

CUSTOMER: \_\_\_\_\_

DATE: 2015-5-12

## APPROVAL SPECIFICATION

PRODUCT NAME: SMD power inductor

YOUR PART NO. :

OUR PART NO. : MAPM0420F Seires

VERSION: V1.0

|   |             |             |
|---|-------------|-------------|
| <p><b>RECEPTION</b></p> <p><b>THE SPECIFICATION HAS BEEN ACCEPTED.</b></p><br><br><p style="text-align: right;"><b>DATE:</b></p> <p><b>COMPANY:</b></p> |             |             |
| <b>CFMD</b>   | <b>CHKD</b> | <b>RCVD</b> |

MANUFACTURING NAME

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|         |       |       |
|---------|-------|-------|
| CFMD.   | CHKD. | DSGD. |
| Charles | 谢诏虹   | 刘维    |

## 目录 CATALOG

|   |   |      |
|---|---|------|
|   | 规格书版本控制 Component SPEC Version Record.....        | 2    |
| 1 | 适用范围 Scope.....                                   | 3    |
| 2 | 品名构成 Product Identification.....                  | 4    |
| 3 | 形状、尺寸和材料 Appearance, Dimensions and Material..... | 4    |
| 4 | 测试条件 Testing Conditions.....                      | 4    |
| 5 | 电气特性 Electrical Characteristics.....              | 5    |
| 6 | 信赖性试验 Reliable Performance.....                   | 7-7  |
| 7 | 焊接条件 Recommended Soldering Conditions.....        | 8-9  |
| 8 | 包装 Packaging.....                                 | 9-10 |
| 9 | 存贮条件 Products Storage.....                        | 11   |

### Component SPEC Version Record

| Rev. | Effective Date | Changed Contents | Change Reasons | Approved By |
|------|----------------|------------------|----------------|-------------|
| V1.0 | 2014.12.04     | New released     | /              | Charles     |

## 1. Scope

This specification applies to the MAPM series of SMD Power inductors.

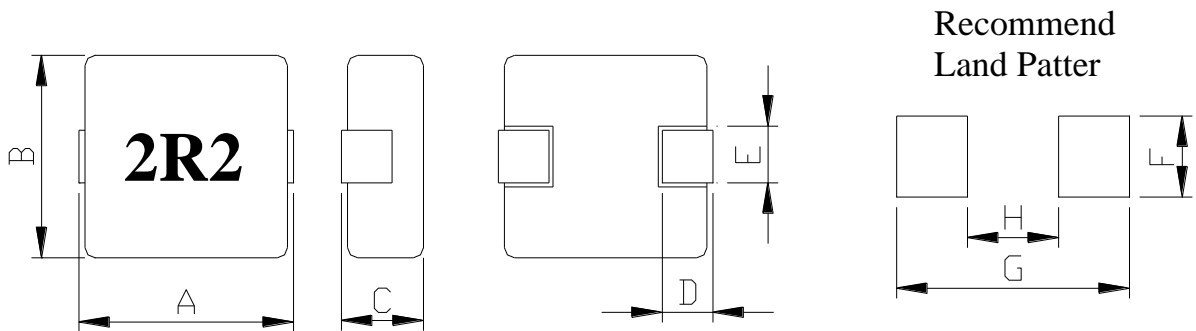
## 2. Product Identification

MAPM   0420F   -2R2   M   -LF  
 ①            ②            ③            ④            ⑤

- ① Product Symbol
- ② Dimensions
- ③ Inductance Value (2R2:2.2uH   220: 22uH;   101:100uH)
- ④ Inductance Tolerance      (K:10% ; M:20% ; N:30%)
- ⑤ Lead-Free

## 3. Construction

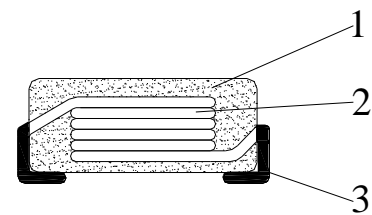
### 3.1 Shape and dimensions



| Dimensions in mm |         |         |          |         |         |      |      |      |
|------------------|---------|---------|----------|---------|---------|------|------|------|
| Model            | A       | B       | C        | D       | E       | F    | G    | H    |
| MAPM0420F        | 4.9Max. | 4.4Max. | 2.0 Max. | 1.0±0.3 | 1.5±0.5 | 2.30 | 4.95 | 2.16 |

### Material List

| No. | Item     | Material             |
|-----|----------|----------------------|
| 1   | Core     | Carbonyl Iron Powder |
| 2   | Wire     | Polyester-Imide      |
| 3   | Terminal | Tin Covered Copper   |



#### 4. Testing Conditions

Unless otherwise specified

Temperature : Ordinary Temperature ( 5 to 35°C)

Humidity : Ordinary Humidity (<70% RH)

Atmospheric Pressure : 86 to 106 kPa

In case of doubt

Temperature : 20±2°C

Humidity : 50 to 65% RH

Atmospheric Pressure : 86 to 106 kPa

#### 5. Electrical Characteristics And Test Instruments

| Microgate Part No. | Customer Part No. | Inductance (uH) | DCR (mΩ) Max | Irms (A) Typ. | Isat (A) Typ. |
|--------------------|-------------------|-----------------|--------------|---------------|---------------|
| MAPM0420F-R22M-LF  |                   | 0.22±20%        | 8            | 9.0           | 12.0          |
| MAPM0420F-R36M-LF  |                   | 0.36±20%        | 15           | 7.0           | 10.0          |
| MAPM0420F-R47M-LF  |                   | 0.47±20%        | 14           | 6.0           | 9.0           |
| MAPM0420F-R56M-LF  |                   | 0.56±20%        | 18           | 5.0           | 8.0           |
| MAPM0420F-1R0M-LF  |                   | 1.0±20%         | 27           | 4.5           | 7.0           |
| MAPM0420F-1R5M-LF  |                   | 1.5±20%         | 45           | 4.0           | 6.0           |
| MAPM0420F-2R2M-LF  |                   | 2.2±20%         | 58           | 3.0           | 4.0           |
| MAPM0420F-3R3M-LF  |                   | 3.3±20%         | 87           | 2.0           | 3.0           |
| MAPM0420F-4R7M-LF  |                   | 4.7±20%         | 150          | 2.0           | 3.0           |
| MAPM0420F-100M-LF  |                   | 10±20%          | 200          | 1.5           | 1.8           |

\* L test condition: 100KHz/1V ;

\* I<sub>rms</sub>: DC current (A) that will cause an approximate Δ T of 40°C.

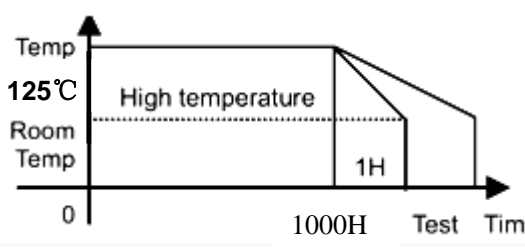
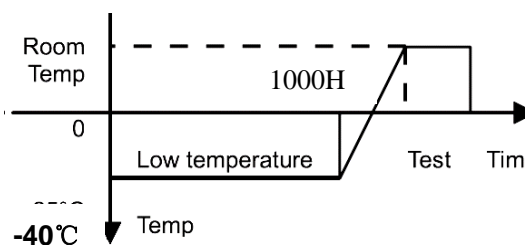
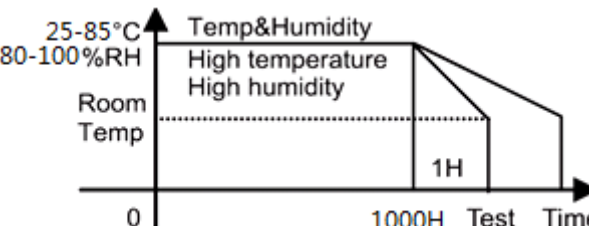
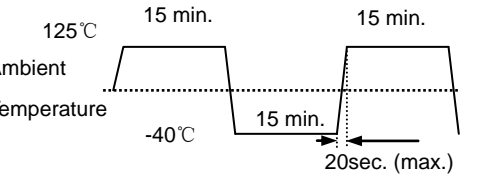
\* I<sub>sat</sub>: DC current (A) that will cause L0 to drop approximately 30%.

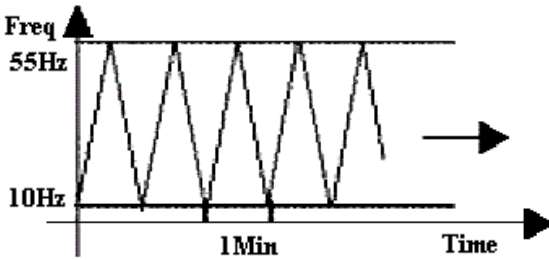
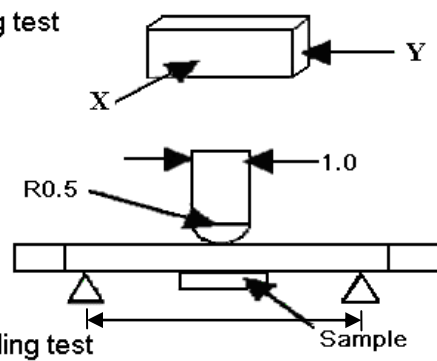
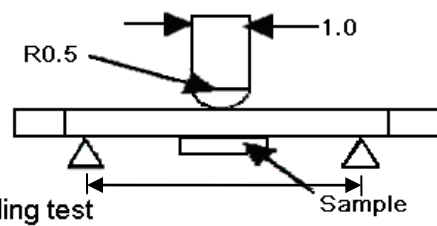
\* All test data is referenced to 25°C ambient.

\* Operating temperature: -55°C to +125°C

\* The part temperature (ambient + temp rise) should not exceed 125°C under worse case operating conditions. Circuit design, component placement, PWB trace size and thickness, airflow and other cooling provision all affect the part temperature. Part temperature should be verified in the end application.

## 6. Reliability and Test Condition

| Item                        | Required Characteristics  | Test Method/Condition  |
|-----------------------------|---|--|
| High temperature resistance |   | <p>Temperature: <math>125 \pm 2^\circ\text{C}</math><br/>           Time : 1000 hours<br/>           Measurement at <math>24 \pm 4</math> hours after test conclusion.</p>   |
| Low temperature resistance  | <ol style="list-style-type: none"> <li>No case deformation or change in appearance.</li> <li><math> \Delta L /L \leq 10\%</math></li> </ol> | <p>Temperature : <math>-40 \pm 2^\circ\text{C}</math><br/>           Time : 1000 hours<br/>           Measurement at <math>24 \pm 4</math> hours after test conclusion.</p>   |
| Humidity test               |   | <ol style="list-style-type: none"> <li>Exposure : Temperature:<math>25-85^\circ\text{C}</math>, Humidity :80-100% RH Time : 1000 hours.</li> <li>Tested while the specimens are still in the chamber.</li> <li>Measurement at <math>24 \pm 4</math> hours after test conclusion.</li> </ol>  |
| Thermal shock test          | <ol style="list-style-type: none"> <li>No case deformation or change in appearance.</li> <li><math> \Delta L /L \leq 10\%</math></li> </ol> | <p>First <math>-40^\circ\text{C}</math> for T time, last <math>125^\circ\text{C}</math> T time as 1 cycle. Go through 1000 cycles.</p>   |

| Item                               | Required Characteristics   | Test Method/Condition   |
|------------------------------------|--|---|
| Solderability test                 | Terminal area must have 95% min. solder coverage.  | Dip pads in flux then dip in solder pot at $245 \pm 5^\circ\text{C}$ for $5 \pm 0.1$ second.<br>Solder: :Sn96.5%、Ag3%、Cu0.5%<br>Flux: rosin flux.   |
| Heat endurance of reflow soldering |  | Refer to the next page reflow curve<br>Go through 3 times.<br>The peak temperature: $260 \pm 5^\circ\text{C}$   |
| Vibration test                     | 1. No case deformation or change in appearance.<br>2. $ \Delta L /L \leq 10\%$   | Apply frequency 10~55Hz. 1.5mm amplitude in each of perpendicular direction for 2 hours in each 3 mutually perpendicular directions.(total 6 hours)<br>   |
| Drop test                          |  | Packaged & drop down from 1m with $981\text{m/s}^2(100\text{G})$ attitude in 1 angle 1 ridges & 2surfaces orientations.   |
| Terminal strength push test        | <b>Pulling test:</b><br>Define:<br>Solder the products on testing PCB using eutectic solder. Then apply a force in the direction of the arrow. 17.64N force.<br>Keep time $\geq 10\text{s}$<br><br><b>Bending test:</b><br>Soldering the products on PCB, after the pulling test and bending test, terminal should not pull off. | Bend the testing PCB at middle point, the deflection shall be 2mm. Pressurizing Speed: 0.5mm/sec, Keep time: $60 \pm 1\text{s}$ ,<br><b>Pulling test</b><br><br><b>Bending test</b><br> |
| Loading Under Humidity Heat        | 1. No case deformation or change in appearance.<br>2. $ \Delta L /L \leq 10\%$   | 1. Exposure : Temperature: $60 \pm 2^\circ\text{C}$ , Humidity : $93 \pm 3\%$ RH Time : 1000 hours. Apply rated current<br>2. Tested while the specimens are still in the chamber.<br>3. Measurement at $24 \pm 4$ hours after test conclusion.   |
| Loading at High Temperature        | 1. No case deformation or change in appearance.<br>2. $ \Delta L /L \leq 10\%$   | 1. Temperature: $85 \pm 2^\circ\text{C}$<br>2. Time : 1000 hours<br>3. Apply rated current<br>4. Measurement at $24 \pm 4$ hours after test conclusion  |

## 7. Recommended Soldering Conditions

Product can be applied to flow and reflow soldering.

### (1) Flux, Solder

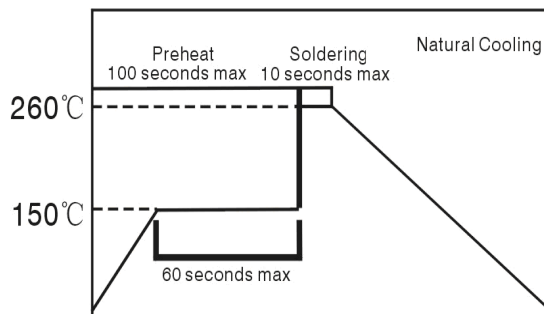
① Use rosin-based flux. Don't use highly acidic flux with halide content exceeding 0.2wt% (chlorine conversion value).

② Use Sn solder.

### (2) Flow soldering conditions

① Pre-heating should be in such a way that the temperature difference between solder and product surface is limited to 150°C max. Cooling into solvent after soldering also should be in such a way that temperature difference is limited to 100°C max. Unwrought pre-heating may cause cracks on the product, resulting in the deterioration of products quality.

② Standard soldering profile.



|                    |                       |
|--------------------|-----------------------|
| <b>Pre-heating</b> | 150°C, 1 minute min   |
| <b>Peak</b>        | 260°C, 10 seconds max |

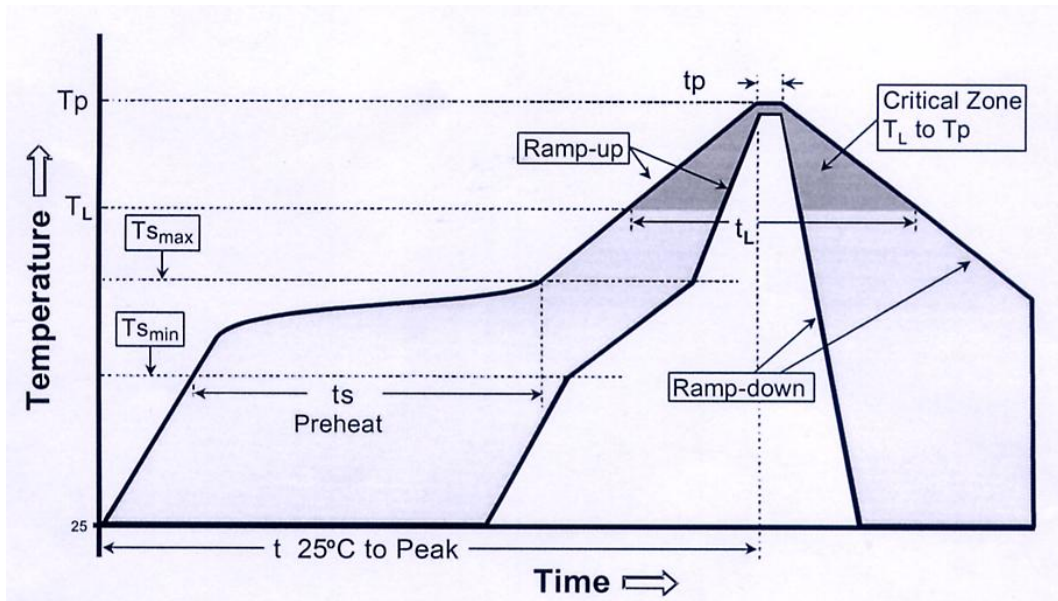
### (3) Reflow soldering conditions

| Profile Feature                                  |                             | Lead-Free Assembly |
|--|-----------------------------|--------------------|
| Average Ramp-Up Rate (Ts max. to Tp)             |                             | 3°C /second max.   |
| Preheat  | - Temperature Min (Ts min.) | 150 °C             |
|  | - Temperature Max (Ts max.) | 200 °C             |
|  | - Time (ts min to ts max.)  | 60-180 seconds     |
| Time maintained above                            | - Temperature (TL)          | 217 °C             |
|  | - Time (tL)                 | 60-150 seconds     |
| Peak/Classification Temperature (Tp)             |                             | 260 °C             |
| Peak/Classification Time (Tp)                    |                             | 3-4 seconds        |
| Time within 5 °C of actual Peak Temperature (tp) |                             | 20-40 seconds      |
| Ramp-Down Rate                                   |                             | 6 °C/second max.   |
| Time 25 °C to Peak Temperature                   |                             | 8 minutes max.     |

Note 1: All temperatures refer to topside of the package, measured on the package body surface.



Reflow curve



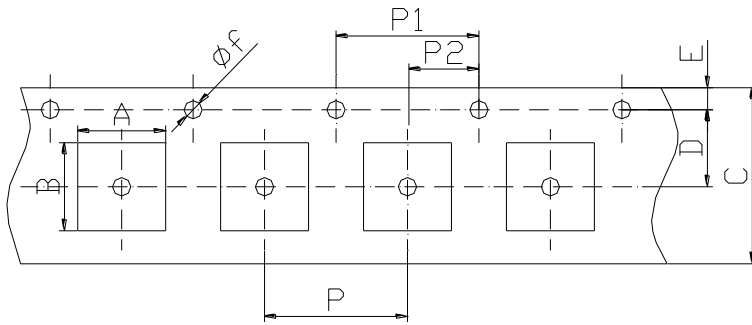
(4) The method on Re-work with using the iron:

The following conditions must be strictly followed when using a soldering iron

|                       |                 |
|-----------------------|-----------------|
| Pre-heating           | 150°C, 1 minute |
| Tip temperature       | 280°C max       |
| Soldering iron output | 20w max         |
| End of soldering iron | φ 1mm max       |
| Soldering time        | 3 seconds max   |

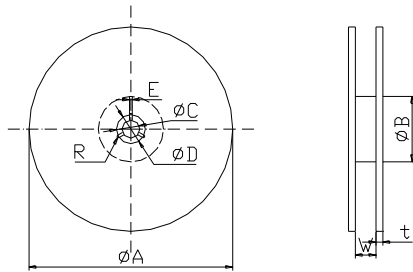
## 8. Packaging

### 8.1 Dimension of tape (Unit: mm)



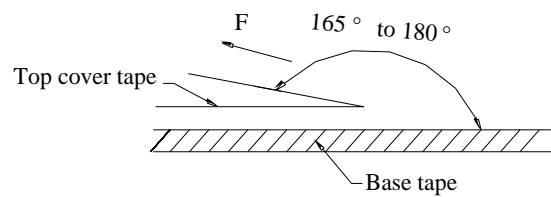
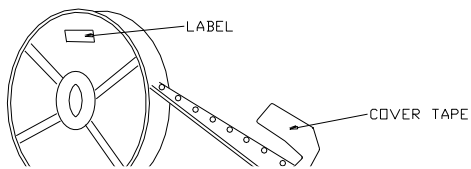
| Series   | MAPM0420F |
|----------|-----------|
| A        | 4.5±0.1   |
| B        | 5.15±0.1  |
| C        | 12.0±0.2  |
| D        | 7.5±0.1   |
| E        | 1.75±0.1  |
| $\phi f$ | 1.5±0.1   |
| P        | 8.0±0.1   |
| P1       | 4.0±0.1   |
| P2       | 2.0±0.05  |

### 9.2 Dimension of reel (Unit: mm)



|   |          |
|---|----------|
| A | 330      |
| B | 100      |
| C | 13.0±1.0 |
| D | 20.0±2.0 |
| E | 2.0±0.5  |
| R | R1.0     |
| W | 12.0±0.5 |
| t | 2.0±0.2  |

### 8.3 Taping figure and drawing direction



## 9. Products Storage

### (1) Storage period

Products which inspected in MICROGATE over 6 months ago should be examined and used, which can be confirmed with inspection No. marked on the container. Solderability should be checked if this period is exceeded.

### (2) Storage conditions

Products should be storage in the warehouse on the following conditions:

Temperature: -10 ~+ 40°C

Humidity : Less than 80% relative and humidity

No rapid change on temperature and humidity

- (3) Don't keep products in corrosive gases such as sulfur, chlorine gas or acid, or it may cause oxidization of electrode, resulting in poor solderability.
- (4) Products should be storage on the palette for the prevention of the influence from humidity, dust and so on.
- (5) Products should be storage in the warehouse without heat shock, vibration, direct sunlight and so on.
- (6) Products should be storage under the airtight packaged condition.