

# Specification for Approval

 Date: 2023/2/24


Certificate of GreenPartner

Customer : \_\_\_\_\_

 TAI-TECH P/N: HCB2012VF-221T30

CUSTOMER P/N: \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

QUANTITY: \_\_\_\_\_ pcs

|                            |  |  |
|----------------------------|--|--|
| REMARK:                    |  |  |
| Customer Approval Feedback |  |  |
|                            |  |  |

西北臺慶科技股份有限公司  
**TAI-TECH Advanced Electronics Co., Ltd**

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R&amp;D Center

| APPROVED | CHECKED | DRAWN |
|----------|---------|-------|
| 鄧福興      | 浦冬生     | 浦婷婷   |

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## Ferrite Chip Bead(Lead Free)

HCB2012VF-221T30

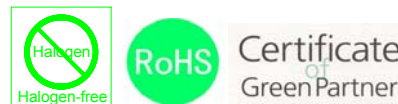
## ECN HISTORY LIST

| 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    | 16/01/26 | 增訂可靠度 Thermal shock:<br>(Bead) Step3 : 125±2°C 30±5min | 楊祥忠      | 詹偉特     | 張嘉玲   |
| 5.0    | 17/02/16 | 修訂 Recommended PC Board Pattern                        | 楊祥忠      | 詹偉特     | 張嘉玲   |
| 6.0    | 20/08/01 | 更新 Reflow 依 IPC EDEC J-STD-020E                        | 鄧福興      | 浦冬生     | 王俞琴   |
| 7.0    | 22/12/05 | 更新可靠度及更正 Reflow 敘述                                     | 鄧福興      | 浦冬生     | 王俞琴   |
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| 備<br>註 |          |  |          |         |       |

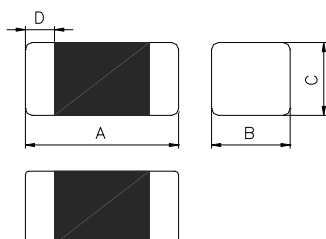
# Ferrite Chip Bead(Lead Free) HCB2012VF-221T30

## 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.
10. Operating Temperature : -55~+125°C (Including self-temperature rise)



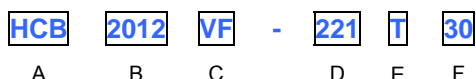
## 2.Dimensions



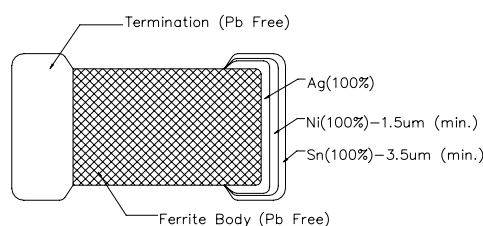
| Chip Size |           |
|-----------|-----------|
| A         | 2.00±0.20 |
| B         | 1.25±0.20 |
| C         | 0.85±0.20 |
| D         | 0.50±0.30 |

Units: mm

## 3.Part Numbering



- A: Series
  - B: Dimension
  - C: Material
  - D: Impedance
  - E: Packaging
  - F: Rated Current
  - G: Category Code
- L x W  
 Lead Free Material  
 221=220Ω  
 T=Taping and Reel, B=Bulk(Bags)  
 30=3000mA

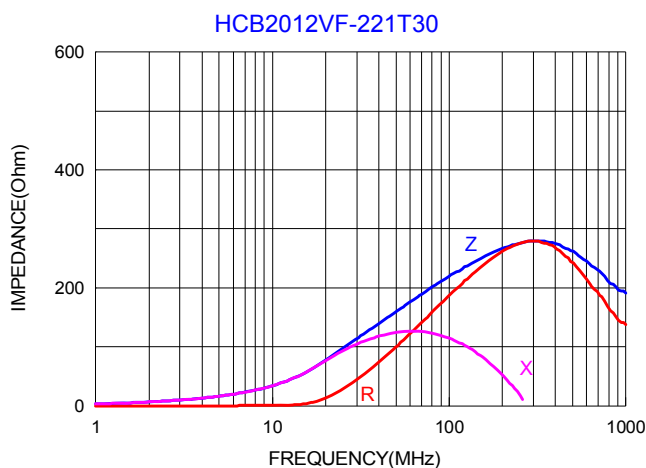


## 4.Specification

| Tai-Tech Part Number | Impedance (Ω) | Test Frequency (Hz) | DC Resistance (Ω) max. | Rated Current (mA) max. |
|----------------------|---------------|---------------------|------------------------|-------------------------|
| HCB2012VF-221T30     | 220±25%       | 60mV/100M           | 0.04                   | 3000                    |

- Rated current: based on temperature rise test
- In compliance with EIA 595

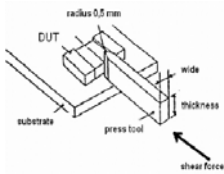
### ■ Impedance-Frequency Characteristics



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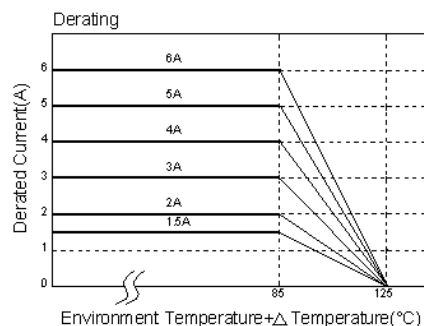
## 5. Reliability and Test Condition

| Item                               | Performance   |                          |           |                            |     | Test Condition  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
|------------------------------------|---|--------------------------|-----------|----------------------------|-----|---|------|------------------|--------------------------|-----------|----------------------------|-----|----|----|-----------|------|------|----|----|-----------|------|
| Series No.                         | FCB   | FCM                      | HCB       | GHB                        | FCA | --  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Operating Temperature              | -55~+125°C<br>(Including self-temperature rise)   |                          |           |                            |     | --  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Transportation Storage Temperature | -55~+125°C<br>(on board)  |                          |           |                            |     | For long storage conditions, please see the Application Notice  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Impedance (Z)                      | Refer to standard electrical characteristics list   |                          |           |                            |     | Agilent4291<br>Agilent E4991<br>Agilent4287<br>Agilent16192   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| DC Resistance                      |   |                          |           |                            |     | Agilent 4338  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Rated Current                      |   |                          |           |                            |     | DC Power Supply<br>Over Rated Current requirements, there will be some risk   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Temperature Rise Test              | Rated Current < 1A ΔT 20°CMax<br>Rated Current ≥ 1A ΔT 40°CMax  |                          |           |                            |     | 1. Applied the allowed DC current.<br>2. Temperature measured by digital surface thermometer.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Life test                          | Appearance: no damage.  |                          |           |                            |     | Preconditioning: Run through reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles)<br>Temperature: 125±2°C<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>RDC : within ±15% of initial value and shall not exceed the specification value                             |                          |           |                            |     | Preconditioning: Run through reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles)<br>Humidity: 85±2%R.H.<br>Temperature: 85±2°C.<br>Duration:1000hrsMin.Bead:with100%ratedcurrent<br>Inductance: with 10% 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>RDC : within ±15% of initial value and shall not exceed the specification value   |                          |           |                            |     | Preconditioning: Run through reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles)<br>Condition for 1 cycle<br>Step1: -55±2°C 30±5 min.<br>Step2: 125±2°C ≤0.5min<br>Step3: 125±2°C 30±5min.<br>Number of cycles: 500<br>Measured at room temperature after placing for 24±2 hrs.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Vibration                          | Appearance : No damage.<br>Impedance : within±15% of initial value<br>RDC : within ±15% of initial value and shall not exceed the specification value |                          |           |                            |     | Preconditioning: Run through reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles)<br>Oscillation Frequency: 10Hz ~ 2KHz ~ 10Hz for 20 minutes<br>Equipment : Vibration checker<br>Total Amplitude:10g<br>Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations) .   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Bending                            | Appearance : No damage.<br>Impedance : within±10% of initial 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:<br>>=0805inch(2012mm):40x100x1.2mm<br><0805inch(2012mm):40x100x0.8mm<br>Bending depth:<br>>=0805inch(2012mm):1.2mm<br><0805inch(2012mm):0.8mm<br>Duration of 10 sec for a min.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Shock                              | Appearance : No damage.<br>Impedance : within±10% of initial value<br>RDC : within ±15% of initial value and shall not exceed the specification value |                          |           |                            |     | Test condition:<br><table border="1"> <thead> <tr> <th>Type</th> <th>Peak Value (a's)</th> <th>Normal duration (D) (ms)</th> <th>Wave form</th> <th>Velocity change (V)/ft/sec</th> </tr> </thead> <tbody> <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> </tbody> </table> | Type | Peak Value (a'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 (a'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                       |     |   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Solderability                      | More than 95% of the terminal electrode should be covered with solder.  |                          |           |                            |     | a.Method B, 4 hrs @155°C dry heat @235°C±5°C Test time:5 +0/-0.5 seconds.<br>b. Method D category 3. (steam aging 8hours ± 15 min)@ 260°C±5°C Test time: 30 +0/-0.5 seconds..   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |

| Item                            | Performance   | Test Condition   |                  |          |  |                      |
|---------------------------------|---|--|------------------|----------|--|----------------------|
| Resistance to Soldering<br>Heat | Appearance : No damage.<br>Impedance : within±15% of initial value<br>RDC : within ±15% of initial value and shall not exceed the specification value | Number of heat cycles: 1   |                  |          |  |                      |
|                                 |   | <table border="1"> <thead> <tr> <th>Temperature (°C)</th> <th>Time (s)</th> <th>Temperature ramp/immersion and emersion rate</th> </tr> </thead> <tbody> <tr> <td>260 ±5 (solder temp)</td> <td>10 ±1</td> <td>25mm/s ±6 mm/s</td> </tr> </tbody> </table>   | Temperature (°C) | Time (s) | Temperature ramp/immersion and emersion rate | 260 ±5 (solder temp) |
| Temperature (°C)                | 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>Impedance : within±15% of initial value<br>RDC : within ±15% of initial value and shall not exceed the specification value |  <p>Preconditioning: Run through reflow for 3 times. ( IPC/JEDEC J-STD-020E Classification Reflow Profiles)<br/>Component mounted on a PCB apply a force &gt;0805inch(2012mm):1kg<br/>&lt;=0805inch(2012mm):0.5kg<br/>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.</p> |                  |          |  |                      |

**\*\*Derating Curve**

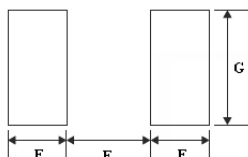
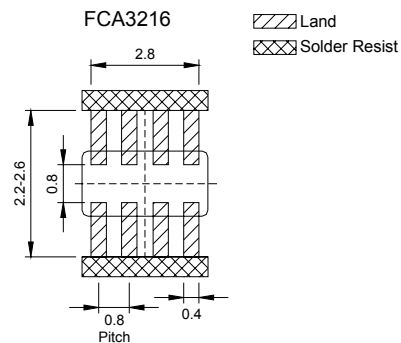
For the ferrite chip bead which withstanding current over 1.5A, as the operating temperature over 85°C, the derating current information is necessary to consider with. For the detail derating of current, please refer to the Derated Current vs. Operating Temperature curve.



**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)                              | E(mm) | F(mm) | G(mm) |
| FCB       | 1005 | 1.0±0.10 | 0.50±0.10 | 0.50±0.10 | 0.25±0.10                          | 0.50  | 0.40  | 0.60  |
| FCM       | 1608 | 1.6±0.15 | 0.80±0.15 | 0.80±0.15 | 0.30±0.20                          | 0.80  | 0.85  | 0.95  |
| HCB       | 2012 | 2.0±0.20 | 1.25±0.20 | 0.85±0.20 | 0.50±0.30                          | 1.05  | 1.00  | 1.45  |
| 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                          | 1.05  | 2.20  | 1.80  |
| FHI       | 3225 | 3.2±0.20 | 2.50±0.20 | 1.30±0.20 | 0.50±0.30                          | 1.05  | 2.20  | 2.70  |
| FCH       | 4516 | 4.5±0.20 | 1.60±0.20 | 1.60±0.20 | 0.50±0.30                          | 1.05  | 3.30  | 1.80  |
| HCI       | 4532 | 4.5±0.20 | 3.20±0.20 | 1.50±0.20 | 0.50±0.30                          | 1.05  | 3.30  | 3.40  |



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. 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.

**6-2.1 Soldering Reflow:**

Recommended temperature profiles for lead free re-flow soldering in Figure 1. Table 1.1&1.2 (J-STD-020E)

**6-2.2 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. (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.

Fig.1 Soldering Reflow

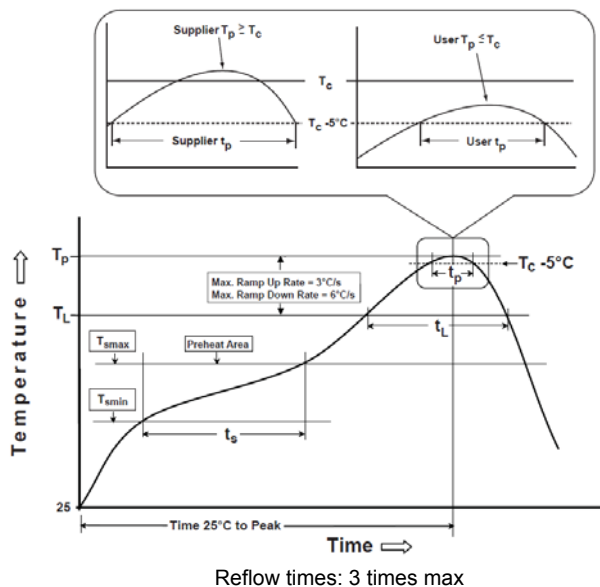
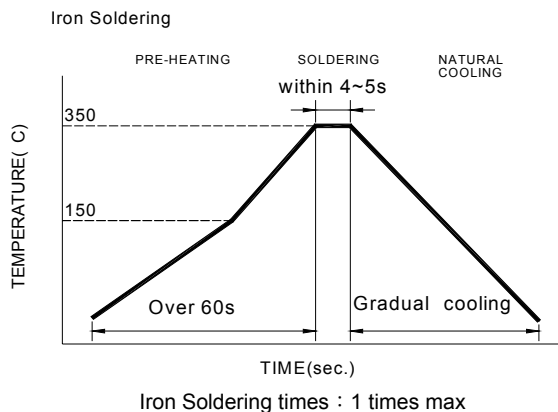


Fig.2 Iron soldering temperature profiles



**Table (1.1): Reflow Profiles**

|   |                  |
|---|------------------|
| Profile Type:   | Pb-Free Assembly |
| Preheat   |                  |
| -Temperature Min( $T_{smin}$ )  | 150°C            |
| -Temperature Max( $T_{smax}$ )  | 200°C            |
| -Time( $t_s$ )from( $T_{smin}$ to $T_{smax}$ )                                      | 60-120seconds    |
| Ramp-up rate( $T_l$ to $T_p$ )  | 3°C/second max.  |
| Liquidus temperature( $T_l$ )   | 217°C            |
| Time( $t_l$ )maintained above $T_l$   | 60-150 seconds   |
| Classification temperature( $T_c$ )   | See Table (1.2)  |
| Time( $t_p$ ) at $T_c - 5^\circ C$ ( $T_p$ should be equal to or less than $T_c$ .) | < 30 seconds     |
| Ramp-down rate( $T_p$ to $T_l$ )  | 6°C /second max. |
| Time 25°C to peak temperature   | 8 minutes max.   |

**Tp**: maximum peak package body temperature, **Tc**: the classification temperature.  
For user (customer) **Tp** should be equal to or less than **Tc**.

**Table (1.2) Package Thickness/Volume and Classification Temperature ( $T_c$ )**

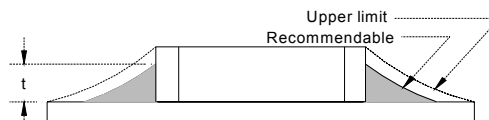
|                  | Package Thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> 350-2000 | Volume mm <sup>3</sup> >2000 |
|------------------|-------------------|-----------------------------|---------------------------------|------------------------------|
| PB-Free Assembly | <1.6mm            | 260°C                       | 260°C                           | 260°C                        |
|                  | 1.6-2.5mm         | 260°C                       | 250°C                           | 245°C                        |
|                  | ≥2.5mm            | 250°C                       | 245°C                           | 245°C                        |

Reflow is referred to standard IPC/JEDEC J-STD-020E ◦

**6-2.3 Solder Volume:**

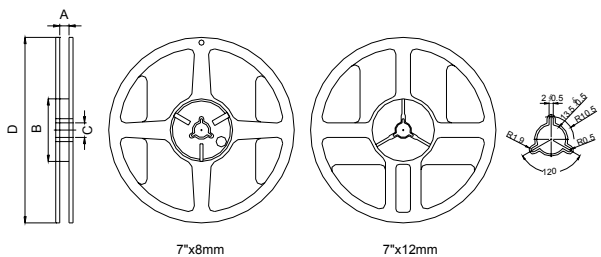
Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance. Solder shall be used not to be exceed as shown in right side:

Minimum fillet height = soldering thickness + 25% product height



## 7.Packaging Information

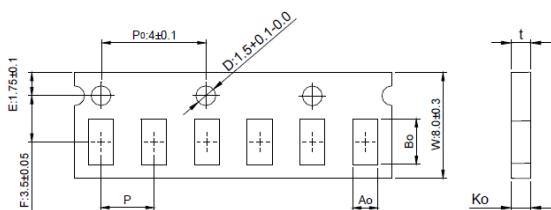
### 7-1. Reel Dimension



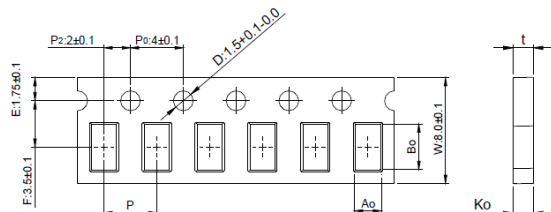
| Type    | A(mm)    | B(mm) | C(mm)    | D(mm) |
|---------|----------|-------|----------|-------|
| 7"x8mm  | 9.0±0.5  | 60±2  | 13.5±0.5 | 178±2 |
| 7"x12mm | 13.5±0.5 | 60±2  | 13.5±0.5 | 178±2 |

### 7-2.1 Tape Dimension / 8mm

Material of taping is paper

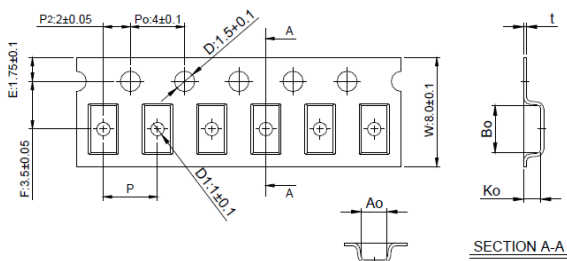


| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------|-----------|----------|-----------|
| 100505 | 1.12±0.03 | 0.62±0.03 | 0.60±0.03 | 2.0±0.05 | 0.60±0.03 |



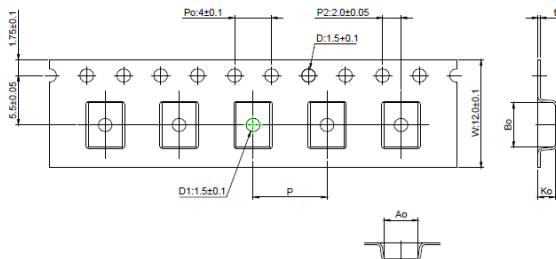
| Size   | Bo(mm)    | Ao(mm)          | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------------|-----------|----------|-----------|
| 160808 | 1.80±0.05 | 0.96+0.05/-0.03 | 0.95±0.05 | 4.0±0.10 | 0.95±0.05 |
| 201209 | 2.10±0.05 | 1.30±0.05       | 0.95±0.05 | 4.0±0.10 | 0.95±0.05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

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

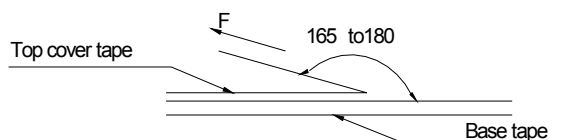


| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     | D1(mm)   |
|--------|-----------|-----------|-----------|----------|-----------|----------|
| 451616 | 4.70±0.10 | 1.75±0.10 | 1.75±0.10 | 4.0±0.10 | 0.24±0.05 | 1.5±0.10 |
| 453215 | 4.70±0.10 | 3.45±0.10 | 1.60±0.10 | 8.0±0.10 |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

## 7-3. Packaging Quantity

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

## 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-020E standard-MSL, level 1.
    2. Temperature and humidity conditions: Less than 40°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

號碼(No.): ETR22B04558

日期(Date): 06-Dec-2022

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西北臺慶科技股份有限公司 (TAI-TECH ADVANCED ELECTRONICS CO., LTD.)  
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江蘇省昆山市鐘朗昆嘉高科技工業區郭澤路 (GUO-ZE ROAD, KUNJIA HI-TECH INDUSTRIAL PARK, KUN-SHAN, JIANG-SU, CHINA)  
中國·江蘇省·宿遷市·泗洪縣·經濟開發區杭州路南側·建設北路東側 (THE SOUTH HANGZHOU ROAD AND THE EAST JIANSHE ROAD · ECONOMIC DEVELOPMENT ZONE · SIHONG COUNTY · SUQIANCITY · JIANGSU PROVINCE · P,R · CHINA)


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 the applicant as) :


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

收件日(Sample Receiving Date) : 29-Nov-2022  
測試期間(Testing Period) : 29-Nov-2022 to 06-Dec-2022

測試需求(Test Requested) : 依據客戶要求進行測試·測試項目請參閱測試結果表格。(Testing item(s) is/are specified by client. Please refer to result table for testing item(s).)

測試結果(Test Results) : 請參閱下一頁 (Please refer to following pages.)

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



PIN CODE: 4545AB9D

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## Test Report

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### 測試部位敘述 (Test Part Description)

No.1 : 整體混測 (MIXED ALL PARTS)

### 測試結果 (Test Results)

| 測試項目<br>(Test Items)  | 測試方法<br>(Method)   | 單位<br>(Unit) | MDL | 結果<br>(Result) |
|---|--|--------------|-----|----------------|
|   |  |              |     | No.1           |
| 鎘 (Cd) (Cadmium (Cd)) (CAS No.: 7440-43-9)                    | 參考IEC 62321-5: 2013 · 以感應耦合電漿發射光譜儀分析。(With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES.)                         | mg/kg        | 2   | n.d.           |
| 鉛 (Pb) (Lead (Pb)) (CAS No.: 7439-92-1)                       | 參考IEC 62321-5: 2013 · 以感應耦合電漿發射光譜儀分析。(With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES.)                         | mg/kg        | 2   | n.d.           |
| 汞 (Hg) (Mercury (Hg)) (CAS No.: 7439-97-6)                    | 參考IEC 62321-4: 2013+ AMD1: 2017 · 以感應耦合電漿發射光譜儀分析。(With reference to IEC 62321-4: 2013+ AMD1: 2017, analysis was performed by ICP-OES.) | mg/kg        | 2   | n.d.           |
| 六價鉻 Cr(VI) (Hexavalent Chromium Cr(VI)) (CAS No.: 18540-29-9) | 參考IEC 62321-7-2: 2017 · 以紫外光-可見光分光光度計分析。(With reference to IEC 62321-7-2: 2017, analysis was performed by UV-VIS.)                     | mg/kg        | 8   | n.d.           |

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## Test Report

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| 測試項目<br>(Test Items)             | 測試方法<br>(Method)   | 單位<br>(Unit) | MDL | 結果<br>(Result) |
|----------------------------------|--|--------------|-----|----------------|
|                                  |  |              |     | No.1           |
| 一溴聯苯 (Monobromobiphenyl)         | 參考IEC 62321-6: 2015 · 以氣相層析儀/質譜儀分析。(With reference to IEC 62321-6: 2015, analysis was performed by GC/MS.) | 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.           |
| 多溴聯苯總和 (Sum of PBBs)             |  | 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.           |
| 多溴聯苯醚總和 (Sum of PBDEs)           |  | mg/kg        | -   | n.d.           |

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# 測試報告

## Test Report

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| 測試項目<br>(Test Items)   | 測試方法<br>(Method)   | 單位<br>(Unit) | MDL | 結果<br>(Result) |
|--|--|--------------|-----|----------------|
|  |  |              |     | No.1           |
| 鄰苯二甲酸丁苯甲酯 (BBP) (Butyl benzyl phthalate (BBP)) (CAS No.: 85-68-7)                | 參考IEC 62321-8: 2017 · 以氣相層析儀/質譜儀分析。(With reference to IEC 62321-8: 2017, analysis was performed by GC/MS.) | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二丁酯 (DBP) (Dibutyl phthalate (DBP)) (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 (DEHP)) (CAS No.: 117-81-7)  |  | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二異丁酯 (DIBP) (Diisobutyl phthalate (DIBP)) (CAS No.: 84-69-5)                |  | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二異癸酯 (DIDP) (Diisodecyl phthalate (DIDP)) (CAS No.: 26761-40-0, 68515-49-1) |  | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二異壬酯 (DINP) (Diisononyl phthalate (DINP)) (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 (DNOP)) (CAS No.: 117-84-0)               |  | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二正戊酯 (DNPP) (Di-n-pentyl phthalate (DNPP)) (CAS No.: 131-18-0)              |  | mg/kg        | 50  | n.d.           |
| 鄰苯二甲酸二正己酯 (DNHP) (Di-n-hexyl phthalate (DNHP)) (CAS No.: 84-75-3)                |  | mg/kg        | 50  | n.d.           |

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| 測試項目<br>(Test Items)   | 測試方法<br>(Method)  | 單位<br>(Unit) | 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(HBCDD) ( $\alpha$ - HBCDD, $\beta$ - HBCDD, $\gamma$ - HBCDD) (Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified ( $\alpha$ - HBCDD, $\beta$ - HBCDD, $\gamma$ - HBCDD)) (CAS No.: 25637-99-4, 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8)) | 參考IEC 62321-9: 2021 · 以氣相層析儀/質譜儀分析。(With reference to IEC 62321-9: 2021, analysis was performed by GC/MS.)                    | mg/kg        | 20   | n.d.           |
| 氟 (F) (Fluorine (F)) (CAS No.: 14762-94-8)   | 參考BS EN 14582: 2016 · 以離子層析儀分析。(With reference to BS EN 14582: 2016, analysis was performed by IC.)                           | mg/kg        | 50   | n.d.           |
| 氯 (Cl) (Chlorine (Cl)) (CAS No.: 22537-15-1)   |   | mg/kg        | 50   | n.d.           |
| 溴 (Br) (Bromine (Br)) (CAS No.: 10097-32-2)  |   | mg/kg        | 50   | n.d.           |
| 碘 (I) (Iodine (I)) (CAS No.: 14362-44-8)   |   | mg/kg        | 50   | n.d.           |
| 全氟辛烷磺酸及其鹽類 (PFOS and its salts) (CAS No.: 1763-23-1 and its salts)   | 參考CEN/TS 15968: 2010 · 以液相層析串聯質譜儀分析。(With reference to CEN/TS 15968: 2010, analysis was performed by LC/MS/MS.)               | mg/kg        | 0.01 | n.d.           |
| 全氟辛酸及其鹽類 (PFOA and its salts) (CAS No.: 335-67-1 and its salts)  |   | mg/kg        | 0.01 | n.d.           |
| 聚氯乙烯 (Polyvinyl chloride) (PVC)  | 參考ASTM E1252: 2021 · 以傅立葉轉換紅外線光譜儀及焰色法分析。(With reference to ASTM E1252: 2021, analysis was performed by FT-IR and Flame Test.) | **           | -    | Negative       |

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# 測試報告

## Test Report

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| 測試項目<br>(Test Items)                         | 測試方法<br>(Method)   | 單位<br>(Unit) | MDL | 結果<br>(Result) |
|--|--|--------------|-----|----------------|
|  |  |              |     | No.1           |
| 銻 (Sb) (Antimony (Sb)) (CAS No.: 7440-36-0)  | 參考US EPA 3052: 1996 · 以感應耦合電漿發射光譜儀分析。(With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.) | mg/kg        | 2   | n.d.           |
| 砷 (As) (Arsenic (As)) (CAS No.: 7440-38-2)   |  | mg/kg        | 2   | n.d.           |
| 鈹 (Be) (Beryllium (Be)) (CAS No.: 7440-41-7) |  | mg/kg        | 2   | n.d.           |

### 備註(Note) :

1. mg/kg = ppm ; 0.1wt% = 0.1% = 1000ppm
2. MDL = Method Detection Limit (方法偵測極限值)
3. n.d. = Not Detected (未檢出); 小於MDL / Less than MDL
4. "-" = Not Regulated (無規格值)
5. \*\* = Qualitative analysis (No Unit) 定性分析(無單位)
6. Negative = Undetectable 陰性(未偵測到); Positive = Detectable 陽性(已偵測到)
7. 全氟辛烷磺酸及其鹽類包含等物質 (PFOS and its salts including) :  
CAS No.: 1763-23-1, 2795-39-3, 29457-72-5, 29081-56-9, 70225-14-8, 56773-42-3, 251099-16-8, 307-35-7, 91036-71-4, 4021-47-0 and others.
8. 全氟辛酸及其鹽類包含等物質 (PFOA and its salts including) :  
CAS No.: 335-67-1, 335-95-5, 2395-00-8, 335-93-3, 335-66-0, 3825-26-1 and others.
9. 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 sample(s) was/were analyzed on behalf of the applicant as mixing sample in one testing. The above result(s) was/were only given as the informality value.

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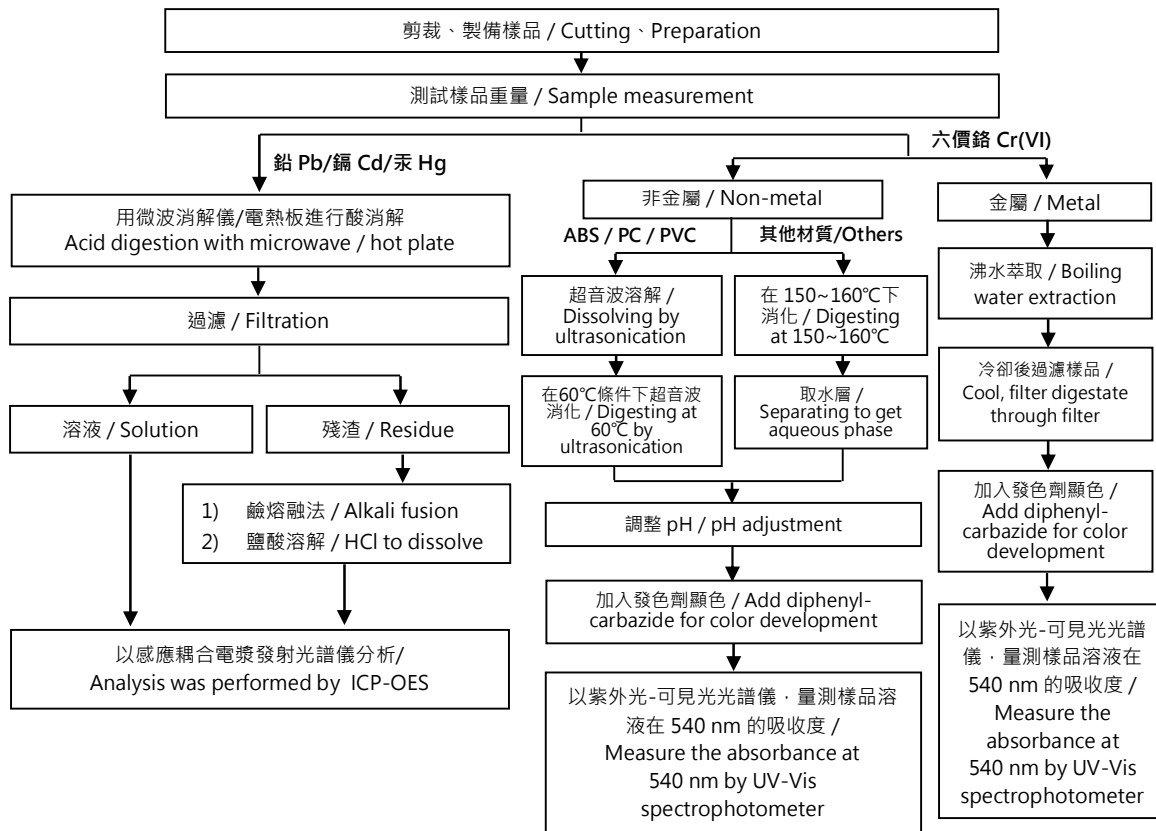
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### 重金屬流程圖 / Analytical flow chart of heavy metal

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)



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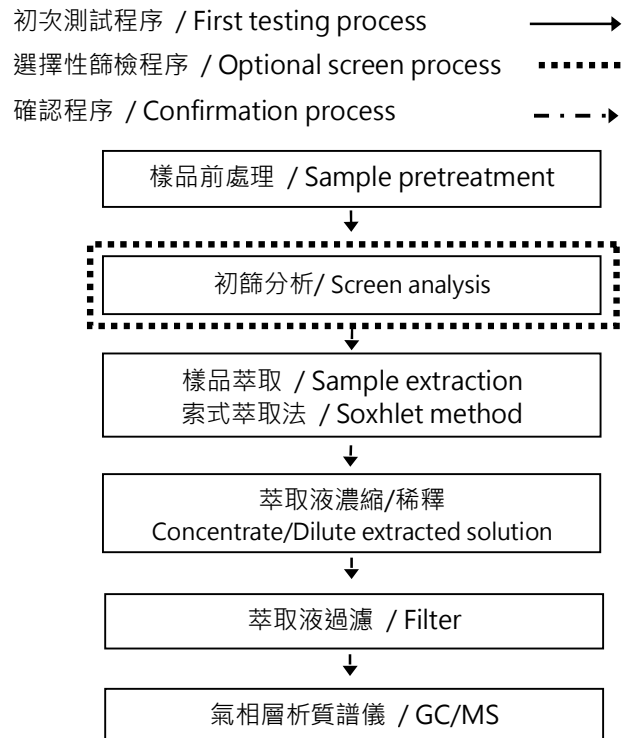
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### 多溴聯苯/多溴聯苯醚分析流程圖 / Analytical flow chart - PBBs/PBDEs



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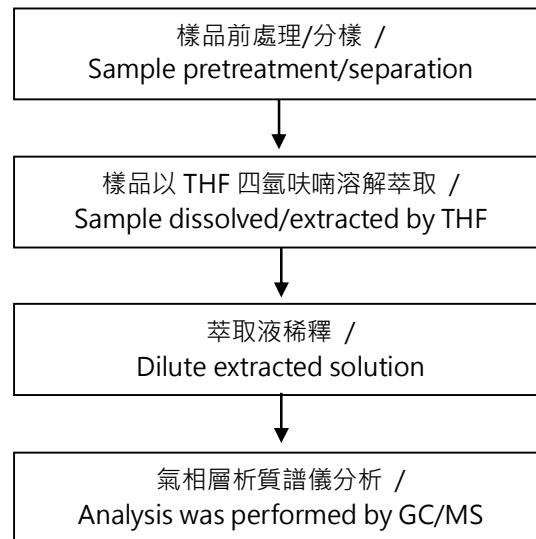
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### 可塑劑分析流程圖 / Analytical flow chart - Phthalate

#### 【測試方法/Test method: IEC 62321-8】



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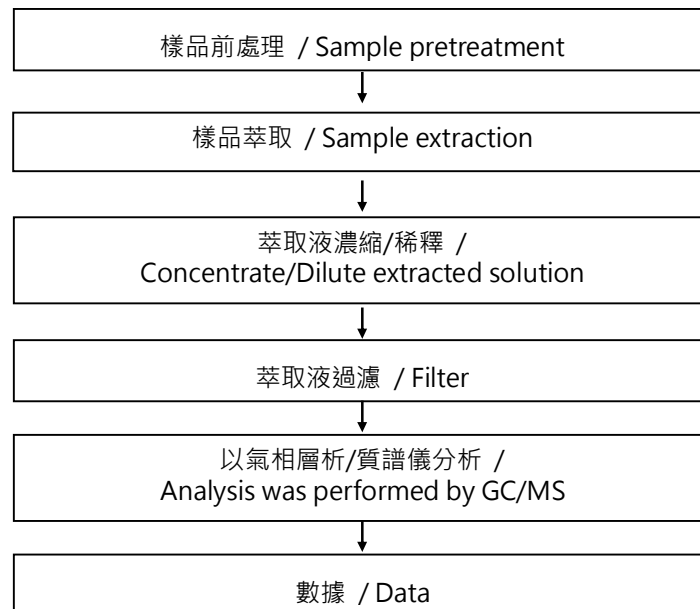
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### 六溴環十二烷分析流程圖 / Analytical flow chart - HBCDD



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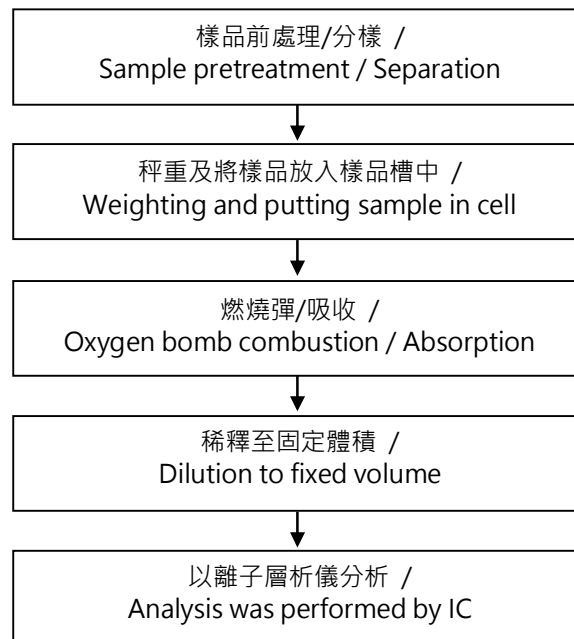
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### 鹵素分析流程圖 / Analytical flow chart - Halogen



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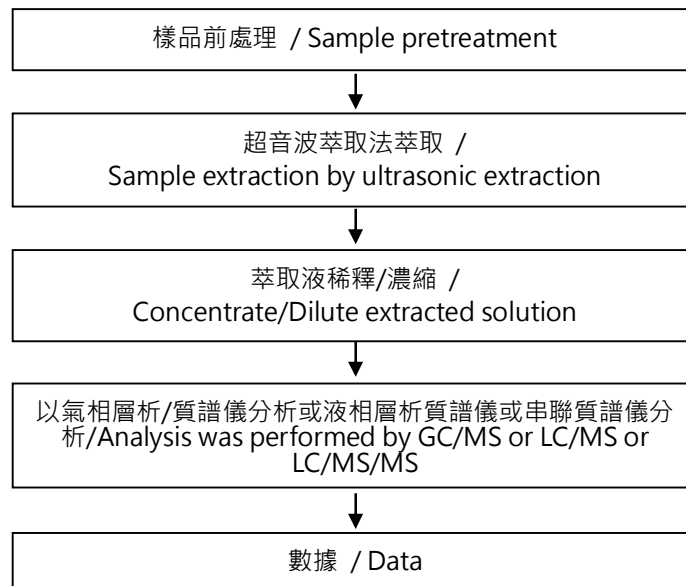
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### 全氟化合物(包含全氟辛酸/全氟辛烷磺酸/其相關化合物等等)分析流程圖 / Analytical flow chart – PFAS (including PFOA/PFOS/its related compound, etc.)



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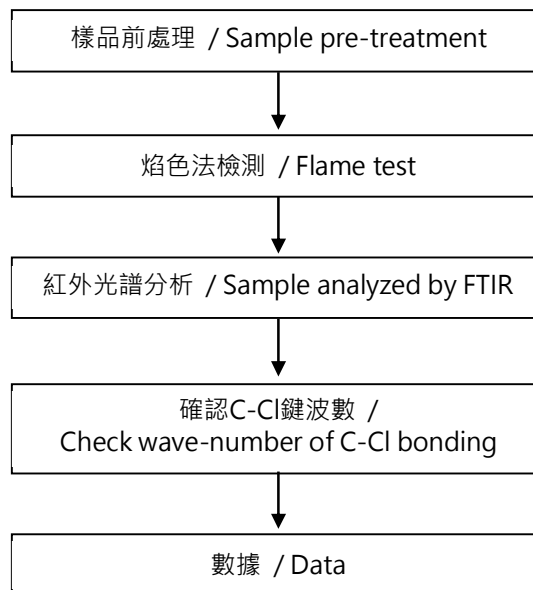
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### 聚氯乙稀物質判定分析流程圖 / Analysis flow chart - PVC



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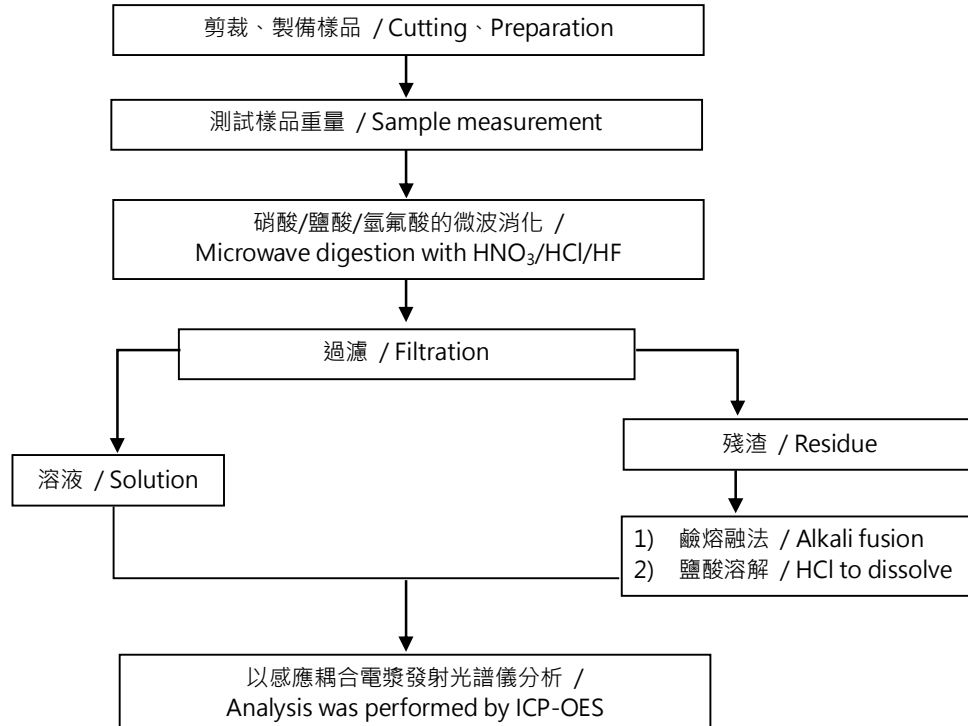
中國 · 江蘇省 · 宿遷市 · 泗洪縣 · 經濟開發區杭州路南側 · 建設北路東側 (THE SOUTH HANGZHOU ROAD AND THE EAST JIANSHE ROAD · ECONOMIC DEVELOPMENT ZONE · SIHONG COUNTY · SUQIANCITY · JIANGSU PROVINCE · P,R · CHINA)

### 元素(含重金屬)分析流程圖 / Analytical flow chart of elements (Heavy metal included)

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.

【參考方法/Reference method : US EPA 3051A、US EPA 3052】



\* US EPA 3051A 方法未添加氫氟酸 / US EPA 3051A method does not add HF.

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## 測試報告

## Test Report

號碼(No.): ETR22B04558

日期(Date): 06-Dec-2022

頁數(Page): 15 of 15

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

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

慶邦電子元器件(泗洪)有限公司 (TAIPAQ ELECTRONICS (SI-HONG) CO., LTD.)

桃園市楊梅區幼獅工業區幼四路1號 (NO. 1, YOU 4TH ROAD, YOUTH INDUSTRIAL DISTRICT, YANG-MEI, TAO-YUAN CITY, TAIWAN R. O. C.)

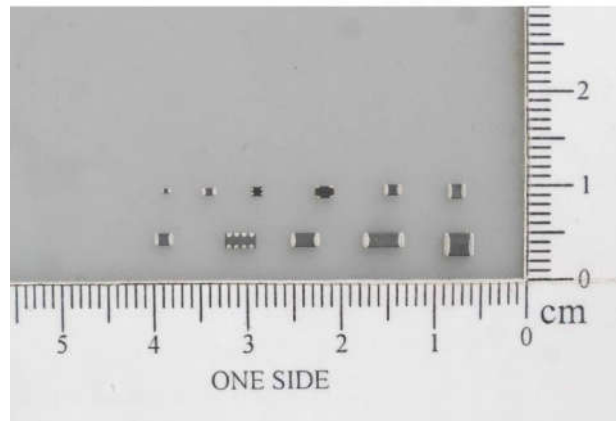
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中國·江蘇省·宿遷市·泗洪縣·經濟開發區杭州路南側·建設北路東側 (THE SOUTH HANGZHOU ROAD AND THE EAST JIANSHE ROAD · ECONOMIC DEVELOPMENT ZONE · SIHONG COUNTY · SUQIANCITY · JIANGSU PROVINCE · P,R · CHINA)

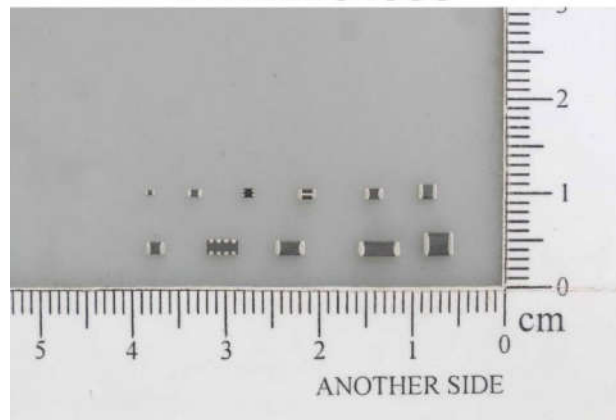
\* 照片中如有箭頭標示·則表示為實際檢測之樣品/部位.\*

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

### ETR22B04558



### ETR22B04558



\*\* 報告結尾 (End of Report) \*\*

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