

**PRODUCT  
DATASHEET**



**SMFF4012 Series Surface Mount Fuses Devices**

## SMFF4012 Series Surface Mount Fuses Devices

### Description

Polytronics SMFF4012 series square shape surface mount fast-acting fuses adopt Wire-in-Air (WIR) construction. Small footprint with wide range of available current rating makes the fuse ideal for over-current protection applications, in DC circuits using surface mount technology. SMFF4012 series is also RoHS compliant and halogen-free to meet global environmental standard.

### Features

- Fast acting, Inrush withstand capability
- Surface mount high current fuse
- Excellent environmental integrity
- Wide Operating temperature
- Enhanced thermal cycling endurance



### Application

- Storage system power
- Cooling fan system for PC server
- Voltage regulator module
- Base station power supply
- Voltage regulator module for PC server
- High end servers/Blade computing
- Battery Management System

### Agency Approval and Environmental Compliance

| Agency                                                                              | File Number    | Regulation                                                                          | Standard            |
|-------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------|---------------------|
|  | UL/CSA:E331807 |  | 2011/65/EU          |
|  | TÜV: J50649605 |  | IEC 61249-2-21:2003 |

### Electrical Characteristic

| Part Number   | Current Rating (A) | Voltage Rating | Interrupting Rating            | Typical Cold DCR† (mΩ) | Nominal I²t‡ (A²S) | Agency Approval                                                                       |                                                                                       |
|---------------|--------------------|----------------|--------------------------------|------------------------|--------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|               |                    |                |                                |                        |                    |  |  |
| SMFF4012P2000 | 20                 | 100V DC        | 300A / 100V DC                 | 3.08                   | 264                | ✓                                                                                     | ✓                                                                                     |
| SMFF4012P2500 | 25                 |                | 500A / 72V DC                  | 2.15                   | 413                | ✓                                                                                     | ✓                                                                                     |
| SMFF4012P3000 | 30                 |                | 1000A / 32V DC                 | 2.08                   | 594                | ✓                                                                                     | ✓                                                                                     |
| SMFF4012P4000 | 40                 | 72V DC         | 180A / 72V DC<br>600A / 60V DC | 1.23                   | 1024               | ✓                                                                                     | ✓                                                                                     |
| SMFF4012P5000 | 50                 |                |                                | 1.00                   | 1650               | ✓                                                                                     | ✓                                                                                     |
| SMFF4012P6000 | 60                 |                |                                | 0.88                   | 2376               | ✓                                                                                     | ✓                                                                                     |

† Measured at ≤10% rated current and 25°C

‡ Melting I²t at 10 times of rated current

## SMFF4012 Series Surface Mount Fuses Devices

### Electrical Specification

| Ampere Rating | % of Current Rating | Opening Time    |
|---------------|---------------------|-----------------|
| 20A~60A       | 100%                | 4 Hours Min.    |
|               | 200%                | 60 Seconds Max. |
|               | 1000%               | 1 mSec Min.     |

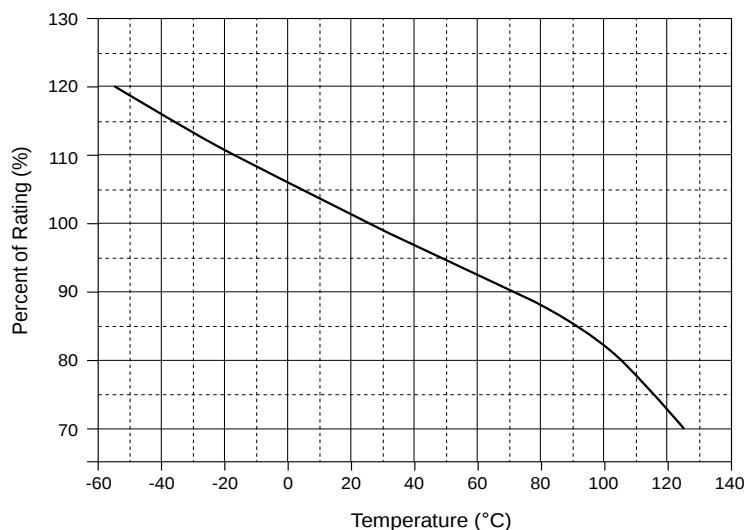
### Physical Specifications

|                      |                                                                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Materials            | Substrate: Ceramic<br>Terminations: Au Plated Brass Cap<br>Element: Tin Plated Copper                                                                     |
| Solderability        | MIL-STD-202                                                                                                                                               |
| Soldering Parameters | Wave Solder: 260°C, 10 seconds max.<br>Reflow Solder: 260°C, 5 seconds max.<br>Hand Solder: 350°C, 3 seconds max. (Soldering iron avoid touch Brass Cap.) |

### Environmental Specifications

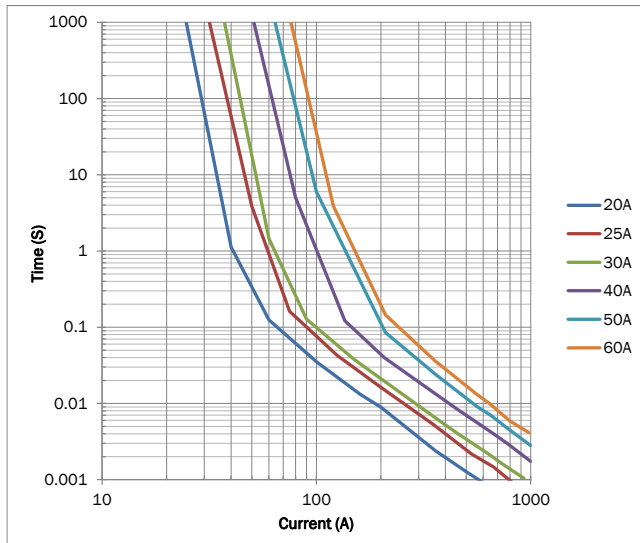
|                       |                |
|-----------------------|----------------|
| Operating Temperature | -55°C to 125°C |
|-----------------------|----------------|

### Thermal Derating Curve

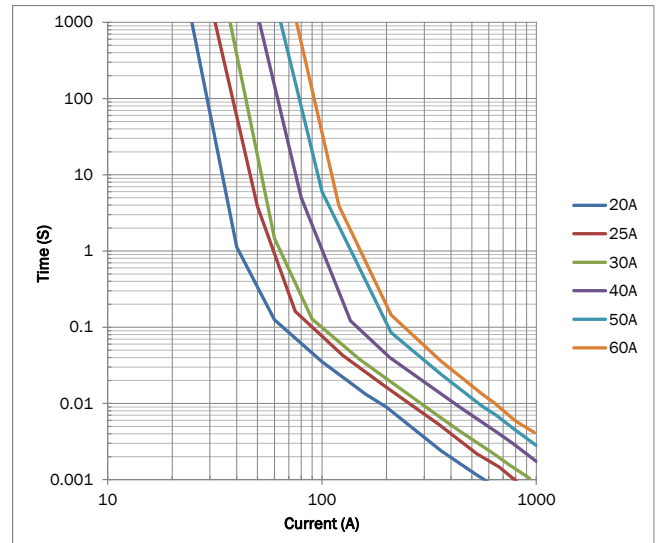


## SMFF4012 Series Surface Mount Fuses Devices

Time-Current Curve



I<sup>2</sup>T vs Time Curve



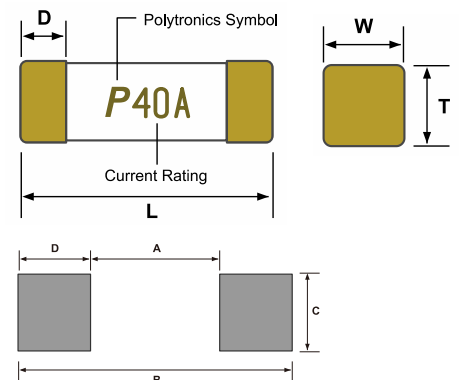
### Physical Dimensions (mm.)

Dimensions (mm)

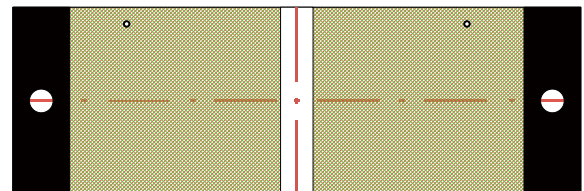
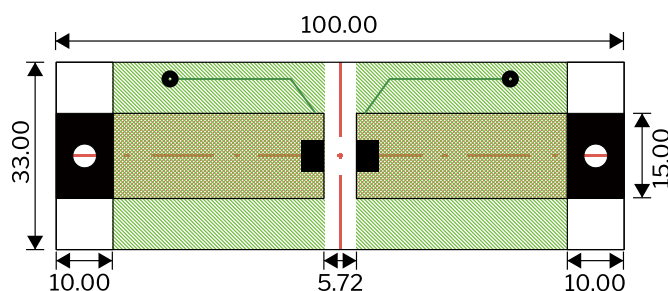
| L          | W         | T         | D         |
|------------|-----------|-----------|-----------|
| 10.25±0.20 | 3.20±0.15 | 3.20±0.15 | 1.75±0.15 |

Recommended Solder Pad Dimension (mm)

| A         | B         | C         | D         |
|-----------|-----------|-----------|-----------|
| 5.72±0.30 | 12.6±0.30 | 3.43±0.30 | 3.25±0.30 |



Dimensionsof Standard Test Board (mm)

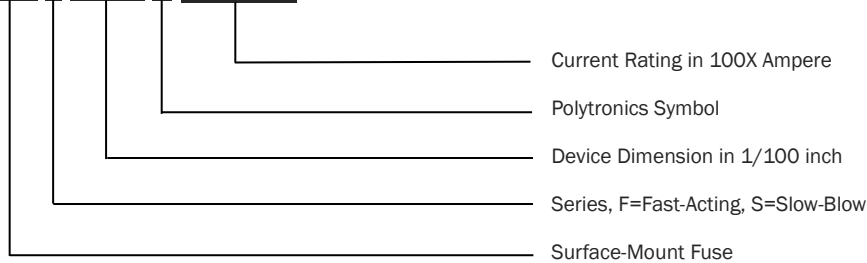


Glass epoxy body on double side  
Board thickness: 1.6mm  
Thickness of Copper layer: ≥100μm  
Width of Copper trace: One side 15mm and the other side 33mm

## SMFF4012 Series Surface Mount Fuses Devices

### Part Number System

SMF F 4012 P □ □ □ □

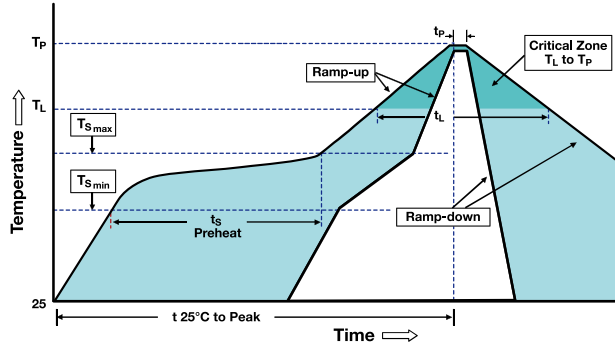


### Reliability Test

| Characteristics          | Test condition / Methods                                                          |                                          | Requirement                                                  | Test Reference                               |
|--------------------------|-----------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------|----------------------------------------------|
| Time/Current             | 100% of current rating                                                            |                                          | No fusing, 4 hours min.                                      | UL248-14                                     |
|                          | 200% of current rating                                                            |                                          | 60 Seconds Max.                                              | Refer to Spec.                               |
|                          | 1000% of current rating                                                           |                                          | 1 mSec. Min.                                                 |                                              |
| Endurance Test           | 100% of rating current for 4 hours and testing Temperature rise at the last 5min. |                                          | No fusing;<br>20~40A: <90°C<br>50~60A: <105°C                | UL248-14                                     |
| Interrupting Ability     | 20A-30A                                                                           | 100VDC 300A<br>72VDC 500A<br>32VDC 1000A | without permanent arcing, ignition and bursting of fuse link | UL248-14<br>IEC 60127-4                      |
|                          | 40A-60A                                                                           | 72VDC 180A<br>60VDC 600A                 |                                                              |                                              |
| Solderability            | 240°C ± 5°C, 3sec ± 0.5sec                                                        |                                          | 95% coverage min                                             | IEC 60127-4<br>IEC 60068-2-20<br>MIL-STD-202 |
| Resistance to Soldering  | 260°C ± 5°C, 10sec ± 0.5sec                                                       |                                          | No Breaking                                                  | MIL-STD-202<br>Method 210                    |
| Moisture resistance      | Temperature Humidity, T: 85°C ± 3°C, RH: 85% ± 5%, Duration: 1000 hours           |                                          | ΔR  : <10%<br>No mechanical damage                           | MIL-STD-202<br>Method 106                    |
| Low Temperature Storage  | T= -55°C ± 3°C, 1000hours                                                         |                                          | ΔR  : <10%                                                   | IEC 60068-2-1                                |
| High temperature Storage | T=125°C ± 2°C, 1000hours                                                          |                                          | ΔR  : <10%                                                   | IEC 60068-2-2                                |
| Salt Spray               | 5% ± 1% salt solution, 48hours                                                    |                                          | ΔR  : <10%                                                   | MIL-STD-202<br>Method 101                    |
| Thermal Shock            | 100 cycles , -55°C to +125°C, 30 minutes @ each extreme                           |                                          | ΔR  : <10%                                                   | IEC 60068-2-14                               |
| Vibration                | Amplitude 10Hz~55Hz in 1 min. 2 hours each XYZ, total 6 hours                     |                                          | ΔR  : <10%<br>No mechanical damage                           | MIL-STD-202F<br>Method 201                   |
| Mechanical shock         | 100G's peak amplitude, saw tooth wave 6ms duration, 3 cycles XYZ + xyz = 18       |                                          | ΔR  : <10%<br>No mechanical damage                           | MIL-STD-202<br>Method 213                    |

## SMFF4012 Series Surface Mount Fuses Devices

### Soldering Parameters



|                                                 |                  |
|-------------------------------------------------|------------------|
| Average Ramp-Up Rate (TS <sub>max</sub> to TP)  | 3°C/second max.  |
| Preheat                                         |                  |
| -Temperature Min (TS <sub>min</sub> )           | 150°C            |
| -Temperature Max (TS <sub>max</sub> )           | 200°C            |
| -Time (TS <sub>min</sub> to TS <sub>max</sub> ) | 60-120 seconds   |
| Time maintained above:                          |                  |
| -Temperature (TL)                               | 217°C            |
| -Time (tL)                                      | 600-150 seconds  |
| Peak Temperature (TP)                           | 260°C            |
| Time within 5°C of actual Peak Temperature (tp) | 20 seconds       |
| Ramp-Down Rate                                  | 6°C /second max. |
| Time 25°C to Peak Temperature                   | 8 minutes max.   |

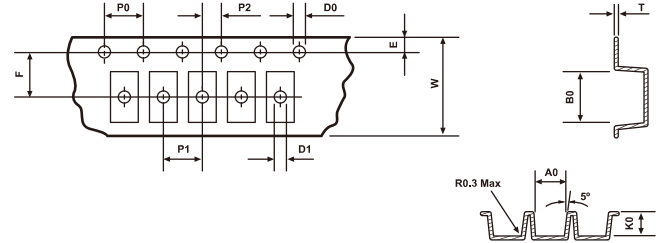
Note 1: All temperature refer to topside of the package, measured on the package body surface.

Note 2: If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

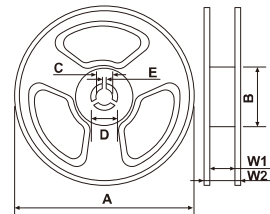
### Packaging Quantity

| Part Number   | Tape & Reel Quantity |
|---------------|----------------------|
| SMFF4012PXXXX | 2000                 |

### Tape & Reel Specification (mm.)



|    |              |    |                |
|----|--------------|----|----------------|
| A0 | 3.50 ± 0.10  | P0 | 4.00 ± 0.10    |
| B0 | 10.60 ± 0.15 | P1 | 8.00 ± 0.10    |
| E  | 1.75 ± 0.10  | P2 | 2.00 ± 0.10    |
| F  | 11.50 ± 0.10 | D0 | 1.50 + 0.10/-0 |
| W  | 24.00 ± 0.30 | D1 | 1.50 + 0.10/-0 |
| K0 | 3.50 ± 0.10  | T  | 0.35 ± 0.05    |



|    |             |
|----|-------------|
| A  | 330.0 ± 2.0 |
| B  | 100.0 ± 1.5 |
| C  | 13.0 ± 0.5  |
| D  | 21.0 ± 0.5  |
| E  | 2.2 ± 0.2   |
| W1 | 24.5 ± 1.5  |
| W2 | 28.5 ± 2.0  |

### Storage

- The ambient temperature recommended for storage shall be between 5°C ~30°C.
- The relative humidity recommended for storage shall be between 25%RH~60%RH.
- The products shall not be stored in areas where harmful gases containing sulfur or chlorine are present.

### Warning

- Fuse product is not recommended for any type of coating. Polytronics is not responsible for any damage directly or indirectly related to the coating.
- For copper layer thickness or copper trace width different from the standard test board, fusing characteristics needs to be verified to ensure product performance meet user requirement.