



Slow-Blow Chip Fuses

Available in industry standard 1206 and 0603 chip sizes, Raychem slow-blow chip fuses help provide overcurrent protection on systems that experience large and frequent current surges as part of their normal operation.

The Raychem slow-blow chip fuse's monolithic, multilayer design helps provide some of the highest current ratings available in the 1206 and 0603 footprints and enhances high-temperature performance in a wide range of circuit protection designs. The devices' small size, high reliability and strong arc suppression characteristics make them suitable for overcurrent protection of power supplies, capacitor filter banks, LCD (Liquid Crystal Display) backlight inverters, electric motors and portable electronics.



Benefits

- Time-delayed design prevents nuisance openings in pulsed and high inrush current applications
- Small size with high-current ratings
- Strong arc suppression characteristics

Features

- RoHS compliant
- Halogen free (refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm)
- Monolithic multilayer design
- High-temperature performance
- -55°C to +125°C operating temperature range

Applications

- | | | |
|------------------------|-----------------------------|-------------------|
| • Small motors systems | • Power over Ethernet (POE) | • Computer drives |
| • Portable electronics | • Test equipment | • Displays |
| • Input power ports | • POL Converter Protection | • Printers |

Table FS1 Clear Time Characteristics for Slow-Blow Chip Fuses

0603SFS Series

% of rated current	Clear time at 25°C	
100%	4 hours (min.)	
200%	1 second (min.)	120 seconds (max.)
300%	0.1 second (min.)	3 seconds (max.)
800%(1.0A-1.5A)	0.0005 second (min.)	0.05 seconds (max.)
800%(2.0A-5.0A)	0.001 second (min.)	0.05 seconds (max.)

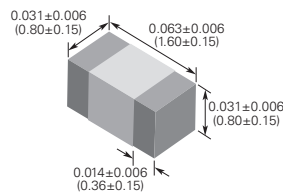
1206SFS Series

% of rated current	Clear time at 25°C	
100%	4 hours (min.)	
200%	1 second (min.)	120 seconds (max.)
300%	0.1 second (min.)	3 seconds (max.)
800%(1.0A-1.5A)	0.0016 second (min.)	0.05 seconds (max.)
800%(2.0A-8.0A)	0.002 second (min.)	0.05 seconds (max.)

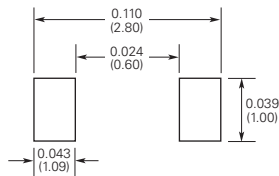
Table FS2 Typical Electrical Characteristics, Dimensions and Recommended Pad Layout for Slow-Blow Chip Fuses

0603 (1608mm) Slow-Blow Chip Fuses

Shape and Dimensions
Inch (mm)



Recommended Pad Layout
Inch (mm)



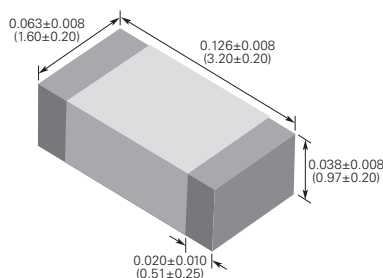
Typical Electrical Characteristics

Max. Interrupt Ratings

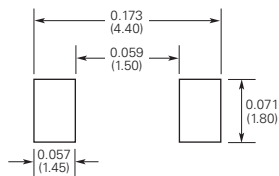
Part Number	Typical Electrical Characteristics			Max. Interrupt Ratings	
	Rated Current (A)	Nominal Cold DCR (Ω)*	Nominal I ² t (A ² sec)†	Voltage (V _{DC})	Current (A)
0603SFS100F/32	1.0	0.200	0.093	32	50
0603SFS150F/32	1.5	0.100	0.18	32	50
0603SFS200F/32	2.0	0.052	0.32	32	50
0603SFS250F/32	2.5	0.041	0.63	32	50
0603SFS300F/32	3.0	0.031	0.87	32	50
0603SFS350F/32	3.5	0.021	1.20	32	50
0603SFS400F/32	4.0	0.017	2.30	32	50
0603SFS450F/32	4.5	0.015	2.70	32	50
0603SFS500F/32	5.0	0.013	3.20	32	50

1206 (3216mm) Slow-Blow Chip Fuses

Shape and Dimensions
Inch (mm)



Recommended Pad Layout
Inch (mm)



Typical Electrical Characteristics

Max. Interrupt Ratings

Part Number	Typical Electrical Characteristics			Max. Interrupt Ratings	
	Rated Current (A)	Nominal Cold DCR (Ω)*	Nominal I ² t (A ² sec)†	Voltage (V _{DC})	Current (A)
1206SFS100F/63	1.0	0.360	0.11	63	50
1206SFS125F/63	1.25	0.200	0.22	63	50
1206SFS150F/63	1.5	0.150	0.23	63	50
1206SFS200F/63	2.0	0.082	0.63	63	50
1206SFS250F/32	2.5	0.070	0.90	32	50
1206SFS300F/32	3.0	0.032	1.20	32	50
1206SFS350F/32	3.5	0.028	1.60	32	50
1206SFS400F/32	4.0	0.024	2.20	32	50
1206SFS450F/32	4.5	0.020	3.60	32	50
1206SFS500F/32	5.0	0.016	5.30	32	50
1206SFS550F/24	5.5	0.014	6.40	24	50
1206SFS600F/24	6.0	0.011	8.50	24	60
1206SFS700F/24	7.0	0.010	10.00	24	60
1206SFS800F/24	8.0	0.009	16.90	24	60

* Measured at ≤10% of rated current and 25°C ambient temperature.
† Melting I²t at 0.001 sec clear time.

Figure FS1-FS4 Family Performance Curves

Figure FS1

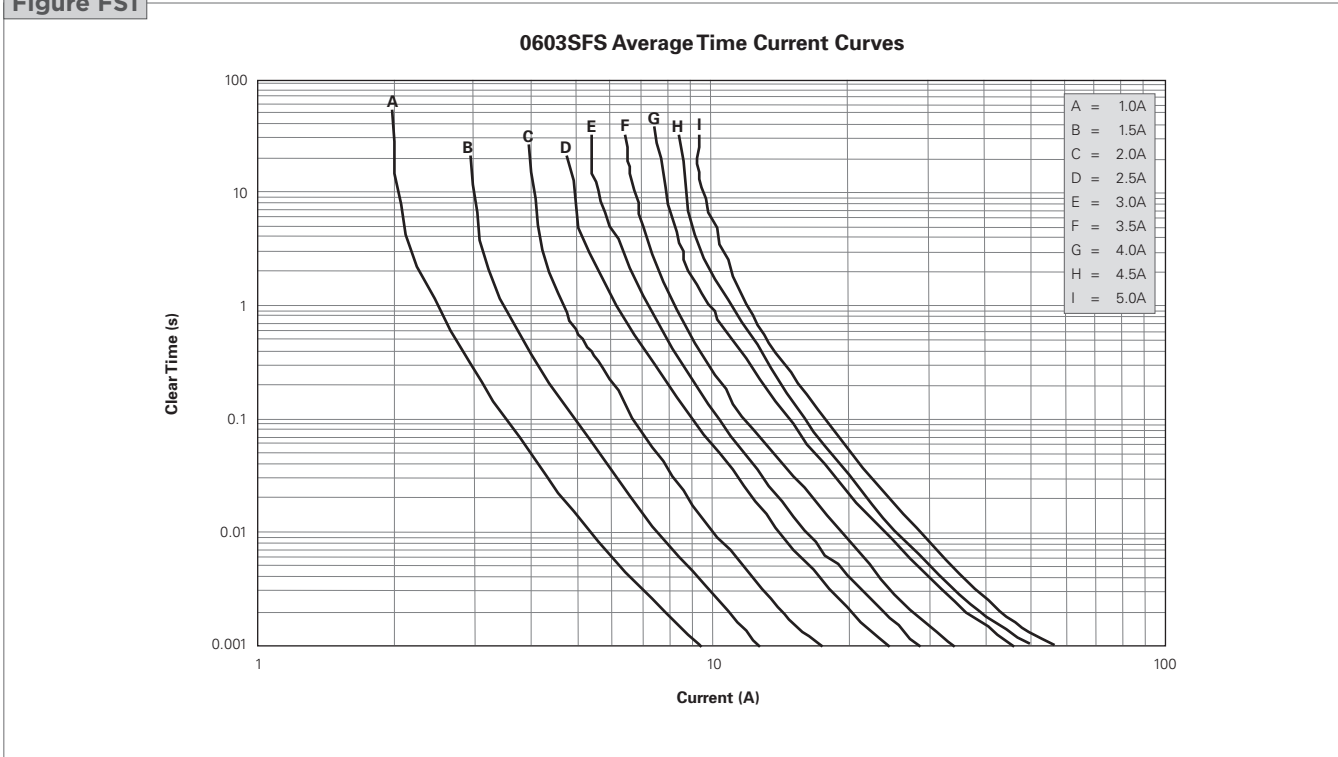


Figure FS2

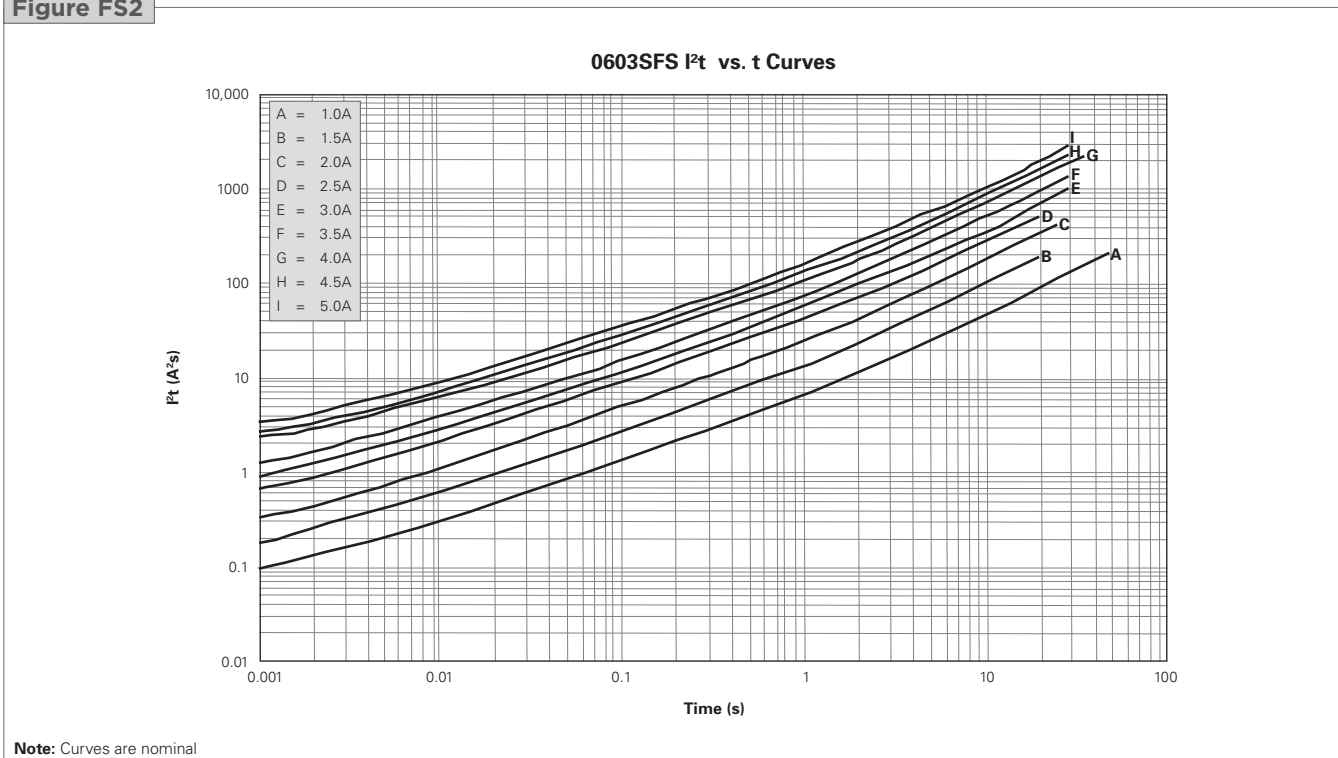


Figure FS3

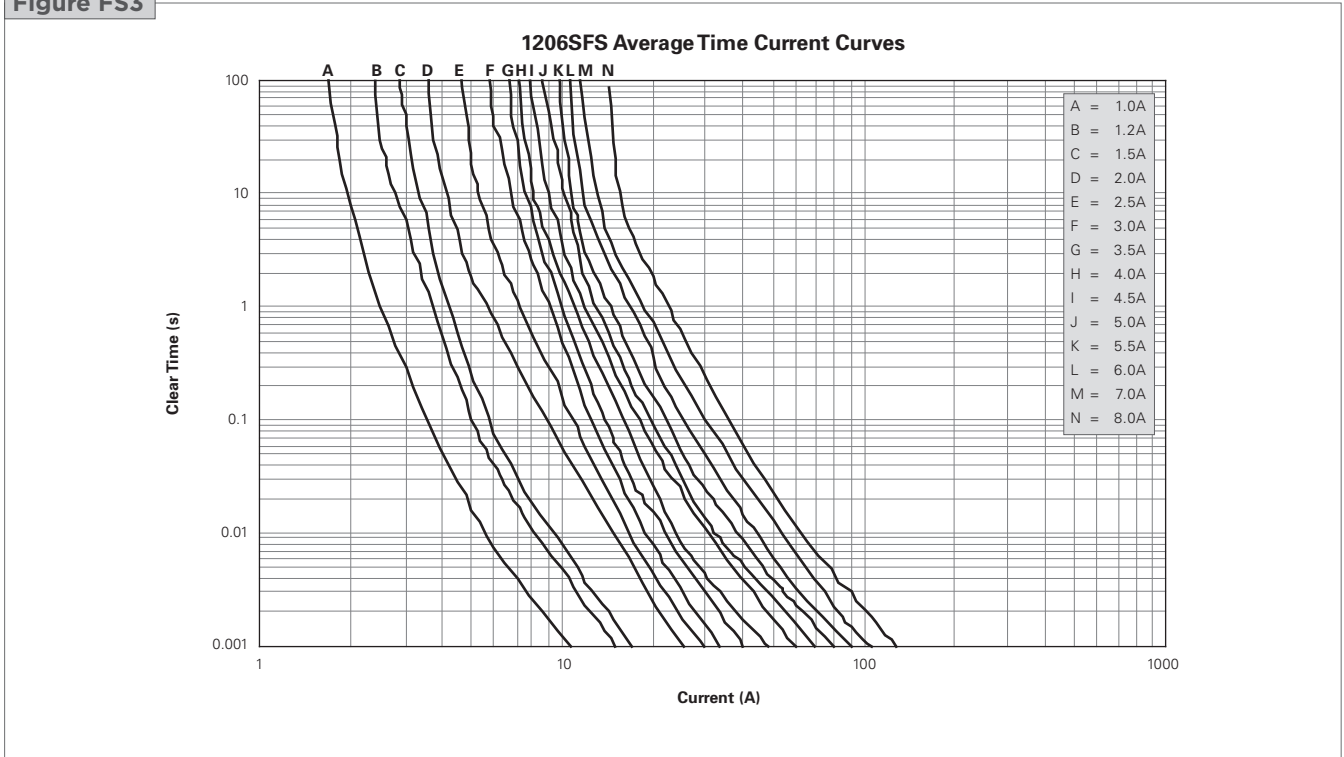
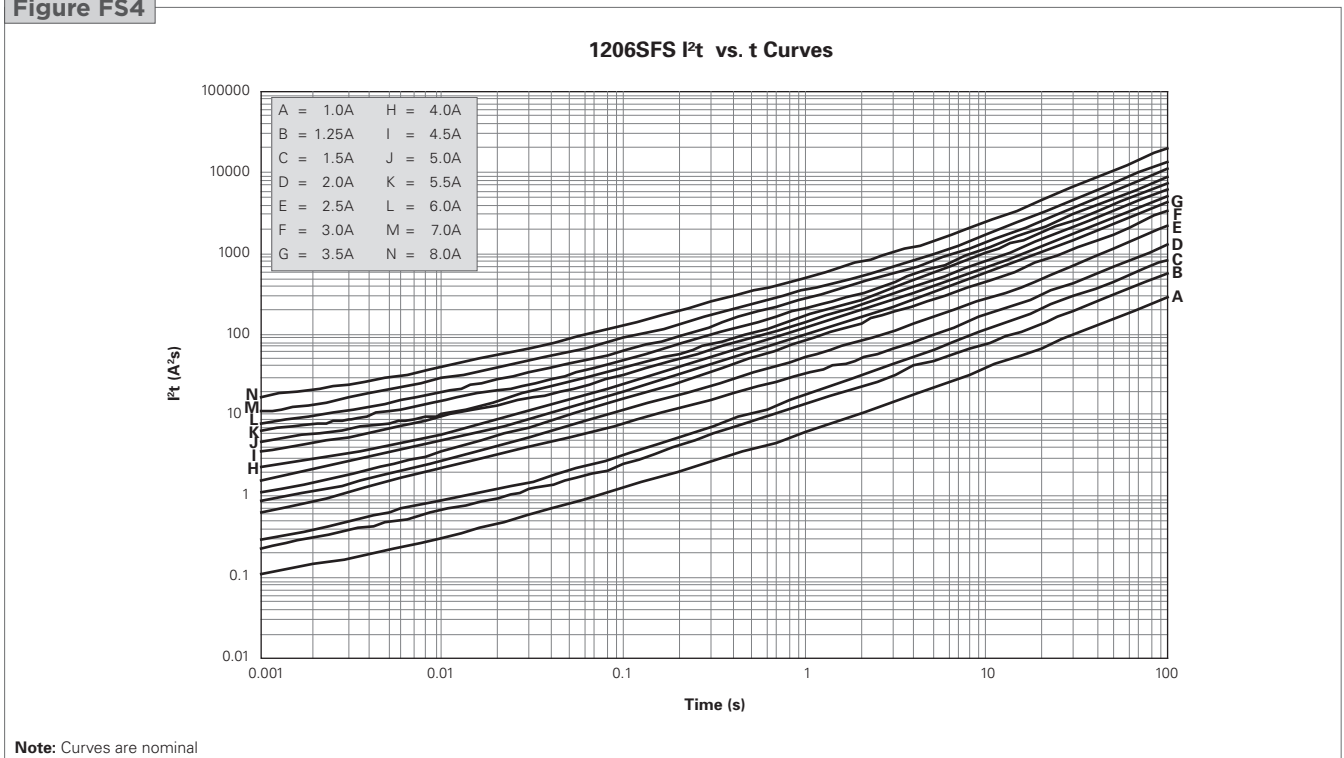


Figure FS4



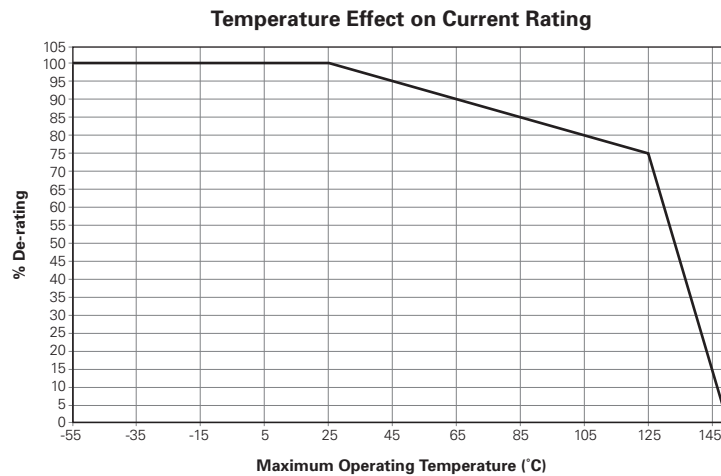
13

Table FS3 Environmental Specifications for Slow-Blow Chip Fuses

Operating temperature	-55°C to +125°C
Mechanical vibration	Withstands 5-3000 Hz at 30 Gs when evaluated per Method 204 of MIL-STD-202
Mechanical shock	Withstands 1500 Gs, 0.5 millisecond half-sine pulses when evaluated per Method 213 of MIL-STD-202
Thermal shock	Withstands 100 cycles from -65°C to +125°C when evaluated per Method 107 of MIL-STD-202
Resistance to soldering heat	Withstands 60 seconds at +260°C when evaluated per Method 210 of MIL-STD-202
Solderability	Meets 95% minimum coverage requirement when evaluated per Method 208 of MIL-STD-202
Moisture resistance	Withstands 10 cycles when evaluated per Method 106 of MIL-STD-202
Salt spray	Withstands 48-hour exposure when evaluated per Method 101 of MIL-STD-202

Table FS4 Material Specifications for Slow-Blow Chip Fuses

Construction body material	Ceramic
Termination material	Silver, Nickel, Tin
Fuse element	Silver

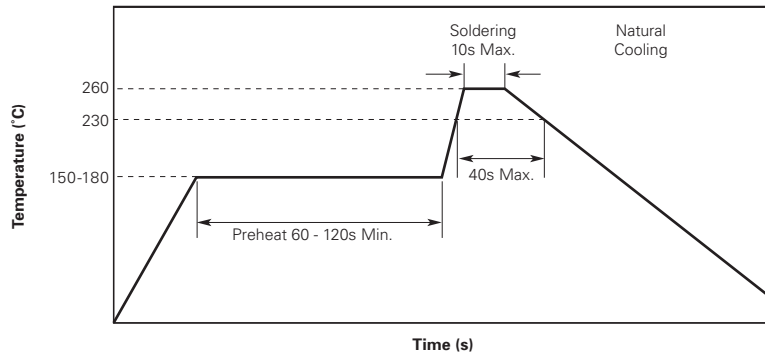
Figure FS5 Thermal Derating Current for Slow-Blow Chip Fuses

Table FS5 Electrical Specifications for Slow-Blow Chip Fuses

Insulation resistance after opening	20,000Ω minimum @ rated voltage. Fuse clearing under low voltage conditions may result in lower post-clearing insulation values. Under normal fault conditions Raychem fuses provide sufficient insulation resistance for circuit protection.
Current carrying capacity	Withstands 100% rated current at +25°C ambient for 4 hours when evaluated per MIL-PRF-23419.

Table FS6 Packaging Information for Slow-Blow Chip Fuses

Size	Reel Quantity (pcs)	Reel Diameter	Reel Width	Carrier Tape Size	Tape Type	Reels per Outside Shipment Box	Outside Shipment Boxes per Overpack
0603 (1608)	4,000	178mm white plastic	9.0 ± 0.5mm	8.00 ± 0.10mm	Plastic	5	5
1206 (3216)	3,000	178mm white plastic	9.0 ± 0.5mm	8.00 ± 0.10mm	Plastic	5	5

Figure FS6 Recommended Soldering Temperature Profile for Slow-Blow Chip Fuses



Recommended conditions for hand soldering:

- Using hot air rework station that can reflow the solder on both terminations at the same time is strongly recommended, do not directly contact the chip termination with the tip of soldering iron.
- Preheating: 150°C, 60s (min).
Appropriate temperature (max) of soldering iron tip/soldering time (max): 280°C / 10s or 350°C / 3s.
Maximum temperature of soldering iron tip/soldering time: 350°C / 9s or 400°C / 8s.

Table FS7 Tape and Reel Material Characteristics for Slow-Blow Chip Fuses

Tolerance X ± 1mm; 0.X ± 0.5mm; 0.XX ± 0.2mm

Performance	Testing Method	Range	
		Min.	Max.
MVR	ASTM D1238	3.60	4.40
Vicat softening temperature	ASTM D1525	97.8	-
Elasticity at break	ASTM D638	50.0	-

Table FS8 Tape and Reel Specifications for Slow-Blow Chip Fuses

Mark	Dimension in inches (mm)			
	0603 (1608)		1206 (3216)	
E ₁	0.069±0.004	(1.75±0.10)	0.069±0.004	(1.75±0.10)
F	0.138±0.002	(3.50±0.05)	0.138±0.002	(3.50±0.05)
W	0.318±0.004	(8.00±0.10)	0.318±0.004	(8.00±0.10)
P ₁	0.157±0.004	(4.00±0.10)	0.157±0.004	(4.00±0.10)
P ₀	0.157±0.004	(4.00±0.10)	0.157±0.004	(4.00±0.10)
P ₂	0.079±0.002	(2.00±0.05)	0.079±0.002	(2.00±0.05)
D ₀	0.059±0.004	(1.50+0.10/-0.00)	0.059±0.004	(1.50+0.10/-0.00)
D ₁	-	-	0.039 max	(1.00 max)
t	0.009±0.001	(0.23±0.02)	0.009±0.001	(0.23±0.02)
A ₀	0.036±0.004	(0.92±0.10)	0.071±0.004	(1.80±0.10)
B ₀	0.071±0.004	(1.80±0.10)	0.138±0.004	(3.50±0.10)
K ₀	0.033±0.004	(0.85±0.10)	0.050±0.004	(1.27±0.10)

Figure FS7 Taped Component Dimensions for Slow-Blow Chip Fuses

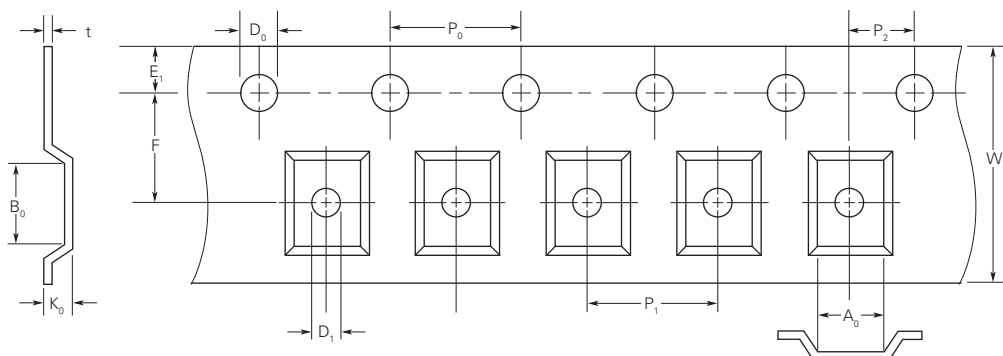
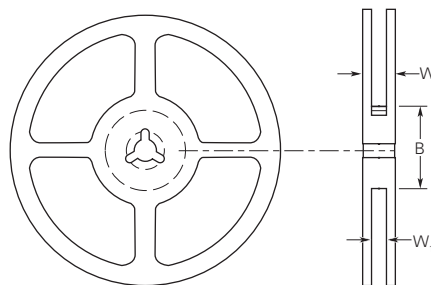


Figure FS8 Reel Dimensions for Slow-Blow Chip Fuses

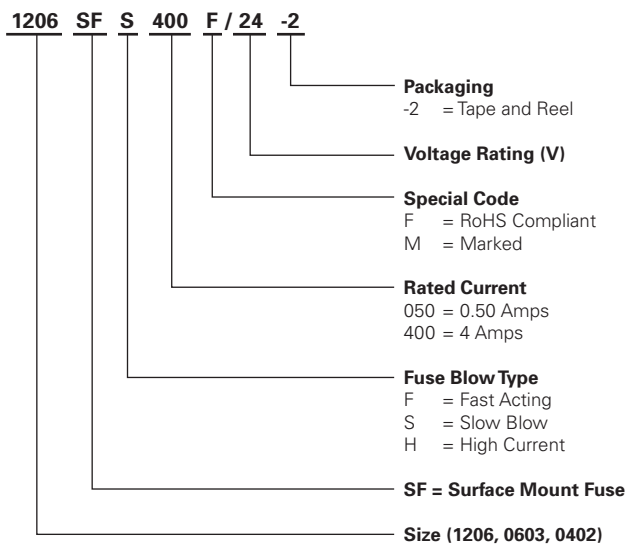
Dimension Description	Mark	Dimensions (mm)
Hub outer diameter	B	60
Reel inside width	W ₁	9
Reel outside width	W ₂	11.4
Tape width		8



Agency Approvals for Slow-Blow Chip Fuses

UL File # E197536

Part Numbering System for Slow-Blow Chip Fuses



Warning :

All information, including illustrations, is believed to be accurate and reliable. Users, however, should independently evaluate the suitability of and test each product selected for their application. Tyco Electronics Corporation makes no warranties as to the accuracy or completeness of the information, and disclaims any liability regarding its use. Tyco Electronics' only obligations are those in the Tyco Electronics' Standard Terms and Conditions of Sale for this product, and in no case will Tyco Electronics be liable for any incidental, indirect, or consequential damages arising from the sale, resale, use, or misuse of the product. Specifications are subject to change without notice. In addition, Tyco Electronics reserves the right to make changes to materials or processing that do not affect compliance with any applicable specification without notification to Buyer.

