
4. Solution analyzed by GC-MS / LC-MS / 以氣相層析質譜儀 / 液相層析質譜儀分析
APPENDIX (附錄)

Test Flowchart of Halogenated Compounds - F, Cl, Br, I:
鹵素: 氟、氯、溴、碘的測試流程圖:

1. **Sample / 樣品**
2. **Grinding into fine pieces / 研磨成細粉**
3. **Calorimetric Oxygen Bomb combustion / 氧彈燃燒法**
   - Sample was combusted in a closed system containing oxygen / 樣品在含氧的密閉環境中燃燒 /
4. **Combusting product was absorbed by the Alkaline absorption solution / 燃燒產物被鹼吸收液吸收**
5. **Transfer the absorption solution into volumetric flask and fixed / 把吸收液轉入定量瓶定量**
6. **Analyze with Ion chromatography / 用離子色譜儀分析**