

# Specification for Approval

Date: 2014/11/28


Certificate  
Green Partner

Customer : 深圳台慶

TAI-TECH P/N: HCB1608KF-221T20

CUSTOMER P/N:

DESCRIPTION:

QUANTITY: pcs

REMARK:

Customer Approval Feedback

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|------------------|------------------|-------------------|
| 楊祥忠<br>Mike Yang | 羅培君<br>Peijun Lo | 張嘉玲<br>Alin Chang |

**Ferrite Chip Bead(Lead Free)**

HCB1608KF-221T20

**ECN HISTORY LIST**

| REV    | DATE     | DESCRIPTION                          | APPROVED | CHECKED | DRAWN |
|--------|----------|--------------------------------------|----------|---------|-------|
| 1.0    | 13/06/06 | 變更可靠度條件                              | 楊祥忠      | 羅培君     | 張嘉玲   |
| 2.0    | 14/01/24 | 變更電鍍錫層厚度<br>3.0um min. => 3.5um min. | 楊祥忠      | 羅培君     | 張嘉玲   |
| 3.0    | 14/08/01 | 變更 Reflow 圖示                         | 楊祥忠      | 羅培君     | 張嘉玲   |
| 3.1    | 14/08/01 | 修正包裝帶尺寸                              | 楊祥忠      | 羅培君     | 張嘉玲   |
| 4.0    | 14/10/13 | 訂正 1608 包裝帶 Ao 尺寸                    | 楊祥忠      | 羅培君     | 張嘉玲   |
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| 備<br>註 |          |                                      |          |         |       |

# Ferrite Chip Bead(Lead Free)

HCB1608KF-221T20

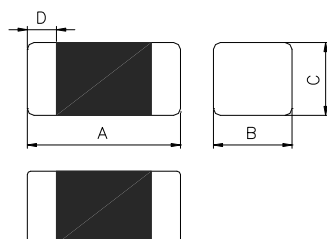
## 1.Features

1. Monolithic inorganic material construction.
2. Closed magnetic circuit avoids crosstalk.
3. Suitable for reflow soldering.
4. Shapes and dimensions follow E.I.A. spec.
5. Available in various sizes.
6. Excellent solder ability and heat resistance.
7. High reliability.
8. 100% Lead(Pb) & Halogen-Free and RoHS compliant.
9. Low DC resistance structure of electrode to prevent wasteful electric power consumption.



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## 2.Dimensions



| Chip Size |           |
|-----------|-----------|
| A         | 1.60±0.15 |
| B         | 0.80±0.15 |
| C         | 0.80±0.15 |
| D         | 0.30±0.20 |

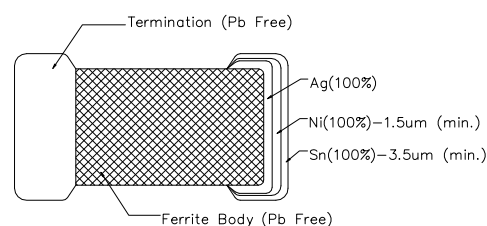
Units: mm

## 3.Part Numbering

|            |             |           |   |            |          |           |
|------------|-------------|-----------|---|------------|----------|-----------|
| <b>HCB</b> | <b>1608</b> | <b>KF</b> | - | <b>221</b> | <b>T</b> | <b>20</b> |
| A          | B           | C         |   | D          | E        | F         |

A: Series  
 B: Dimension  
 C: Material  
 D: Impedance  
 E: Packaging  
 F: Rated Current

L x W  
 Lead Free Material  
 221=220Ω  
 T=Taping and Reel, B=Bulk(Bags)  
 20=2000mA

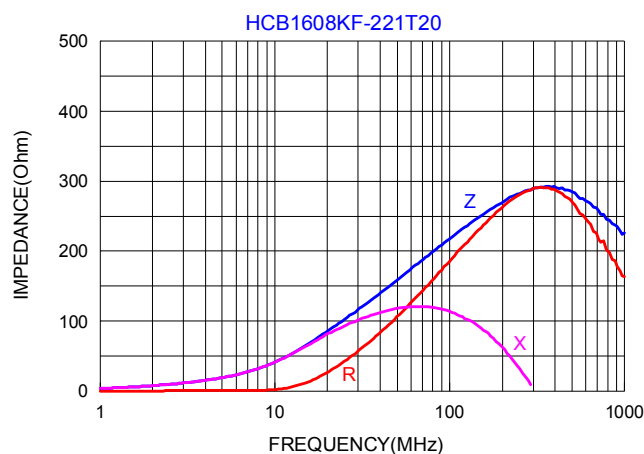


## 4.Specification

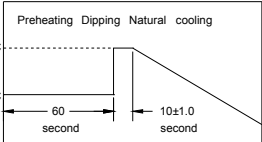
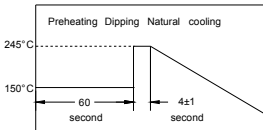
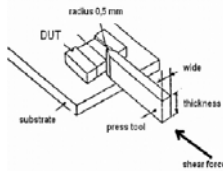
| Tai-Tech Part Number | Impedance (Ω) | Test Frequency (Hz) | DC Resistance (Ω) max. | Rated Current (mA) max. |
|----------------------|---------------|---------------------|------------------------|-------------------------|
| HCB1608KF-221T20     | 220±25%       | 60mV/100M           | 0.10                   | 2000                    |

● Rated current: based on temperature rise test

### ■ Impedance-Frequency Characteristics



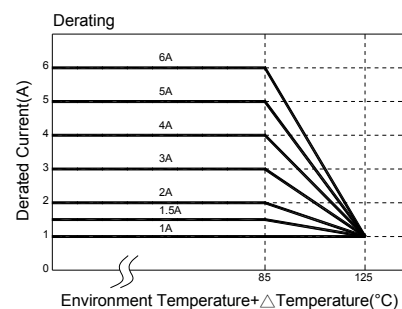
## 5. Reliability and Test Condition

| Item                                  | Performance                                                                                                                                                                                                                                                                                                                                |                          |           |                           |     |                                                |     |     |     |    | Test Condition                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------|---------------------------|-----|------------------------------------------------|-----|-----|-----|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|------|------------------|--------------------------|-----------|---------------------------|-----|-------|-----|-----------|------|------|-----|---|-----------|------|
| Series No.                            | FCB                                                                                                                                                                                                                                                                                                                                        | FCM                      | HCB       | GHB                       | FCA | FCI                                            | FHI | FCH | HCI | -- |                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Operating Temperature                 | -40~+125℃<br>(Including self-temperature rise)                                                                                                                                                                                                                                                                                             |                          |           |                           |     | -40~+105℃<br>(Including self-temperature rise) |     |     |     |    | --                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Transportation<br>Storage Temperature | -40~+125℃<br>(on board)                                                                                                                                                                                                                                                                                                                    |                          |           |                           |     | -40~+105℃<br>(on board)                        |     |     |     |    | For long storage conditions, please see the Application Notice                                                                                                                                                                                                                                                                                           |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Impedance (Z)                         | Refer to standard electrical characteristics list                                                                                                                                                                                                                                                                                          |                          |           |                           |     |                                                |     |     |     |    | Agilent4291                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Inductance (Ls)                       |                                                                                                                                                                                                                                                                                                                                            |                          |           |                           |     |                                                |     |     |     |    | Agilent E4991                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Q Factor                              |                                                                                                                                                                                                                                                                                                                                            |                          |           |                           |     |                                                |     |     |     |    | Agilent4287                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| DC Resistance                         |                                                                                                                                                                                                                                                                                                                                            |                          |           |                           |     |                                                |     |     |     |    | Agilent16192                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Rated Current                         |                                                                                                                                                                                                                                                                                                                                            |                          |           |                           |     |                                                |     |     |     |    | Agilent 4338                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Temperature Rise Test                 | Rated Current < 1A ΔT 20℃Max<br>Rated Current ≥ 1A ΔT 40℃Max                                                                                                                                                                                                                                                                               |                          |           |                           |     |                                                |     |     |     |    | 1. Applied the allowed DC current.<br>2. Temperature measured by digital surface thermometer.                                                                                                                                                                                                                                                            |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Resistance to Soldering<br>Heat       | Appearance : No damage.<br>Impedance : within±15% of initial value<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                                                                                         |                          |           |                           |     |                                                |     |     |     |    | Preheat: 150℃,60sec.<br>Solder: Sn99.5%-Cu0.5%<br>Solder temperature: 260±5℃<br>Flux for lead free: Rosin. 9.5%<br>Temperature ramp/immersion and immersion rate: 25±6 mm/s<br>Dip time: 10±1sec.<br>Depth: completely cover the termination.<br>                    |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Solderability                         | More than 95% of the terminal electrode should be covered with solder.<br>                                                                                                                                                                             |                          |           |                           |     |                                                |     |     |     |    | Preheat: 150℃,60sec.<br>Solder: Sn99.5%-Cu0.5%<br>Solder temperature: 245±5℃<br>Flux for lead free: Rosin. 9.5%<br>Depth: completely cover the termination.<br>Dip time: 4±1sec.                                                                                                                                                                         |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Terminal strength                     | Appearance : No damage.<br>Impedance : within±15% of initial value<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<br> |                          |           |                           |     |                                                |     |     |     |    | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Component mounted on a PCB apply a force (>0805:1kg <=0805:0.5kg)to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to shock the component being tested. |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Bending                               | Appearance : No damage.<br>Impedance : within±10% of initial value<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                                                                                         |                          |           |                           |     |                                                |     |     |     |    | Shall be mounted on a FR4 substrate of the following dimensions:>=0805:40x100x1.2mm<br><0805:40x100x0.8mm<br>Bending depth:>=0805:1.2mm<br><0805:0.8mm<br>Duration of 10 sec for a min.                                                                                                                                                                  |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Vibration Test                        | Appearance : No damage.<br>Impedance : within±15% of initial value<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-020D Classification Reflow Profiles)<br>Oscillation Frequency: 10~2K~10Hz for 20 minutes<br>Equipment : Vibration checker<br>Total Amplitude:1.52mm±10%<br>Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations) °                                                  |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Shock                                 | Appearance : No damage.<br>Impedance : within±15% of initial value<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                                                                                         |                          |           |                           |     |                                                |     |     |     |    | Test condition: <table><tr><th>Type</th><th>Peak Value (g's)</th><th>Normal duration (D) (ms)</th><th>Wave form</th><th>Velocity change (V)ft/sec</th></tr><tr><td>SMD</td><td>1,500</td><td>0.5</td><td>Half-sine</td><td>15.4</td></tr><tr><td>Lead</td><td>100</td><td>6</td><td>Half-sine</td><td>12.3</td></tr></table>                             |  |  |  |  | Type | Peak Value (g's) | Normal duration (D) (ms) | Wave form | Velocity change (V)ft/sec | SMD | 1,500 | 0.5 | Half-sine | 15.4 | Lead | 100 | 6 | Half-sine | 12.3 |
| Type                                  | Peak Value (g's)                                                                                                                                                                                                                                                                                                                           | Normal duration (D) (ms) | Wave form | Velocity change (V)ft/sec |     |                                                |     |     |     |    |                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| SMD                                   | 1,500                                                                                                                                                                                                                                                                                                                                      | 0.5                      | Half-sine | 15.4                      |     |                                                |     |     |     |    |                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |
| Lead                                  | 100                                                                                                                                                                                                                                                                                                                                        | 6                        | Half-sine | 12.3                      |     |                                                |     |     |     |    |                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |      |                  |                          |           |                           |     |       |     |           |      |      |     |   |           |      |

| Item                  | Performance                                                                                                                                                                                                                                     | Test Condition                                                                                                                                                                                                                                                                                        |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Life test             | Appearance: no damage.                                                                                                                                                                                                                          | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Temperature: 125±2℃ (bead),<br>85±2℃ (inductor)<br>Applied current: rated current.<br>Duration: 1000±12hrs.<br>Measured at room temperature after placing for 24±2 hrs.                  |
| Load Humidity         | Impedance: within±15%of initial value.<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-020D Classification Reflow Profiles)<br>Humidity: 85±2%R.H.<br>Temperature: 85±2℃.<br>Duration: 1000hrs Min. with 100% rated current.<br>Measured at room temperature after placing for 24±2 hrs.                                |
| Thermal shock         | Appearance: no damage.<br>Impedance: within±15%of initial value.<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-020D Classification Reflow Profiles)<br>Condition for 1 cycle<br>Step1: -40±2℃ 30±5 min.<br>Step2: 25±2℃ ≤0.5min<br>Step3: +105±2℃ 30±5min.<br>Number of cycles: 500<br>Measured at room temperature after placing for 24±2 hrs. |
| Insulation Resistance | IR>1GΩ                                                                                                                                                                                                                                          | Chip Inductor Only<br>Test Voltage:100±10%V for 30Sec.                                                                                                                                                                                                                                                |

### \*\*Derating Curve

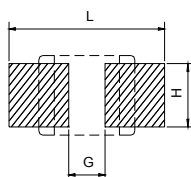
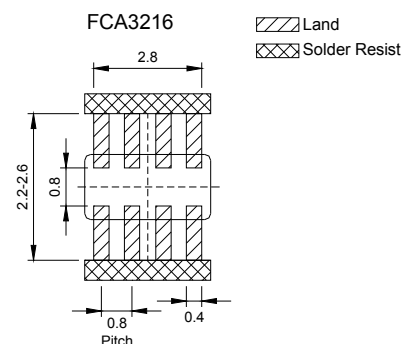
For the ferrite chip bead which withstanding current over 1.5A, as the operating temperature over 85℃, the derating current information is necessary to consider with. For the detail derating of current, please refer to the Derated Current vs. Operating Temperature curve.



## 6.Soldering and Mounting

### 6-1. Recommended PC Board Pattern

| Chip Size |      |          |           |           |           | Land Patterns For Reflow Soldering |       |       |
|-----------|------|----------|-----------|-----------|-----------|------------------------------------|-------|-------|
| Series    | Type | A(mm)    | B(mm)     | C(mm)     | D(mm)     | L(mm)                              | G(mm) | H(mm) |
| FCB       | 0603 | 0.6±0.03 | 0.30±0.03 | 0.30±0.03 | 0.15±0.05 | 0.80                               | 0.30  | 0.30  |
|           | 1005 | 1.0±0.10 | 0.50±0.10 | 0.50±0.10 | 0.25±0.10 | 1.50                               | 0.40  | 0.55  |
| FCM       | 1608 | 1.6±0.15 | 0.80±0.15 | 0.80±0.15 | 0.30±0.20 | 2.60                               | 0.60  | 0.80  |
| HCB       | 2012 | 2.0±0.20 | 1.25±0.20 | 0.85±0.20 | 0.50±0.30 | 3.00                               | 1.00  | 1.00  |
| GHB       |      | 2.0±0.20 | 1.25±0.20 | 1.25±0.20 | 0.50±0.30 |                                    |       |       |
| FCI       | 3216 | 3.2±0.20 | 1.60±0.20 | 1.10±0.20 | 0.50±0.30 | 4.40                               | 2.20  | 1.40  |
| FHI       | 3225 | 3.2±0.20 | 2.50±0.20 | 1.30±0.20 | 0.50±0.30 | 4.40                               | 2.20  | 3.40  |
| FCH       | 4516 | 4.5±0.20 | 1.60±0.20 | 1.60±0.20 | 0.50±0.30 | 5.70                               | 2.70  | 1.40  |
| HCI       | 4532 | 4.5±0.20 | 3.20±0.20 | 1.50±0.20 | 0.50±0.30 | 5.90                               | 2.57  | 4.22  |



PC board should be designed so that products can prevent damage from mechanical stress when warping the board.

## 6-2. Soldering

Mildly activated rosin fluxes are preferred. The 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.

Note.

If wave soldering is used, there will be some risk.

Re-flow soldering temperatures below 240 degrees, there will be non-wetting risk

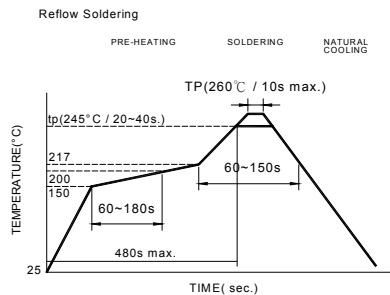
### 6-2.1 Lead Free Solder re-flow:

Recommended temperature profiles for lead free re-flow soldering in Figure 1. (Referred to J-STD-020C)

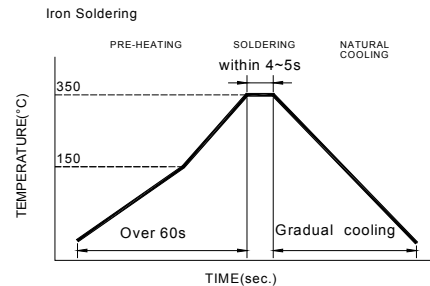
### 6-2.2 Soldering Iron:

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. If a soldering iron must be employed the following precautions are recommended. for Iron Soldering in Figure 2.

- 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
- 350°C tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.



Reflow times: 3 times max  
Fig.1

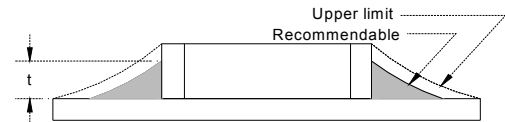


Iron Soldering times : 1 times max  
Fig.2

### 6-2.3 Solder Volume:

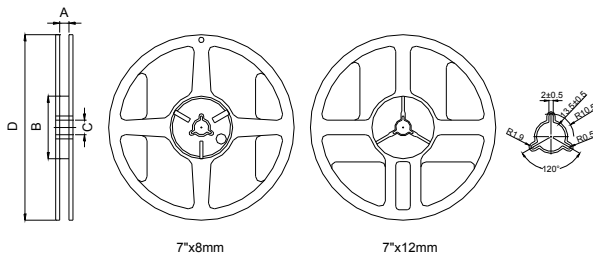
Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance. Solder shall be used not to be exceed as shown in right side:

Minimum fillet height = soldering thickness + 25% product height



## 7. Packaging Information

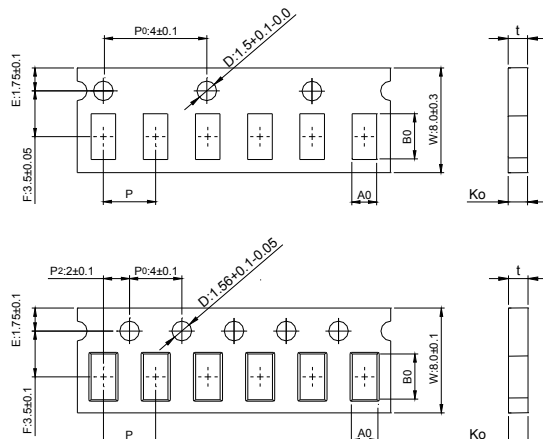
### 7-1. Reel Dimension



| Type    | A(mm)    | B(mm) | C(mm)    | D(mm) |
|---------|----------|-------|----------|-------|
| 7"x8mm  | 9.0±0.5  | 60±2  | 13.5±0.5 | 178±2 |
| 7"x12mm | 13.5±0.5 | 60±2  | 13.5±0.5 | 178±2 |

### 7-2.1 Tape Dimension / 8mm

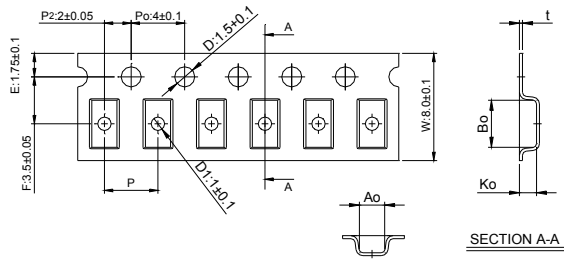
■ Material of taping is paper



| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------|-----------|----------|-----------|
| 060303 | 0.68±0.05 | 0.38±0.05 | 0.50max   | 2.0±0.05 | 0.50max   |
| 100505 | 1.12±0.03 | 0.62±0.03 | 0.60±0.03 | 2.0±0.05 | 0.60±0.03 |

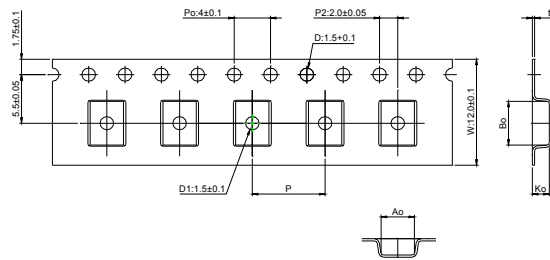
| Size   | Bo(mm)    | Ao(mm)          | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------------|-----------|----------|-----------|
| 160808 | 1.80±0.05 | 0.96+0.05/-0.03 | 0.95±0.05 | 4.0±0.10 | 0.95±0.05 |
| 201209 | 2.10±0.05 | 1.30±0.05       | 0.95±0.05 | 4.0±0.10 | 0.95±0.05 |

■ Material of taping is plastic



| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     | D1(mm)   |
|--------|-----------|-----------|-----------|----------|-----------|----------|
| 201212 | 2.10±0.10 | 1.28±0.10 | 1.28±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |
| 321611 | 3.35±0.10 | 1.75±0.10 | 1.25±0.10 | 4.0±0.10 | 0.23±0.05 | 1.0±0.10 |
| 322513 | 3.42±0.10 | 2.77±0.10 | 1.55±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |
| 321609 | 3.40±0.10 | 1.77±0.10 | 1.04±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |

### 7-2.2 Tape Dimension / 12mm

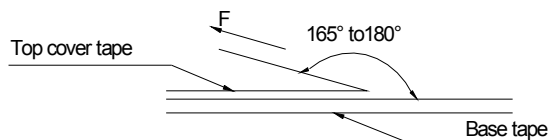


| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     | D1(mm)  |
|--------|-----------|-----------|-----------|----------|-----------|---------|
| 451616 | 4.70±0.10 | 1.75±0.10 | 1.75±0.10 | 4.0±0.10 | 0.24±0.05 | 1.5±0.1 |
| 453215 | 4.70±0.10 | 3.45±0.10 | 1.60±0.10 | 8.0±0.10 | 0.24±0.05 | 1.5±0.1 |

### 7-3. Packaging Quantity

| Chip Size   | 453215 | 451616 | 322513 | 321611 | 321609 | 201212 | 201209 | 160808 | 100505 | 060303 |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Chip / Reel | 1000   | 2000   | 2500   | 3000   | 3000   | 2000   | 4000   | 4000   | 10000  | 15000  |
| Inner box   | 4000   | 8000   | 12500  | 15000  | 15000  | 10000  | 20000  | 20000  | 50000  | 75000  |
| Middle box  | 20000  | 40000  | 62500  | 75000  | 75000  | 50000  | 100000 | 100000 | 250000 | 375000 |
| Carton      | 40000  | 80000  | 125000 | 150000 | 150000 | 100000 | 200000 | 200000 | 500000 | 750000 |

### 7-4. Tearing Off Force



The force for tearing off cover tape is 15 to 60 grams in the arrow direction under the following conditions.

| 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 solder ability 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 from 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.

# 測試報告

## Test Report

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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) : FERRITE CHIP BEAD INDUCTOR ARRAY MCF MCM YMV SERIES

樣品型號(Style/Item No.) : FERRITE CHIP BEAD INDUCTOR ARRAY MCF MCM YMV SERIES

收件日期(Sample Receiving Date) : 2013/12/05

測試期間(Testing Period) : 2013/12/05 TO 2013/12/12

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

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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方法, 以感應耦合電漿原子發射光譜儀檢測. / With reference to IEC 62321-5: 2013 and performed by ICP-AES.      | 2                    | n.d.           |
| 鉛 / Lead (Pb)                    | mg/kg        | 參考IEC 62321-5: 2013方法, 以感應耦合電漿原子發射光譜儀檢測. / With reference to IEC 62321-5: 2013 and performed by ICP-AES.      | 2                    | n.d.           |
| 汞 / Mercury (Hg)                 | mg/kg        | 參考IEC 62321-4: 2013方法, 以感應耦合電漿原子發射光譜儀檢測. / With reference to IEC 62321-4: 2013 and performed by ICP-AES.      | 2                    | n.d.           |
| 六價鉻 / Hexavalent Chromium Cr(VI) | mg/kg        | 參考IEC 62321: 2008方法, 以UV-VIS檢測. / With reference to IEC 62321: 2008 and performed by UV-VIS.                  | 2                    | n.d.           |
| 鈹 / Beryllium (Be)               | mg/kg        | 參考US EPA 3052方法, 以感應耦合電漿原子發射光譜儀檢測. / With reference to US EPA Method 3052. Analysis was performed by ICP-AES. | 2                    | n.d.           |
| 銻 / Antimony (Sb)                | mg/kg        | 參考US EPA 3052方法, 以感應耦合電漿原子發射光譜儀檢測. / With reference to US EPA Method 3052. Analysis was performed by ICP-AES. | 2                    | n.d.           |

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# 測試報告

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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           |
| 全氟辛烷磺酸 / Perfluorooctane sulfonates (PFOS-Acid, Metal Salt, Amide)                                                                                                                                                             | mg/kg        | 參考US EPA 3550C: 2007方法, 以液相層析/質譜儀檢測。 / With reference to US EPA 3550C: 2007. Analysis was performed by LC/MS.  | 10                   | n.d.           |
| 全氟辛酸 / PFOA (CAS No.: 335-67-1)                                                                                                                                                                                                | mg/kg        | 參考US EPA 3550C: 2007方法, 以液相層析/質譜儀檢測。 / With reference to US EPA 3550C: 2007. Analysis was performed by LC/MS.  | 10                   | n.d.           |
| 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方法, 以氣相層析/質譜儀檢測。 / With reference to IEC 62321: 2008 method. Analysis was performed by GC/MS. | 5                    | n.d.           |
| 鄰苯二甲酸甲基丁酯 / BBP (Benzyl butyl phthalate) (CAS No.: 85-68-7)                                                                                                                                                                    | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。 / With reference to EN 14372. Analysis was performed by GC/MS.                       | 0.003                | n.d.           |
| 鄰苯二甲酸二(2-乙基己基)酯 / DEHP (Di-(2-ethylhexyl) phthalate) (CAS No.: 117-81-7)                                                                                                                                                       | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。 / With reference to EN 14372. Analysis was performed by GC/MS.                       | 0.003                | n.d.           |
| 鄰苯二甲酸二異癸酯 / DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0; 68515-49-1)                                                                                                                                                     | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。 / With reference to EN 14372. Analysis was performed by GC/MS.                       | 0.01                 | n.d.           |
| 鄰苯二甲酸二異壬酯 / DINP (Di-isononyl phthalate) (CAS No.: 28553-12-0; 68515-48-0)                                                                                                                                                     | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。 / With reference to EN 14372. Analysis was performed by GC/MS.                       | 0.01                 | n.d.           |

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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           |
| 鄰苯二甲酸二正辛酯 / DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0) | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。<br>/ With reference to EN 14372. Analysis was performed by GC/MS.          | 0.003                | n.d.           |
| 鄰苯二甲酸二丁酯 / DBP (Dibutyl phthalate) (CAS No.: 84-74-2)       | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。<br>/ With reference to EN 14372. Analysis was performed by GC/MS.          | 0.003                | n.d.           |
| 鄰苯二甲酸二異丁酯 / DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5) | %            | 參考EN 14372, 以氣相層析/質譜儀檢測之。<br>/ With reference to EN 14372. Analysis was performed by GC/MS.          | 0.003                | n.d.           |
| <b>鹵素 / Halogen</b>                                         |              |                                                                                                      |                      |                |
| 鹵素 (氟) / Halogen-Fluorine (F)<br>(CAS No.: 14762-94-8)      | mg/kg        | 參考BS EN 14582:2007, 以離子層析儀分析。<br>/ With reference to BS EN 14582:2007. Analysis was performed by IC. | 50                   | n.d.           |
| 鹵素 (氯) / Halogen-Chlorine (Cl)<br>(CAS No.: 22537-15-1)     | mg/kg        | 參考BS EN 14582:2007, 以離子層析儀分析。<br>/ With reference to BS EN 14582:2007. Analysis was performed by IC. | 50                   | n.d.           |
| 鹵素 (溴) / Halogen-Bromine (Br)<br>(CAS No.: 10097-32-2)      | mg/kg        | 參考BS EN 14582:2007, 以離子層析儀分析。<br>/ With reference to BS EN 14582:2007. Analysis was performed by IC. | 50                   | n.d.           |
| 鹵素 (碘) / Halogen-Iodine (I)<br>(CAS No.: 14362-44-8)        | mg/kg        | 參考BS EN 14582:2007, 以離子層析儀分析。<br>/ With reference to BS EN 14582:2007. Analysis was performed by IC. | 50                   | n.d.           |

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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           |
| 多溴聯苯總和 / Sum of PBBs             | mg/kg        | 參考 IEC 62321: 2008 方法, 以氣相層析/質譜儀檢測。 / With reference to IEC 62321: 2008 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.           |
| 多溴聯苯醚總和 / Sum of PBDEs           | mg/kg        |                                                                                                 | -                    | 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.           |

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## 測試報告

## Test Report

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### 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)
5. 樣品的測試是基於申請人要求混合測試，報告中的混合測試結果不代表其中個別單一材質的含量。(The samples was/were analyzed on behalf of the applicant as mixing sample in one testing. The above results was/were only given as the informality value.)

### PFOS參考資訊(Reference Information) : 持久性有機污染物 POPs - (EU) 757/2010

PFOS濃度在物質或製備中不得超過0.001%(10ppm)，在半成品、成品或零部件中不得超過0.1%(1000ppm)，在紡織品或塗層材料中不得超過1µg/m<sup>2</sup>。

(Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above 1µg/m<sup>2</sup>.)

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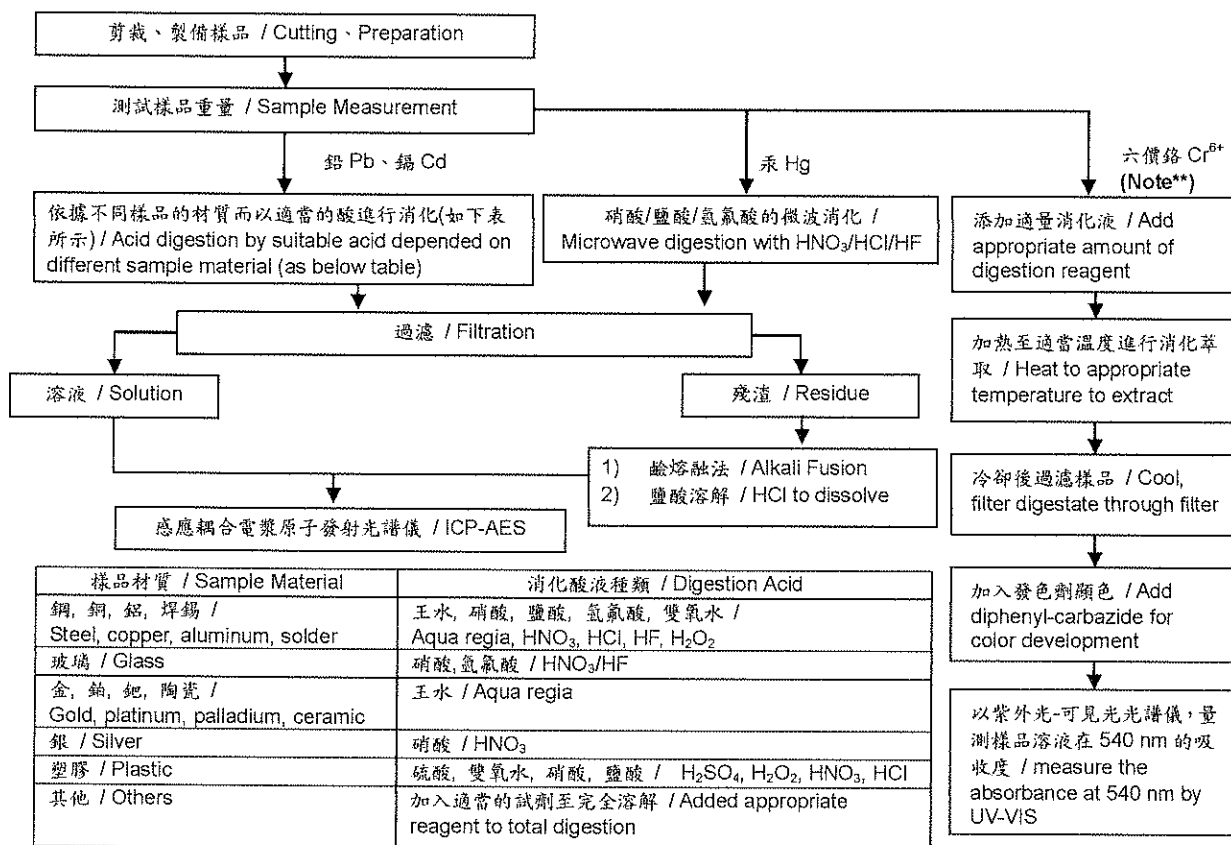
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- 1) 根據以下的流程圖之條件，樣品已完全溶解。(六價鉻測試方法除外) / These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)
- 2) 測試人員: 楊登偉 / Name of the person who made measurement: Climbgreat Yang
- 3) 測試負責人: 張啓興 / Name of the person in charge of measurement: Troy Chang



### Note\*\* (For IEC 62321)

- (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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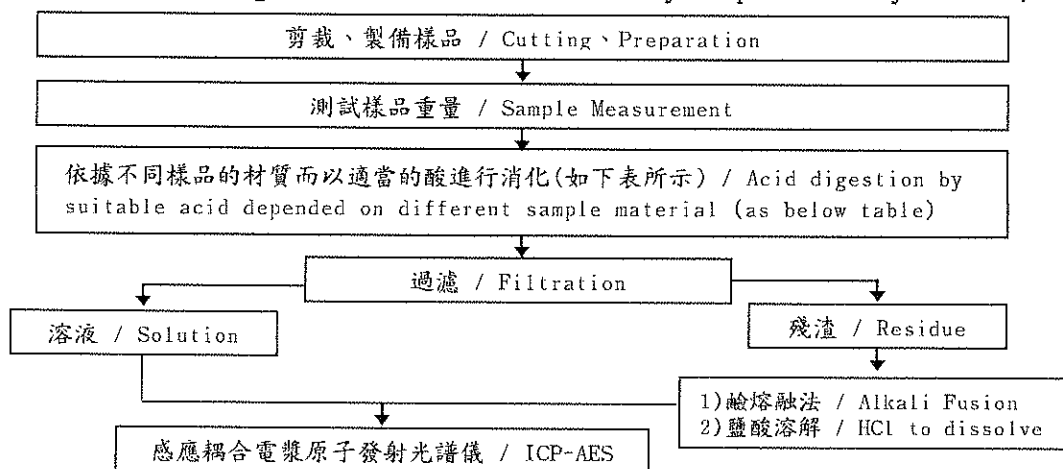
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- 1) 根據以下的流程圖之條件，樣品已完全溶解。 / These samples were dissolved totally by pre-conditioning method according to below flow chart.
- 2) 測試人員：楊登偉 / Name of the person who made measurement: Climbgreat Yang
- 3) 測試負責人：張啓興 / Name of the person in charge of measurement: 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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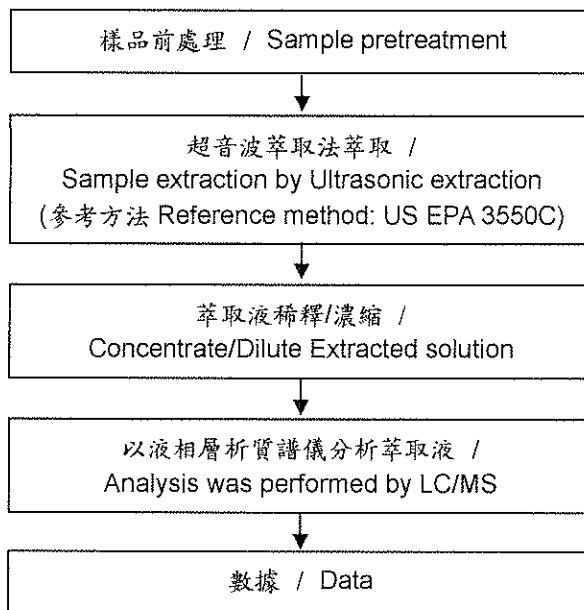
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### 全氟辛酸/全氟辛烷磺酸分析流程圖 / PFOA/PFOS analytical flow chart

- 測試人員：翁賜彬 / Name of the person who made measurement: Roman Wong
- 測試負責人：張啓興 / Name of the person in charge of measurement: Troy Chang



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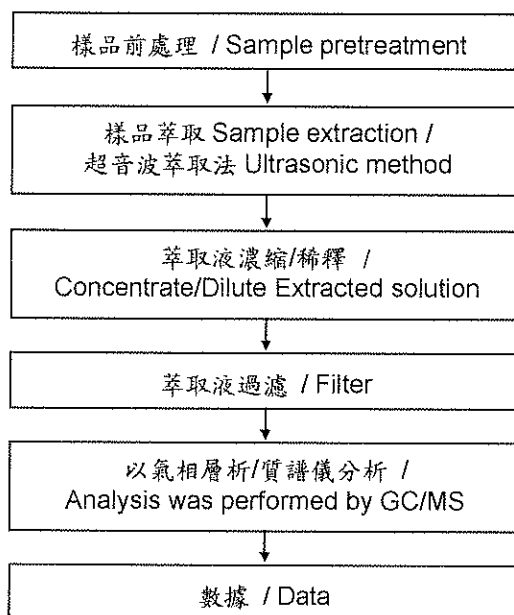
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### 六溴環十二烷分析流程圖 / HBCDD analytical flow chart

- 測試人員：翁賜彬 / Name of the person who made measurement: Roman Wong
- 測試負責人：張啓興 / Name of the person in charge of measurement: Troy Chang



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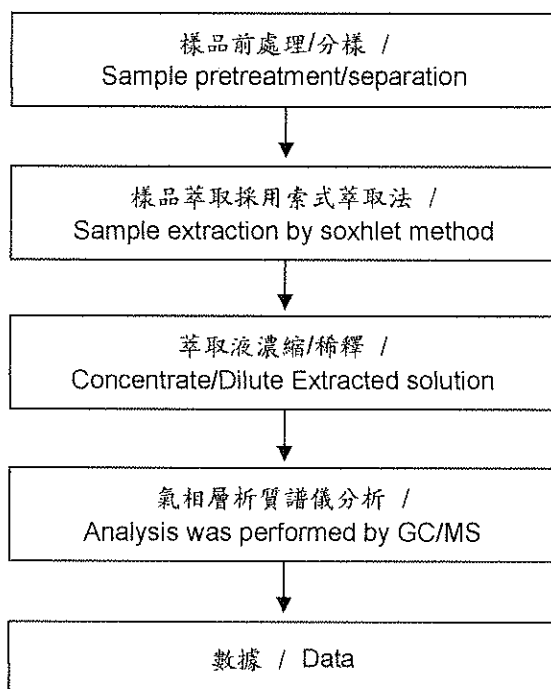
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### 可塑劑分析流程圖 / Analytical flow chart of phthalate content

- 測試人員：翁賜彬 / Name of the person who made measurement: Roman Wong
- 測試負責人：張啓興 / Name of the person in charge of measurement: Troy Chang



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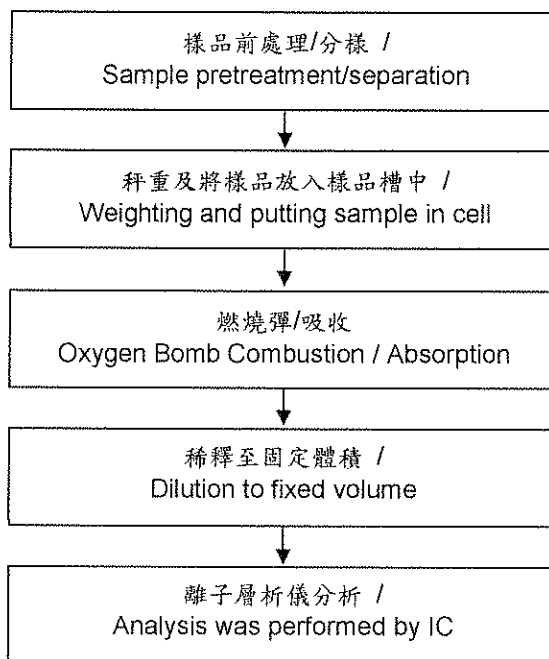
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### 鹵素分析流程圖 / Analytical flow chart of halogen content

- 測試人員：陳思臻 / Name of the person who made measurement: Rita Chen
- 測試負責人：張啓興 / Name of the person in charge of measurement: Troy Chang



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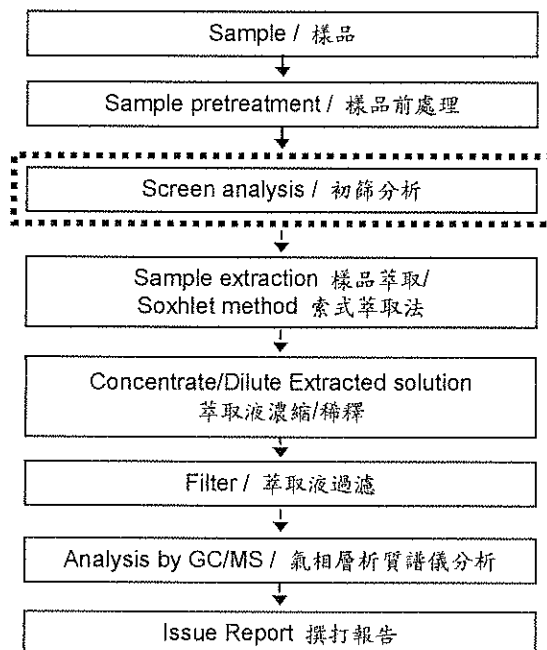
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### 多溴聯苯/多溴聯苯醚分析流程圖 / PBB/PBDE analytical FLOW CHART

- 測試人員：翁賜彬 / Name of the person who made measurement: Roman Wong
- 測試負責人：張啓興 / Name of the person in charge of measurement: 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/2013/C0960 日期(Date) : 2013/12/12 頁數(Page) : 14 of 14

西北臺慶科技股份有限公司 / TAI-TECH ADVANCED ELECTRONICS CO., LTD.



(東莞臺慶精密電子有限公司 / TAI-TECH ADVANCED ELECTRONICS (DONGGUAN) CO. LTD.)

(臺慶精密電子(昆山)有限公司 / TAI-TECH ADVANCED ELECTRONICS (KUN-SHAN) CO. LTD.)

桃園縣楊梅市幼獅工業區幼四路1號 / NO. 1, YOU 4TH ROAD, YOUTH INDUSTRIAL DISTRICT, YANG-MEI CITY, TAO-YUAN HSIEN, TAIWAN R. O. C.

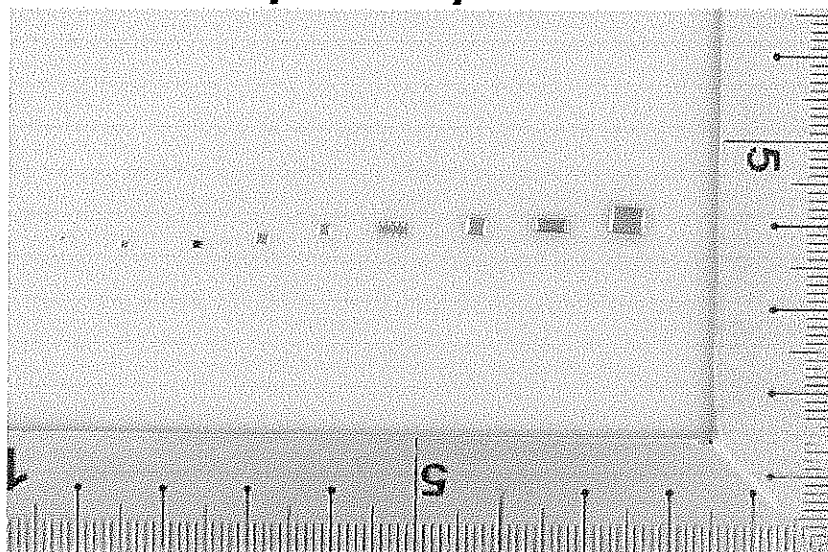
(廣東省東莞市黃江鎮黃牛埔福祥街2號 / NO. 2, FUXIANG STREET, HUANGNIUPU, HUANGJIANG TOWN, DONGGUAN, GUANGDONG)

(江蘇省昆山市蓬朗鎮嘉高科技工業區郭澤路 / GUO-ZE ROAD, KUNJIA HI-TECH INDUSTRIAL PARK, KUN-SHAN, JIANG-SU, CHINA)

\* 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.)

### CE/2013/C0960



\*\* 報告結尾 (End of Report) \*\*

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