Surface-mount Fuses
Fundamentals

Overview

Tyco Electronics offers the widest selection of surface-mount fuses available for addressing a broad range of overcurrent protection applications. Helping to prevent costly damage and promote a safe environment for electronic and electrical equipment, our single-use chip fuses provide performance stability to support applications with current ratings from .5A up to 20A.

Tyco Electronics also offers the telecom FT600 fuse for telecommunications applications. This telecom fuse helps comply with North American overcurrent protection requirements, including Telcordia, GR-1089, TIA-968-A (formerly FCC Part 68), and UL60950 3rd edition.

Multi-layer Design Enhanced Arc Suppression Characteristics

The multi-layer design has the benefit of exposing more fuse element surface area to the glass-ceramic absorption material. When the fuse elements open, there is more material for the vaporizing fuse metals to absorb into, resulting in a very efficient and effective quenching of the fuse arc.

Figure 1 compared the multi-layer design of our SFF fuses with standard glass coated designs. The glass coated designs rely on the coating on only one side of the fuse element to absorb the vaporizing fuse material when it opens. Therefore, there is much less absorption material available to absorb the fuse metals. The result can be prolonged arcing and possible coating breach.

Figure 2 shows how the absorption characteristics of the two designs differ. The multi-layer design indicates a clean separation with the fuse element evenly diffusing into the surrounding ceramic substrate. In the glass coated design, the element diffusion takes place in a small portion of the device and is only absorbed by the glass material directly above the area of failure.

Figure 1

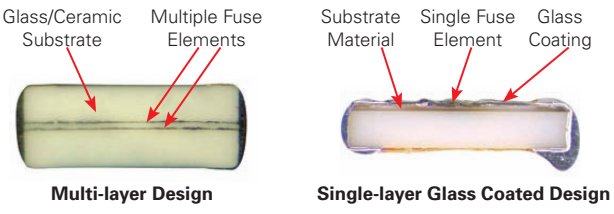
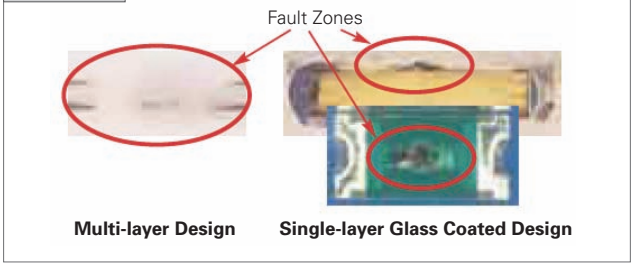


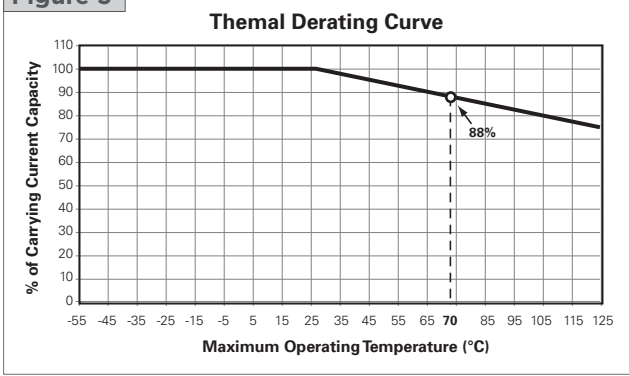
Figure 2



Temperature Derating

A fuse is a temperature sensitive device. Therefore, operating temperature will have an effect on fuse performance and lifetime. Operating temperature should be taken into consideration when selecting the fuse current rating. The Thermal Derating Curve for Raychem surface mount chip fuses is presented in Figure 3. Use it to determine the derating percentage based on operating temperature and apply it to the derated system current.

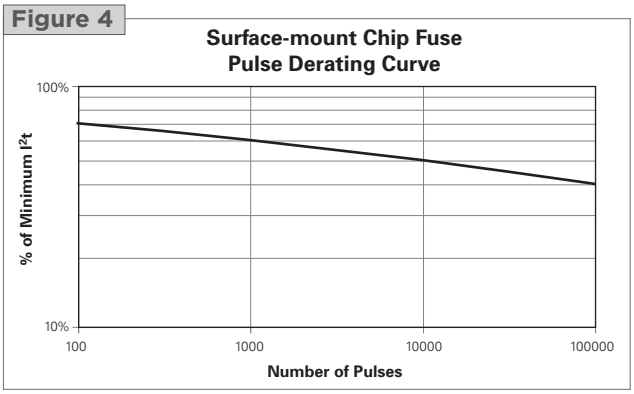
Figure 3



Pulse Cycle Derating

Once the I^2t value for the application waveform has been determined, it must be derated based on the number of cycles expected over the system lifetime. Since the stress induced by the current pulse is mechanical in nature, the number of times the stress is applied has significant bearing on how much derating must be applied to the fuse rating. Figure 4 presents the current pulse derating curve for our surface-mount chip fuses up to 100,000 cycles.

Figure 4



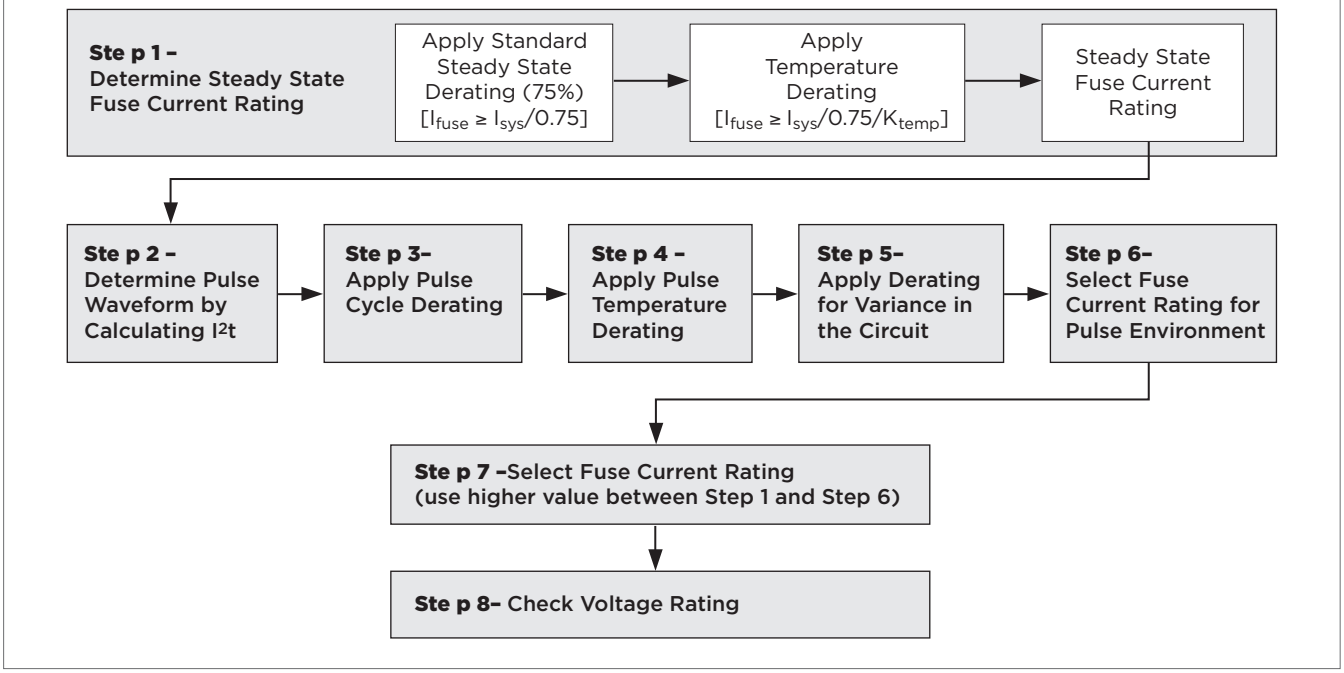
Selecting Surface-mount Chip Fuses

Fuse selection seems straightforward, in that, you pick one which has a current rating just a bit higher than your worstcase system operating current. Unfortunately, it's not that simple. There are derating considerations for operating current and application temperature. Turn-on and other system operations (like processor speed changes or motor start up) cause current surges or spikes that also require consideration when selecting a fuse. So selecting the right fuse for your application is not as simple as knowing the nominal current drawn by the system.

Fuse Selection Flowchart

However, the basic considerations for fuse selection are shown in the flowchart presented in Figure 5. Following this flow chart will help you select a fuse best suited for your application conditions.

Figure 5



Surface-mount Fuses
Fast-Acting Chip Fuses

Fast-acting chip fuses help provide overcurrent protection on systems using DC power sources up to 63V_{DC}. The fuse's monolithic, multilayer design provides the highest hold current in the smallest footprint, reduces diffusion-related aging, improves product reliability and resilience, and enhances high-temperature performance in a wide range of circuit designs.

These RoHS-compliant surface-mount devices offer strong arc suppression characteristics and facilitate the development of more reliable, high performance consumer electronics such as laptops, multimedia devices, cell phones, and other portable electronics.

Benefits

- Small size with high-current ratings
- Excellent temperature stability
- High reliability and resilience
- Strong arc suppression characteristics

Features

- Lead free materials and 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

- Laptops
- Digital cameras
- Cell phones
- Printers
- DVD players
- Portable electronics
- Game systems
- LCD monitors
- Scanners

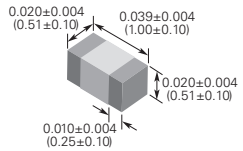
Table FF1 Clear Time Characteristics for Fast-Acting Chip Fuses

% of rated current	Clear time at 25°C
100%	4 hours min.
250%	5 seconds max.
400%	0.05 seconds max.

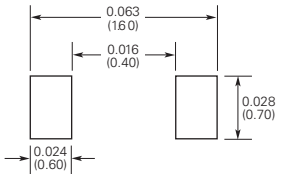
Table FF2 Typical Electrical Characteristics, Dimensions and Recommended Pad Layout for Fast-Acting Chip Fuses

0402 (1005mm) Fast-Acting Chip Fuses

Shape and Dimensions
Inch (mm)



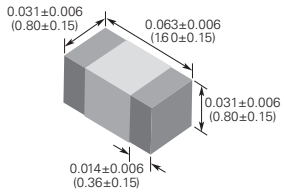
Recommended Pad Layout
Inch (mm)



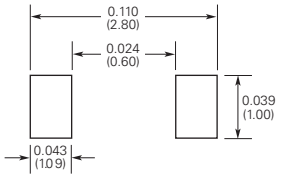
Part Number	Typical Electrical Characteristics: Rated Current (A)	Typical Electrical Characteristics: Nominal Cold DCR* (Ω)	Max. Interrupt Ratings: Voltage (V_{DC})	Max. Interrupt Ratings: Current (A)
0402SFF050F/24	0.50	0.380	24	35
0402SFF075F/24	0.75	0.210	24	35
0402SFF100F/24	1.00	0.120	24	35
0402SFF150F/24	1.50	0.056	24	35
0402SFF200F/24	2.00	0.035	24	35
0402SFF300F/24	3.00	0.021	24	35
0402SFF400F/24	4.00	0.014	24	35

0603 (1608mm) Fast-Acting Chip Fuses

Shape and Dimensions
Inch (mm)



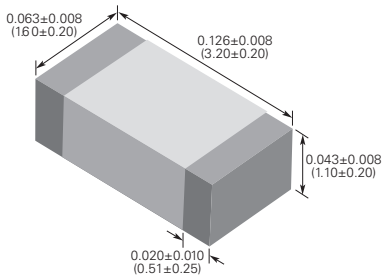
Recommended Pad Layout
Inch (mm)



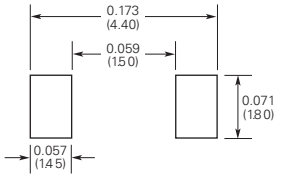
Part Number	Typical Electrical Characteristics: Rated Current (A)	Typical Electrical Characteristics: Nominal Cold DCR* (Ω)	Max. Interrupt Ratings: Voltage (V_{DC})	Max. Interrupt Ratings: Current (A)
0603SFF050F/32	0.50	0.485	32	50
0603SFF075F/32	0.75	0.254	32	50
0603SFF100F/32	1.00	0.131	32	50
0603SFF150F/32	1.50	0.059	32	35
0603SFF200F/32	2.00	0.044	32	35
0603SFF250F/32	2.50	0.032	32	35
0603SFF300F/32	3.00	0.025	32	35
0603SFF350F/32	3.50	0.024	32	35
0603SFF400F/32	4.00	0.018	32	35
0603SFF500F/32	5.00	0.013	32	35
0603SFF600F/24	6.00	0.010	24	35

1206 (3216mm) Fast-Acting Chip Fuses

Shape and Dimensions
Inch (mm)



Recommended Pad Layout
Inch (mm)



Part Number	Typical Electrical Characteristics: Rated Current (A)	Typical Electrical Characteristics: Nominal Cold DCR* (Ω)	Max. Interrupt Ratings: Voltage (V_{DC})	Max. Interrupt Ratings: Current (A)
1206SFF050F/63	0.50	0.730	63	50
1206SFF075F/63	0.75	0.513	63	50
1206SFF100F/63	1.00	0.220	63	50
1206SFF150F/63	1.50	0.120	63	50
1206SFF175F/63	1.75	0.100	63	50
1206SFF200F/63	2.00	0.050	63	50
1206SFF250F/32	2.50	0.035	32	50
1206SFF300F/32	3.00	0.031	32	50
1206SFF400F/32	4.00	0.022	32	45
1206SFF500F/32	5.00	0.015	32	45
1206SFF600F/24	6.00	0.013	24	45
1206SFF700F/24	7.00	0.011	24	45
1206SFF800F/24	8.00	0.008	24	45

* Measured at ≤10% of rated current and 25°C ambient temperature.

RoHS Compliant, ELV Compliant HF Halogen Free

Figure FF1-FF6 Family Performance Curves for Fast-Acting Chip Fuses

Figure FF1

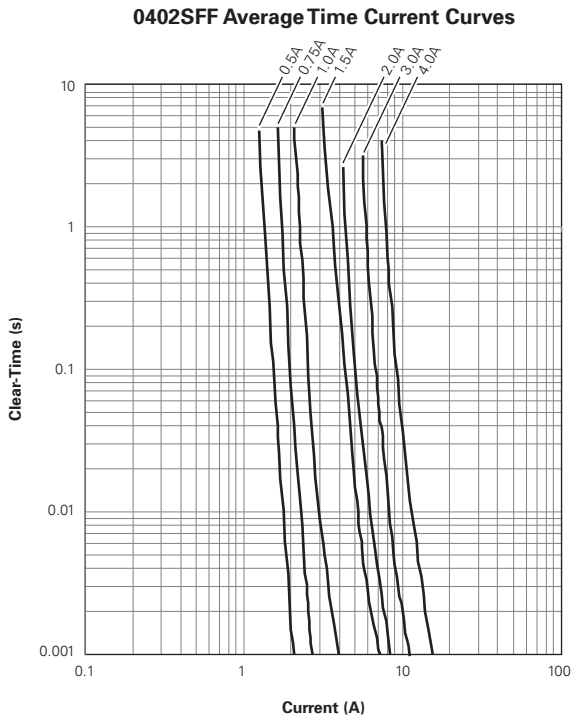
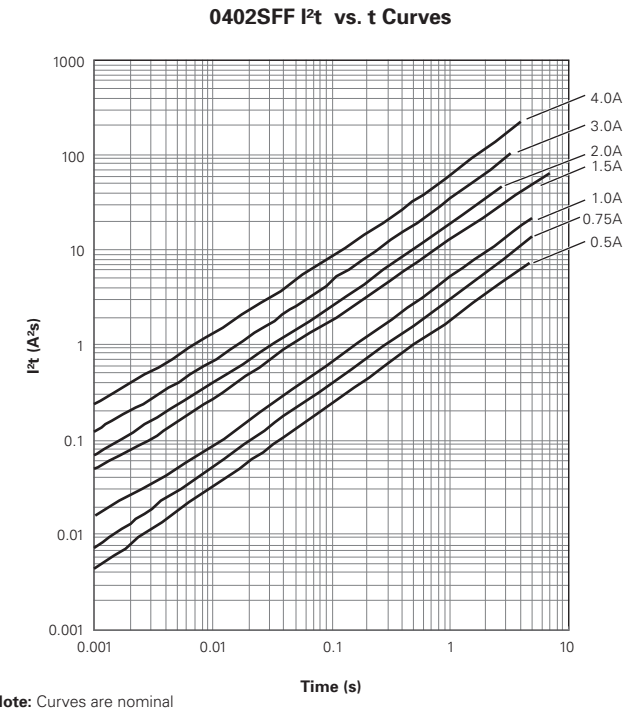


Figure FF2



Note: Curves are nominal

Figure FF3

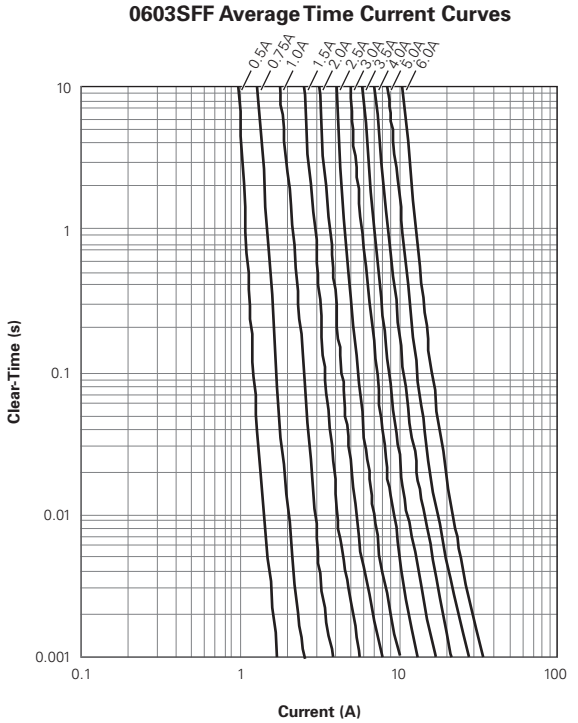
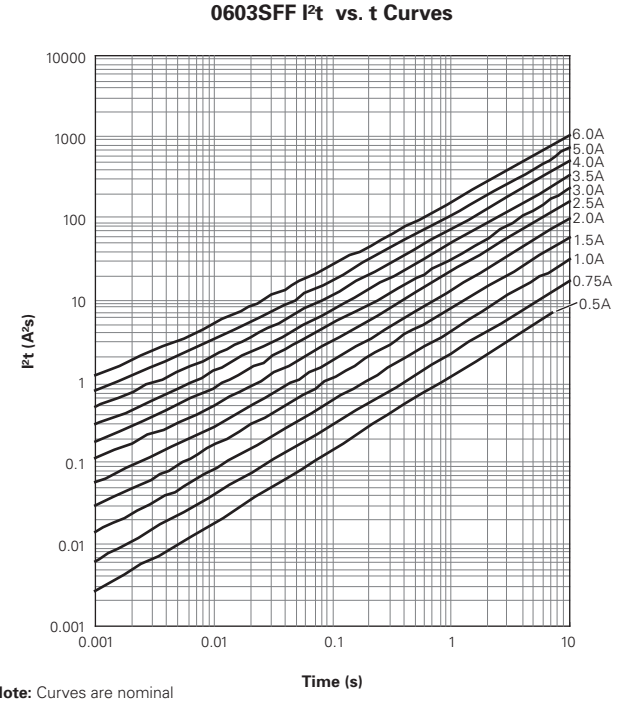


Figure FF4



Note: Curves are nominal

Figure FF1-FF6 Family Performance Curves for Fast-Acting Chip Fuses Cont'd

Figure FF5

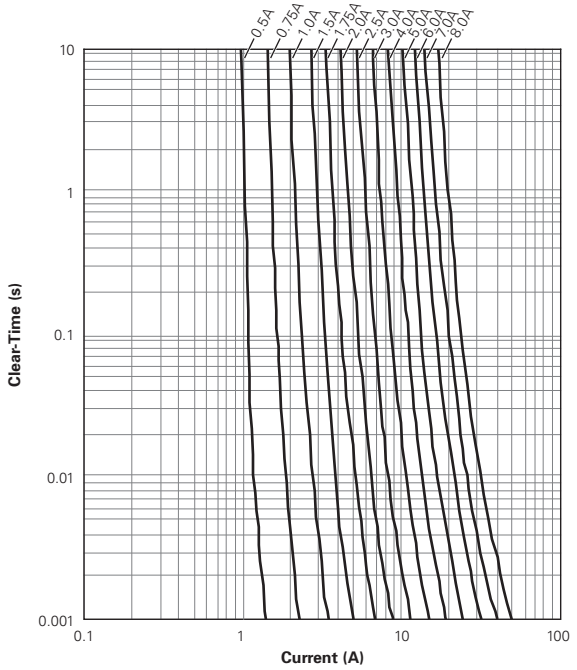
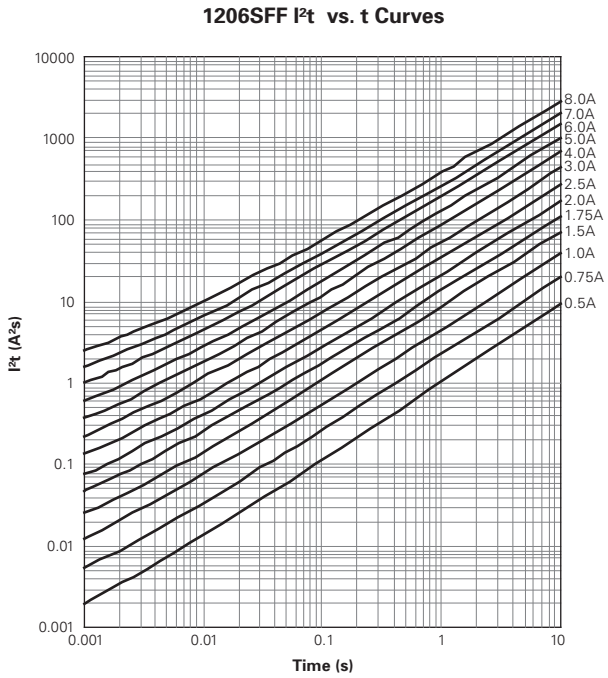


Figure FF6

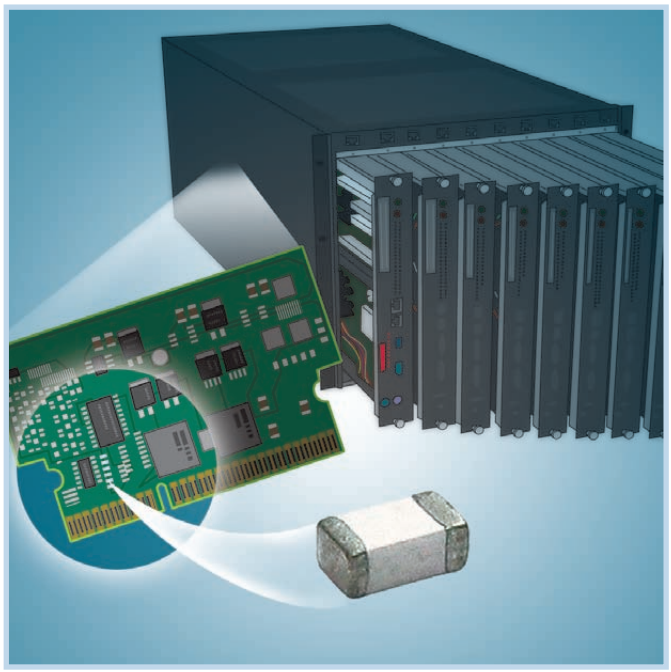


Note: Curves are nominal

➔ **Please go to page 75 for more information for Fast-Acting Chip Fuses.**

Surface-mount Fuses
High-Current-Rated Chip Fuses

The monolithic multilayer design of the Tyco Electronics high-current-rated chip fuses helps to provide some of the highest current ratings available in the 1206 size 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, servers, communications equipment, voltage regulator modules, and other high-current, small size applications.



Benefits

- Glass ceramic monolithic structure provides stability in application cycling
- High-current rating in a small package allows more efficient use in system space
- Strong arc suppression in overcurrent conditions

Features

- Lead free materials and 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

- Communications equipment
- Voltage regulator modules
- Power supplies
- Servers

Table FH1 Clear Time Characteristics for High-Current-Rated Chip Fuses

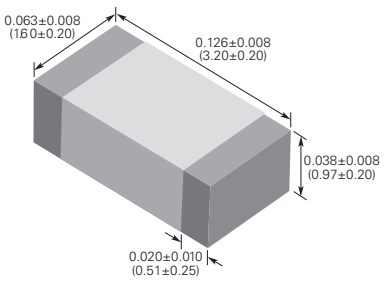
1206SFH Series

% of rated current	Clear time at 25°C
100%	4 hours (min.)
250%	5 seconds (max.)

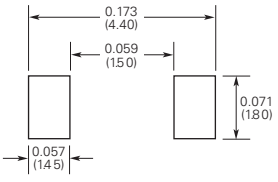
Table FH2 Typical Electrical Characteristics, Dimensions and Recommended Pad Layout for High-Current-Rated Chip Fuses

1206 (3216mm) High-Current-Rated Chip Fuses

Shape and Dimensions
Inch (mm)



Recommended Pad Layout
Inch (mm)



Part Number	Typical Electrical Characteristics: Rated Current (A)	Nominal Cold DCR (Ω)*	Nominal I^2t (A^2sec)†	Max. Interrupt Ratings: Voltage (V_{DC})	Current (A)
1206SFH100F/24	10	0.010	9	24	100
1206SFH120F/24	12	0.008	14	24	100
1206SFH150F/24	15	0.005	26	24	100
1206SFH200F/24	20	0.003	56	24	100

* Measured at ≤10% of rated current and 25°C ambient temperature.
† Melting I^2t at 0.001 sec clear time.

Figure FH1-FH2 Family Performance Curves for High-Current-Rated Chip Fuses

9

Figure FH1

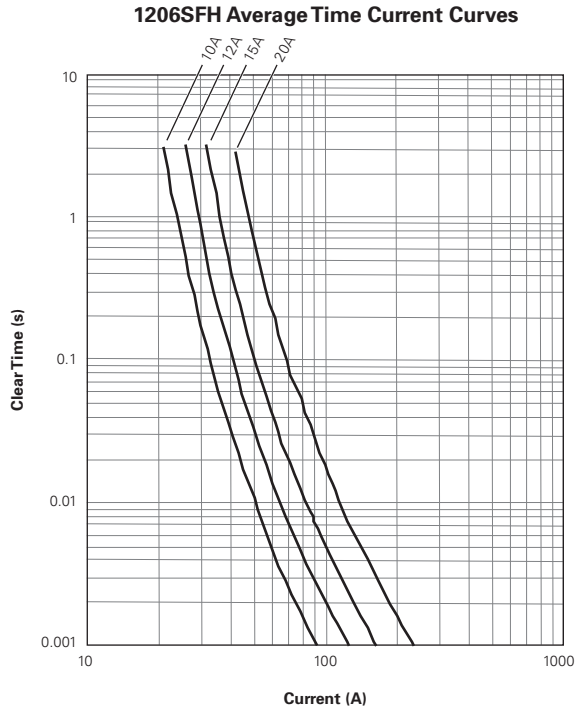
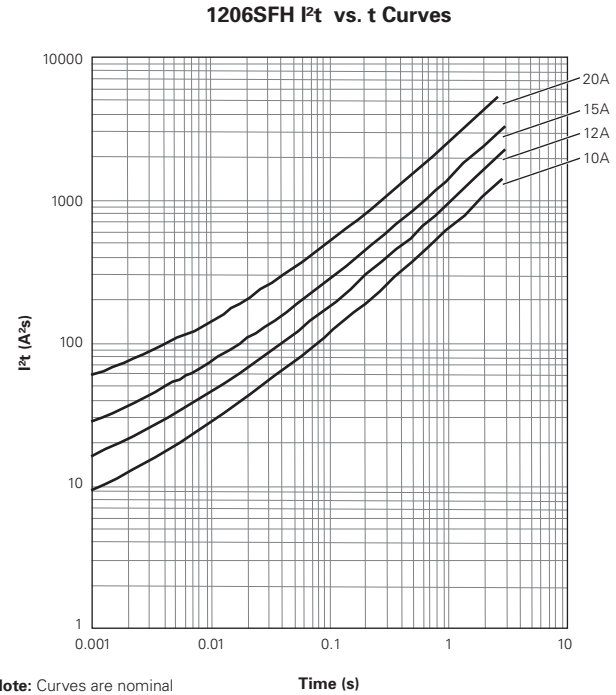


Figure FH2



Note: Curves are nominal

➔ **Please go to page 75 for more information for High-Current-Rated Chip Fuses.**

RoHS Compliant, ELV Compliant HF Halogen Free

Surface-mount Fuses
Slow-Blow Chip Fuses

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

The 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

- Lead free materials and 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
- Portable electronics
- Input power ports
- Power over Ethernet (POE)
- Test equipment
- POL converter protection
- Computer drives
- Displays
- 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.)

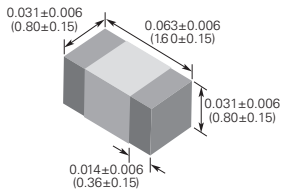
1206SFS Series

% 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.)

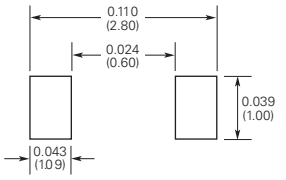
Table FS2 Typical Electrical Characteristics, Dimensions and Recommended Pad Layout for Slow-Blow Chip Fuses

0603 (1608mm) Slow-Blow Chip Fuses

Shape and Dimensions
Inch (mm)



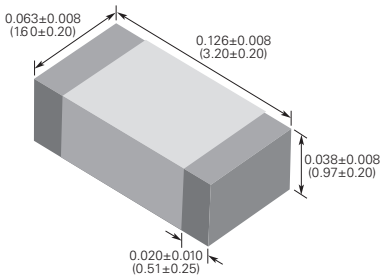
Recommended Pad Layout
Inch (mm)



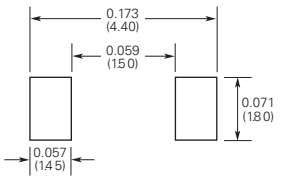
Part Number	Typical Electrical Characteristics: Rated Current (A)	Nominal Cold DCR (Ω)*	Nominal I^2t (A^2sec)†	Max. Interrupt Ratings: Voltage (V_{DC})	Current (A)
0603SFS100F/32	1.0	0.200	0.093	32	50
0603SFS150F/32	1.5	0.100	0.18	32	50
0603SFS200F/32	2.0	0.052	0.32	32	50
0603SFS250F/32	2.5	0.041	0.63	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)



Part Number	Typical Electrical Characteristics: Rated Current (A)	Nominal Cold DCR (Ω)*	Nominal I^2t (A^2sec)†	Max. Interrupt Ratings: 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 I^2t at 0.001 sec clear time.

RoHS Compliant, ELV Compliant HF Halogen Free

Figure FS1-FS4 Family Performance Curves for Slow-Blow Chip Fuses

Figure FS1

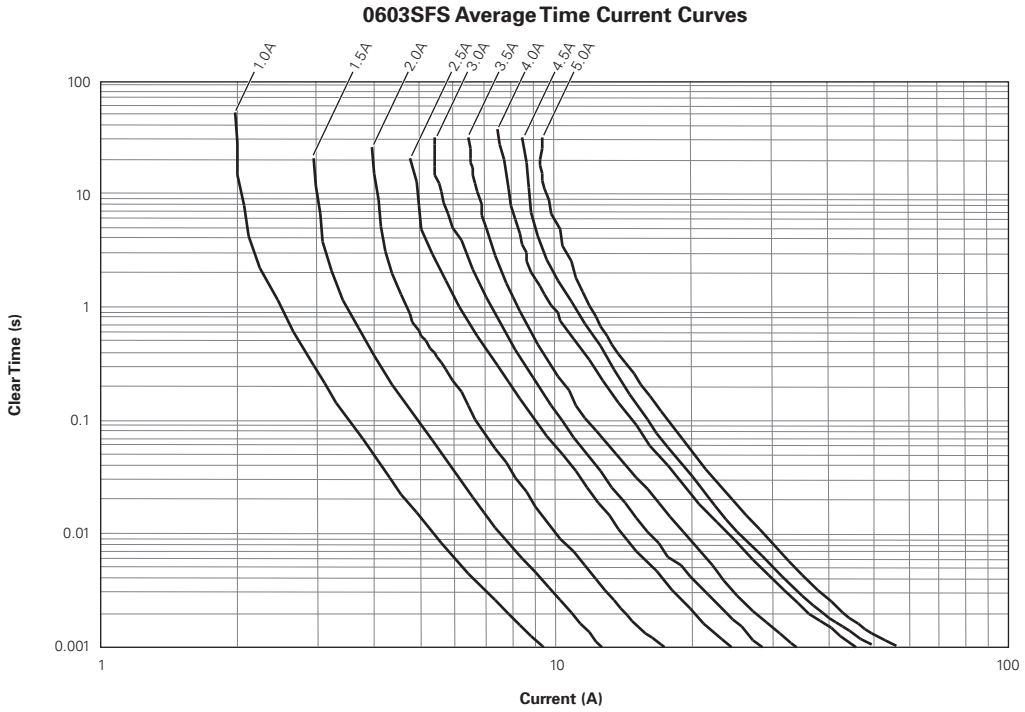
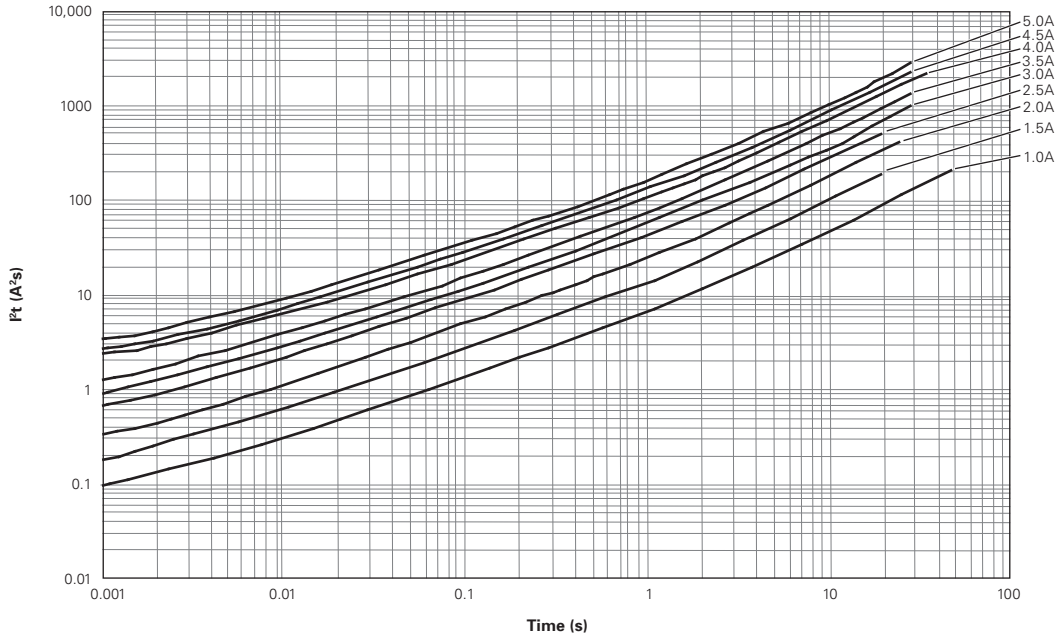


Figure FS2



Note: Curves are nominal

Figure FS1-FS4 Family Performance Curves for Slow-Blow Chip Fuses Cont'd

Figure FS3

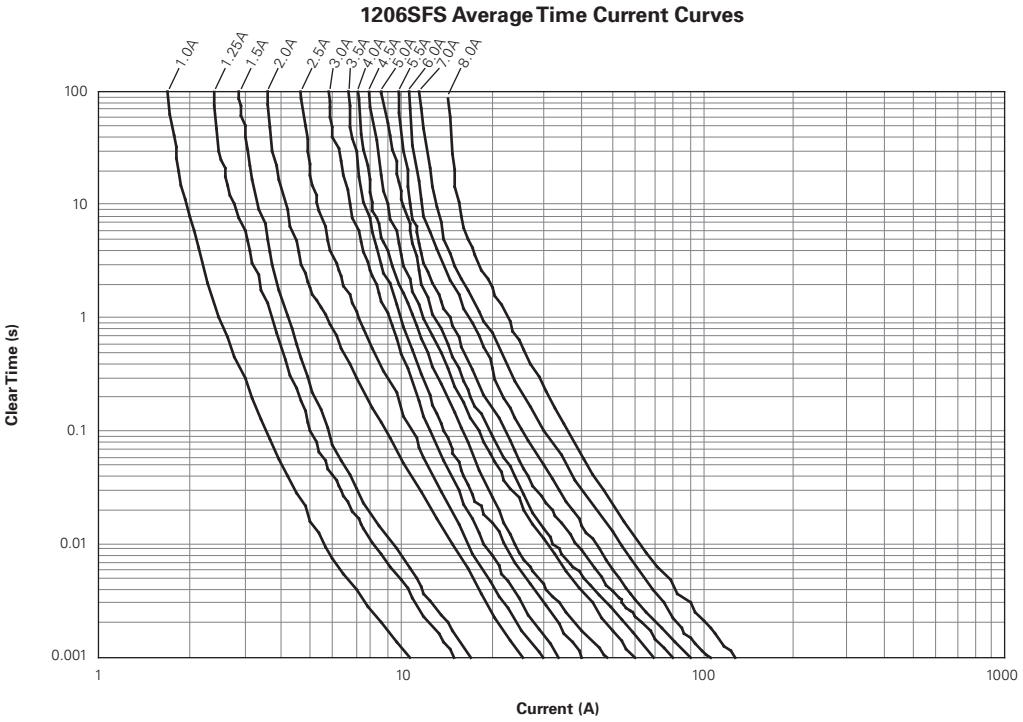
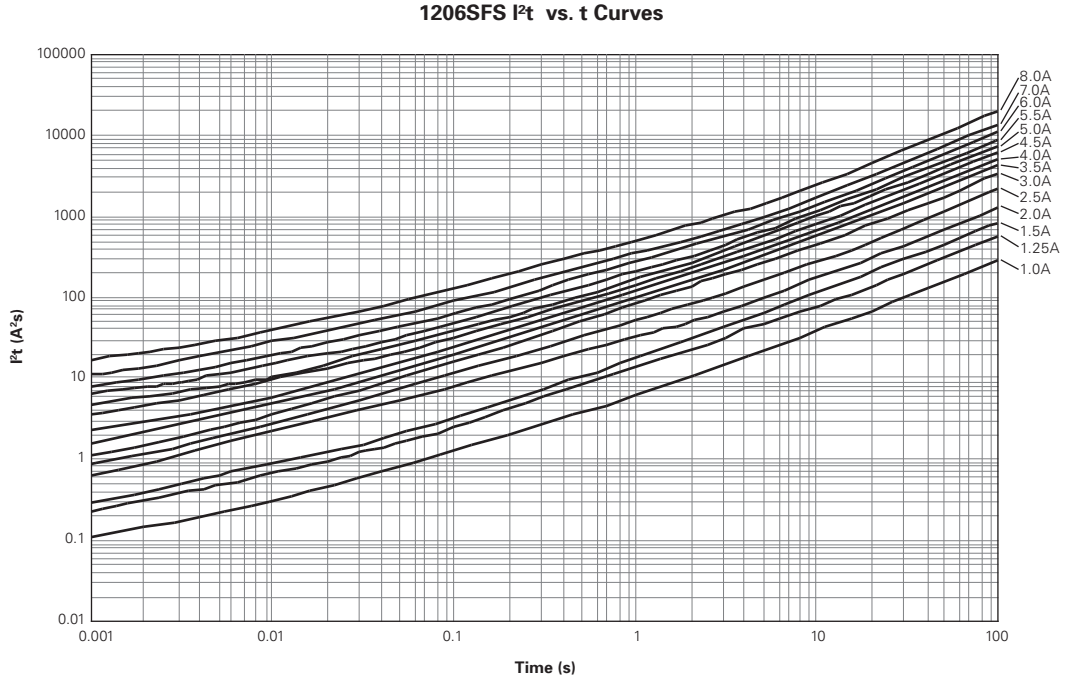


Figure FS4



Note: Curves are nominal

➔ **Please go to page 75 for more information for Slow-Blow Chip Fuses.**

RoHS Compliant, ELV Compliant HF Halogen Free

Specifications, Packaging Information, Agency Approvals and Part Numbering Systems for All Chip Fuses

Table F1 Environmental Specifications for Fast-Acting, High-Current-Rated and 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 F2 Material Specifications for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

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

Figure F1 Thermal Derating Current for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

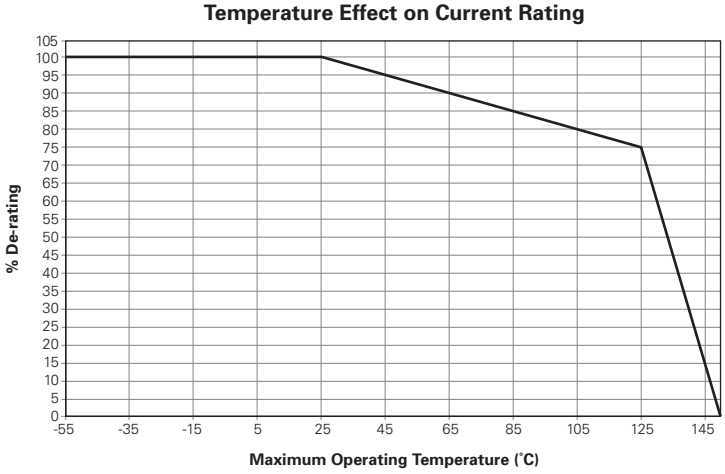


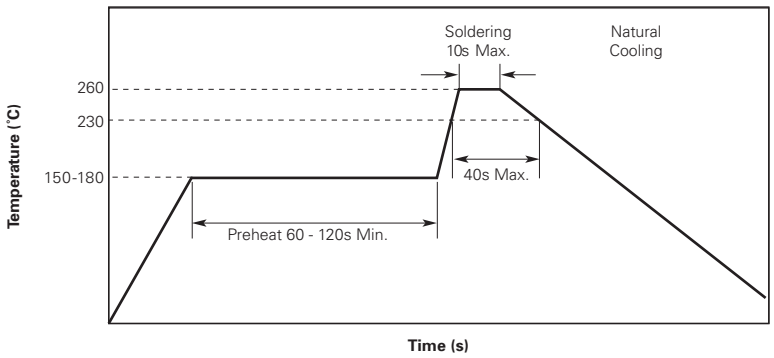
Table F3 Electrical Specifications for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

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 F4 Packaging Information for Fast-Acting, High-Current-Rated and 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
0402 (1005)	10,000	178mm white plastic	9.0 ± 0.5mm	8.00 ± 0.10mm	Paper	5	5
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 F2 Recommended Soldering Temperature Profile for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses



Recommended conditions for hand soldering:

1. 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.
2. 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 F5 Tape and Reel Specifications for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

	Dimension in inches (mm)					
Mark	0402 (1005)		0603 (1608)		1206 (3216)	
E_1	0.069±0.004	(1.75±0.10)	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)	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)	0.318±0.004	(8.00±0.10)
P_1	0.079±0.004	(2.00±0.10)	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)	0.157±0.004	(4.00±0.10)
P_2	0.040±0.002	(1.00±0.05)	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)	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)	0.009±0.001	(0.23±0.02)
A_0	0.026±0.004	(0.67±0.10)	0.036±0.004	(0.92±0.10)	0.071±0.004	(1.80±0.10)
B_0	0.046±0.004	(1.17±0.10)	0.071±0.004	(1.80±0.10)	0.138±0.004	(3.50±0.10)
K_0	0.025±0.004	(0.63±0.10)	0.033±0.004	(0.85±0.10)	0.050±0.004	(1.27±0.10)

Figure F3 Component Tape Dimensions for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

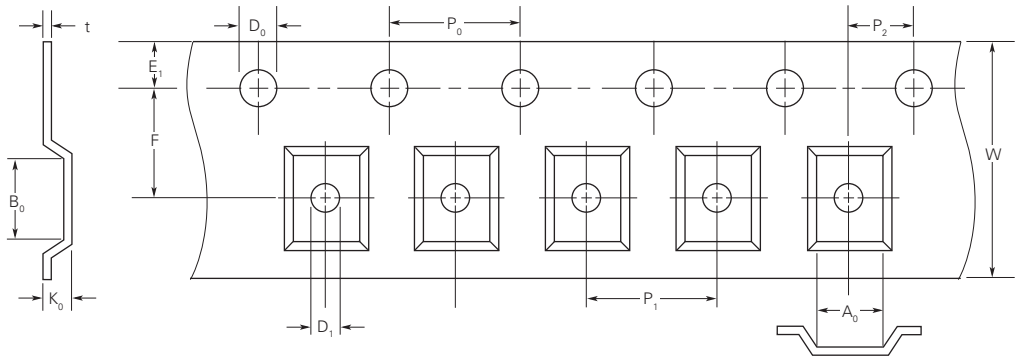
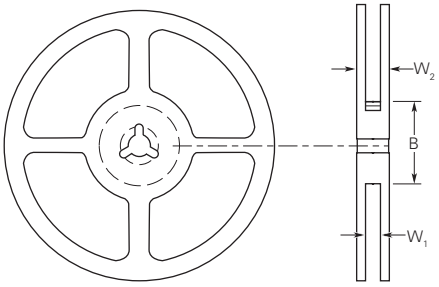


Figure F4 Reel Dimensions for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

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 Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

UL File # E197536

Part Numbering System for Fast-Acting, High-Current-Rated and Slow-Blow Chip Fuses

1206 SF F 400 F / 24 -2

Packaging
-2 = Tape and Reel

Voltage Rating (V)

Special Code
F = RoHS Compliant
FM = RoHS Compliant + Marked Part

Rated Current
050 = 0.50 Amps
400 = 4 Amps

Fuse Blow Type
F = Fast Acting
S = Slow Blow
H = High Current

SF = Surface Mount Fuse

Size (1206, 0603, 0402)

Surface-mount Fuses
Telecom Fuses

The telecom FT600 fuse helps telecommunications equipment manufacturers comply with North American overcurrent protection requirements, including Telcordia GR-1089, TIA-968-A (formerly FCC Part 68), and UL60950 3rd edition.

Tyco Electronics' telecom fuses offer low temperature-rise performance under sneak current fault events to help prevent damage to circuit traces or multilayer boards, and their low profile and small footprint make them suitable for high-density and space-constrained applications.

Benefits

- High density placement in multi-port system designs
- Improved temperature rise performance over other similar surface-mount fuse devices under sneak current testing
- The FT600, in conjunction with a thyristor surge suppression device, assists designers to meet regulatory standards without additional series components

Features

- Lead free materials and RoHS compliant
- Halogen free
  (refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm)
- Low profile and small footprint
- The lightning robust surface-mount fuse offers overcurrent protection in case of power fault events
- Enables the design of equipment complying with applicable telecom specifications including UL60950, TIA-968-A, and Telcordia GR-1089
- Low resistance

Applications

- ADSL, ADSL2, ADSL2plus, SHDSL, VDSL linecards and modems
- T1/E1 systems
- Twisted-pair telecom ports requiring Telcordia GR-1089, UL60950 and FCC Part TIA-968-A compliance

Protection Application Guide for Telecommunications and Networking Devices

To use this guide, follow the steps below:
1. Select your equipment type from the guide below.
2. Use the Key Device Selection Criteria (time-to-open, surface temperature) to determine best suitability for your application.
3. Use Agency Specification / Selection Guide to select a specific part number for each application based on the agency requirements.

Key Device Selection Criteria

Application	Specification	Faster Time-To-Open	Cooler Surface Temperature
Customer premises equipment, IT equipment	UL 60950	FT600-0500	FT600-2000
Analog modems, V.90 modems, ISDN modems, xDSL modems, ADSL splitters, phone sets, fax machines, answering machines, caller ID, internet appliances, PBX systems, POS terminals, wall plugs	TIA-968-A	FT600-1250	
Access network equipment	Telcordia GR-1089	FT600-1250	FT600-2000
Remote terminals, line repeaters, multiplexers, cross-connects, WAN equipment	TIA-968-A		
Central office switching equipment	Telcordia GR-1089	FT600-1250	FT600-2000
Analog/POTS linecards, ISDN linecards, xDSL modems, ADSL/VDSL splitters, T1/E1 linecards, multiplexers, CSU/DSU, servers	TIA-968-A		

Note : This list is not exhaustive. Tyco Electronics welcomes our customers' input for additional application ideas for overcurrent protection of telecom applications.

Agency Specification/Selection Guide for FT600 Devices

Use the guide below to select FT600 devices appropriate for use in your application. The following pages contain specifications for part numbers recommended below. FT600 devices enable telecommunication equipment to meet the applicable protection requirements of these industry specifications. Refer to individual agency specifications for test procedures and circuit schematics. Users should independently evaluate the suitability of, and test each product for their application.

Family	Product	Lightning	Power Cross
FT600	FT600-0500	TIA-968-A – Types A & B	UL60950, 3rd Ed. – 600V_{AC}, 40A
	FT600-1250	Telcordia GR-1089 – Level 1 and 2	Telcordia GR-1089 – 600 V_{AC}, 40A
	FT600-2000	TIA-968-A	UL60950

Notes: FT600-1250 and FT600-2000 assist equipment in complying with Telcordia GR-1089 specifications. In-circuit testing is strongly recommended.
The FT600-0500, FT600-1250 and FT600-2000 help meet the UL60950 Power Cross and FCC TIA-968-A 68 lightning surge requirements. Note that Type A tests allow for an overcurrent protection component to fuse open during the surge.

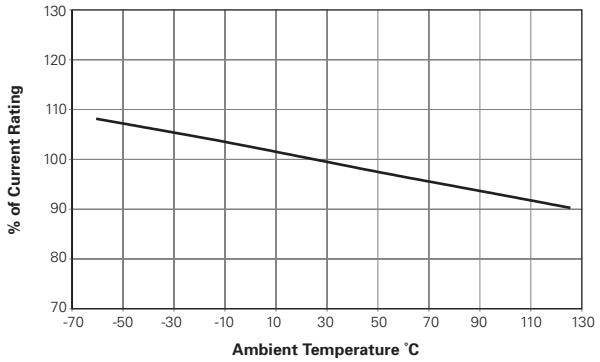
Table FT1 Interrupt Voltage and Current Ratings for FT600 Devices

Part Number	Ampere Rating (A)	Voltage Rating (V)	Typical Resistance (Ω)	Typical I^2t (A^2s)*
FT600-0500	0.50	250	0.50	1
FT600-1250	1.25	250	0.10	16
FT600-2000	2.00	250	0.05	18

Note: The FT600-xxxx devices carry 100% of rated current for 4 hours minimum and 250% of rated current for 1 second minimum, 120 seconds maximum. Resistance measured at 10% of rated current.

*I^2t is calculated at 10 ms or less.

Figure FT1 Thermal Derating Curve (Normalized) for FT600 Devices



RoHS Compliant, ELV Compliant HF Halogen Free

Table FT2 Dimensions for FT600 Devices in Millimeters (Inches)

	A		B		C		
Part Number	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Figure**
FT600-0500	—	10.2 (0.402)	—	3.1 (0.122)	—	3.1 (0.122)	FT2
FT600-1250	—	10.2 (0.402)	—	3.1 (0.122)	—	3.1 (0.122)	FT2
FT600-2000	—	10.2 (0.402)	—	3.1 (0.122)	—	3.1 (0.122)	FT2

Figure FT2 Dimension Figures for FT600 Devices

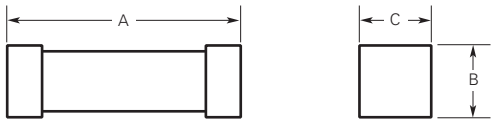


Figure FT3 Typical Time-to-open Characteristics (at 20°C) for FT600 Devices

FT600

A = FT600-0500
B = FT600-1250
C = FT600-2000

Figure FT3

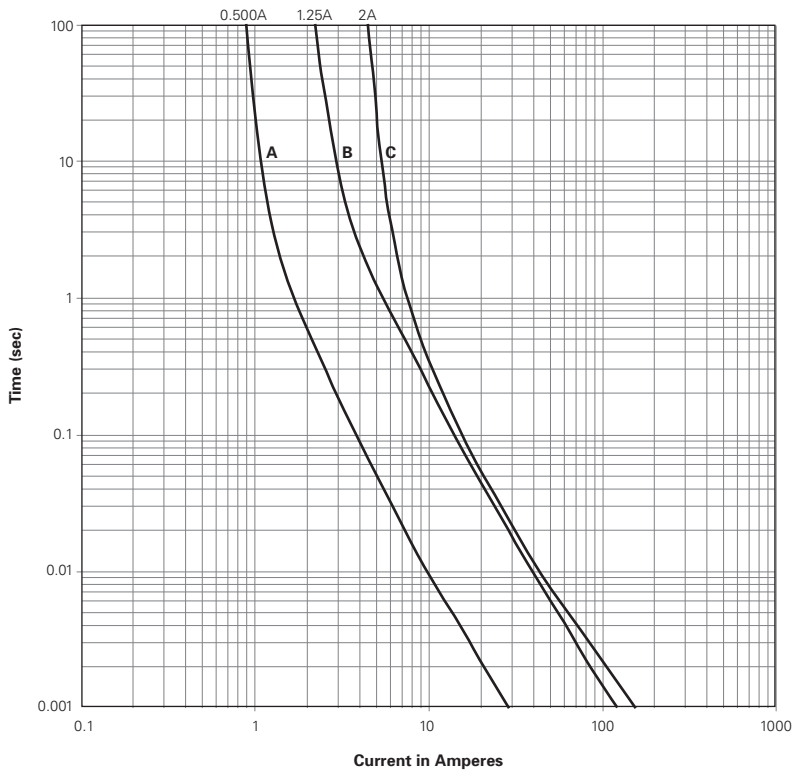


Table FT3 Physical Characteristics and Environmental Specifications for FT600 Devices

Physical Characteristics

Terminal material	Silver-plated brass*
Body material	Ceramic
Termination solderability	Per IEC-60127-4

*FT600 devices use high Pb content solder for internal construction. They are RoHS compliant.

Environmental Specifications

Test	Conditions
Solder heat withstand	Per MIL-STD-202, Method 210, Test Condition J
Solvent resistance	Per MIL-STD-202F, Method 215J
Storage temperature	≤30°C/ 85% RH
Storage humidity	Per MIL-STD-202F, Method 106F

Table FT4 Packaging and Marking Information for FT600 Devices

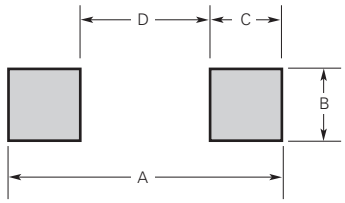
Part Number	Bag Quantity	Tape & Reel Quantity	Standard Package Quantity	Part Marking	Agency Recognition
FT600-0500-2	—	2,500	10,000	500	UL, CSA
FT600-1250-2	—	2,500	10,000	1250	UL, CSA
FT600-2000-2	—	2,500	10,000	2000	UL, CSA

Note: The -2 designates tape and reel, the package style for this product.

Table FT5 Recommended Pad Layouts for FT600 Devices in Millimeters (Inches) Nominal

Device	A	B	C	D	Figure for Dimensions
FT600-0500	12.6 (0.496)	4.0 (0.157)	3.7 (0.145)	5.2 (0.204)	FT4
FT600-1250	12.6 (0.496)	4.0 (0.157)	3.7 (0.145)	5.2 (0.204)	FT4
FT600-2000	12.6 (0.496)	4.0 (0.157)	3.7 (0.145)	5.2 (0.204)	FT4

Figure FT4



Solder Reflow and Rework Recommendations for FT600 Devices

Solder Reflow

- Recommended reflow methods: IR, vapor phase oven, hot air oven
- Devices can be cleaned using standard industry methods and solvents

Rework

- If a device is removed from the board, it should be discarded and replaced by a new device

Figure FT5

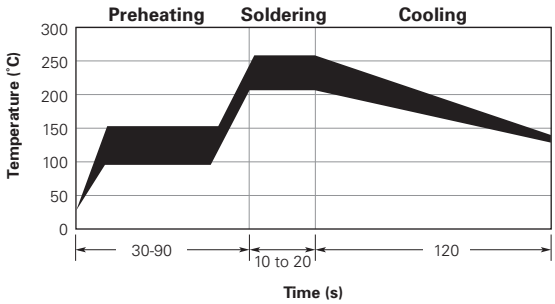


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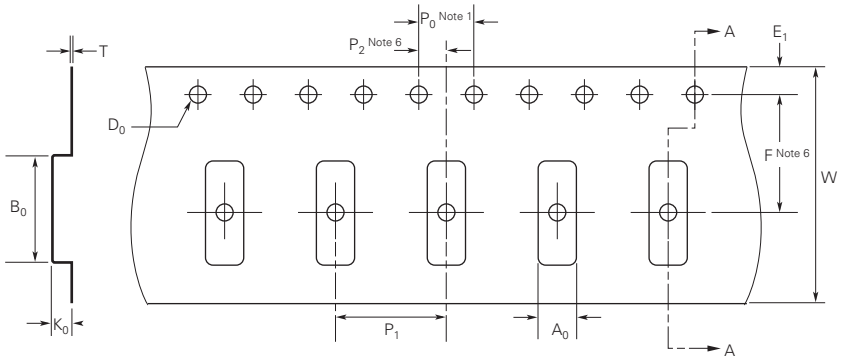
Table FT6 Tape and Reel Specifications for FT600 Devices

Dimension Description	EIA Mark	Dimension (mm)	Tolerance
Carrier tape width	W	24	±0.3
Sprocket hole pitch	P_0	4	±0.1
	P_1	8	±0.1
	P_2	2	±0.1
	A_0	3.68	±0.1
	B_0	10.44	±0.1
Sprocket hole diameter	D_0	1.5	+0.1 / -0.0
	F	11.5	±0.1
	E_1	1.75	±0.1
Tape thickness	T max.	0.3	±0.05
	K_0	3.25	+1.0 / -0.05
Reel Dimensions			
Reel diameter	A max.	331.5	
Core diameter	N min.	98.5	
Space between flanges less devices	W_0	25	±0.5
Reel width	W_1 max.	31	

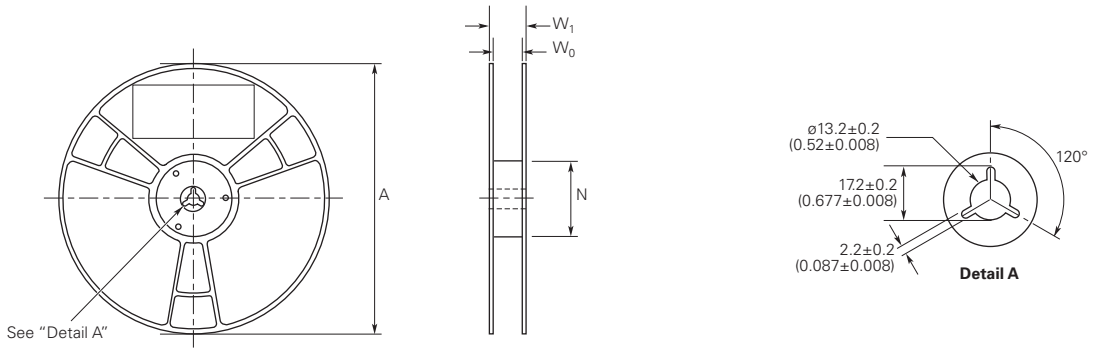
Figure FT6 EIA Referenced Taped Component Dimensions for FT600 Devices



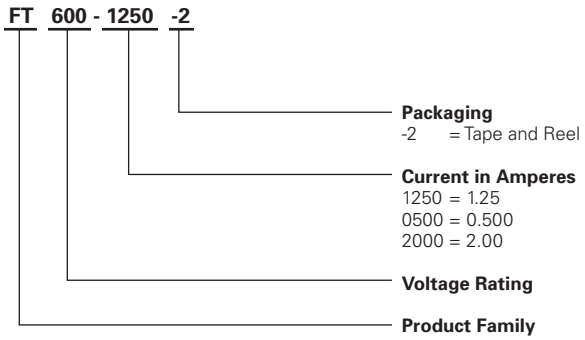
Notes:

1. 10 sprocket hole pitch cumulative tolerance ±0.2
2. Allowable camber to be 1mm/250mm
3. Material: Black conductive
4. A_0 and B_0 measured on a plane 0.3mm above the bottom of the pocket
5. K_0 measured from the plane on the inside bottom of the pocket to the top surface of the carrier
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole
7. Quantity per reel to be 174m

Figure FT7 EIA Referenced Reel Dimensions for FT600 Devices



Part Numbering System for FT600 Devices



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