

# Specification for Approval

Date: 2017/03/24

Customer : 深圳臺慶

TAI-TECH P/N: TMPC0503H-Series(G)-D

CUSTOMER P/N:

DESCRIPTION:

QUANTITY: pcs

REMARK:

Customer Approval Feedback

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**SMD Power Choke Coil**

TMPC0503H-Series(G)-D

| ECN HISTORY LIST |          |              |          |         |       |
|------------------|----------|--------------|----------|---------|-------|
| REV              | DATE     | DESCRIPTION  | APPROVED | CHECKED | DRAWN |
| 1.0              | 15/09/10 | 新 發 行        | 楊祥忠      | 詹偉特     | 何秦芝   |
| 1.1              | 17/03/24 | 增加:電流 MAX 規格 | 楊祥忠      | 詹偉特     | 何秦芝   |
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# SMD Power Choke Coil

**TMPC0503H-Series(G)-D**

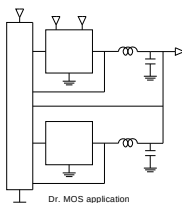
## 1. Features

1. Carbonyl powder inductor.
2. Compact design.
3. High current , low DCR , high efficiency.
4. Very low acoustic noise and very low leakage flux noise.
5. High reliability.
6. 100% Lead(Pb) & Halogen-Free and RoHS compliant.

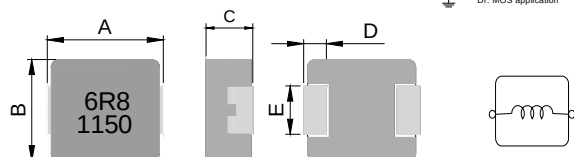


## 2. Applications

Note PC power system , incl. IMVP-6  
DC/DC converter.

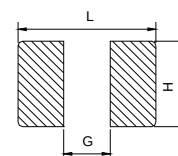


## 3. Dimensions



| Series    | A(mm)   | B(mm)   | C(mm)   | D(mm)   | E(mm)   |
|-----------|---------|---------|---------|---------|---------|
| TMPC0503H | 5.7±0.3 | 5.2±0.2 | 2.8±0.2 | 1.1±0.3 | 1.5±0.2 |

### Recommend PC Board Pattern



| L(mm) | G(mm) | H(mm) |
|-------|-------|-------|
| 6.5   | 2.5   | 1.8   |

Note: 1. The above PCB layout reference only.  
2. Recommend solder paste thickness at 0.12mm and above.

## 4. Part Numbering

**TMPC** **0503** **H** - **6R8** **MG** - **D**  
A B C D E F

A: Series  
B: Dimension  
C: Type  
D: Inductance  
E: Inductance Tolerance  
F: D/C

BxC  
Carbonyl powder  
6R8=6.8uH  
M=±20%

印字:黑色 : 6R8 及 D/C 1150 (D/C 前二碼是年份,後二碼是週期,依實際生產週期而定)

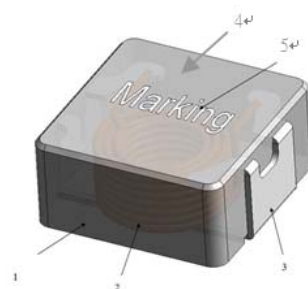
## 5. Specification

| Part Number       | Inductance<br>L0 (uH)±20%<br>@ 0 A | I rms (A) |      | I sat (A) |      | DCR(mΩ)<br>Typ.@25℃ | DCR(mΩ)<br>Max.@25℃ |
|-------------------|------------------------------------|-----------|------|-----------|------|---------------------|---------------------|
|                   |                                    | Typ       | Max  | Typ       | Max  |                     |                     |
| TMPC0503H-R10YG-D | 0.10±30%                           | 23.0      | 20.0 | 27.0      | 24.0 | 2.5                 | 3.0                 |
| TMPC0503H-R15YG-D | 0.15±30%                           | 18.0      | 16.0 | 30.0      | 26.0 | 2.3                 | 2.7                 |
| TMPC0503H-R20YG-D | 0.20±30%                           | 16.0      | 14.0 | 25.0      | 21.0 | 2.6                 | 3.2                 |
| TMPC0503H-R22MG-D | 0.22                               | 15.5      | 13.0 | 21.0      | 19.0 | 3.7                 | 4.4                 |
| TMPC0503H-R25MG-D | 0.25                               | 15.0      | 12.0 | 20.0      | 18.0 | 3.7                 | 4.1                 |
| TMPC0503H-R33MG-D | 0.33                               | 14.0      | 11.0 | 18.0      | 16.0 | 4.3                 | 5.0                 |
| TMPC0503H-R47MG-D | 0.47                               | 12.0      | 10.0 | 16.0      | 14.0 | 6.4                 | 7.4                 |
| TMPC0503H-R56MG-D | 0.56                               | 10.0      | 9.00 | 15.0      | 13.5 | 8.0                 | 10                  |
| TMPC0503H-R68MG-D | 0.68                               | 8.50      | 7.50 | 14.0      | 12.5 | 10                  | 12                  |
| TMPC0503H-R82MG-D | 0.82                               | 8.00      | 7.00 | 12.5      | 11.0 | 11.5                | 13                  |
| TMPC0503H-1R0MG-D | 1.00                               | 7.00      | 6.00 | 11.0      | 9.50 | 13                  | 14                  |
| TMPC0503H-1R2MG-D | 1.20                               | 6.50      | 5.50 | 11.0      | 9.50 | 14                  | 16                  |
| TMPC0503H-1R5MG-D | 1.50                               | 6.00      | 5.00 | 10.0      | 9.00 | 16                  | 25                  |
| TMPC0503H-2R2MG-D | 2.20                               | 5.50      | 4.80 | 9.00      | 8.00 | 25                  | 35                  |
| TMPC0503H-3R3MG-D | 3.30                               | 5.00      | 4.30 | 8.00      | 7.00 | 32                  | 38                  |
| TMPC0503H-3R6MG-D | 3.60                               | 4.90      | 4.10 | 7.00      | 6.00 | 46                  | 54                  |
| TMPC0503H-4R7MG-D | 4.70                               | 4.60      | 4.00 | 6.00      | 5.00 | 50                  | 53                  |
| TMPC0503H-5R6MG-D | 5.60                               | 4.25      | 3.80 | 4.50      | 4.00 | 55                  | 63                  |
| TMPC0503H-6R8MG-D | 6.80                               | 4.00      | 3.60 | 4.30      | 3.80 | 68                  | 76.2                |
| TMPC0503H-100MG-D | 10.0                               | 2.75      | 2.40 | 3.50      | 3.10 | 110                 | 128                 |
| TMPC0503H-150MG-D | 15.0                               | 2.10      | 1.90 | 2.60      | 2.20 | 165                 | 190                 |
| TMPC0503H-180MG-D | 18.0                               | 2.00      | 1.80 | 2.30      | 2.00 | 195                 | 230                 |
| TMPC0503H-220MG-D | 22.0                               | 1.90      | 1.70 | 1.70      | 1.50 | 220                 | 250                 |
| TMPC0503H-330MG-D | 33.0                               | 1.60      | 1.50 | 1.60      | 1.40 | 380                 | 440                 |

Note:

1. Test frequency : Ls : 100KHz /1.0V.
2. All test data referenced to 25℃ ambient.
3. Testing Instrument(or equ) : L: HP4284A,CH11025,CH3302,CH1320,CH1320S LCR METER / Rdc:CH16502,Agilent33420A MICRO OHMMETER.
4. Heat Rated Current (Irms) will cause the coil temperature rise approximately ΔT of 40℃
5. Saturation Current (Isat) will cause L0 to drop approximately 20%.
6. The part temperature (ambient + temp rise) should not exceed 125℃ under worst case operating conditions. Circuit design, component, PCB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application.
7. Special inquiries besides the above common used types can be met on your requirement.

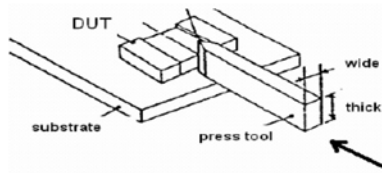
## 6. Material List



| NO | Items | Materials                            |
|----|-------|--------------------------------------|
| 1  | Core  | Carbonyl Powder.                     |
| 2  | Wire  | Polyester Wire or equivalent.        |
| 3  | Clip  | 100% Pb free solder(Ni+Sn---Plating) |
| 4  | paint | Epoxy resin                          |
| 5  | Ink   | Halogen-free ketone                  |

## 7. Reliability and Test Condition

| Item                               | Performance                                                                                                                                                                                                          | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating temperature              | -40~+125℃ (Including self - temperature rise)                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Storage temperature                | 1. -10~+40℃, 50~60%RH (Product without taping)<br>2. -40~+125℃ (on board)                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Electrical Performance Test</b> |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Inductance                         | Refer to standard electrical characteristics list.                                                                                                                                                                   | HP4284A, CH11025, CH3302, CH1320, CH1320S<br>LCR Meter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| DCR                                |                                                                                                                                                                                                                      | CH16502, Agilent33420A Micro-Ohm Meter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Saturation Current (Isat)          | Approximately $\Delta L20\%$ .                                                                                                                                                                                       | Saturation DC Current (Isat) will cause L0 to drop $\Delta L(\%)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Heat Rated Current (Irms)          | Approximately $\Delta T40^{\circ}\text{C}$                                                                                                                                                                           | Heat Rated Current (Irms) will cause the coil temperature rise $\Delta T(^{\circ}\text{C})$ .<br>1. Applied the allowed DC current<br>2. Temperature measured by digital surface thermometer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Reliability Test</b>            |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Life Test                          | Appearance : No damage.<br>Inductance : within $\pm 10\%$ of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within $\pm 15\%$ of initial value and shall not exceed the specification value | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Temperature : $125 \pm 2^{\circ}\text{C}$ (Inductor)<br>Applied current : rated current<br>Duration : 1000 $\pm$ 12hrs<br>Measured at room temperature after placing for 24 $\pm$ 2 hrs                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Load Humidity                      |                                                                                                                                                                                                                      | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Humidity : $85 \pm 2\%$ R.H,<br>Temperature : $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$<br>Duration : 1000hrs Min. with 100% rated current<br>Measured at room temperature after placing for 24 $\pm$ 2 hrs                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Moisture Resistance                |                                                                                                                                                                                                                      | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>1. Baked at $50^{\circ}\text{C}$ for 25hrs, measured at room temperature after placing for 4 hrs.<br>2. Raise temperature to $65 \pm 2^{\circ}\text{C}$ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to $25^{\circ}\text{C}$ in 2.5hrs.<br>3. Raise temperature to $65 \pm 2^{\circ}\text{C}$ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to $25^{\circ}\text{C}$ in 2.5hrs, keep at $25^{\circ}\text{C}$ for 2 hrs then keep at $-10^{\circ}\text{C}$ for 3 hrs<br>4. Keep at $25^{\circ}\text{C}$ 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at room temperature after placing for 1~2 hrs. |
| Thermal shock                      |                                                                                                                                                                                                                      | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Condition for 1 cycle<br>Step1 : $-40 \pm 2^{\circ}\text{C}$ 30 $\pm$ 5min<br>Step2 : $25 \pm 2^{\circ}\text{C}$ $\leq$ 0.5min<br>Step3 : $125 \pm 2^{\circ}\text{C}$ 30 $\pm$ 5min<br>Number of cycles : 500<br>Measured at room temperature after placing for 24 $\pm$ 2 hrs                                                                                                                                                                                                                                                                                                                                                                |
| Vibration                          |                                                                                                                                                                                                                      | Oscillation Frequency: 10 ~ 2K ~ 10Hz for 20 minutes<br>Equipment : Vibration checker<br>Total Amplitude: $1.52\text{mm} \pm 10\%$<br>Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Item                         | Performance                                                                                                                                                                                             | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------|----------------------------------------------|---------------------|---------------------------|----------------|----|----|-----------|------|------|----|----|-----------|------|
| Shock                        | Appearance : No damage.<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value | <table><tr><td>Type</td><td>Peak value (g's)</td><td>Normal duration (D) (ms)</td><td>Wave form</td><td>Velocity change (V)ft/sec</td></tr><tr><td>SMD</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr><tr><td>Lead</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr></table>                                                                                                                                                                                                                        | Type            | Peak value (g's)          | Normal duration (D) (ms)                     | Wave form           | Velocity change (V)ft/sec | SMD            | 50 | 11 | Half-sine | 11.3 | Lead | 50 | 11 | Half-sine | 11.3 |
| Type                         | Peak value (g's)                                                                                                                                                                                        | Normal duration (D) (ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Wave form       | Velocity change (V)ft/sec |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| SMD                          | 50                                                                                                                                                                                                      | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Half-sine       | 11.3                      |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| Lead                         | 50                                                                                                                                                                                                      | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Half-sine       | 11.3                      |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| Bending                      |                                                                                                                                                                                                         | Shall be mounted on a FR4 substrate of the following dimensions: >=0805 inch(2012mm):40x100x1.2mm<br><0805 inch(2012mm):40x100x0.8mm<br>Bending depth: >=0805 inch(2012mm):1.2mm<br><0805 inch(2012mm):0.8mm<br>duration of 10 sec.                                                                                                                                                                                                                                                                                             |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| Solderability                | More than 95% of the terminal electrode should be covered with solder.                                                                                                                                  | Preheat: 150℃,60sec.。<br>Solder: Sn96.5% Ag3% Cu0.5%<br>Temperature: 245±5℃。<br>Flux for lead free: Rosin. 9.5%。<br>Dip time: 4±1sec.。<br>Depth: completely cover the termination                                                                                                                                                                                                                                                                                                                                               |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| Resistance to Soldering Heat |                                                                                                                                                                                                         | Number of heat cycles: 1<br><table><tr><td>Temperature (℃)</td><td>Time(s)</td><td>Temperature ramp/immersion and emersion rate</td></tr><tr><td>260 ±5(solder temp)</td><td>10 ±1</td><td>25mm/s ±6 mm/s</td></tr></table>                                                                                                                                                                                                                                                                                                     | Temperature (℃) | Time(s)                   | Temperature ramp/immersion and emersion rate | 260 ±5(solder temp) | 10 ±1                     | 25mm/s ±6 mm/s |    |    |           |      |      |    |    |           |      |
| Temperature (℃)              | Time(s)                                                                                                                                                                                                 | Temperature ramp/immersion and emersion rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| 260 ±5(solder temp)          | 10 ±1                                                                                                                                                                                                   | 25mm/s ±6 mm/s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |
| Terminal Strength            | Appearance : No damage.<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification Reflow Profiles<br>With the component mounted on a PCB with the device to be tested, apply a force (>0805 inch(2012mm):1kg , <=0805 inch(2012mm):0.5kg)to the side of a device being tested.<br>This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested.<br> |                 |                           |                                              |                     |                           |                |    |    |           |      |      |    |    |           |      |

Note : When there are questions concerning measurement result : measurement shall be made after 48 ± 2 hours of recovery under the standard condition.

## 8. Soldering and Mounting

### (1) Soldering

Mildly activated rosin fluxes are preferred. The minimum amount of solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. TAI-TECH terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

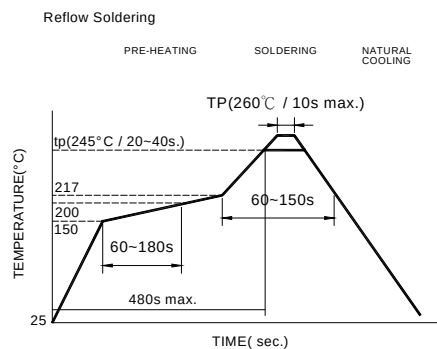
### (2) Solder re-flow:

Recommended temperature profiles for re-flow soldering in Figure 1.

### (3) Soldering Iron:

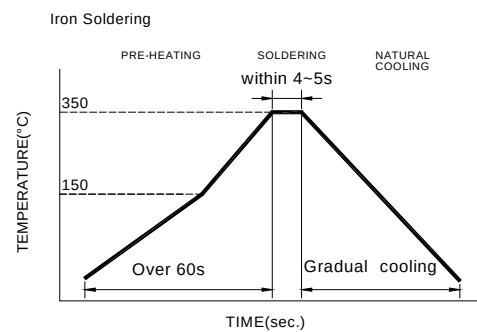
Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended.

- Preheat circuit and products to 150°C
- Never contact the ceramic with the iron tip
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- 355°C tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.



Reflow times: 3 times max.

Fig.1

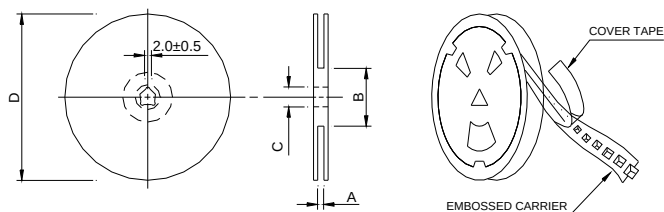


Iron Soldering times: 1 times max.

Fig.2

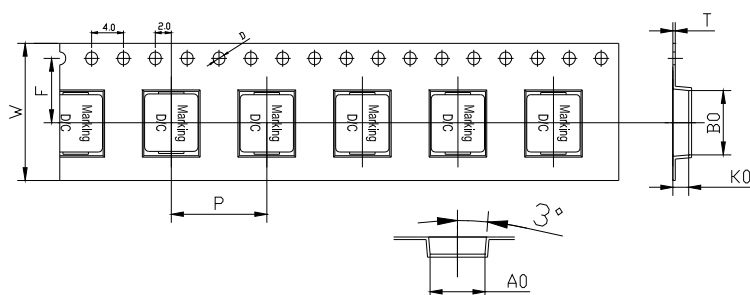
## 9. Packaging Information

### (1) Reel Dimension



| Type     | A(mm)     | B(mm) | C(mm)       | D(mm) |
|----------|-----------|-------|-------------|-------|
| 13"x12mm | 12.4+2/-0 | 100±2 | 13+0.5/-0.2 | 330   |

### (2) Tape Dimension

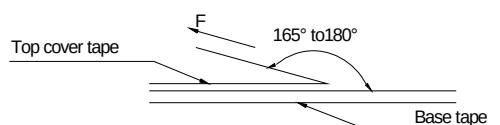


| Series | Size | Bo(mm)  | Ao(mm)  | Ko(mm)  | P(mm)   | W(mm)    | F(mm)   | t(mm)     | D(mm)   |
|--------|------|---------|---------|---------|---------|----------|---------|-----------|---------|
| TMPC   | 0503 | 6.2±0.1 | 5.6±0.1 | 3.3±0.1 | 8.0±0.1 | 12.0±0.3 | 5.5±0.1 | 0.35±0.05 | 1.5±0.1 |

### (3) Packaging Quantity

| TMPC        | 0503  |
|-------------|-------|
| Chip / Reel | 2000  |
| Inner box   | 4000  |
| Carton      | 16000 |

### (4) Tearing Off Force



The force for tearing off cover tape is 10 to 130 grams in the arrow direction under the following conditions(referenced ANSI/EIA-481-C-2003 of 4.11 standard).

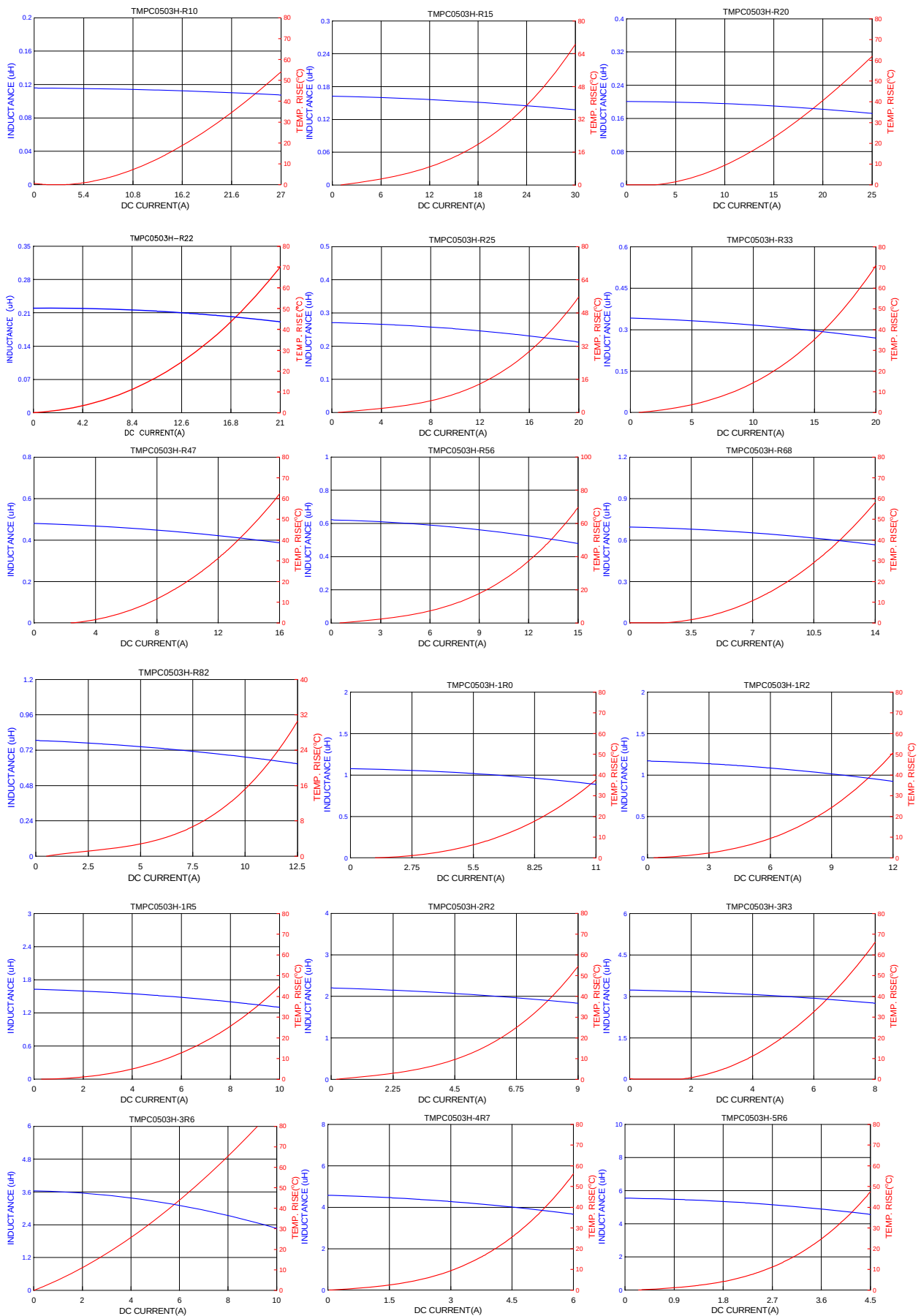
| Room Temp.<br>(°C) | Room Humidity<br>(%) | Room atm<br>(hPa) | Tearing Speed<br>mm/min |
|--------------------|----------------------|-------------------|-------------------------|
| 5~35               | 45~85                | 860~1060          | 300                     |

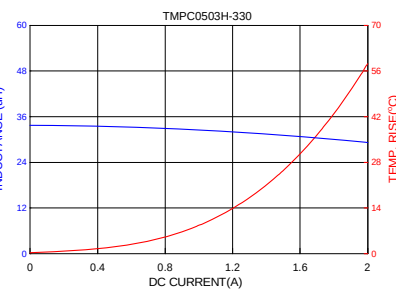
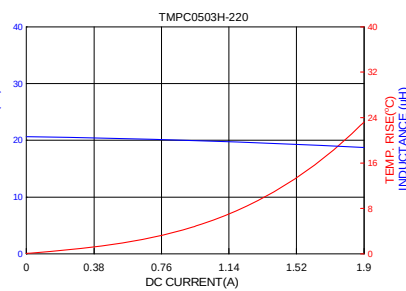
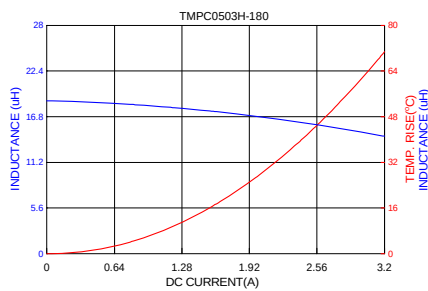
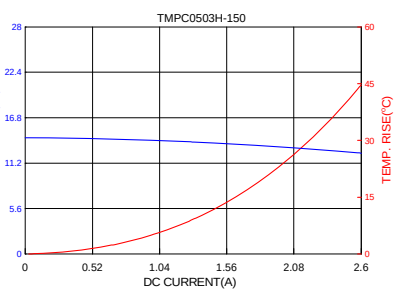
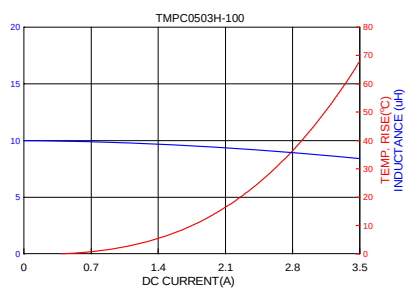
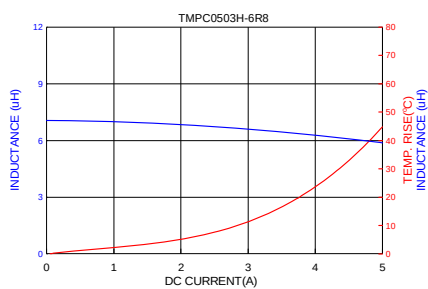
#### Application Notice

- Storage Conditions(component level)  
To maintain the solderability of terminal electrodes:
  1. TAI-TECH products meet IPC/JEDEC J-STD-020D standard-MSL, level 1.
  2. Temperature and humidity conditions: Less than  $40^\circ\text{C}$  and 60% RH.
  3. Recommended products should be used within 12 months form the time of delivery.
  4. The packaging material should be kept where no chlorine or sulfur exists in the air.
- Transportation
  1. Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
  3. Bulk handling should ensure that abrasion and mechanical shock are minimized.



## 10. Typical Performance Curves





## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 1 of 12

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以下測試樣品係由申請廠商所提供及確認 (The following sample(s) was/were submitted and identified by/on behalf of the applicant as):

樣品名稱(Sample Description) : SMD POWER INDUCTOR  
樣品型號(Style/Item No.) : TMPB、TMPC、TMPA、TMPF、SLPI、SMPI、EPI(ePI)、VMPI、MLPI SERIES  
收件日期(Sample Receiving Date) : 2016/10/05  
測試期間(Testing Period) : 2016/10/05 TO 2016/10/13

### 測試需求(Test Requested):

- (1) 依據客戶指定, 參考RoHS2011/65/EU Annex II及其修訂指令(EU) 2015/863測試鎘、鉛、汞、六價鉻、多溴聯苯、多溴聯苯醚, DBP, BBP, DEHP, DIBP. (As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample.)
- (2) 其他測試項目請見下一頁. (Please refer to next pages for the other item(s).)

測試結果(Test Results) : 請見下一頁 (Please refer to next pages).

Troy Chang, Manager-Tech  
Signed for and on behalf of  
SGS TAIWAN LTD.  
Chemical Laboratory - Taipei



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# 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 2 of 12

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## 測試結果(Test Results)

測試部位(PART NAME)No. 1 : 整體混測 (MIXED ALL PARTS)

| 測試項目<br>(Test Items)             | 單位<br>(Unit) | 測試方法<br>(Method)                                                                                                             | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|----------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|
|                                  |              |                                                                                                                              |                      | No. 1          |
| 鎘 / Cadmium (Cd)                 | mg/kg        | 參考IEC 62321-5 (2013), 以感應耦合<br>電漿原子發射光譜儀檢測。 / With<br>reference to IEC 62321-5 (2013)<br>and performed by ICP-AES.           | 2                    | n. d.          |
| 鉛 / Lead (Pb)                    | mg/kg        | 參考IEC 62321-5 (2013), 以感應耦合<br>電漿原子發射光譜儀檢測。 / With<br>reference to IEC 62321-5 (2013)<br>and performed by ICP-AES.           | 2                    | n. d.          |
| 汞 / Mercury (Hg)                 | mg/kg        | 參考IEC 62321-4 (2013), 以感應耦合<br>電漿原子發射光譜儀檢測。 / With<br>reference to IEC 62321-4 (2013)<br>and performed by ICP-AES.           | 2                    | n. d.          |
| 六價鉻 / Hexavalent Chromium Cr(VI) | mg/kg        | 參考IEC 62321 (2008), 以UV-VIS檢<br>測。 / With reference to IEC 62321<br>(2008) and performed by UV-VIS.                          | 2                    | n. d.          |
| 鈹 / Beryllium (Be)               | mg/kg        | 參考US EPA 3052 (1996), 以感應耦合<br>電漿原子發射光譜儀檢測。 / With<br>reference to US EPA 3052 (1996).<br>Analysis was performed by ICP-AES. | 2                    | n. d.          |
| 銻 / Antimony (Sb)                | mg/kg        | 參考US EPA 3052 (1996), 以感應耦合<br>電漿原子發射光譜儀檢測。 / With<br>reference to US EPA 3052 (1996).<br>Analysis was performed by ICP-AES. | 2                    | n. d.          |

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# 測試報告

## Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 3 of 12

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| 測試項目<br>(Test Items)                                                                                                                                                                                                           | 單位<br>(Unit) | 測試方法<br>(Method)                                                                                                   | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|----------------------|----------------|
|                                                                                                                                                                                                                                |              |                                                                                                                    |                      | No. 1          |
| 六溴環十二烷及所有主要被辨別出的異構物 / Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified ( $\alpha$ -HBCDD, $\beta$ -HBCDD, $\gamma$ -HBCDD) (CAS No.: 25637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8)) | mg/kg        | 參考IEC 62321 (2008), 以氣相層析/質譜儀檢測。 / With reference to IEC 62321 (2008). Analysis was performed by GC/MS.            | 5                    | n. d.          |
| 鹵素 / Halogen                                                                                                                                                                                                                   |              |                                                                                                                    |                      |                |
| 鹵素(氟) / Halogen-Fluorine (F) (CAS No.: 14762-94-8)                                                                                                                                                                             | mg/kg        | 參考BS EN 14582 (2007), 以離子層析儀分析。 / With reference to BS EN 14582 (2007). Analysis was performed by IC.              | 50                   | n. d.          |
| 鹵素(氯) / Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)                                                                                                                                                                            | mg/kg        |                                                                                                                    | 50                   | n. d.          |
| 鹵素(溴) / Halogen-Bromine (Br) (CAS No.: 10097-32-2)                                                                                                                                                                             | mg/kg        |                                                                                                                    | 50                   | n. d.          |
| 鹵素(碘) / Halogen-Iodine (I) (CAS No.: 14362-44-8)                                                                                                                                                                               | mg/kg        |                                                                                                                    | 50                   | n. d.          |
| 鄰苯二甲酸丁苯甲酯 / BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)                                                                                                                                                                    | mg/kg        | 參考IEC 62321-8/CD (2013), 以氣相層析儀/質譜儀檢測。 / With reference to IEC 62321-8/CD (2013). Analysis was performed by GC/MS. | 50                   | n. d.          |
| 鄰苯二甲酸二丁酯 / DBP (Dibutyl phthalate) (CAS No.: 84-74-2)                                                                                                                                                                          | mg/kg        |                                                                                                                    | 50                   | n. d.          |
| 鄰苯二甲酸二(2-乙基己基)酯 / DEHP (Di-(2-ethylhexyl) phthalate) (CAS No.: 117-81-7)                                                                                                                                                       | mg/kg        |                                                                                                                    | 50                   | n. d.          |

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## 測試報告

## Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 4 of 12

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| 測試項目<br>(Test Items)                                                       | 單位<br>(Unit) | 測試方法<br>(Method)                                                                                                    | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|----------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------|----------------------|----------------|
|                                                                            |              |                                                                                                                     |                      | No. 1          |
| 鄰苯二甲酸二異丁酯 / DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)                | mg/kg        | 參考 IEC 62321-8/CD (2013), 以氣相層析儀/質譜儀檢測. / With reference to IEC 62321-8/CD (2013). Analysis was performed by GC/MS. | 50                   | n. d.          |
| 鄰苯二甲酸二異癸酯 / DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0; 68515-49-1) | mg/kg        |                                                                                                                     | 50                   | n. d.          |
| 鄰苯二甲酸二異壬酯 / DINP (Di-isononyl phthalate) (CAS No.: 28553-12-0; 68515-48-0) | mg/kg        |                                                                                                                     | 50                   | n. d.          |
| 鄰苯二甲酸二正辛酯 / DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0)                | mg/kg        |                                                                                                                     | 50                   | n. d.          |
| 鄰苯二甲酸二正己酯 / DNHP (Di-n-hexyl phthalate) (CAS No.: 84-75-3)                 | mg/kg        |                                                                                                                     | 50                   | n. d.          |
| 鄰苯二甲酸二戊酯 / Di-n-pentyl phthalate (CAS No.: 131-18-0)                       | mg/kg        |                                                                                                                     | 50                   | n. d.          |
| 多溴聯苯總和 / Sum of PBBs                                                       | mg/kg        | 參考 IEC 62321-6 (2015), 以氣相層析/質譜儀檢測. / With reference to IEC 62321-6 (2015) and performed by GC/MS.                  | -                    | n. d.          |
| 一溴聯苯 / Monobromobiphenyl                                                   | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 二溴聯苯 / Dibromobiphenyl                                                     | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 三溴聯苯 / Tribromobiphenyl                                                    | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 四溴聯苯 / Tetrabromobiphenyl                                                  | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 五溴聯苯 / Pentabromobiphenyl                                                  | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 六溴聯苯 / Hexabromobiphenyl                                                   | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 七溴聯苯 / Heptabromobiphenyl                                                  | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 八溴聯苯 / Octabromobiphenyl                                                   | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 九溴聯苯 / Nonabromobiphenyl                                                   | mg/kg        |                                                                                                                     | 5                    | n. d.          |
| 十溴聯苯 / Decabromobiphenyl                                                   | mg/kg        |                                                                                                                     | 5                    | n. d.          |

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## 測試報告

## Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 5 of 12

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| 測試項目<br>(Test Items)             | 單位<br>(Unit) | 測試方法<br>(Method)                                                                                     | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|----------------------------------|--------------|------------------------------------------------------------------------------------------------------|----------------------|----------------|
|                                  |              |                                                                                                      |                      | No. 1          |
| 多溴聯苯醚總和 / Sum of PBDEs           | mg/kg        | 參考 IEC 62321-6 (2015), 以氣相層析 / 質譜儀檢測. / With reference to IEC 62321-6 (2015) and performed by GC/MS. | -                    | n. d.          |
| 一溴聯苯醚 / Monobromodiphenyl ether  | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 二溴聯苯醚 / Dibromodiphenyl ether    | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 三溴聯苯醚 / Tribromodiphenyl ether   | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 四溴聯苯醚 / Tetrabromodiphenyl ether | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 五溴聯苯醚 / Pentabromodiphenyl ether | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 六溴聯苯醚 / Hexabromodiphenyl ether  | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 七溴聯苯醚 / Heptabromodiphenyl ether | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 八溴聯苯醚 / Octabromodiphenyl ether  | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 九溴聯苯醚 / Nonabromodiphenyl ether  | mg/kg        |                                                                                                      | 5                    | n. d.          |
| 十溴聯苯醚 / Decabromodiphenyl ether  | mg/kg        |                                                                                                      | 5                    | n. d.          |

### 備註(Note) :

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. n. d. = Not Detected (未檢出)
3. MDL = Method Detection Limit (方法偵測極限值)
4. "-" = Not Regulated (無規格值)

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## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 6 of 12

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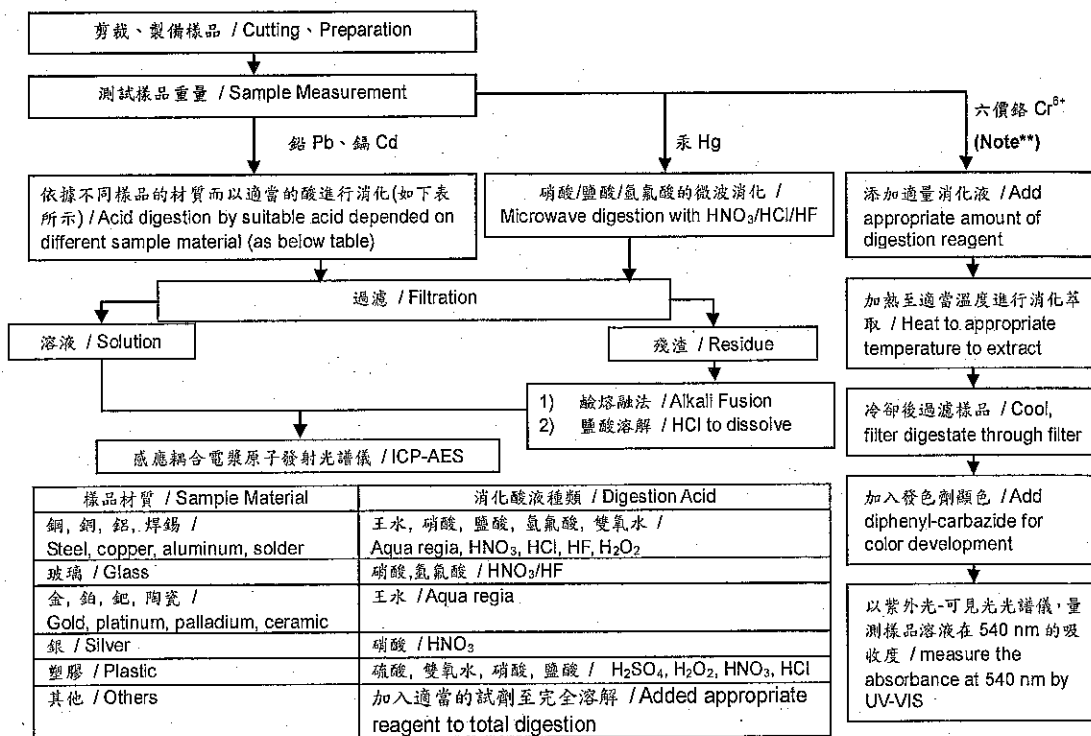
### 重金屬流程圖 / Analytical flow chart of Heavy Metal (IEC 62321)

根據以下的流程圖之條件，樣品已完全溶解。(六價鉻測試方法除外) /

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)

■ 測試人員: 王志瑋 / Technician: JR Wang

■ 測試負責人: 張啟興 / Supervisor: Troy Chang



Note\*\*: (1) 針對非金屬材料加入鹼性消化液, 加熱至 90~95°C 萃取。 / For non-metallic material, add alkaline digestion reagent and heat to 90~95°C.

(2) 針對金屬材料加入純水, 加熱至沸騰萃取。 / For metallic material, add pure water and heat to boiling

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## 測試報告 Test Report

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日期(Date) : 2016/10/13

頁數(Page): 7 of 12

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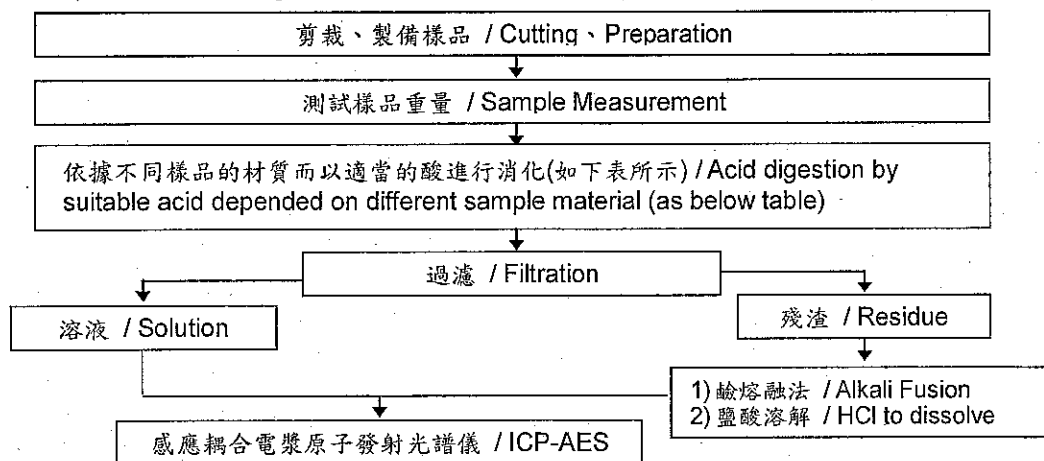
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根據以下的流程圖之條件，樣品已完全溶解。 / These samples were dissolved totally by pre-conditioning method according to below flow chart.

■ 測試人員：王志瑋 / Technician: JR Wang

■ 測試負責人：張啟興 / Supervisor: Troy Chang

### 元素以 ICP-AES 分析的消化流程圖 (Flow Chart of digestion for the elements analysis performed by ICP-AES)



|                                               |                                                                                                        |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 鋼,銅,鋁,焊錫 / Steel, copper, aluminum, solder    | 王水,硝酸,鹽酸,氫氟酸,雙氧水 / Aqua regia, HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub>               |
| 玻璃 / Glass                                    | 硝酸,氫氟酸 / HNO <sub>3</sub> /HF                                                                          |
| 金,鉑,鈀,陶瓷 / Gold, platinum, palladium, ceramic | 王水 / Aqua regia                                                                                        |
| 銀 / Silver                                    | 硝酸 / HNO <sub>3</sub>                                                                                  |
| 塑膠 / Plastic                                  | 硫酸,雙氧水,硝酸,鹽酸 / H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O <sub>2</sub> , HNO <sub>3</sub> , HCl |
| 其他 / Others                                   | 加入適當的試劑至完全溶解 / Added appropriate reagent to total digestion                                            |

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## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 8 of 12

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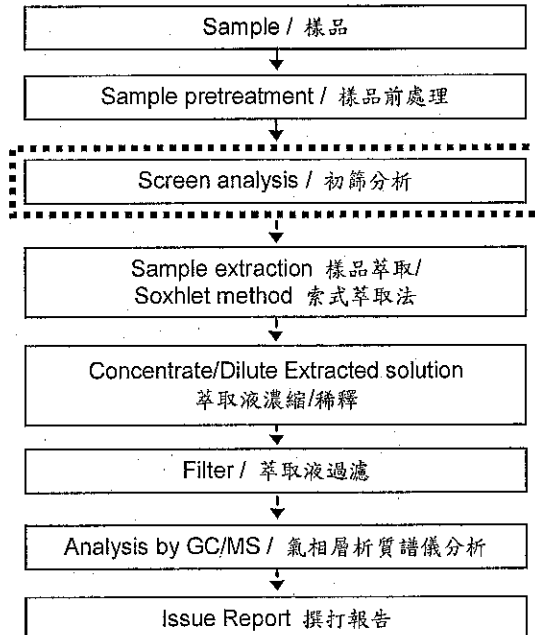
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### 多溴聯苯/多溴聯苯醚分析流程圖 / Analytical flow chart - PBB/PBDE

- 測試人員：涂雅琴 / Technician: Yaling Tu
- 測試負責人：張啟興 / Supervisor: Troy Chang

初次測試程序 / First testing process —————→  
 選擇性篩檢程序 / Optional screen process .....  
 確認程序 / Confirmation process - - - ->



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## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 9 of 12

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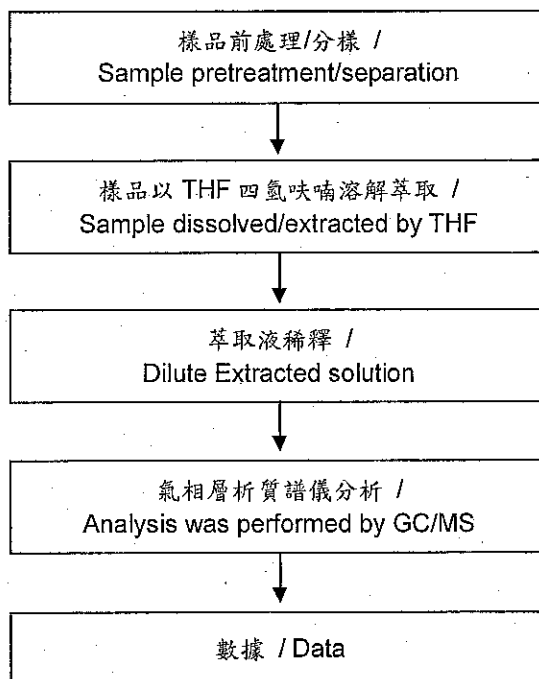
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### 可塑劑分析流程圖 / Analytical flow chart - Phthalate

- 測試人員：徐毓明 / Technician: Andy Shu
- 測試負責人：張啟興 / Supervisor: Troy Chang

### 【測試方法/Test method: IEC 62321-8】



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## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 10 of 12

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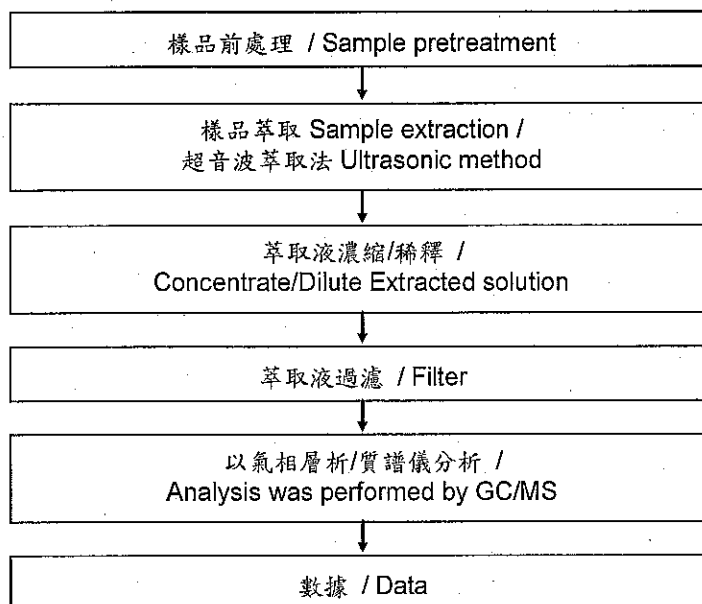
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### 六溴環十二烷分析流程圖 / Analytical flow chart - HBCDD

- 測試人員：涂雅苓 / Technician: Yaling Tu
- 測試負責人：張啟興 / Supervisor: Troy Chang



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## 測試報告 Test Report

號碼(No.) : CE/2016/A0549

日期(Date) : 2016/10/13

頁數(Page): 11 of 12

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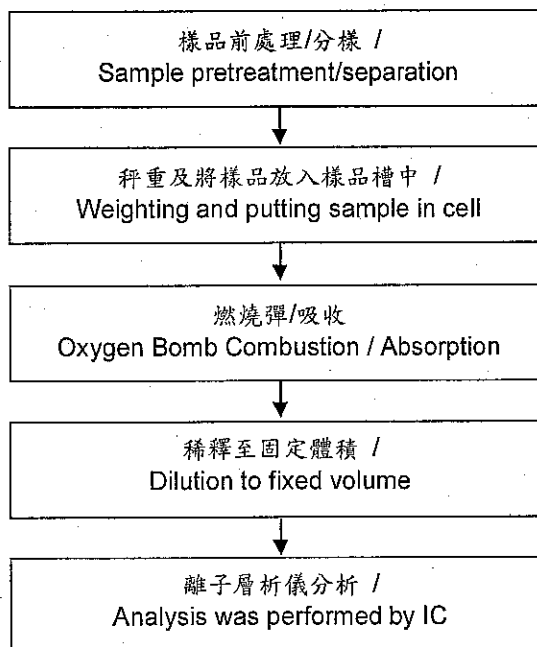
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### 鹵素分析流程圖 / Analytical flow chart - Halogen

- 測試人員：陳思臻 / Technician: Rita Chen
- 測試負責人：張啟興 / Supervisor: Troy Chang



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日期(Date) : 2016/10/13

頁數(Page): 12 of 12

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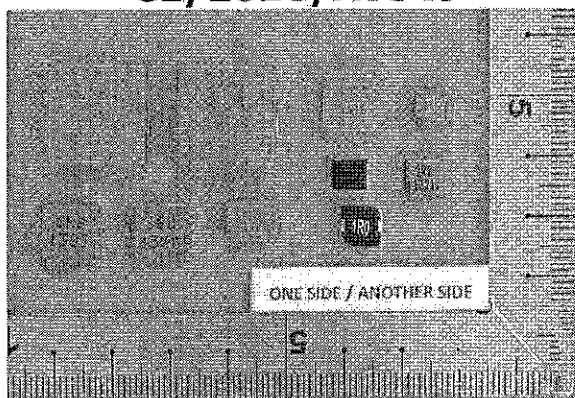
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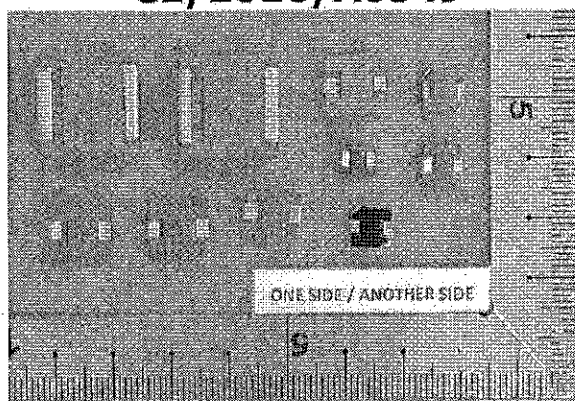
\* 照片中如有箭頭標示，則表示為實際檢測之樣品/部位。 \*

(The tested sample / part is marked by an arrow if it's shown on the photo.)

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**CE/2016/A0549**



\*\* 報告結尾 (End of Report) \*\*

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