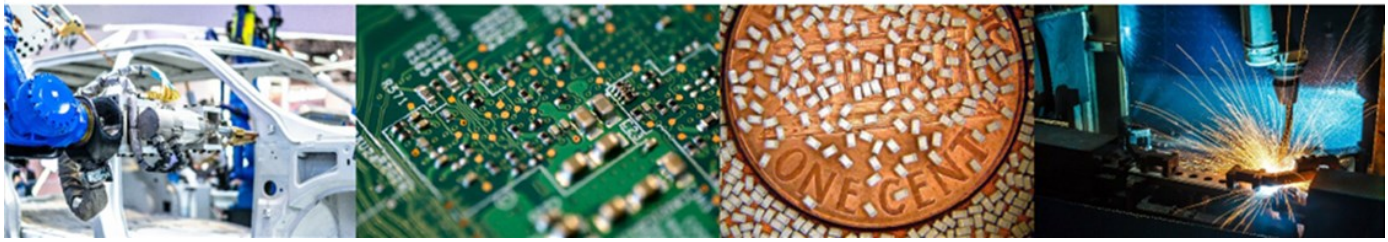
Circuit Protective Components for Consumer Electronics

AEM®

Innovative Circuit Protection Solutions

Highly Reliable Products for Applications from Aerospace to Consumer Electronics



Company Overview

AEM, a global manufacturer of electronic components, was founded to redefine the standards of quality and value in the industry with continuous innovation.

Inc 500 3-Time Winner

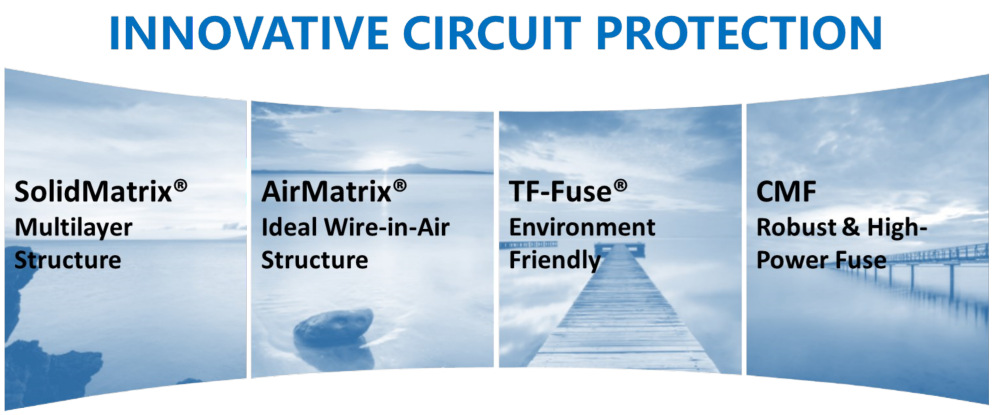
ISO 9001:2015 **IATF 16949:2016** **ISO 14001:2015**

AEM, headquartered in San Diego, California, is a global leader in providing innovative circuit protection solutions.

AEM designs and produces mission-critical, passive circuit protection components through two divisions. AEM's A&D division provides advanced, high-reliability fuses, ferrite chip beads, and tin whisker mitigation products for satellite, defense, and aerospace applications. Its products, which are often custom and application-specific in nature, are used in harsh, technical environments where performance is mission critical. AEM has a deep heritage in high-reliability components and a reputation as a market leading supplier of such components.

AEM's Commercial division provides high-end SolidMatrix® and AirMatrix® surface mount fuses and inductive components for commercial applications, including IT, visual display, automotive and EV, power tools, lithium battery, 5G, IoT, security devices, and telecom. The division focuses on providing complex, highly-engineered components for use in safety critical applications which demand superior performance specifications and smaller form factors.

AEM Technology Platforms



AEM Product Portfolios

- **Commercial Circuit Protective Components**
  - SolidMatrix® Multilayer Monolithic Chip Fuses
  - AirMatrix® Surface Mount Fuses
  - TF-FUSE® Surface Mount Fuses
  - CMF High Power Surface Mount Fuses
  - Automotive Surface Mount Fuses
  - Multilayer Varistors

Company Overview

AEM, a global manufacturer of electronic components, was founded to redefine the standards of quality and value in the industry with continuous innovation.

Inc 500 3-Time Winner

ISO 9001 Certified **ISO 9001:2015**

IATF **IATF 16949:2016**

ISO 14001:2015 **ISO 14001:2015**

AEM Quality Assurance

AEM Suzhou facility is IATF 16949:2016, ISO 9001:2015 and ISO 14001:2016 certified. Long known for its high quality products and exceptional customer service, AEM also provides a 7x24 technical support hotline.

AEM is committed to constantly striving for excellence and perfection in providing products and customer services with the

SolidMatrix® Chip Fuses

AEM offers the broadest line of surface mount chip fuses in the industry. AEM SolidMatrix® Surface Mount Chip Fuses are recognized by Underwriters Laboratories (UL). Constructed as a multilayer monolithic structure using a co-firing process, these fuses offer superior mechanical integrity and are ideal for applications in LCD monitors, PC cards, disk drives, portable communication products, PDAs, digital cameras, DVDs, TVs, cell phones, rechargeable battery packs, battery chargers, etc.

AirMatrix® Surface Mount Fuses

With multiple internal safety approvals, high consistency and excellent inrush current withstanding capability, AEM's AirMatrix® wire-in-air surface mount fuses are ideal for applications with high voltage and high inrush current, such as converters, inverters, lightings, LED drivers, LCD monitors, notebooks, PC servers, communication technology devices, office automation electronics, industrial equipment, home electrical applications, etc.

CMF High Power Surface Mount Fuses

AEM Components introduces a new line high-current, high-power density surface mount solid body fuses. The new CMF Series is available in both commercial and automotive grade (AEC-Q200 qualified) versions, with part numbers at current ratings from 20A to 125A. All models in this series are offered in the same 2822 case size package. This standardized footprint for all models is a great benefit in platform design.

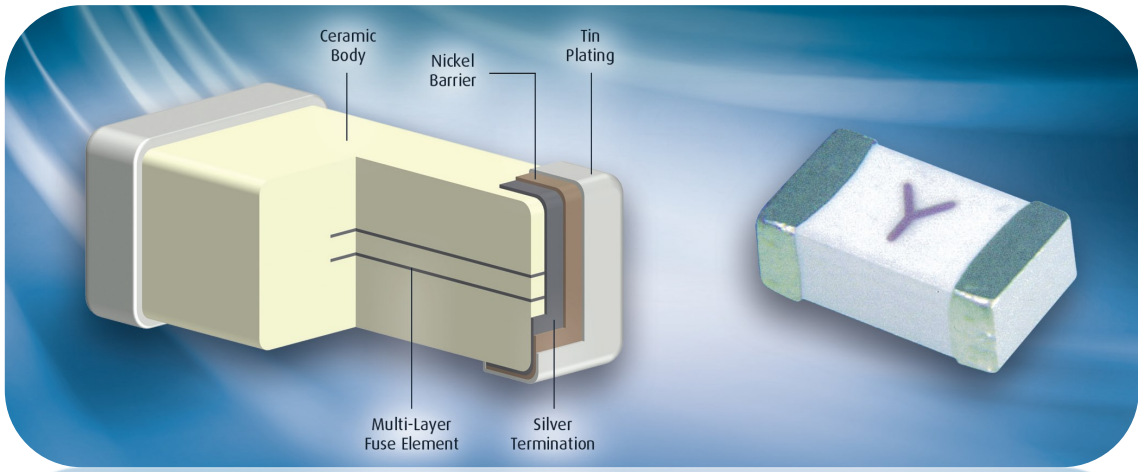
AEM Multilayer Varistors

AEM's Surface Mount Multilayer Varistors (MLV) are manufactured with zinc oxide based semi-conductive ceramics using multilayer co-firing technology. These varistors are designed to protect electronics systems from surge and transient overvoltages by limiting surge voltage and absorbing energy. The MLV products have a wide range of applications, such as cell phones, digital cameras, PDA, MP3, notebooks, telecommunications, automotive systems, data systems, power supplies, etc.

CONTENTS

SolidMatrix® Surface Mount Chip Fuses

Solid Construction with Superior Performance



Fuse links and arc suppressing material are buried inside of fuse body. When fuse link opens, there is no fly arc or spark leak. Multiple fuse links design in parallel could improve the amperage rating and save board space. Fuse element diffused into ceramic body, so the integrity of fuse body is maintained and the airtight package is preserved.

SolidMatrix® Features:

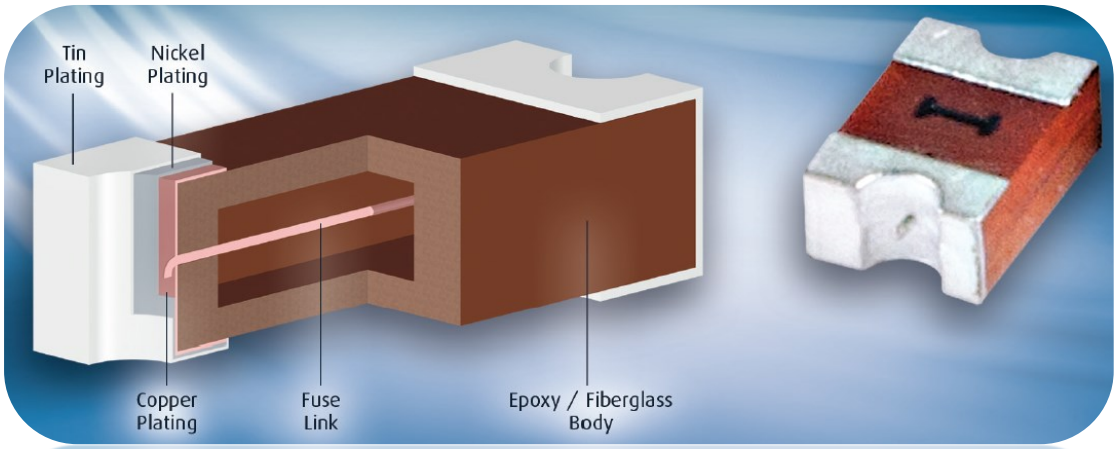
- Solid body with multilayer fuse link structure
- Maintains mechanical integrity and safely clears with no debris and no collateral damage
- No prolonged arcing even at higher voltage conditions
- Wide range of current and voltage ratings in EIA 0402, 0603 and 1206 case sizes
- Circuit protection catachrestic from very fast acting, fast acting, slow blow to high in-rush
- Reliable design with consistent performance characteristics

SolidMatrix® Applications:

- Power-over-Ethernet
- Panel & Display
- PC & Notebook
- Power tools
- Server and storage systems
- Battery, BMS and infotainment systems

AirMatrix® Surface Mount Chip Fuses

Advanced Wire-In-Air Construction with International Safety Approvals



One of the industry's smallest 250V surface mount fuses, the AirMatrix product series are primarily designed for overcurrent protection of line voltage circuits and are widely used in power, battery and server applications. The innovations of AEM's unique material, product design and manufacturing processes provide better reliability, stability and performance.

AirMatrix® Features:

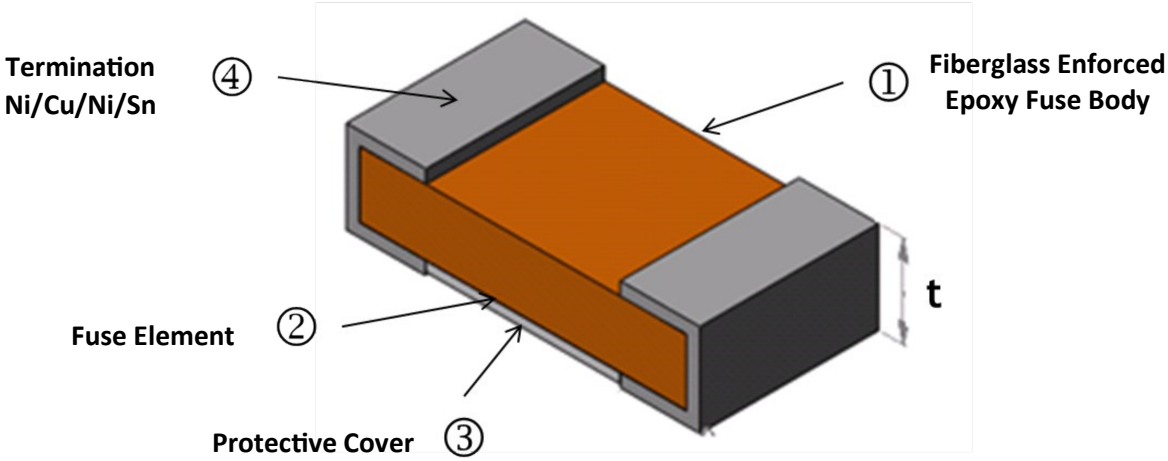
- Airtight robust package prevents outgassing and moisture issues
- Solderless SMD construction
- High in-rush current withstanding capability
- Best in class volumetric efficiency
- Consistent and predictable performance characteristics even in extreme conditions
- Over current protection of line voltage circuits for power applications

AirMatrix® Applications:

- Automotive, EV and Battery
- Power Supplies
- Medical & Industrial Equipment
- White Goods
- Consumer Electronics
- LED Lighting

TF-FUSE® Surface Mount Chip Fuses

Low Profile TF-FUSE® with Superior Performance



With patent technology and by integrating the advanced think film technology, AEM thin film fuses offer a fusing characteristic from very fast acting to high in-rush current. The fiberglass enforced epoxy fuse body and bi-metal fuse element make fuse to provide protection at low fusing temperature.

TF-FUSE® Features:

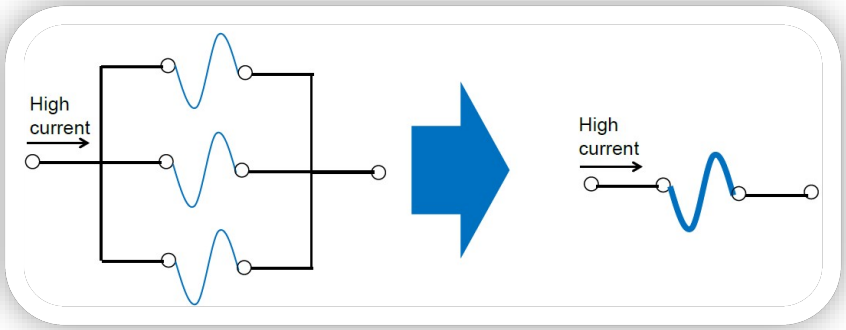
- Low rating current capability (from 150mA to 5A)
- Low DCR
- Low fusing ratio
- Low fusing temperature
- Low profile (thickness ~ 0.3mm)
- Small case size (EIA 0402 & 0603)

TF-FUSE® Applications:

- Notebook computers and tablets
- Memory cards, HDD
- Toys
- Portable electronic devices
- Panels
- Battery pack

CMF High Power Surface Mount Fuses

Robust Construction at Best-in-Class Safe Power Density



The CMF high power surface mount fuses build on AEM advanced manufacturing technology. The solid, robust structure assures reliable operation in environments where temperature cycling and high mechanical vibration are present. The devices singular fuse link/terminal construction eliminates problems that occur with traditional ceramic tube interconnection techniques

CMF High Power Fuse Features:

- Thermal simulation on critical fuse element design with optimized & safe fuse performances
- Standardized 2822 footprint / miniaturized package for current rating from 20A to 125A
- 100% interconnection reliability with single piece of metal functioning as fuse link and surface mount terminations
- Low DC resistance (DCR) – Minimizes excessive power loss
- Automotive grade with AEC-Q200 qualification
- High interrupting ratings – for excellent inrush current capability

CMF High Power Fuse Applications:

- Drones
- Power tools
- Energy storage
- Power distribution units
- Data, server and cloud systems
- UPS/Routers
- EV, BMS and battery
- E-Bike

Surface Mount Fuses

Quick Index:

Series		Size	Current Rating (A)	Voltage Rating	Page
SolidMatrix®	FA (Fast Acting)	1206	0.5, 0.75, 1.0, 1.5, 1.75, 2.0	63VDC	9
			2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0	32VDC	
		0603	0.5, 0.75, 1.0, 1.5	63VDC	12
			2.0, 2.5, 3.0, 3.5, 4.0, 5.0	32VDC	
			6.0	24VDC	
		0402	0.5, 0.75, 1.0, 1.5, 2.0, 3.0, 4.0	24VDC	15
	SB (Slow Blow)	1206	1.0, 1.25, 1.5, 2.0	63VDC	18
			2.5, 3.0, 3.5, 4.0, 4.5, 5.0	32VDC	
			5.5, 6.0, 7.0, 8.0	24VDC	
		0603	1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 7.0, 8.0	32VDC	21
	HI (High Inrush)	1206	0.5, 0.75	65VDC	24
			1.0, 1.5, 2.0	63VDC	
			2.5, 3.0, 3.5, 4.0, 4.5, 5.0	32VDC	
			6.0, 7.0, 8.0	24VDC	
		0603	1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 7.0, 8.0	32VDC	27
	HA (High Current)	1206	10, 12, 15, 20	24VDC	30
	HB (High Current)	1206	10, 12, 15, 20, 25, 30	24VDC	33
	HC (High Current)	1206	10, 12, 15, 20, 25, 30, 40	35VDC	36
	FF (Very Fast Acting)	0603	0.5, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0	32VDC	39
	VH (Voltage High)	1206	2.5, 3.0, 3.5, 4.0, 4.5, 5.0	65VDC	42
			6.0, 7.0, 8.0	48VDC	
TF-FUSE®	FF (Very Fast Acting)	0402	0.20, 0.25, 0.375, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.5, 3.00, 3.50, 4.00, 5.00	35VDC	47
		0603	0.150, 0.200, 0.250, 0.375, 0.50, 0.75, 1.00, 1.25, 1.50	65VDC	50
			1.75, 2.00, 2.50, 3.00, 3.50, 4.00, 5.00	35VDC	
	HI (High Inrush)	0603	0.50, 0.75, 1.00, 1.50	65VDC	53
			2.00, 2.50, 3.00, 3.50, 4.00	35VDC	
AirMatrix®	AF	2410	0.5, 0.63, 0.75, 1.0, 1.25, 1.5, 2.0	250VAC/125VDC	59
			2.5, 3.0, 3.15, 3.5, 4.0, 5.0, 6.3, 7.0, 8.0, 10.0	125VAC/DC	
			12.0, 15.0, 20.0	65VAC/DC	
		1206	1.50, 1.60, 2.00, 2.50, 3.00, 3.15, 3.50, 4.00	65VDC	63
			5.00, 6.30, 7.00, 8.00, 10.0, 12.0, 15.0	32VDC	
	MF	2410	0.50, 0.63, 0.80, 1.00, 1.25, 1.60, 2.00	250VAC	67
High Power	CMF	2822	20, 30, 40, 50	125VDC	71
			60, 70, 80, 90, 100, 125	75VDC	

SolidMatrix® Surface Mount Fuses

Product Identification:

F 0603 FA 1000 V032 T M
(1) (2) (3) (4) (5) (6) (7)

(1) Product Code: F—Chip Fuse

(2) Size Code: Standard EIA Chip Sizes

(3) Series Code: FA - Fast Acting, SB - Slow Blow,
HI - High Inrush, FF - Very Fast Acting, HB - High Current

(4) Current Rating Code: 1000 - 1000 mA (For HB, 10 - 10A)

(5) Voltage Rating Code: V032 - 32 VDC

(6) Package Code: T - Tape & Reel, B - Bulk

(7) Marking Code: M - With Marking

F 1206 HC 20A0 T M
(1) (2) (3) (4) (5) (6)

(1) Product Code: F—Chip Fuse

(2) Size Code: L x W (inch),
the first two digits-L (length),
the last two digits-W (width)

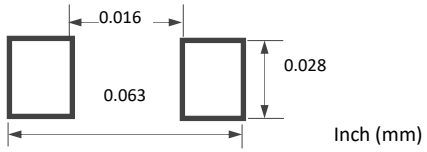
(3) Series Code: HC Series

(4) Current Rating Code: 20A0—20.0A

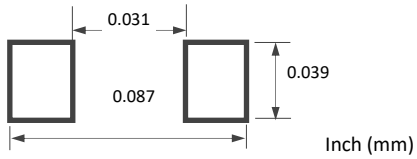
(5) Package Code: T - Tape & Reel, B - Bulk

(6) Marking Code: M - With Marking

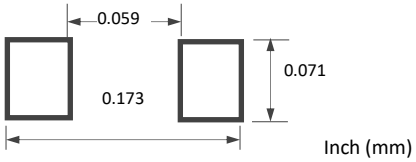
Recommended Land Pattern:



0402 Size



0603 Size



1206 Size

Environmental Tests:

No.	Test	Test Condition and Requirement	Test reference
1	Soldering heat resistance	DCR change ≤ ±10%. No mechanical damage One dip at 260°C for 60 seconds	MIL-STD-202 Method 210
2	Solderability	245°C , 5 seconds, new solder coverage ≥95%	MIL-STD-202 Method 208
3	Thermal shock	DCR change ≤ ±10%. No mechanical damage 100 cycles between -65°C and +125° C	MIL-STD-202 Method 107
4	Moisture resistance	10 cycles, DCR change ≤ ±10%, no excessive corrosion	MIL-STD-202 Method 106
5	Salt spray	DCR change ≤ ±10%. No excessive corrosion 48 hour exposure	MIL-STD-202 Method 101
6	Mechanical vibration	DCR change ≤ ±10%. No mechanical damage. 0.4 ” D.A. or 30 G between 5 – 3000 Hz	MIL-STD-202 Method 204
7	Mechanical shock	DCR change ≤ ±10%. No mechanical damage. 1500 G, 0.5 ms, half-sine shocks	MIL-STD-202 Method 213
8	Life	80% rated current (75% for <1A), 2000 hours, ambient temperature (from +20°C to 30°C), voltage drop change within ±10%	Refer to AEM QIQ106

Moisture Sensitivity Level 1

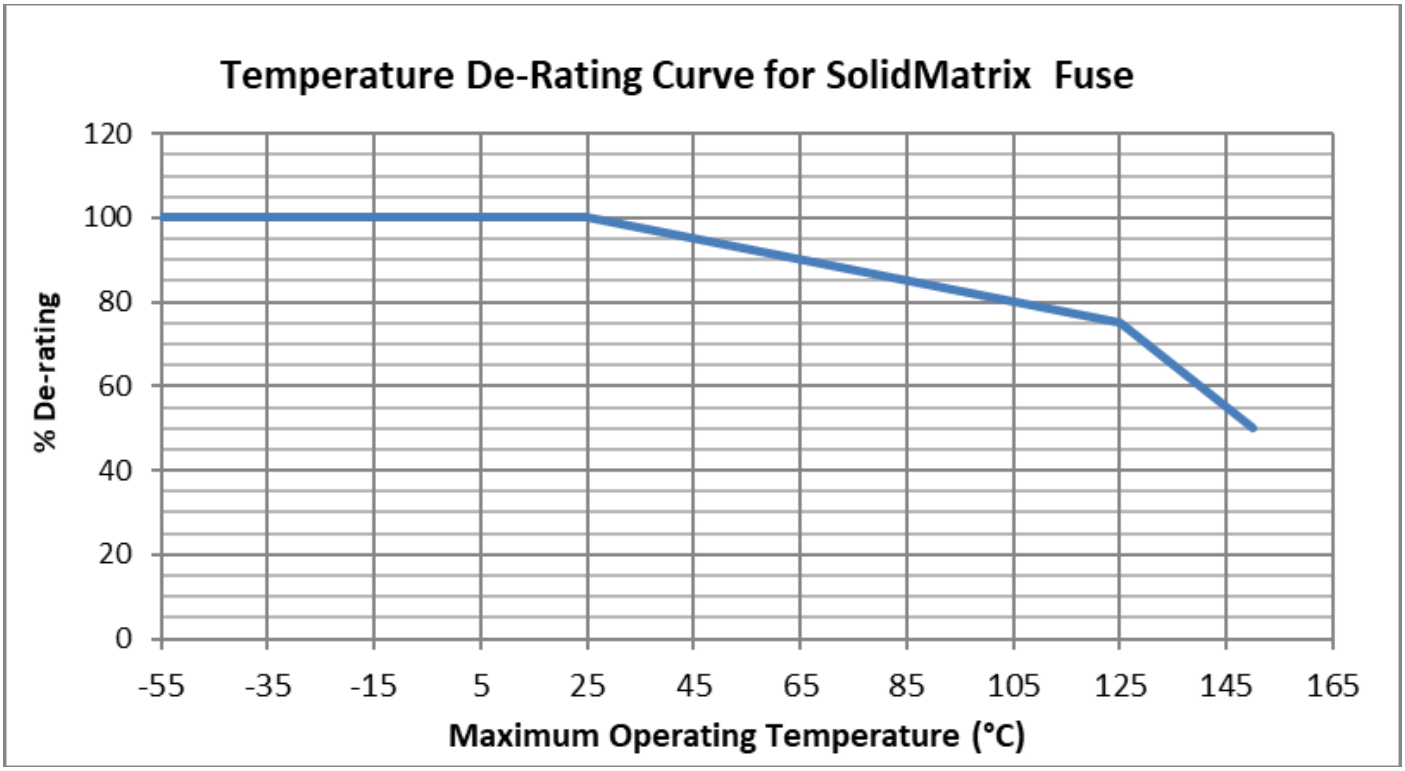
SolidMatrix® Surface Mount Fuses

Electrical Specification:

Clearing Time Characteristics:
Same as specified on the Short Form Data Sheet
Insulation Resistance after Opening:
20,000 ohms typical when cleared with rated voltage applied. Fuse clearing under low voltage conditions may result in lower after clearing insulation resistance values. (Note: Under normal fault conditions (low or rated voltage conditions), AEM SolidMatrix fuses provide sufficient after clearing insulation resistance values for circuit protection.)
Current Carrying Capacity:
100% rated current at +25°C ambient for 4 hours minimum when evaluated per MIL-PRF-23419
Interrupt Ratings:
Same as specified in this catalog.

Fuse Selection and Temperature De-rating Guideline:

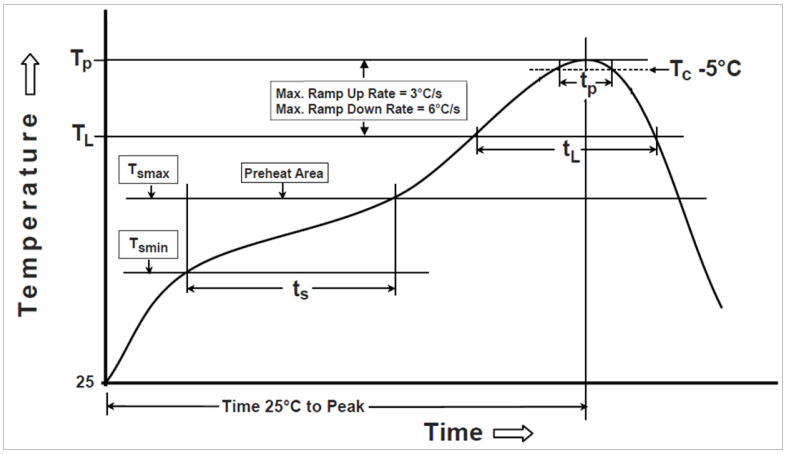
The ambient temperature affects the current carrying capacity of fuses. When a fuse is operating at a temperature higher than 25°C, the fuse shall be "de-rated".
To select a fuse from the catalog, the following rule may be followed:
Catalog Fuse Current Rating = Nominal Operating Current / 0.75 / % De-rating at the maximum operating temperature.
Example: At maximum operating temperature of 65°C, % De-rating is 90%. The nominal operating current is 4 A. The current rating for fuse selected from the catalog shall be: 4 / 0.75 / 90% = 5.9 or 6 A. Specifications and descriptions in this literature are as accurate as known at the time of publish, but are subject to change without notice.



SolidMatrix® Surface Mount Fuses

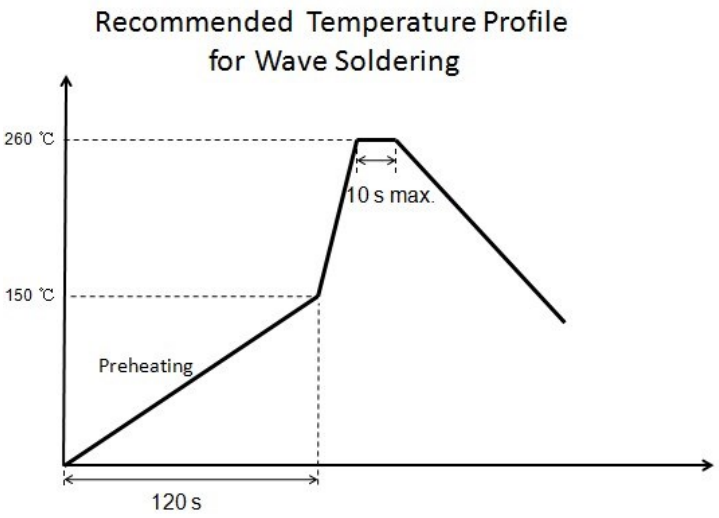
Soldering Temperature Profile:

* Recommended Temperature Profile for Reflow Soldering



Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150°C 200°C 60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217°C 60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

* Recommended Temperature Profile for Wave Soldering



Notice: Wave Soldering is suitable for 1206 and 0603 size.

Packaging:

Chip Size	Parts on 7 inch (178 mm) Reel
0402 (1005)	10,000
0603 (1608)	4,000
0603FF (1608)	6,000
1206 (3216)	3,000

SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 1206 Size

Features:

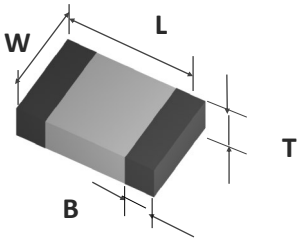
- Multilayer monolithic structure with glass ceramic body and silver fusing element
- Silver termination with nickel and pure-tin solder plating, providing excellent solderability
- Compatible with both wave and reflow soldering processes
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

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

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.043 ± 0.008	1.10 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Panel
- Power tools
- PC & Notebook
- Server
- Battery pack
- Dock station

Ordering Information:

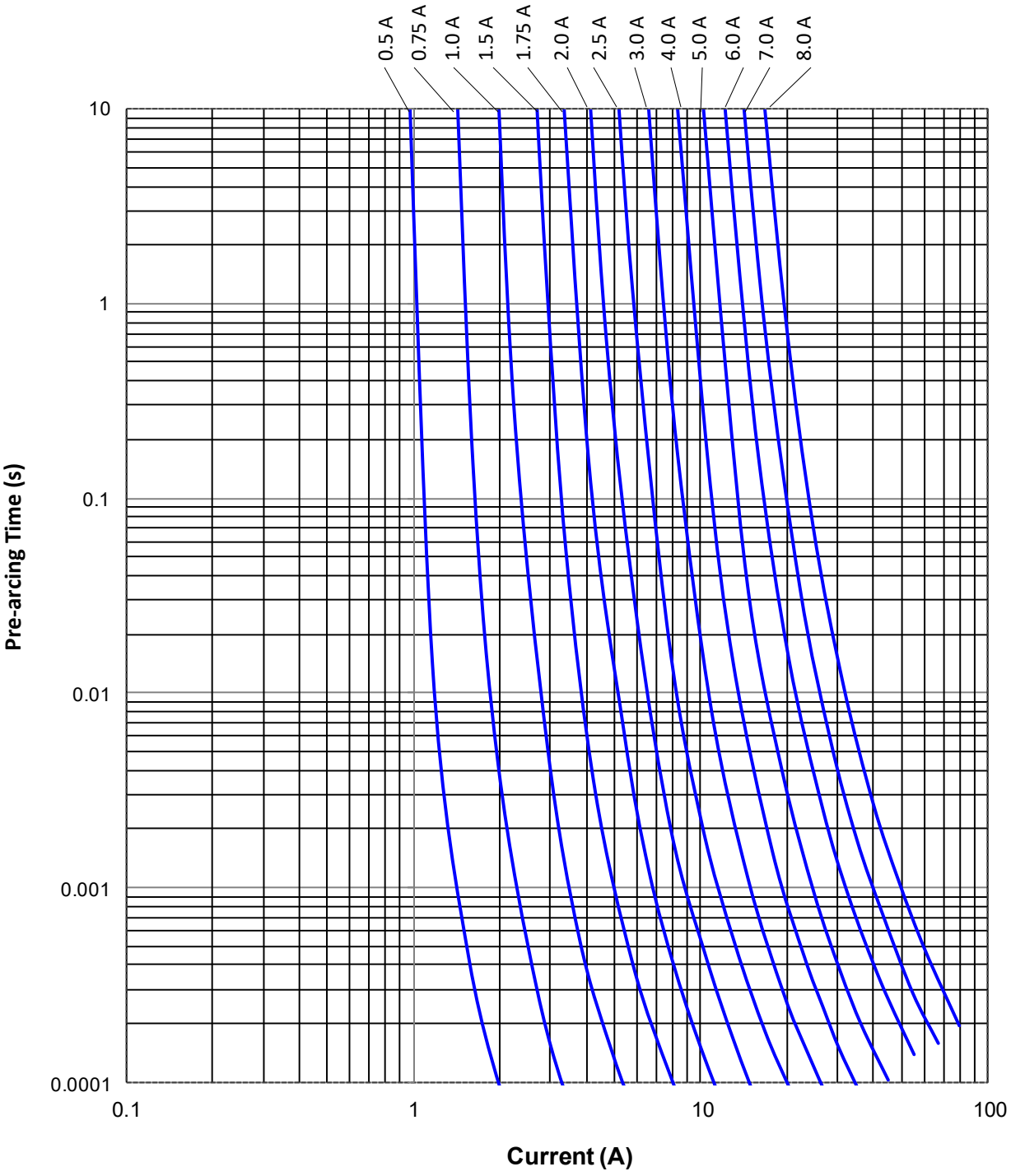
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking Code[3]
F1206FA0500V063TM	0.5	63	50 A at rated voltages	0.730	0.002	C
F1206FA0750V063TM	0.75	63		0.513	0.005	D
F1206FA1000V063TM	1.0	63		0.220	0.011	E
F1206FA1500V063TM	1.5	63		0.120	0.024	G
F1206FA1750V063TM	1.75	63		0.100	0.045	H
F1206FA2000V063TM	2.0	63		0.050	0.075	I
F1206FA2500V032TM	2.5	32		0.035	0.11	J
F1206FA3000V032TM	3.0	32		0.031	0.21	K
F1206FA4000V032TM	4.0	32	45 A at rated voltages	0.022	0.35	M
F1206FA5000V032TM	5.0	32		0.015	0.60	N
F1206FA6000V032TM	6.0	32	50 A at rated voltages	0.013	1.0	+
F1206FA7000V032TM	7.0	32		0.011	1.6	-
F1206FA8000V032TM	8.0	32		0.008	2.3	=

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 0.001 second pre-arcing time. 3. Black Marking Character Code.

SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 1206 Size

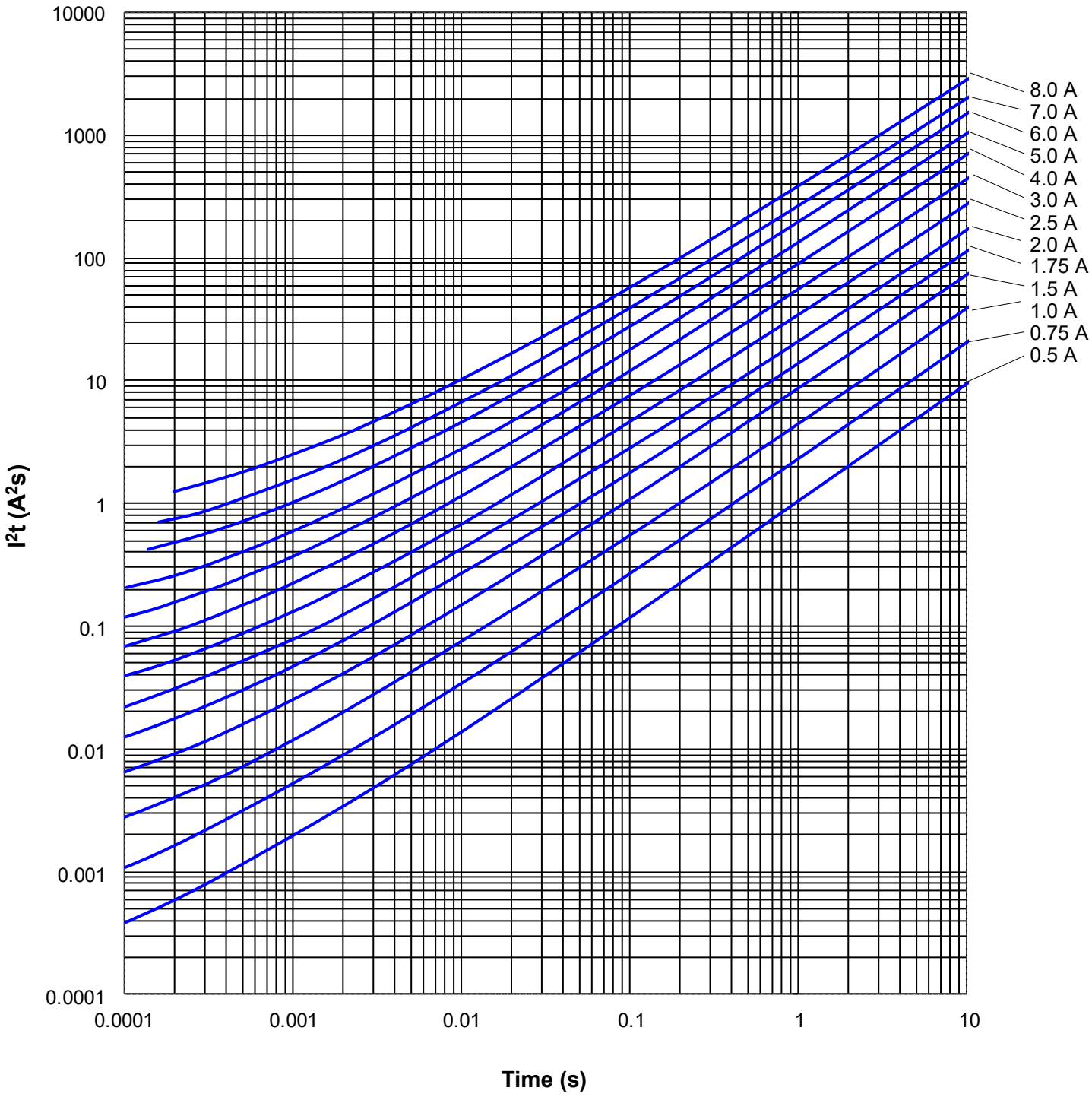
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0603 Size

Features:

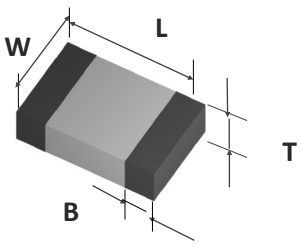
- Multilayer monolithic structure with glass ceramic body and silver fusing element
- Silver termination with nickel and pure-tin solder plating, providing excellent solderability
- Compatible with both wave and reflow soldering processes
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

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

Shape and Dimensions:

Unit	Inch	mm
L	0.063 ± 0.006	1.60 ± 0.15
W	0.031 ± 0.006	0.80 ± 0.15
T	0.031 ± 0.006	0.80 ± 0.15
B	0.014 ± 0.006	0.36 ± 0.15



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Panel
- Notebook
- Toy
- Battery pack
- IoT
- Infotainment System

Ordering Information:

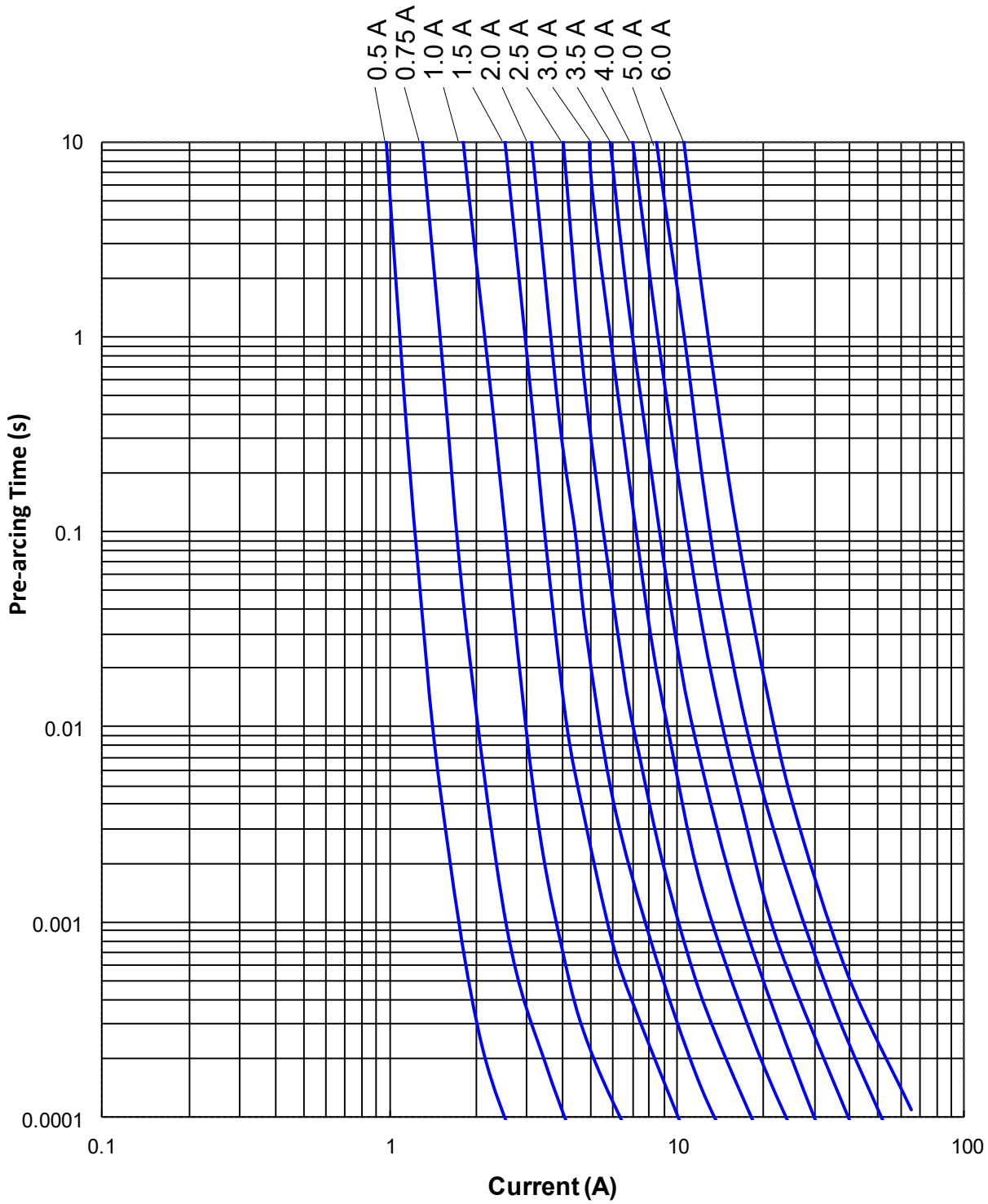
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$	Marking (Optional)[3]
F0603FA0500V063TM	0.5	63	35 A at rated voltages	0.485	0.003	C
F0603FA0750V063TM	0.75	63		0.254	0.006	D
F0603FA1000V063TM	1.0	63		0.147	0.013	E
F0603FA1500V063TM	1.5	63		0.059	0.030	G
F0603FA2000V032TM	2.0	32		0.044	0.060	I
F0603FA2500V032TM	2.5	32		0.032	0.10	J
F0603FA3000V032TM	3.0	32		0.025	0.18	K
F0603FA3500V032TM	3.5	32		0.024	0.30	L
F0603FA4000V032TM	4.0	32		0.018	0.50	M
F0603FA5000V032TM	5.0	32		0.013	0.80	N
F0603FA6000V024TM	6.0	24		0.010	1.10	O

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 0.001 second pre-arcing time. 3. Black Marking Character Code.

SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0603 Size

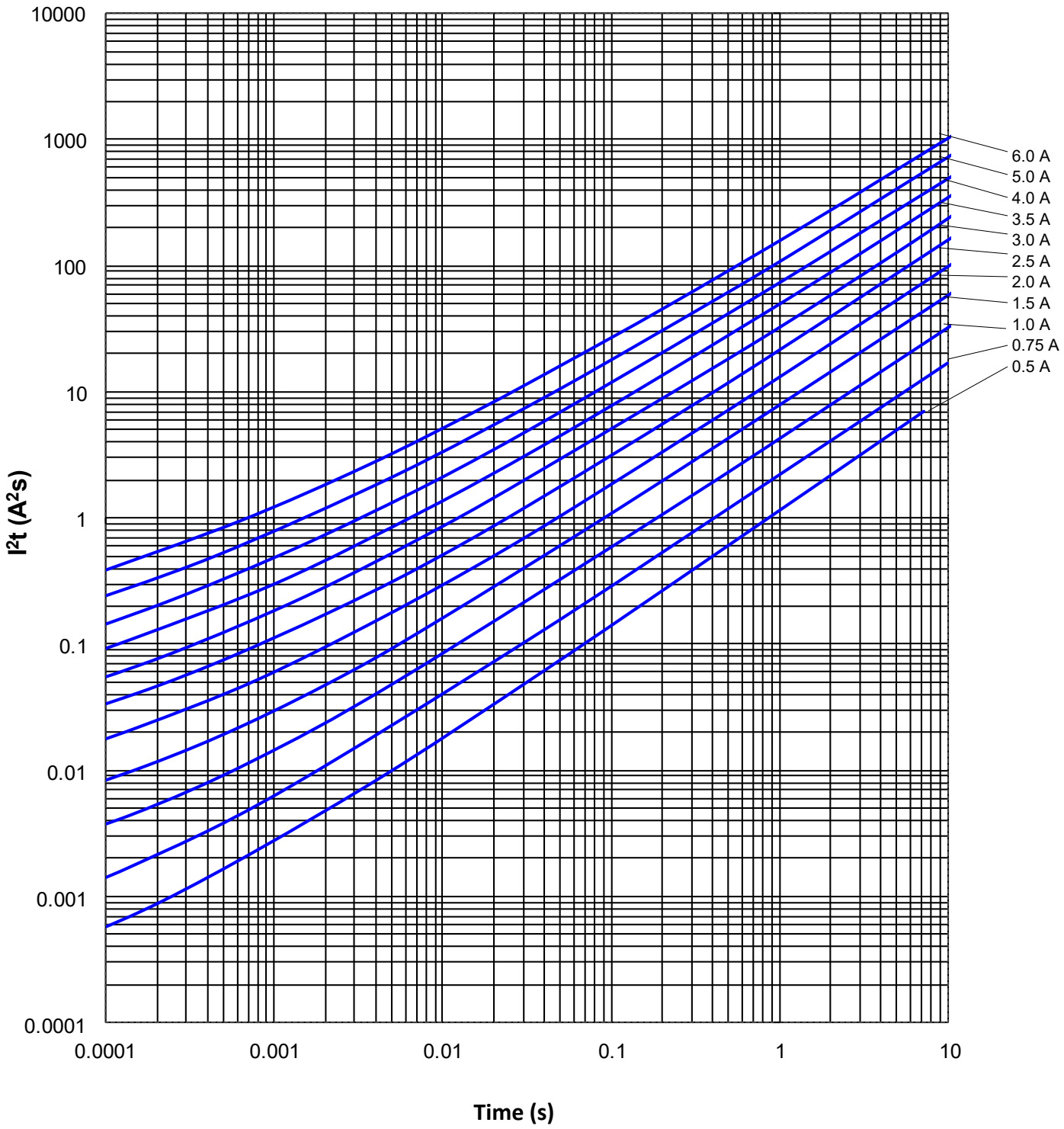
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0603 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0402 Size

Features:

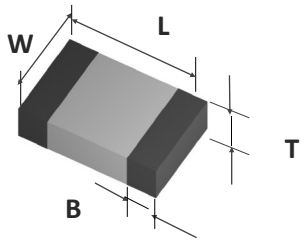
- Multilayer monolithic structure with glass ceramic body and silver fusing element
- Silver termination with nickel and pure-tin solder plating, providing excellent solderability
- Compatible with both wave and reflow soldering processes
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

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

Shape and Dimensions:

Unit	Inch	mm
L	0.039 ± 0.004	1.00 ± 0.10
W	0.020 ± 0.004	0.51 ± 0.10
T	0.020 ± 0.004	0.51 ± 0.10
B	0.010 ± 0.004	0.25 ± 0.10



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Panel
- Notebook
- Toy
- HDD
- IoT
- Finger print
- Smart lock
- Battery pack

Ordering Information:

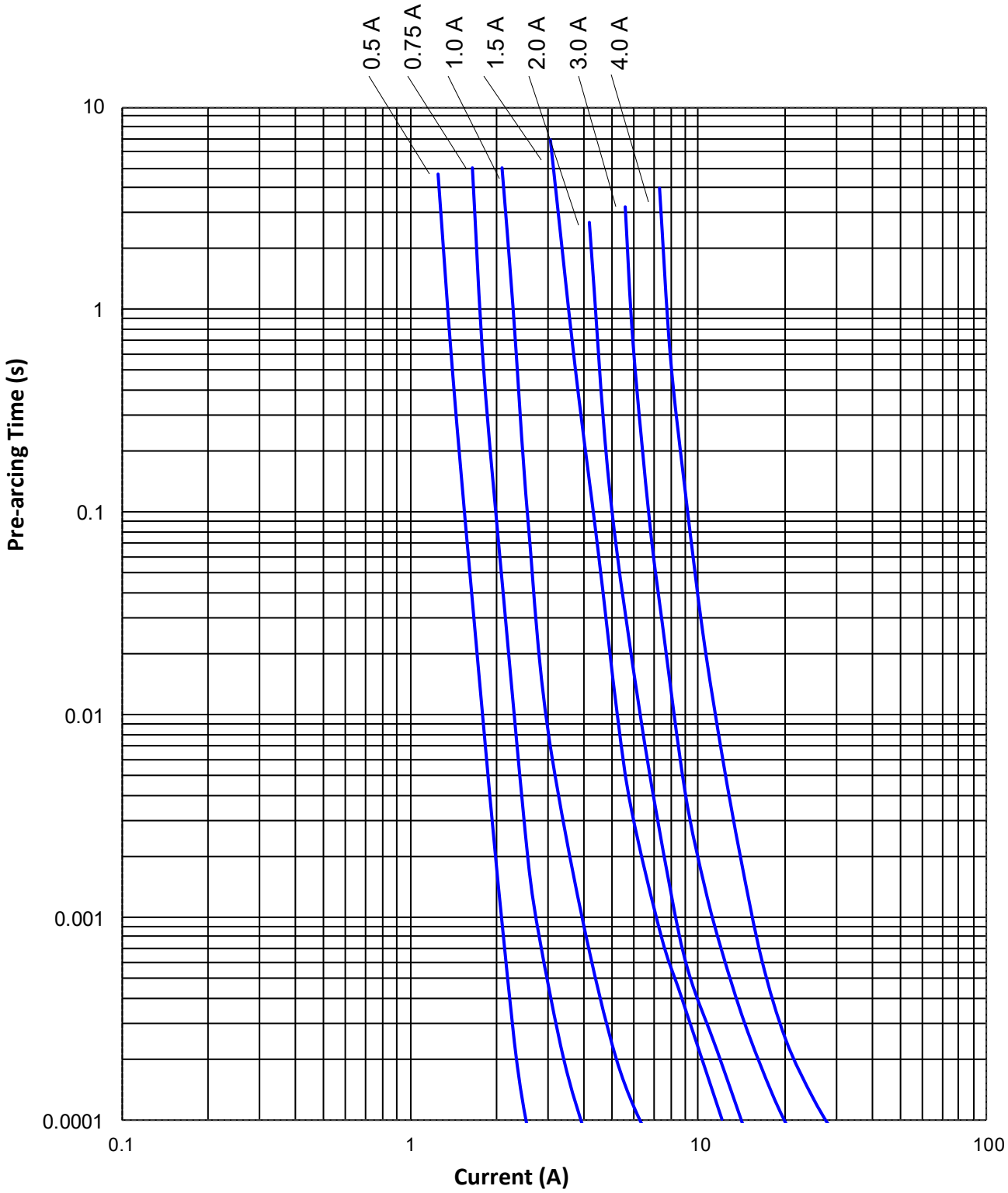
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$
F0402FA0500V024T	0.5	24	35 A at rated voltage	0.380	0.004
F0402FA0750V024T	0.75	24		0.210	0.007
F0402FA1000V024T	1.0	24		0.120	0.014
F0402FA1500V024T	1.5	24		0.056	0.050
F0402FA2000V024T	2.0	24		0.035	0.070
F0402FA3000V024T	3.0	24		0.021	0.11
F0402FA4000V024T	4.0	24		0.014	0.21

1. Measured at ≤ 10% rated current and 25°C ambient .
2. Melting I^2t at 0.001 second pre-arcing time.

SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0402 Size

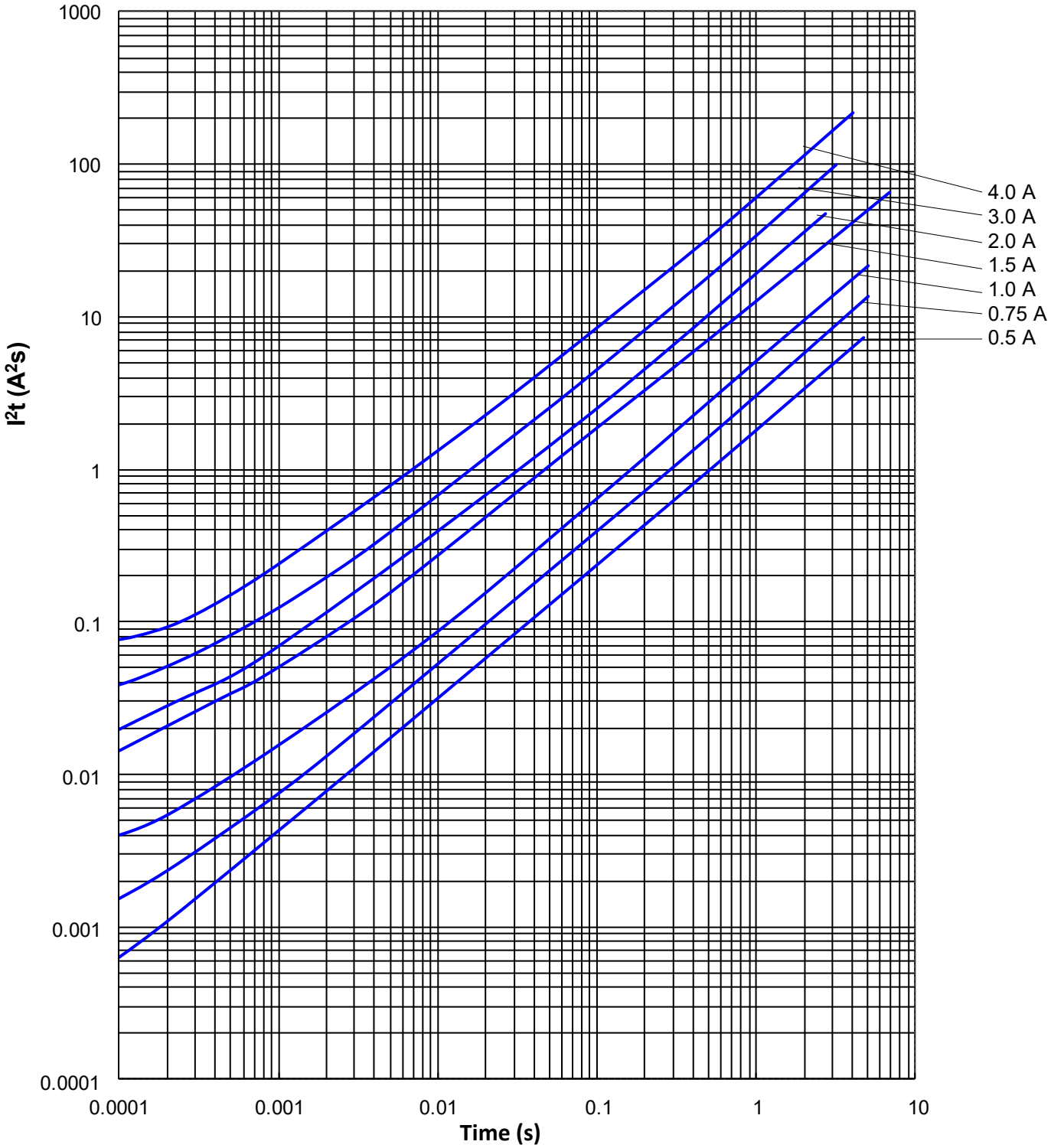
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

FA Series (Fast Acting), 0402 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 1206 Size

Features:

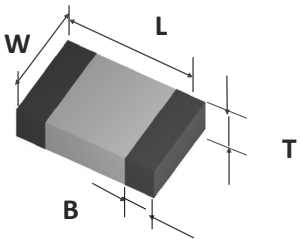
- High inrush current withstanding capability
- Multilayer monolithic structure with glass ceramic body and silver fusing element
- Silver termination with nickel and pure-tin solder plating, providing excellent solderability
- Compatible with both wave and reflow soldering processes
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of current rating	Clearing time at 25°C	
100%	4 hours min.	
200%	1 second min.	120 seconds max.
300%	0.1 seconds min.	3 seconds max.
800%	0.002 seconds min.	0. 05 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.038 ± 0.008	0.97 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Display
- PC & NB
- Server
- Battery pack
- Set top box

Ordering Information:

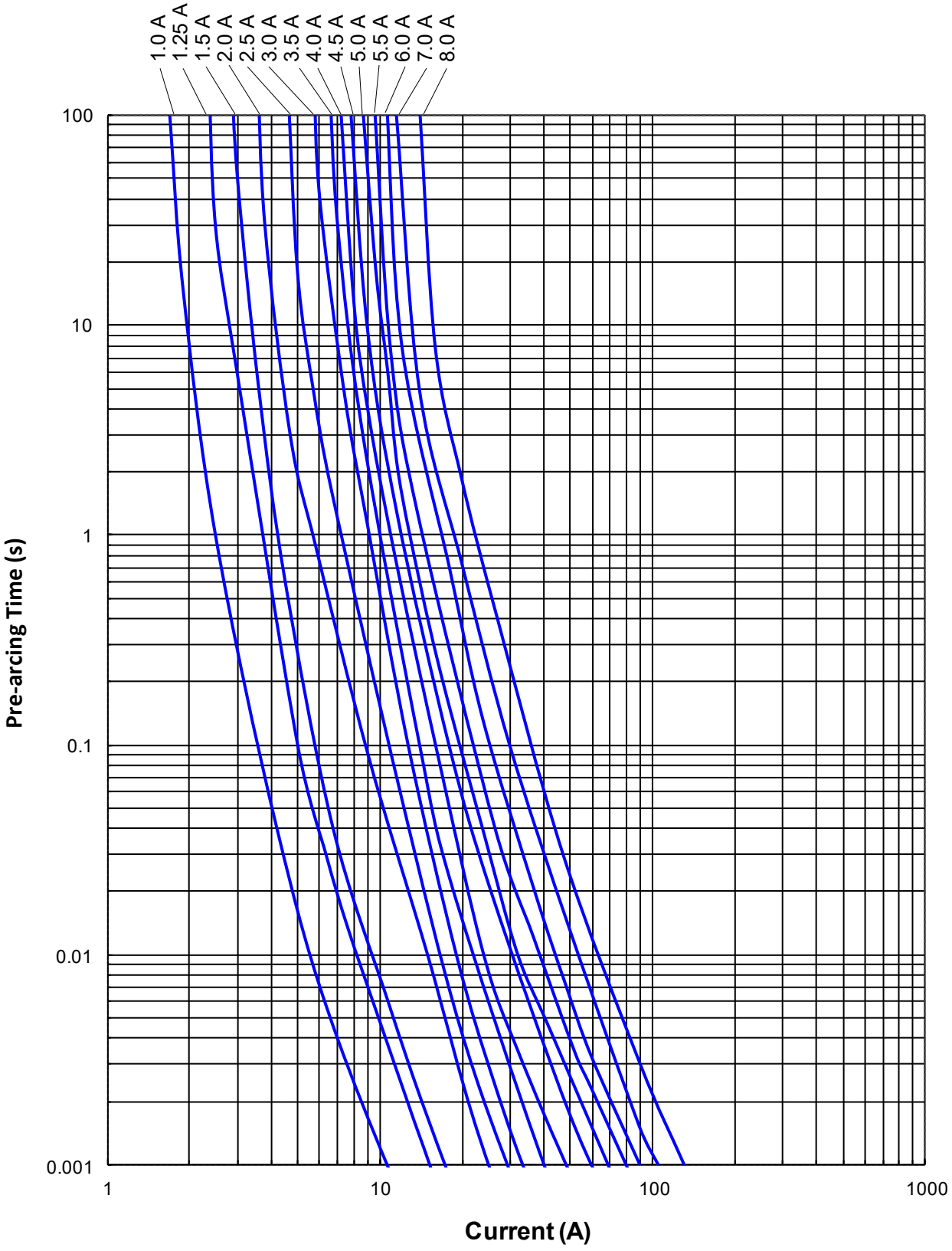
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$	Marking Code[3]
F1206SB1000V063TM	1.0	63	50 A at rated voltages	0.360	0.11	E
F1206SB1250V063TM	1.25	63		0.200	0.22	F
F1206SB1500V063TM	1.5	63		0.150	0.23	G
F1206SB2000V063TM	2.0	63		0.088	0.63	I
F1206SB2500V032TM	2.5	32		0.065	0.90	J
F1206SB3000V032TM	3.0	32		0.034	1.20	K
F1206SB3500V032TM	3.5	32		0.028	1.60	L
F1206SB4000V032TM	4.0	32		0.024	2.20	M
F1206SB4500V032TM	4.5	32		0.020	3.60	T
F1206SB5000V032TM	5.0	32		0.018	5.30	N
F1206SB5500V024TM	5.5	24		0.014	6.40	U
F1206SB6000V024TM	6.0	24	60 A at rated voltage	0.011	8.50	O
F1206SB7000V024TM	7.0	24		0.010	10.0	P
F1206SB8000V024TM	8.0	24		0.009	16.9	R

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 0.001 second pre-arcing time. 3. Red Marking Character Code.

SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 1206 Size

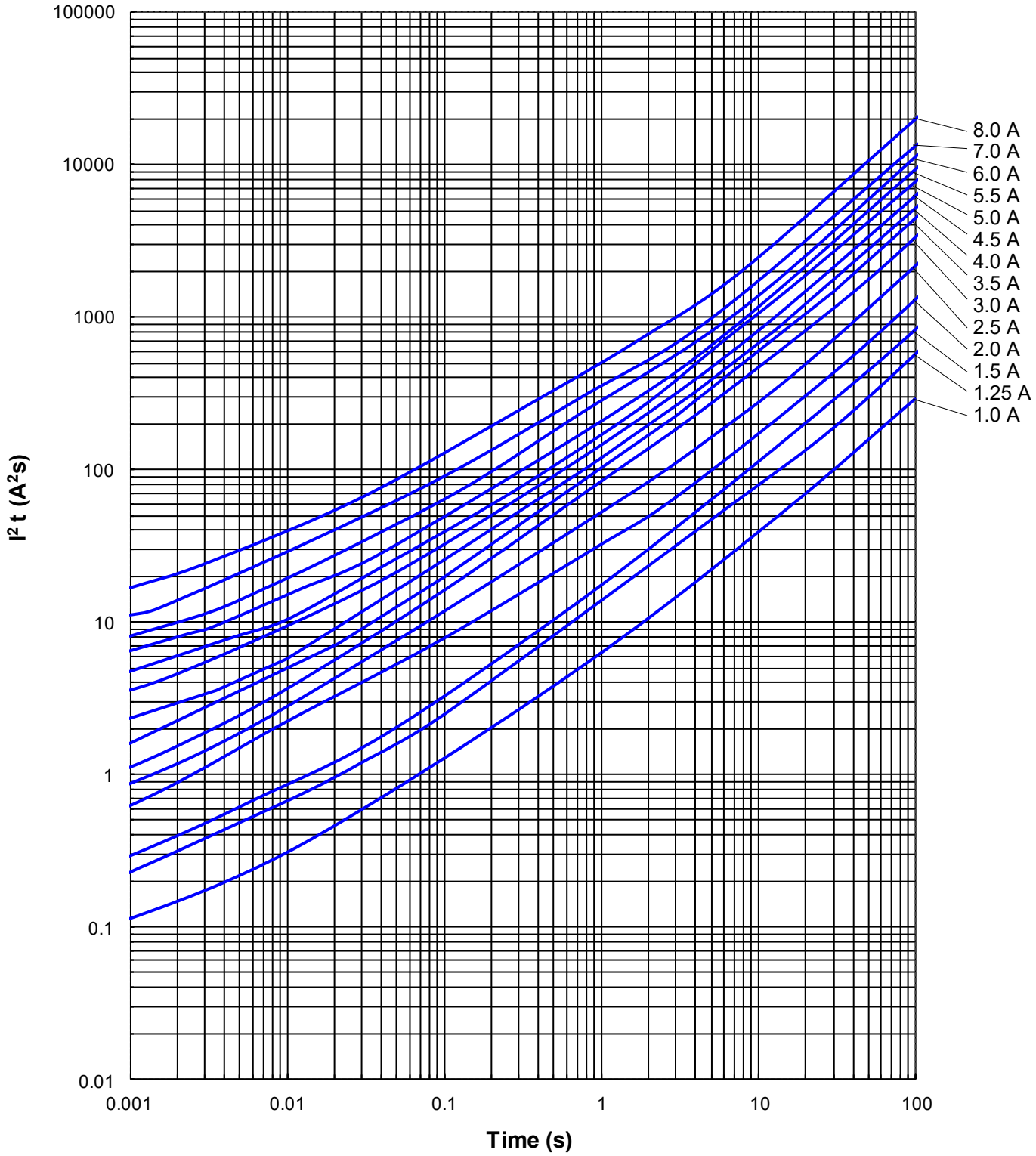
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 0603 Size

Features:

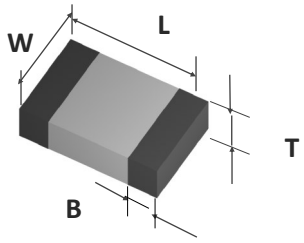
- High inrush current withstanding capability
- Ceramic Monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of Current Rating	Clearing time at 25°C	
100%	4 hours min.	
200%	1 second min.	120 seconds max.
300%	0.1 seconds min.	3 seconds max.
800% (1 A - 1.5 A)	0.0005 seconds min.	0.05 seconds max.
800% (2 A - 8 A)	0.001 seconds min.	0.05 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.063 ± 0.006	1.60 ± 0.15
W	0.031 ± 0.006	0.80 ± 0.15
T	0.031 ± 0.006	0.80 ± 0.15
B	0.014 ± 0.006	0.36 ± 0.15



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Panel
- PC & NB
- Server
- Battery pack
- Set top box

Ordering Information:

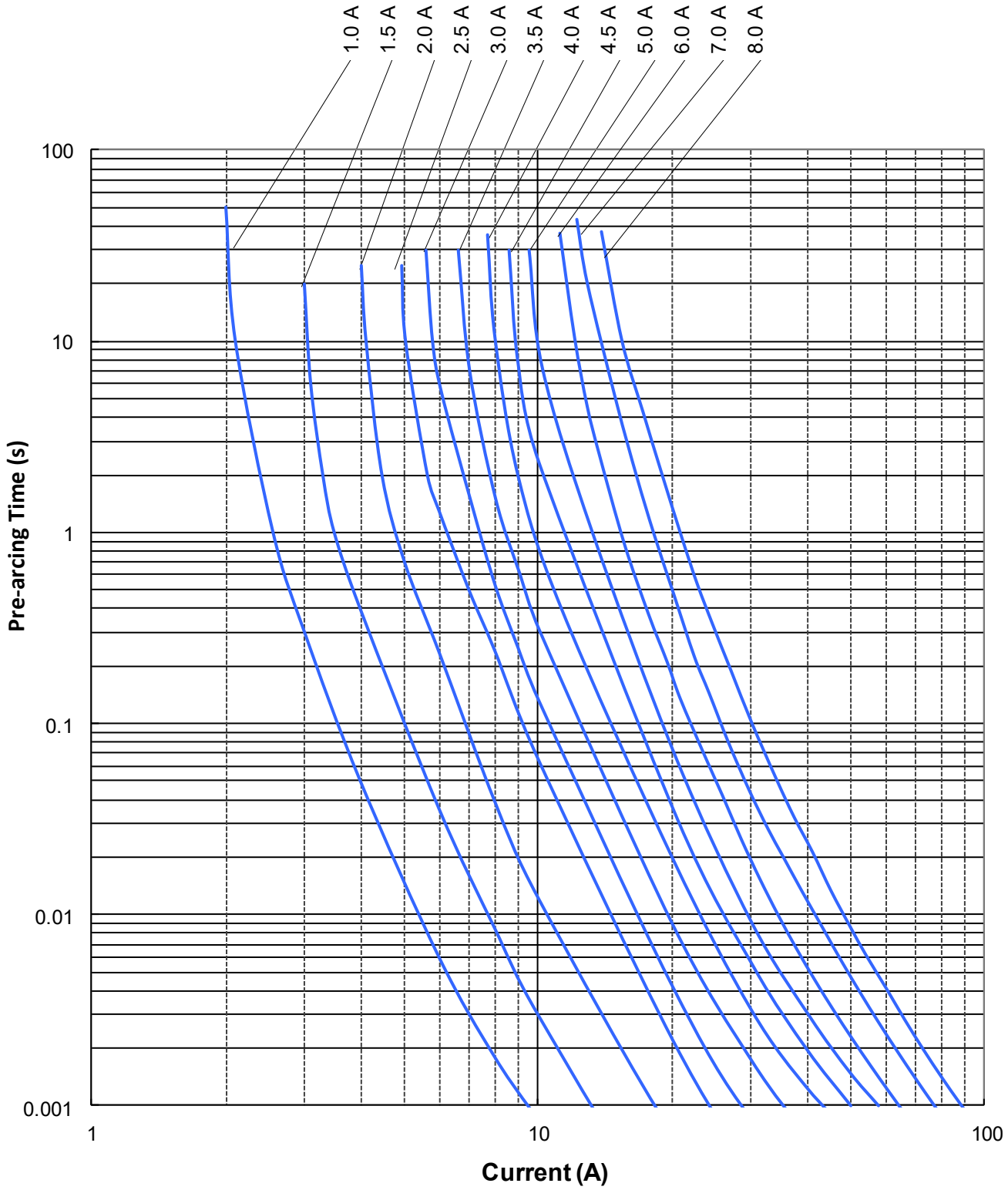
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$	Marking (Optional)[3]
F0603SB1000V032TM	1.0	32	50A at rated voltage	0.200	0.093	E
F0603SB1500V032TM	1.5	32		0.100	0.18	G
F0603SB2000V032TM	2.0	32		0.052	0.32	I
F0603SB2500V032TM	2.5	32		0.041	0.63	J
F0603SB3000V032TM	3.0	32		0.031	0.87	K
F0603SB3500V032TM	3.5	32		0.021	1.20	L
F0603SB4000V032TM	4.0	32		0.017	2.30	M
F0603SB4500V032TM	4.5	32		0.015	2.70	T
F0603SB5000V032TM	5.0	32		0.013	3.20	N
F0603SB6000V032TM	6.0	32	80A at rated voltage	0.010	4.00	O
F0603SB7000V032TM	7.0	32		0.008	5.00	P
F0603SB8000V032TM	8.0	32		0.006	7.00	R

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 0.001 second pre-arcing time. 3. Red Marking Character Code.

SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 0603 Size

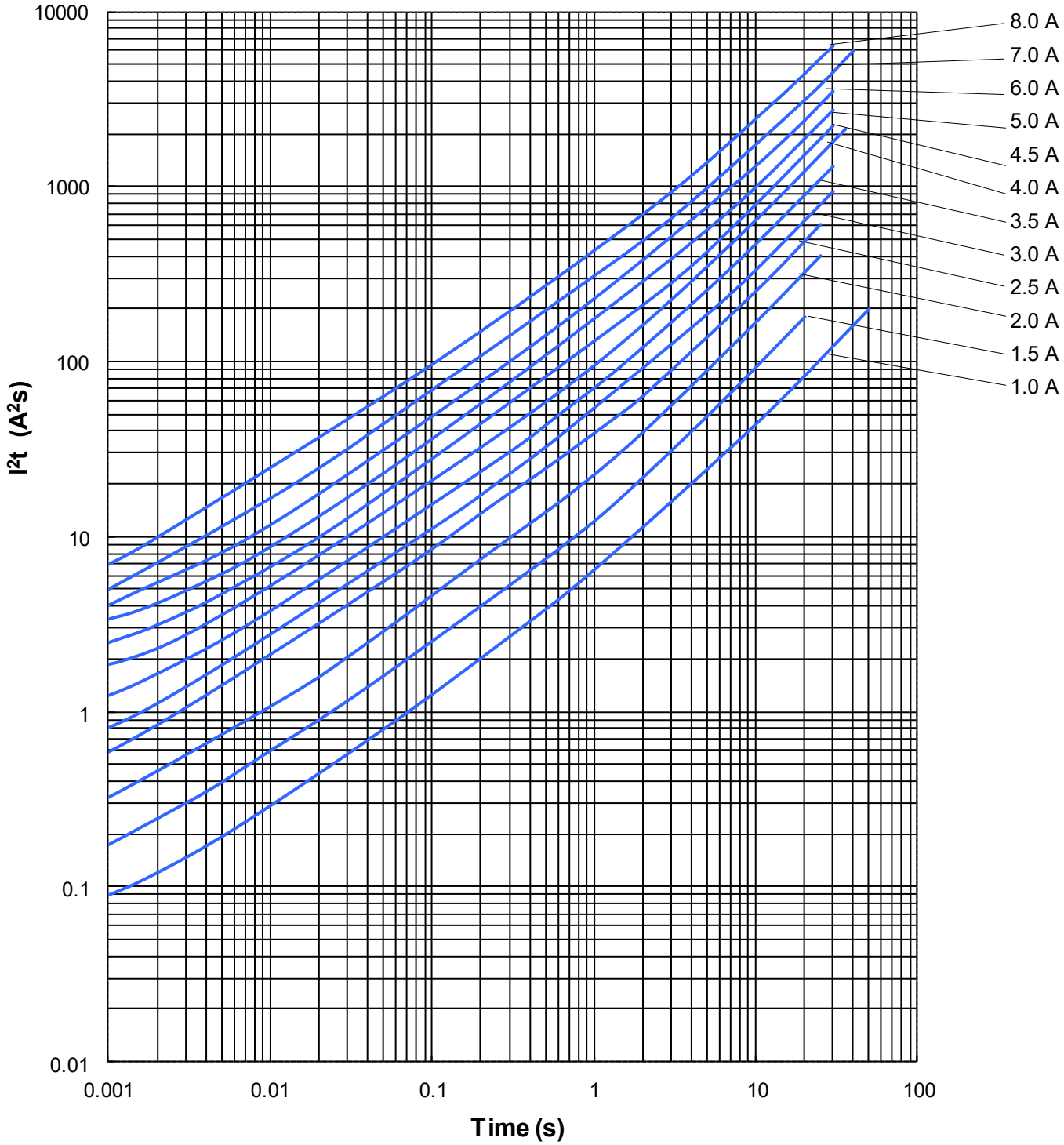
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

SB Series (Slow Blow), 0603 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 1206 Size

Features:

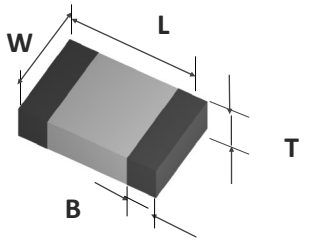
- High inrush current withstanding capability
- Ceramic Monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of Current Rating	Clearing time at 25°C	
100%	4 hours min.	
200% (1.0 A -8.0A)	1 second min.	60 seconds max.
350% (0.5 A -0.75 A)		5 seconds max.
1000% (0.5 A -5.0 A)	0.0002 seconds min.	0.02 seconds max.
1000% (6.0 A -8.0 A)	0.0002 seconds min.	0.04 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.038 ± 0.008	0.97 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Display
- PC & NB
- Server
- Battery pack
- Set top box

Ordering Information:

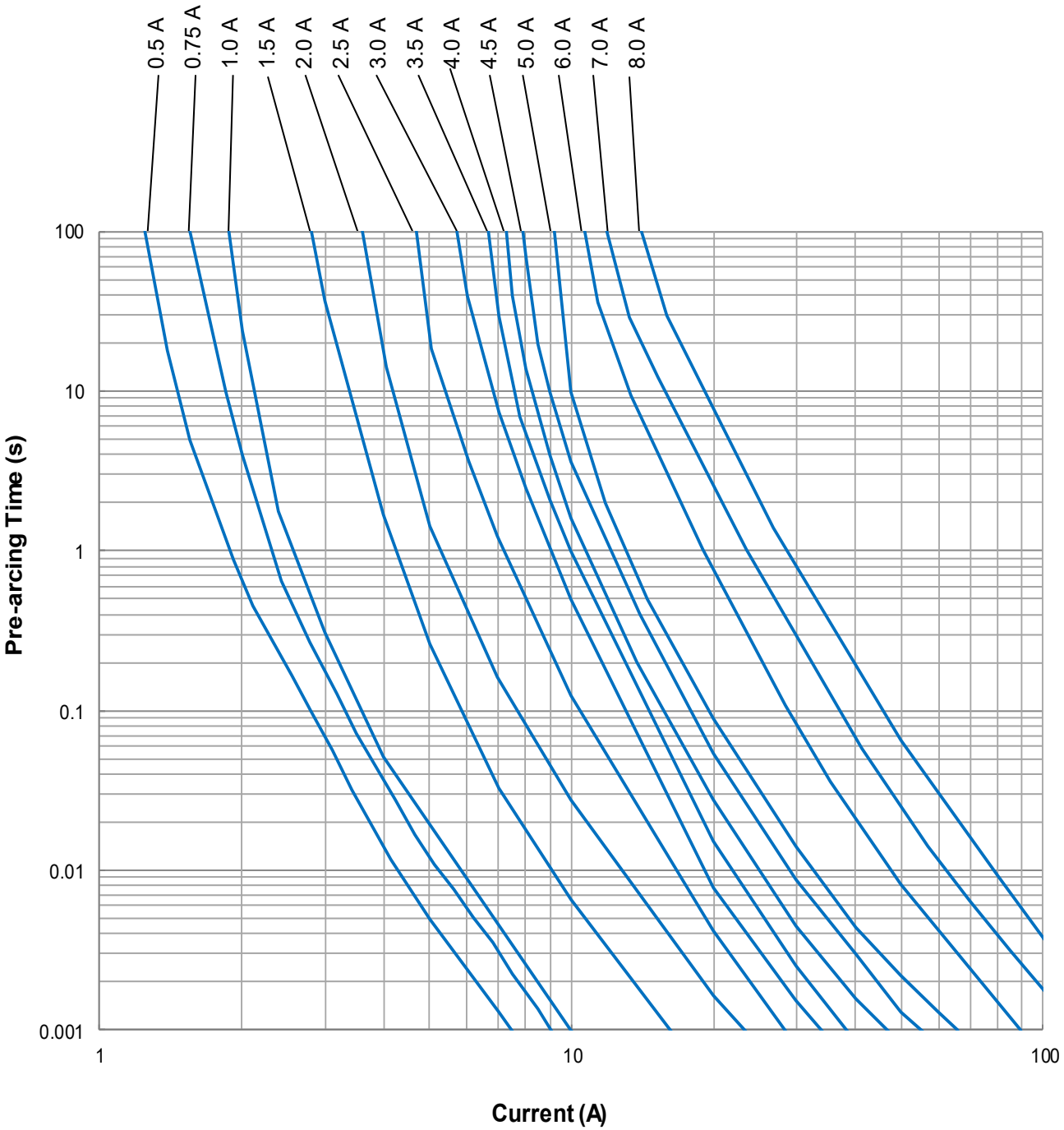
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking Code[3]
F1206HI0500V065TM	0.5	65	50A at rated voltages	1.000	0.035	C
F1206HI0750V065TM	0.75	65		0.420	0.10	D
F1206HI1000V063TM	1.0	63		0.340	0.11	E
F1206HI1500V063TM	1.5	63		0.150	0.33	G
F1206HI2000V063TM	2.0	63		0.090	0.80	I
F1206HI2500V032TM	2.5	32		0.065	1.19	J
F1206HI3000V032TM	3.0	32		0.035	1.35	K
F1206HI3500V032TM	3.5	32		0.029	1.84	L
F1206HI4000V032TM	4.0	32		0.023	2.74	M
F1206HI4500V032TM	4.5	32		0.021	3.20	T
F1206HI5000V032TM	5.0	32		0.017	5.50	N
F1206HI6000V024TM	6.0	24	80A at rated voltage	0.013	12.5	O
F1206HI7000V024TM	7.0	24		0.010	30.0	P
F1206HI8000V024TM	8.0	24		0.009	60.0	R

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 1000% of current rating. 3. Green Marking Character Code.

SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 1206 Size

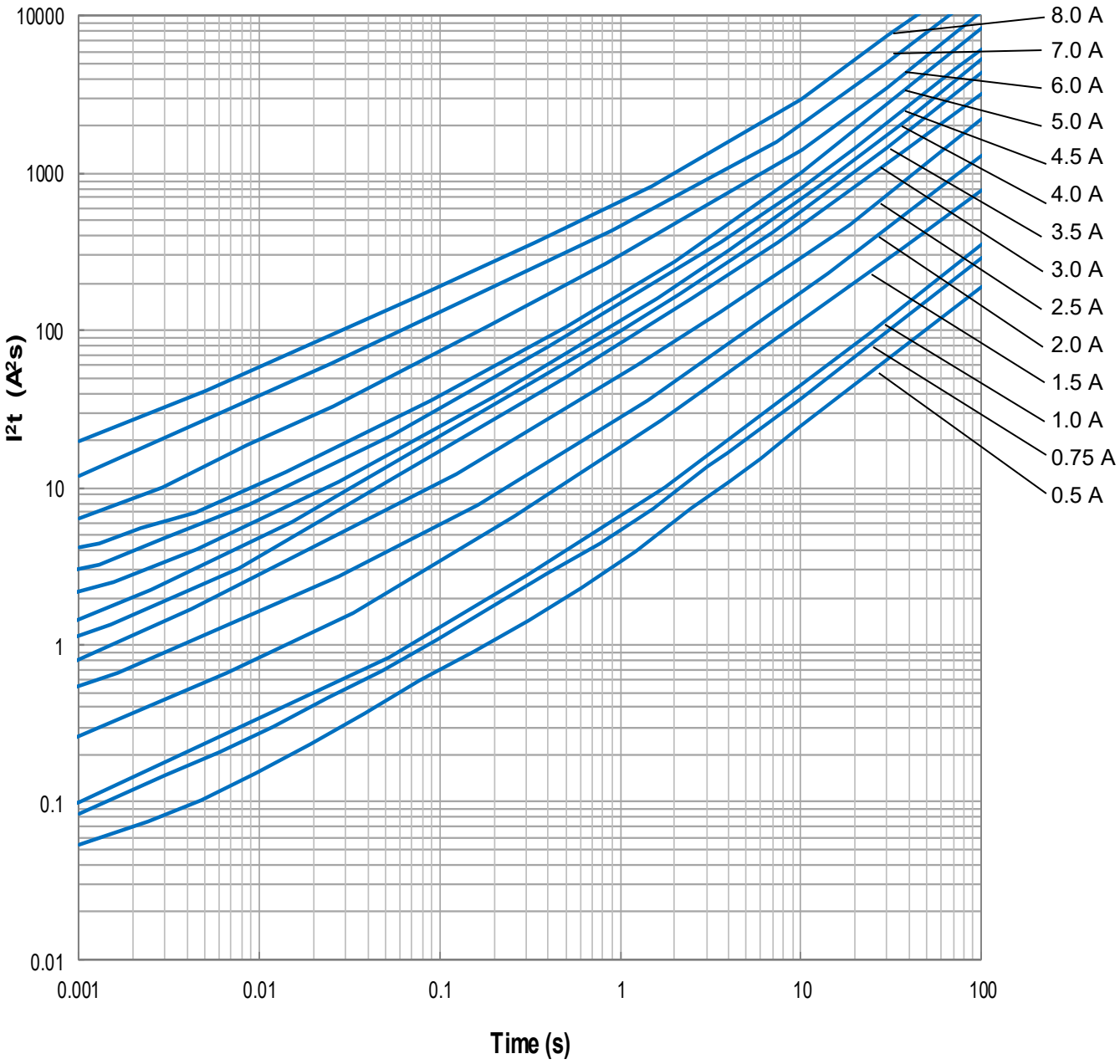
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 0603 Size

Features:

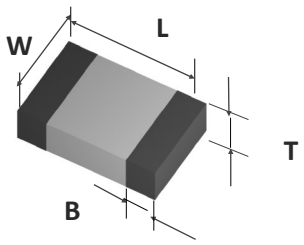
- High inrush current withstanding capability
- Ceramic Monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of Current Rating	Clearing time at 25°C	
100%	4 hours min.	
200%	1 second min.	60 seconds max.
1000%（1-5A）	0.0002 seconds min.	0.02 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.063 ± 0.006	1.60 ± 0.15
W	0.031 ± 0.006	0.80 ± 0.15
T	0.031 ± 0.006	0.80 ± 0.15
B	0.014 ± 0.006	0.36 ± 0.15



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Panel
- PC
- Server
- Battery pack
- Set top box

Ordering Information:

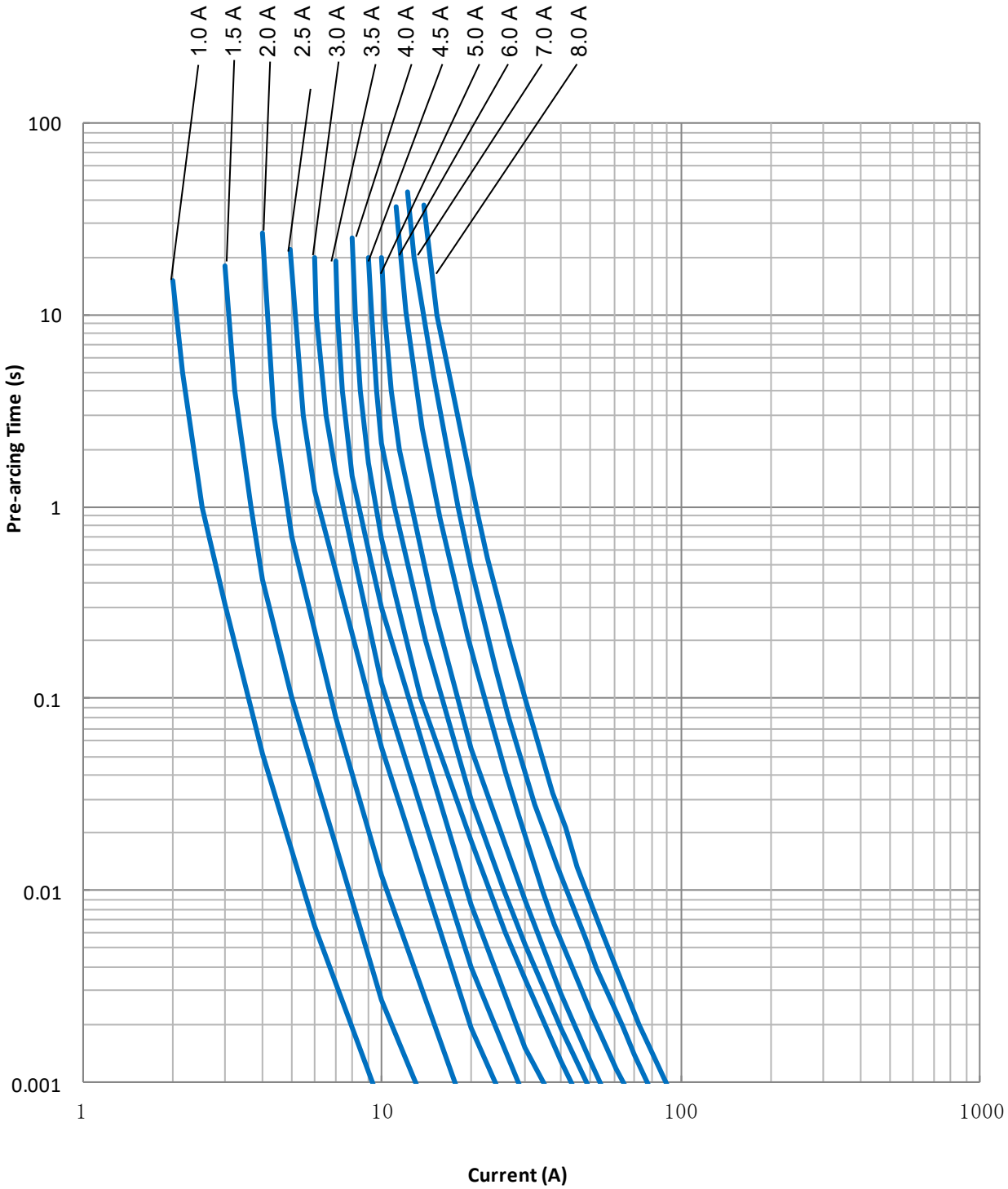
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking (Optional)[3]
F0603HI1000V032TM	1.0	32	50A at rated voltage	0.210	0.08	E
F0603HI1500V032TM	1.5	32		0.101	0.11	G
F0603HI2000V032TM	2.0	32		0.057	0.24	I
F0603HI2500V032TM	2.5	32		0.042	0.56	J
F0603HI3000V032TM	3.0	32		0.030	0.72	K
F0603HI3500V032TM	3.5	32		0.022	1.10	L
F0603HI4000V032TM	4.0	32		0.018	2.08	M
F0603HI4500V032TM	4.5	32		0.014	2.63	T
F0603HI5000V032TM	5.0	32		0.013	3.25	N
F0603HI6000V032TM	6.0	32	70A at rated voltage	0.010	4.00	O
F0603HI7000V032TM	7.0	32	80A at rated voltage	0.008	5.00	P
F0603HI8000V032TM	8.0	32		0.006	7.00	R

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 1000% of current rating. 3. Green Marking Character Code.

SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 0603 Size

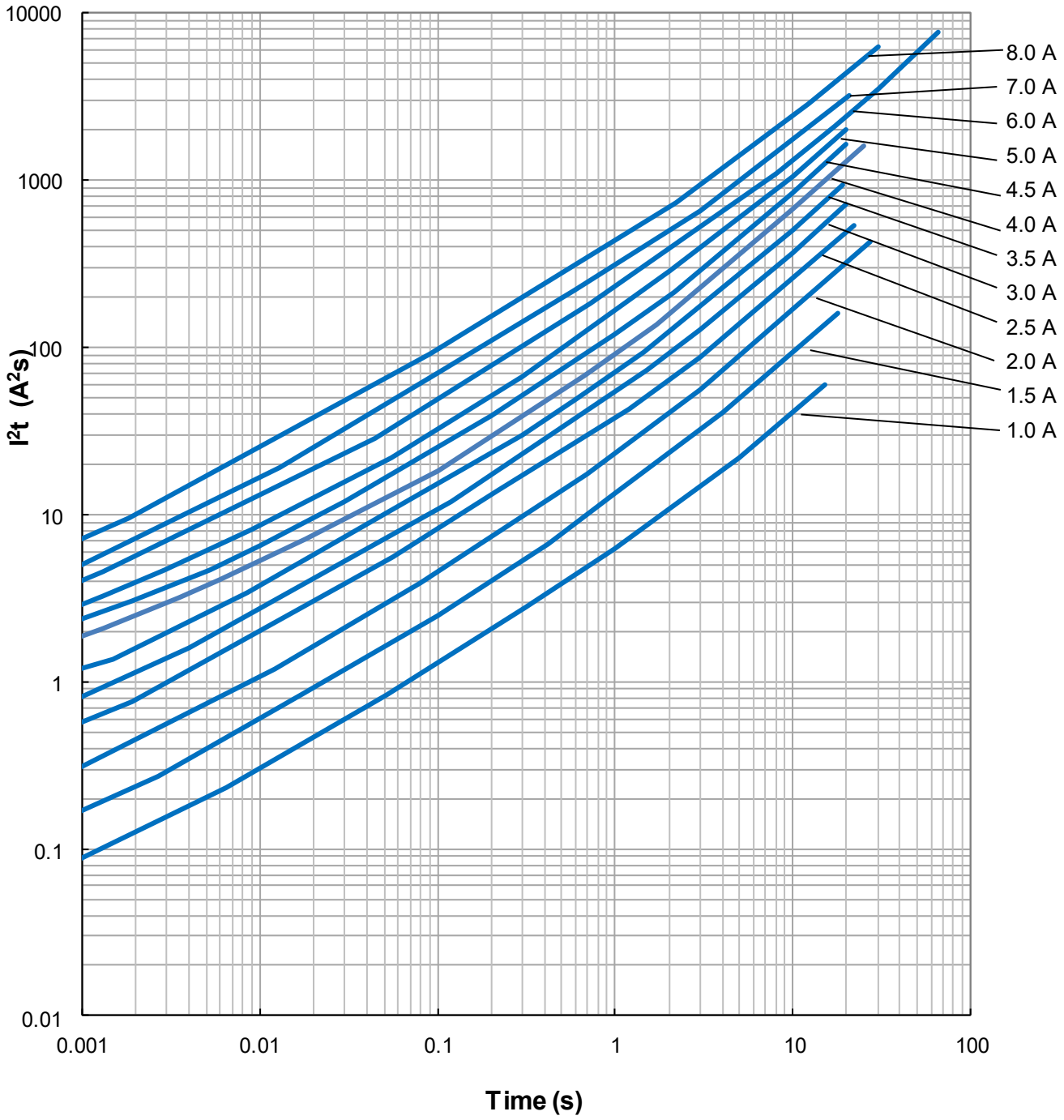
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

HI Series (High Inrush), 0603 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

HA Series (High Current), 1206 Size

Features:

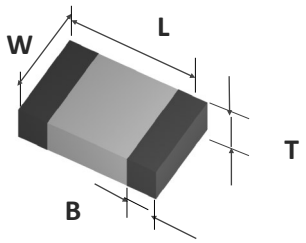
- Special products for high current rating applications
- Glass ceramic monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- RoHS compliant and lead-free materials
- Superior arc suppression capability
- High current ratings
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to 150°C (with de-rating)

Clearing Time Characteristics:

% of current rating	Clearing time at 25°C
100%	4 hours min.
250%	5 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.038 ± 0.008	0.97 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Display
- PC & Notebook
- Server
- Battery pack

Ordering Information:

Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$	Marking Code[3]
F1206HA10V024TM	10	24	100A@24Vdc	0.010	9	Q
F1206HA12V024TM	12	24		0.008	14	X
F1206HA15V024TM	15	24		0.005	26	Y
F1206HA20V024TM	20	24		0.003	56	Z

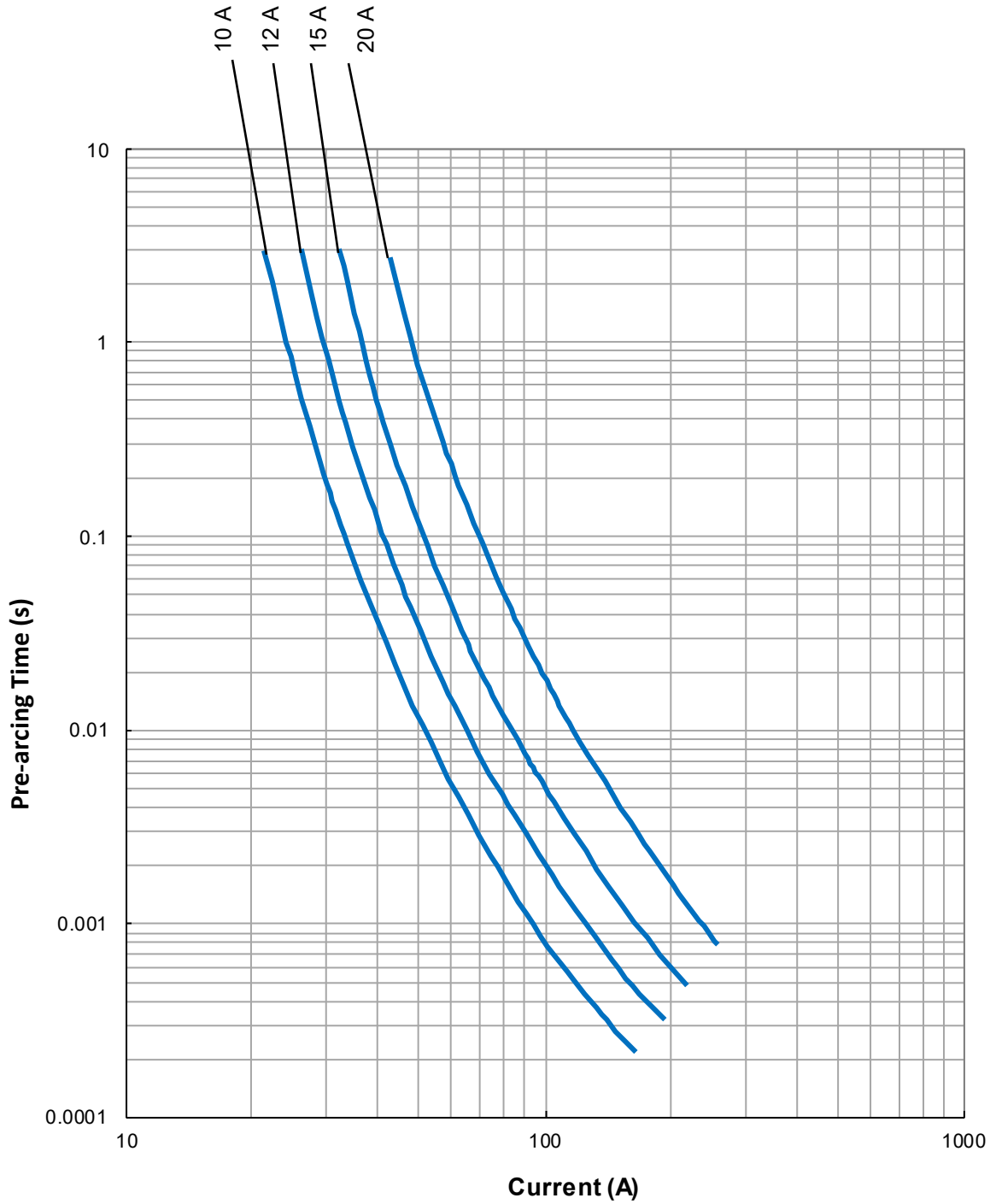
1. Measured at ≤ 10% rated current and 25ºC ambient.

2. Melting I^2t at 0.001 second pre-arcing time

SolidMatrix® Surface Mount Fuses

HA Series (High Current), 1206 Size

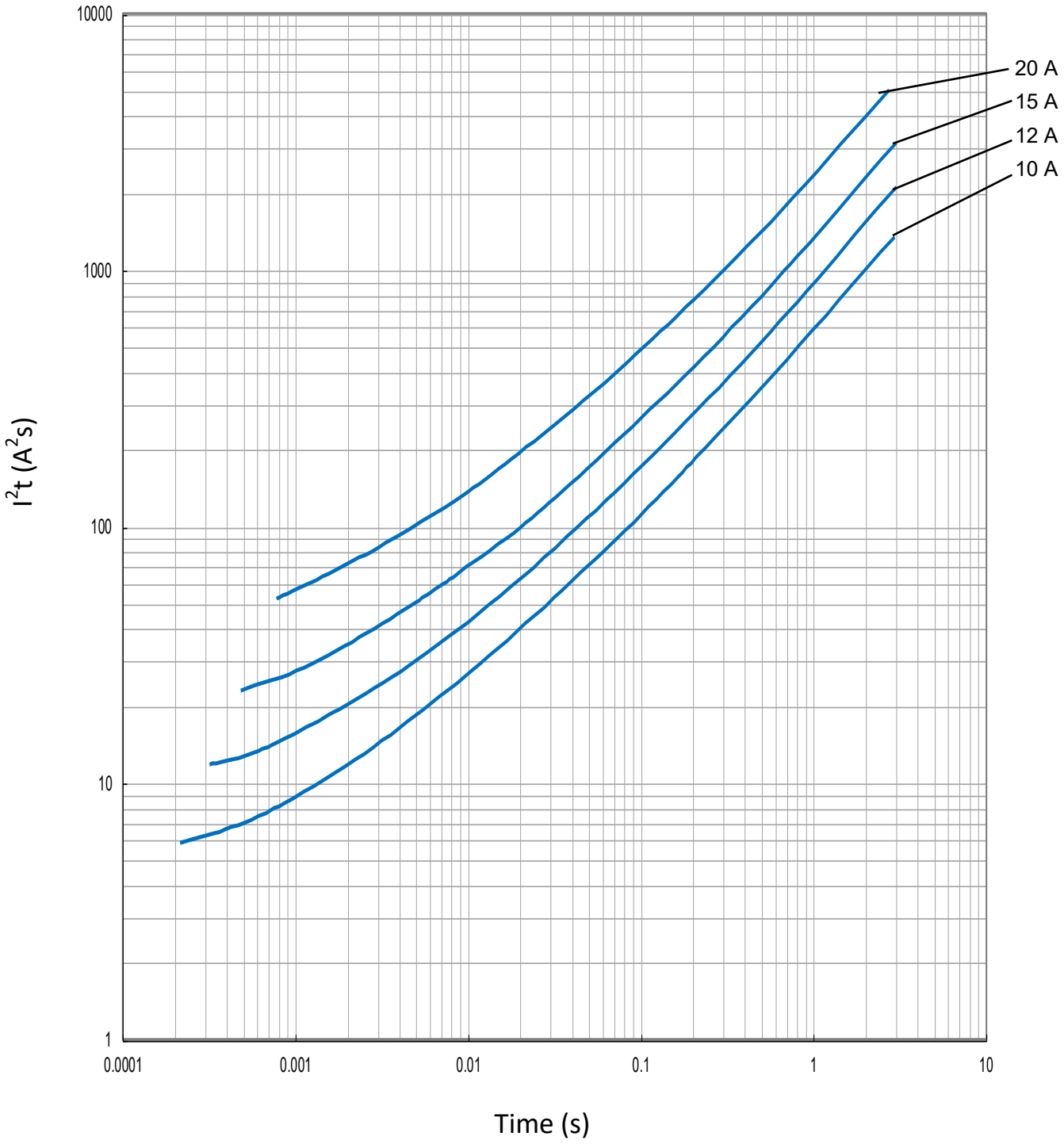
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

HA Series (High Current), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

HB Series (High Current), 1206 Size

Features:

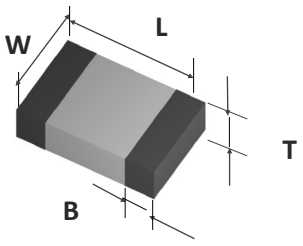
- Special products for high current rating applications
- Higher current ratings and excellent inrush current withstanding capability (high I^2t)
- Glass ceramic monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Superior arc suppression capability
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to 150°C (with de-rating)

Clearing Time Characteristics:

% of current rating	Clearing time at 25°C
100%	4 hours min.
350%	5 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.038 ± 0.008	0.97 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Power tools
- DC-DC convert
- Display
- PC & Notebook
- Server
- Battery pack

Ordering Information:

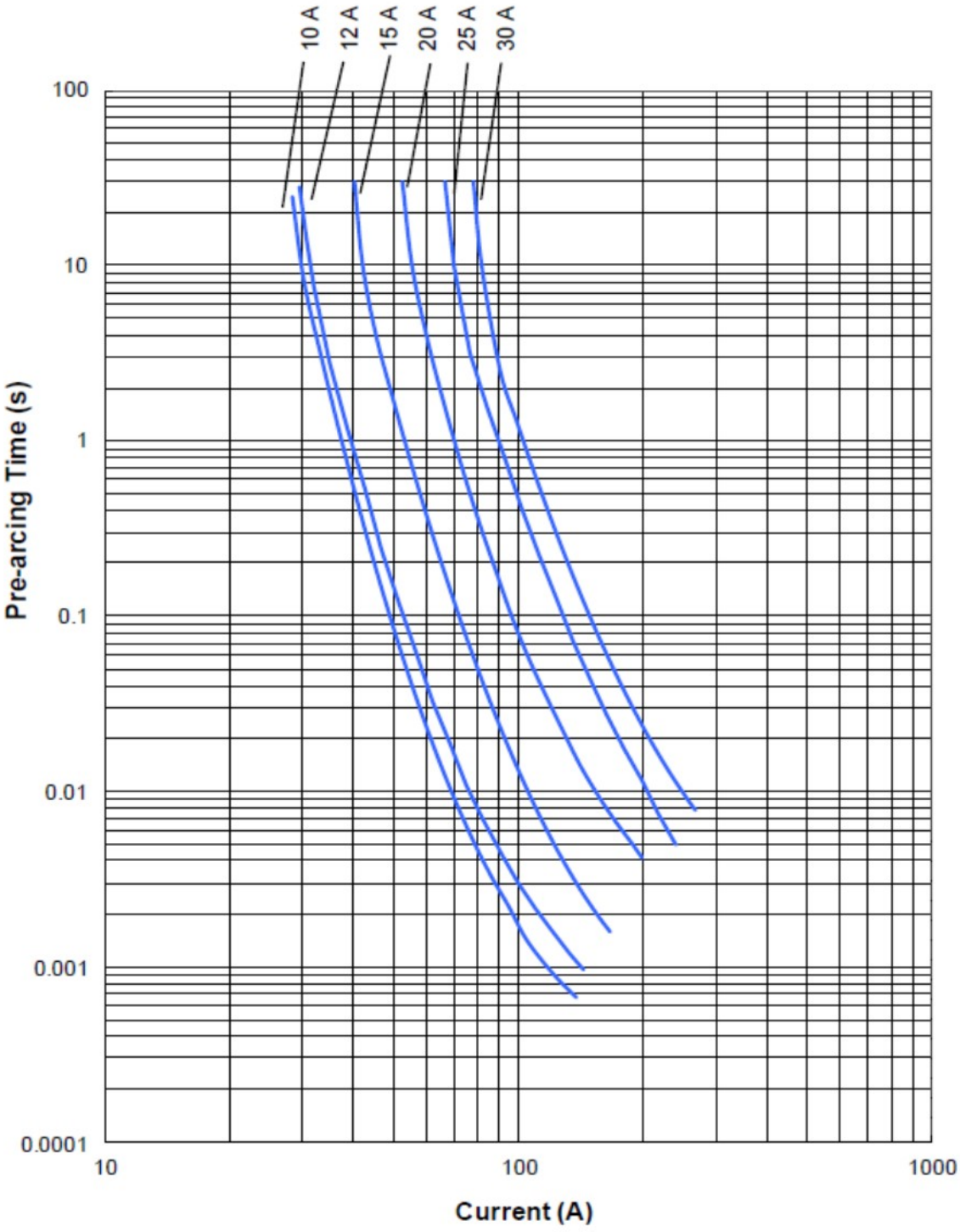
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR(Ω)[1]	Nominal I^2t (A^2s)[2]	Marking Code[3]
F1206HB10V024TM	10	24	150 A at rated voltage	0.0045	12	Q
F1206HB12V024TM	12	24		0.0039	19	X
F1206HB15V024TM	15	24	200 A at rated voltage	0.0031	34	Y
F1206HB20V024TM	20	24		0.0020	64	Z
F1206HB25V024TM	25	24	250 A at rated voltage	0.0016	187	S
F1206HB30V024TM	30	24	300 A at rated voltage	0.0012	270	V

1. Measured at ≤ 10% rated current and 25°C ambient.
2. Melting I^2t at 1000% of current rating.
3. Red Marking Character Code.

SolidMatrix® Surface Mount Fuses

HB Series (High Current), 1206 Size

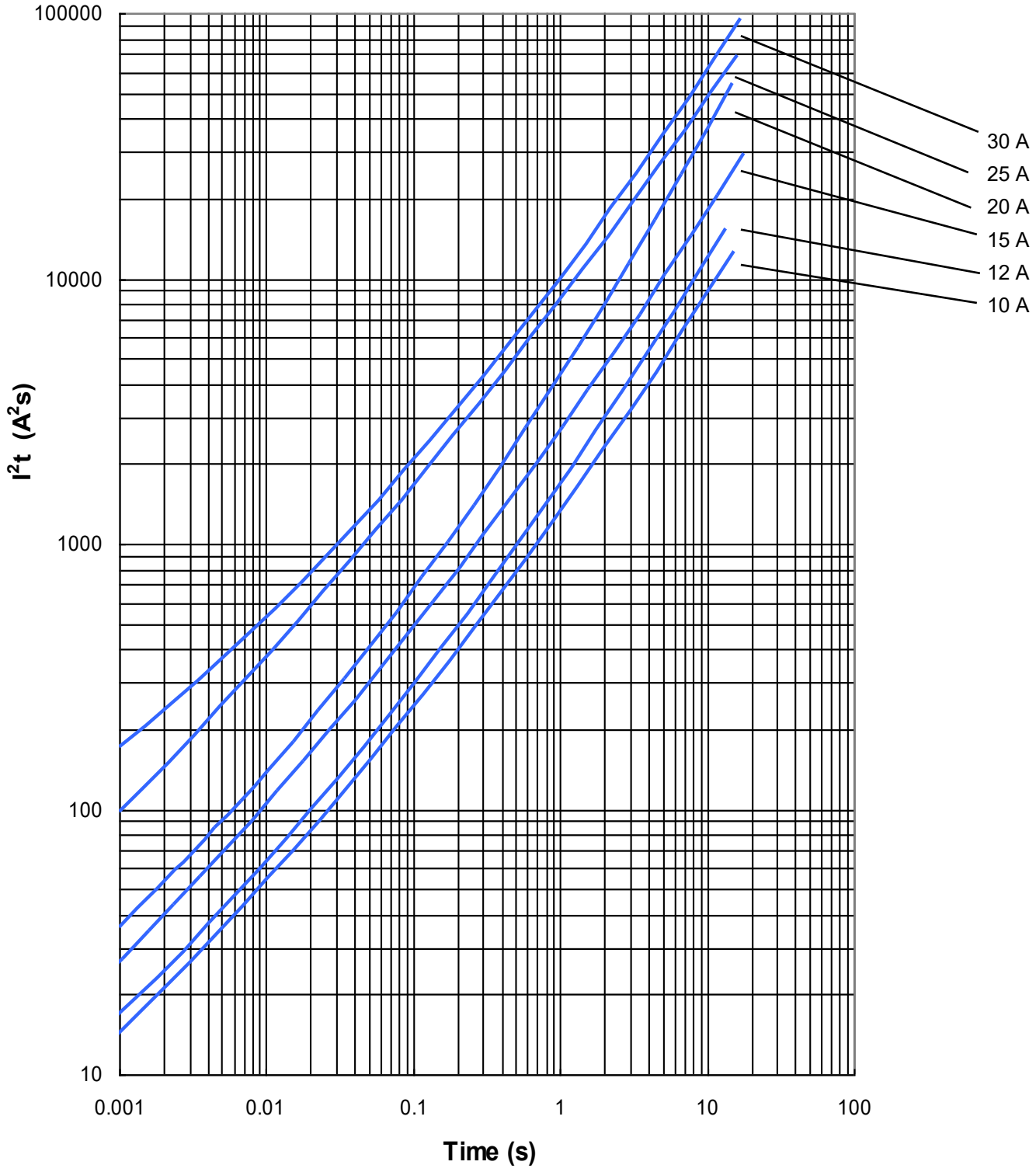
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

HB Series (High Current), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

HC Series (High Current), 1206 Size

Features:

- High inrush current withstanding capability at high voltage
- Glass ceramic monolithic structure
- Sliver fusing element and silver termination with nickel and tin plating
- Superior arc suppression capability
- RoHS compliant and lead free materials
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of current rating	Clearing time at 25°C
100%	4 hours min.
350%	5 seconds max.

Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

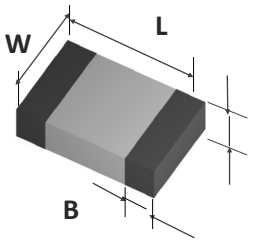
Applications:

- Power tools
- DC-DC convert
- Display
- PC & Notebook
- Server
- Battery pack

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T1	0.038 ± 0.008	0.97 ± 0.20
T2	0.051 ± 0.008	1.30 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25

T1: Thickness for 10-25A;
T2: Thickness for 30-40A.



T1 or T2

Ordering Information:

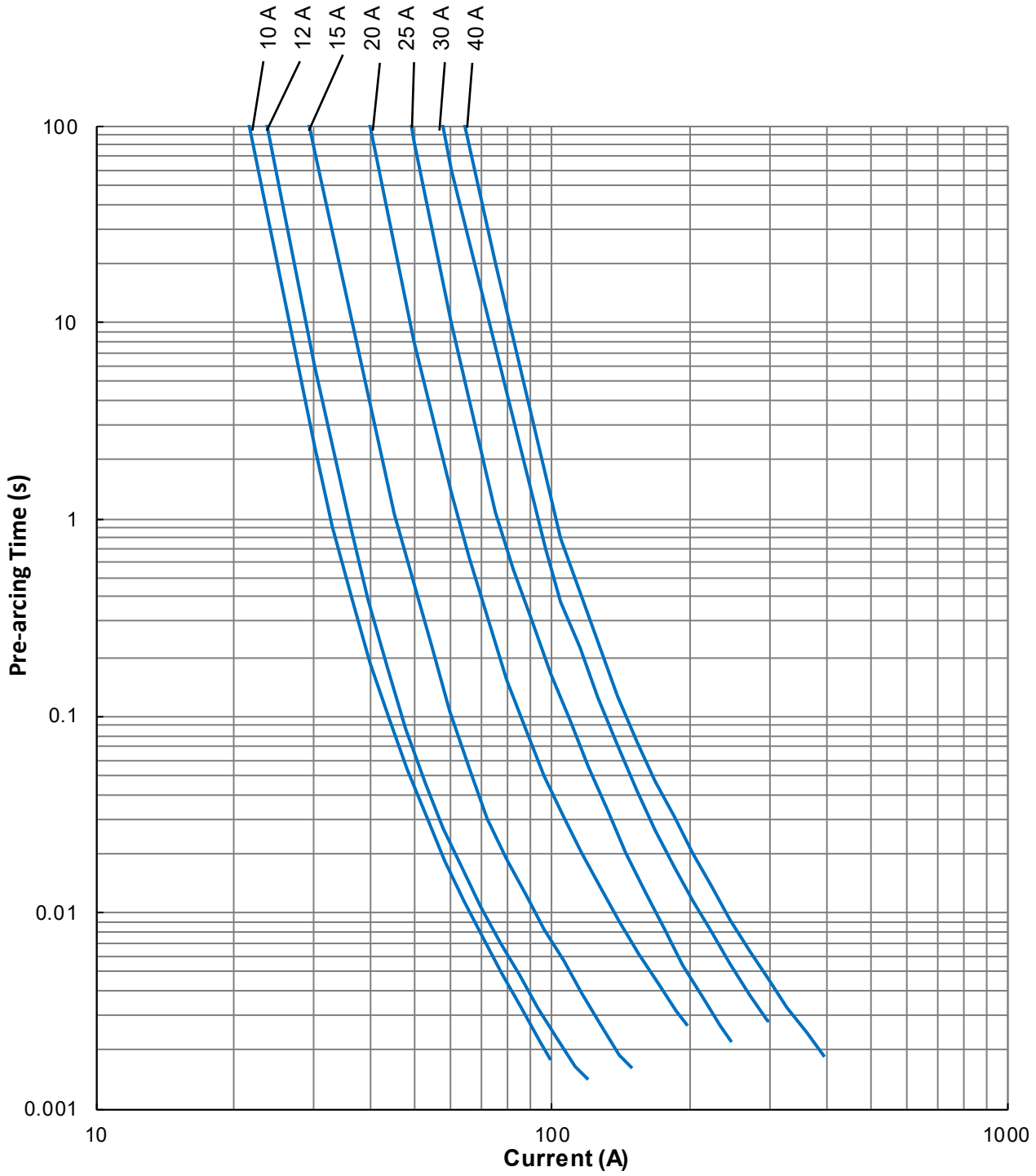
Part Number	Current Rating (A)	Voltage Rating Vdc)	Interrupting Ratings	Nominal Cold DCR(Ω)[1]	Nominal I^2t (A^2s)[2]	Marking Code[3]
F1206HC10A0TM	10	35	150A@35Vdc	0.0055	15	Q
F1206HC12A0TM	12	35		0.0045	20	X
F1206HC15A0TM	15	35		0.0032	35	Y
F1206HC20A0TM	20	35		0.0023	80	Z
F1206HC25A0TM	25	35	200A@35Vdc	0.0016	120	S
F1206HC30A0TM	30	35	200A@35Vdc; 300A@26Vdc	0.0012	180	V
F1206HC40A0TM	40	35		0.0009	240	O

1. Measured at ≤ 10% rated current and 25°C ambient.
2. Melting I^2t at 1000% of current rating.
3. Blue Marking Character Code. Devices designed to be mounted with marking code facing up.

SolidMatrix® Surface Mount Fuses

HC Series (High Current), 1206 Size

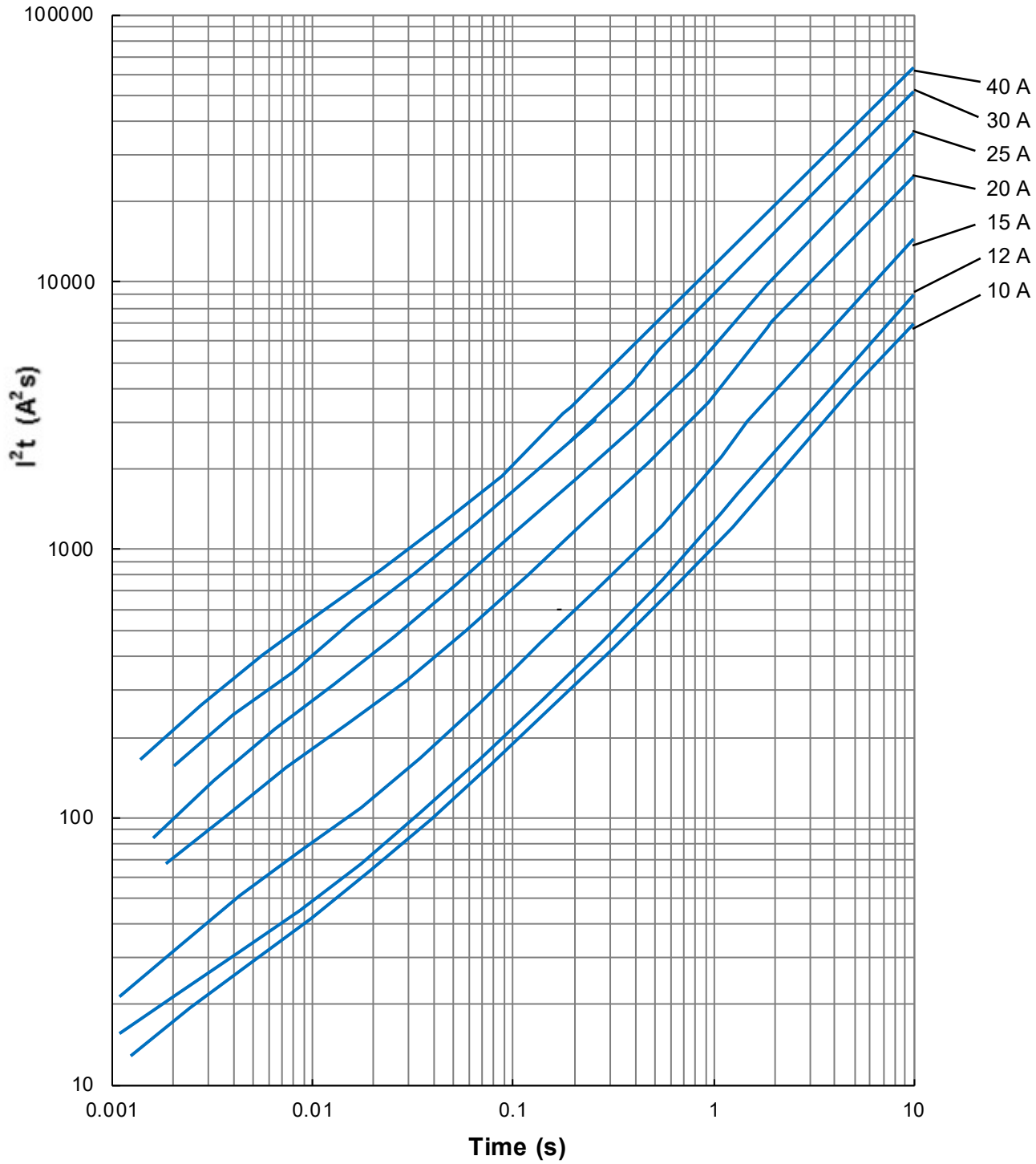
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

HC Series (High Current), 1206 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

FF Series (Very Fast Acting), 0603 Size

Features:

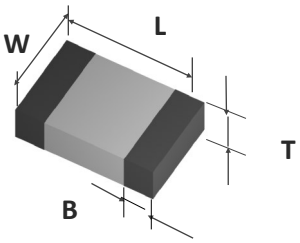
- Very fast acting at 200% and 300% overloads
- Excellent inrush current withstanding capability at high over-loads
- Thin body for space limiting applications
- Glass ceramic monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to +150°C (with de-rating)

Clearing Time Characteristics:

% of Current Rating	Clearing Time at 25°C	
100%	4 hours min.	
200%	0.01 seconds min.	5 seconds max.
300%	0.001 seconds min.	0.2 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.063 ± 0.006	1.60 ± 0.15
W	0.031 ± 0.006	0.80 ± 0.15
T	0.012 + 0.007 / -0.003	0.30 + 0.18 / -0.08
B	0.014 ± 0.006	0.36 ± 0.15



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Panel
- Notebook
- Toy
- IoT
- Infotainment System
- Battery pack

Ordering Information:

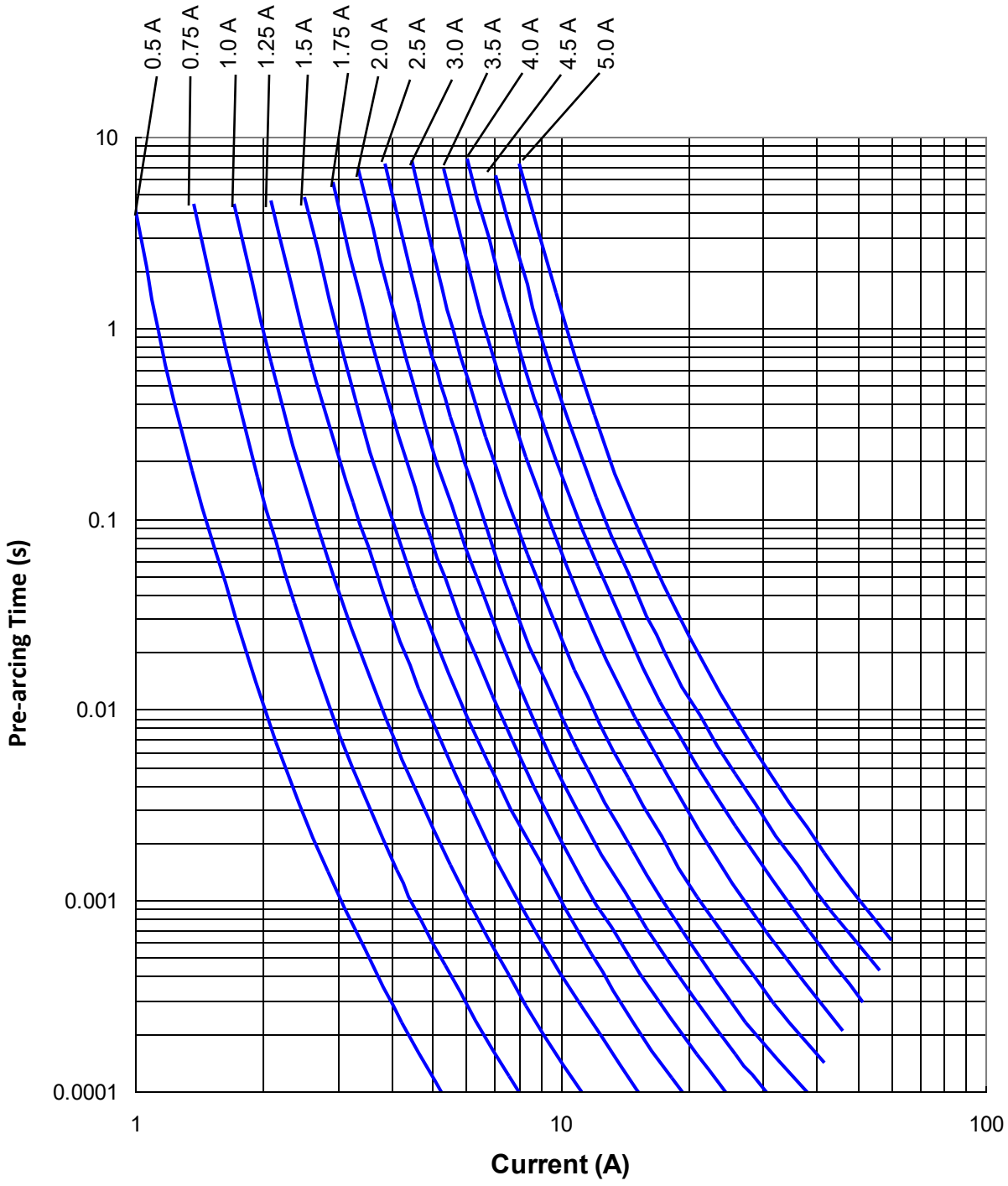
Part Number	Current Rating (A)	Voltage Rating Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking (Optional)[3]
F0603FF0500V032TM	0.5	32	50A at rated voltage	1.000	0.0093	C
F0603FF0750V032TM	0.75	32		0.450	0.0191	D
F0603FF1000V032TM	1.0	32		0.280	0.036	E
F0603FF1250V032TM	1.25	32	35A at rated voltage	0.205	0.063	F
F0603FF1500V032TM	1.5	32		0.143	0.095	G
F0603FF1750V032TM	1.75	32		0.095	0.14	H
F0603FF2000V032TM	2.0	32		0.073	0.21	I
F0603FF2500V032TM	2.5	32		0.046	0.30	J
F0603FF3000V032TM	3.0	32		0.039	0.46	K
F0603FF3500V032TM	3.5	32		0.028	0.73	L
F0603FF4000V032TM	4.0	32		0.023	1.15	M
F0603FF4500V032TM	4.5	32		0.019	1.68	T
F0603FF5000V032TM	5.0	32		0.015	2.62	N

1. Measured at ≤ 10% rated current and 25°C ambient. 2. Melting I^2t at 0.001 second pre-arcing time. 3. Blue Marking Character Code.

SolidMatrix® Surface Mount Fuses

FF Series (Very Fast Acting), 0603 Size

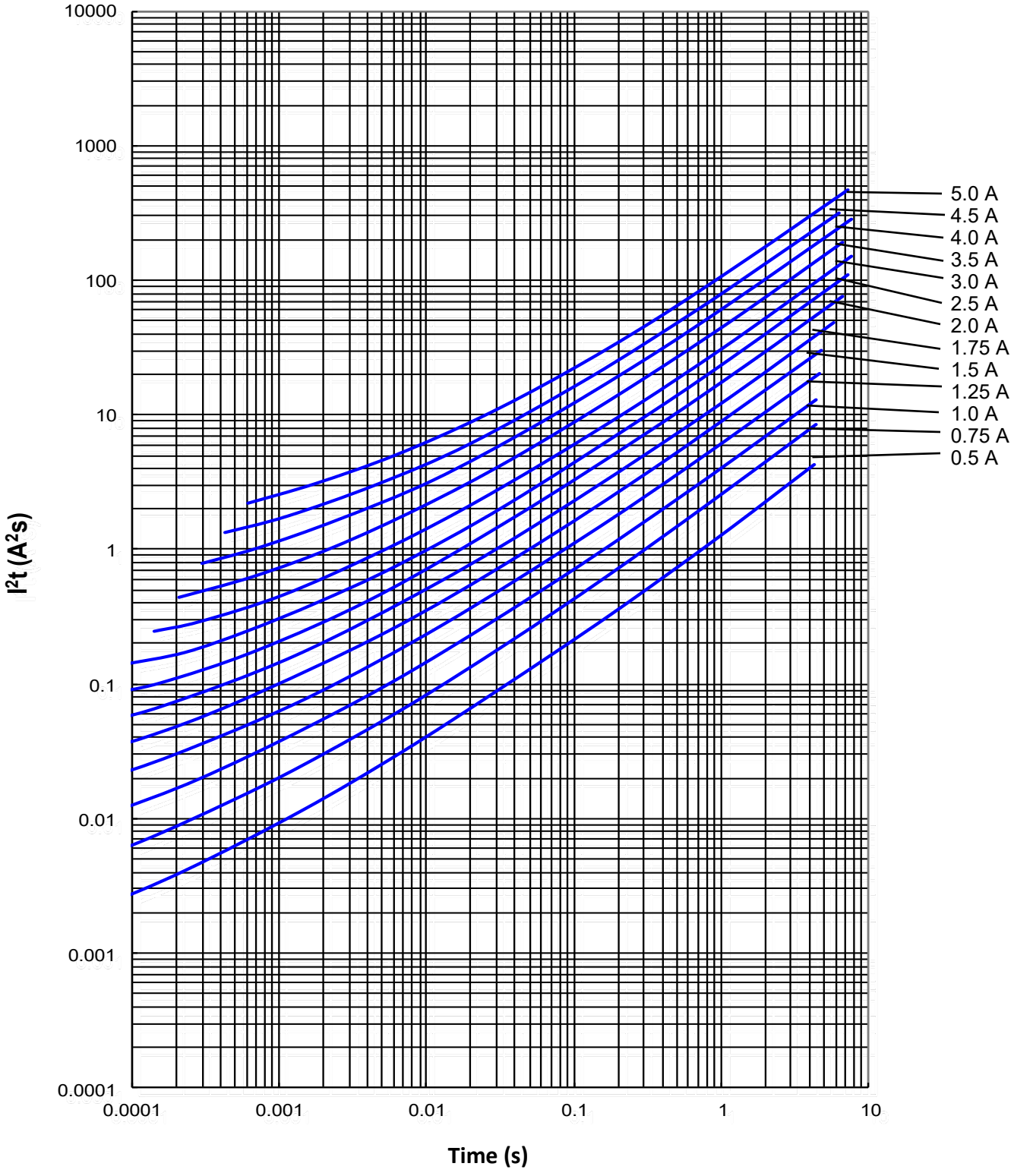
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

FF Series (Very Fast Acting), 0603 Size

Average I^2t vs. t Curves:



SolidMatrix® Surface Mount Fuses

VH Series (Voltage High), 1206 Size

Features:

- High inrush current withstanding capability
- Ceramic Monolithic structure
- Silver fusing element and silver termination with nickel and tin plating
- Symmetrical design with marking on both sides (optional)
- Operating temperature range: -55°C to +125°C (with de-rating)

Clearing Time Characteristics:

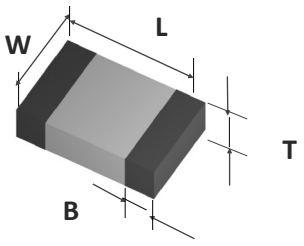
% of Current Rating	Clearing Time at 25°C	
100%	4 hours min.	
200% (2.5 A - 5.0 A)		60 seconds max.
350% (6.0 A - 8.0 A)		5 seconds max.
1000%	0.0002 seconds min.	0.02 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.034 ± 0.008	0.85 ± 0.20
B	0.020 ± 0.010	0.51 ± 0.25

Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.



Applications:

- Power tools
- DC-DC convert
- Display
- PC
- Server
- Battery pack
- Set top box

Ordering Information:

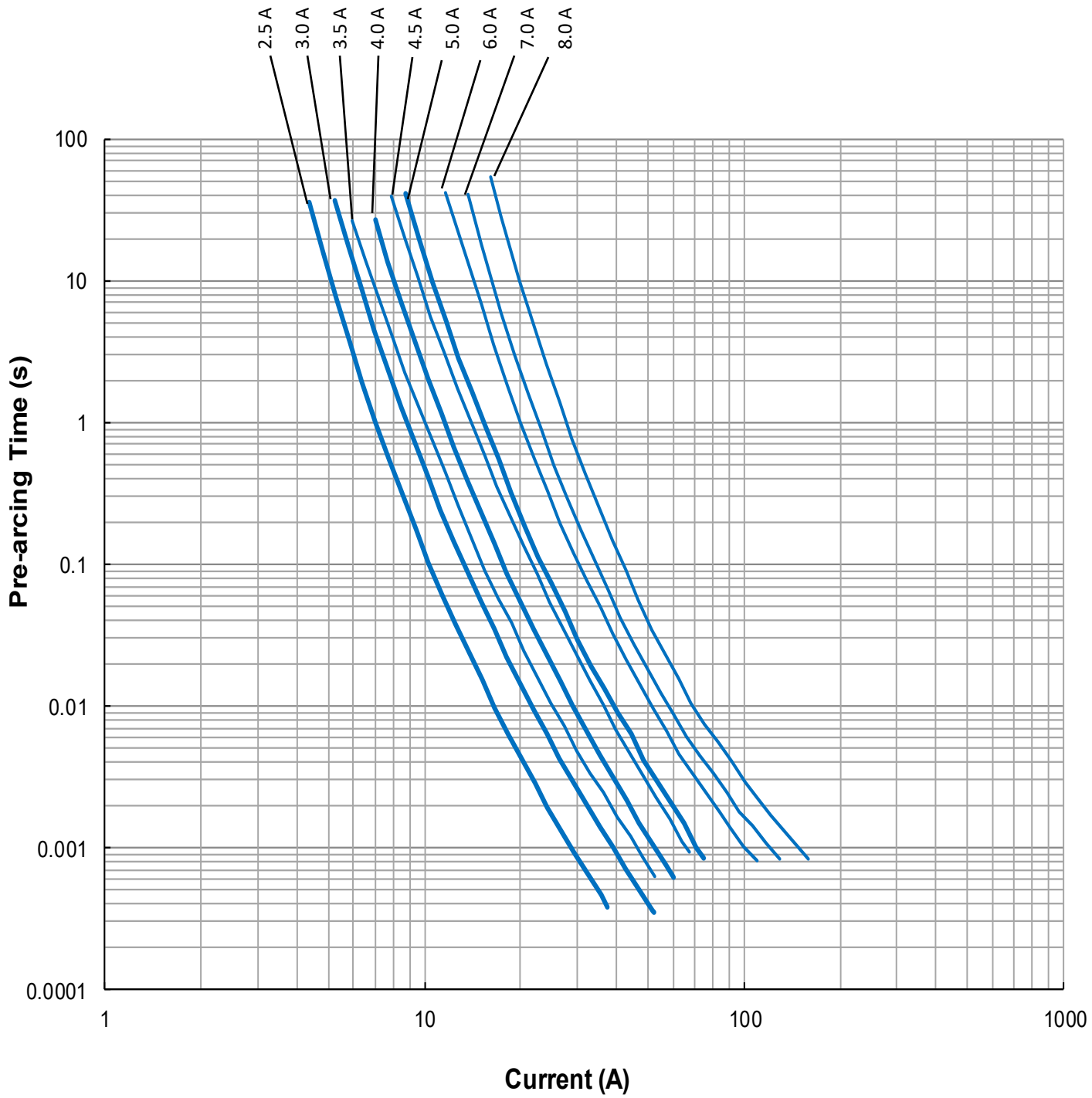
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking[3]
F1206VH2500TM	2.5	65V	60A@ 65Vdc 80A@48Vdc 100A@32Vdc	0.065	1.15	J
F1206VH3000TM	3.0			0.042	2.40	K
F1206VH3500TM	3.5			0.033	2.80	L
F1206VH4000TM	4.0			0.026	3.80	M
F1206VH4500TM	4.5			0.024	3.90	T
F1206VH5000TM	5.0			0.018	4.40	N
F1206VH6000TM	6.0	48V	80A@48Vdc 100A@32Vdc	0.011	13.0	+
F1206VH7000TM	7.0			0.009	19.0	-
F1206VH8000TM	8.0			0.007	20.0	=

1. Measured at ≤ 10% rated current and 25°C ambient.
2. Melting I^2t at 10 times of rated current.
3. Blue Marking Character Code.

SolidMatrix® Surface Mount Fuses

VH Series (Voltage High), 1206 Size

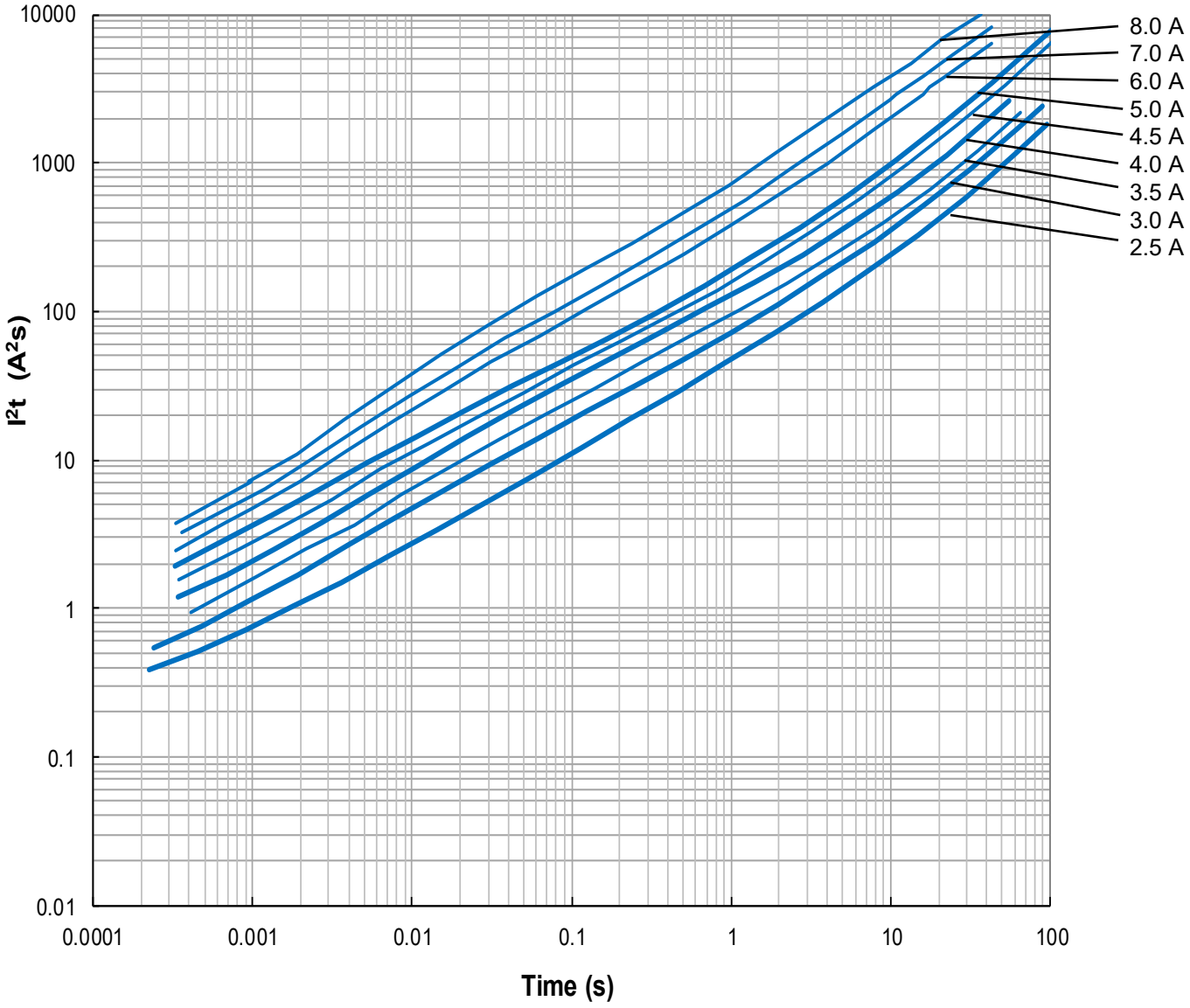
Average Pre-arcing Time Curves:



SolidMatrix® Surface Mount Fuses

VH Series (Voltage High), 1206 Size

Average I^2t vs. t Curves:



TF-FUSE® Thin Film Surface Mount Fuses

Product Identification:

T 0603 FF 1000 T M
(1) (2) (3) (4) (5) (6)

(1) Product Code: T-Thin Film
(2) Size Code: Standard EIA chip sizes
(3) Series Code: FF—Very Fast Acting, HI—High Inrush
(4) Current Rating Code: 0500—0.5A, 1000—1.0A
(5) Package Code: T—Tape & Reel; B—Bulk
(6) Marking Code: M—With mark (optional)

Environmental Tests:

No.	Test item	Test Condition and Requirement	Reference
1	Bend	2 mm bend, DCR change within ±20%. (±10% for ≤1A), no mechanical damage	IEC60068-2-21
2	Solderability	245°C, 5 seconds, new solder coverage ≥95%	MIL-STD-202 Method 208
3	Thermal shock	DCR change ≤ ±10%. No mechanical damage. 100 cycles between -55°C and +125°C	MIL-STD-202 Method 107
4	Moisture resistance	10 cycles, DCR change within ±10%, no excessive corrosion	MIL-STD-202 Method 106
5	Salt spray	DCR change ≤ ±10%. No excessive corrosion. 5% salt solution, 48 hour exposure	MIL-STD-202 Method 101
6	Mechanical vibration	DCR change ≤ ±10%. No mechanical damage. 0.4" D.A. or 30G between 5 and 3000 Hz	MIL-STD-202 Method 204
7	Mechanical shock	DCR change ≤ ±10%. No mechanical damage. 1500G, 0.5 ms, half sine shocks	MIL-STD-202 Method 213
8	Life	75% rated current, 2000 hours at ambient temperature from +20°C to 30 °C, no open circuit, voltage drop change within ±10%	Refer to AEM QIQ106

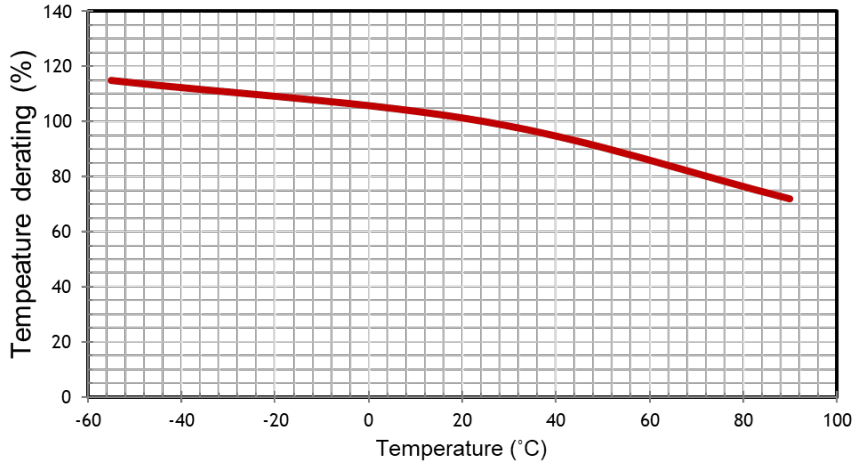
Moisture Sensitivity Level 1

Packaging:

Chip Size	Parts on 7 inch (178mm) Reel
0603 (1608)	8,000
0402 (1005)	20,000

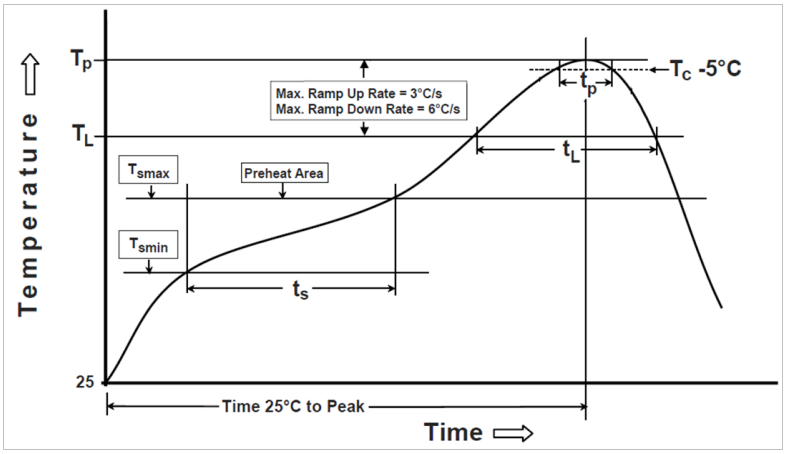
TF-FUSE® Thin Film Surface Mount Fuses

Temperature Effect on Current Rating:



Recommended Reflow Soldering Profile:

Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150°C 200°C 60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217°C 60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	



Thermal Shock When Making Correction with a Soldering Iron:

The temperature of solder iron tip should be controlled under 350˚C and soldering time should be less than 3 sec.

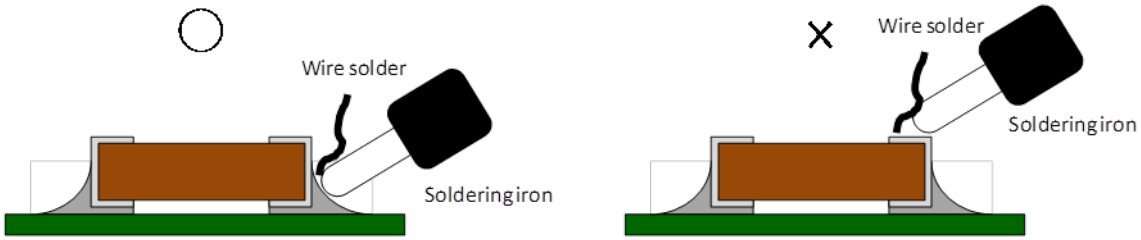
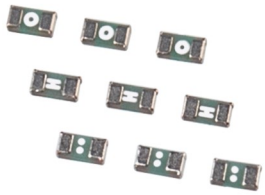


Fig 3 Correct handling method of soldering iron

TF-FUSE® Thin Film Surface Mount Fuses

FF Series (Very Fast Acting), 0402 Size



Features:

- Very fast acting
- Low DCR
- High inrush current withstanding capability
- Fiberglass enforced epoxy fuse body
- Copper termination with nickel and tin plating
- Halogen free, RoHS compliance and lead-free

Clearing Time Characteristics:

% of Current Rating	Ampere Rating	Opening Time at 25°C
100%	0.200A-5.00A	4 hours min.
200%	0.375A-5.00A	5 seconds max.
300%	0.200A-0.250A	5 seconds max.
	0.375A-5.00A	0.2 second max.

Shape and Dimensions:

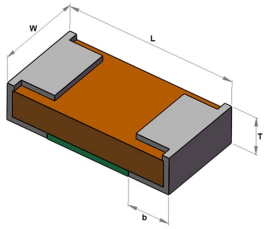
Unit	Inch	mm
Length (L)	0.039± 0.004	1.00 ± 0.10
Width (W)	0.020 ± 0.004	0.51± 0.10
Thickness (T)	0.013 ± 0.004	0.33 ± 0.10
Termination band-width (b)	0.012 ± 0.004	0.30 ± 0.10

Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Applications:

- Panel
- Notebook
- Toy
- HDD
- IoT
- Finger print
- Smart lock
- Battery pack



Typical Ratings and Electric Characteristics:

Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Rating	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A2s)^2$	Marking
T0402FF0200TM	0.200	35	35A@35Vdc	0.60	0.0017	••
T0402FF0250TM	0.250	35		0.33	0.0035	:
T0402FF0375TM	0.375	35		0.24	0.0036	•••
T0402FF0500TM	0.50	35		0.16	0.0060	I
T0402FF0750TM	0.75	35		0.10	0.012	—
T0402FF1000TM	1.00	35		0.073	0.024	+
T0402FF1250TM	1.25	35		0.054	0.045	×
T0402FF1500TM	1.50	35		0.040	0.081	II
T0402FF1750TM	1.75	35		0.034	0.092	=
T0402FF2000TM	2.00	35		0.031	0.12	≠
T0402FF2500TM	2.50	35		0.018	0.22	H
T0402FF3000TM	3.00	35		0.015	0.27	III
T0402FF3500TM	3.50	35		0.012	0.34	HH
T0402FF4000TM	4.00	35		0.011	0.36	□
T0402FF5000TM	5.00	35		0.0090	0.55	○

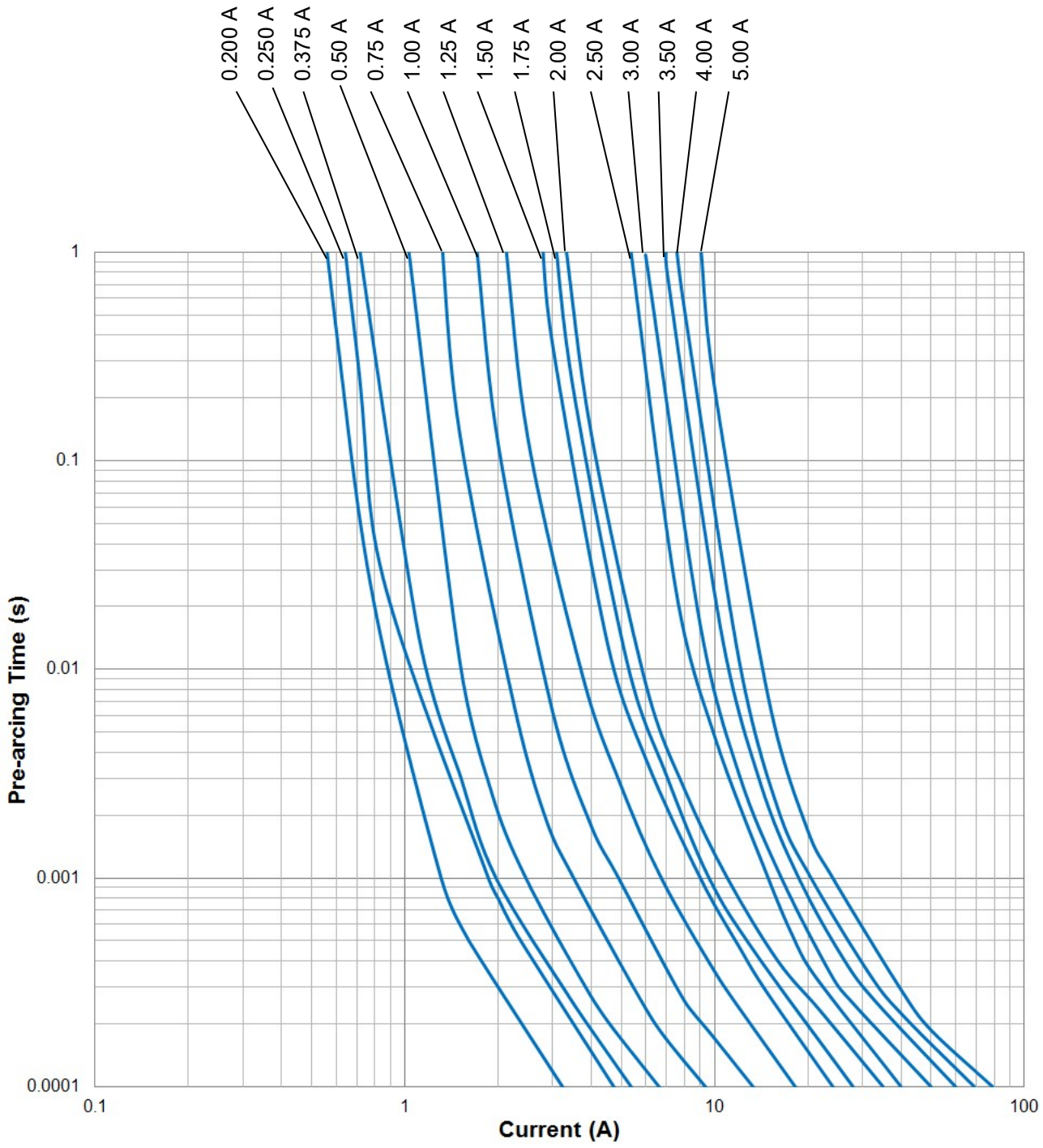
[1] Measured at ≤ 10% of rated current and 25℃ ambient . [2] Melting I^2t at 0.001 second of current rating.

Operating temperature: -55 to +90°C

TF-FUSE® Thin Film Surface Mount Fuses

FF Series (Very Fast Acting), 0402 Size

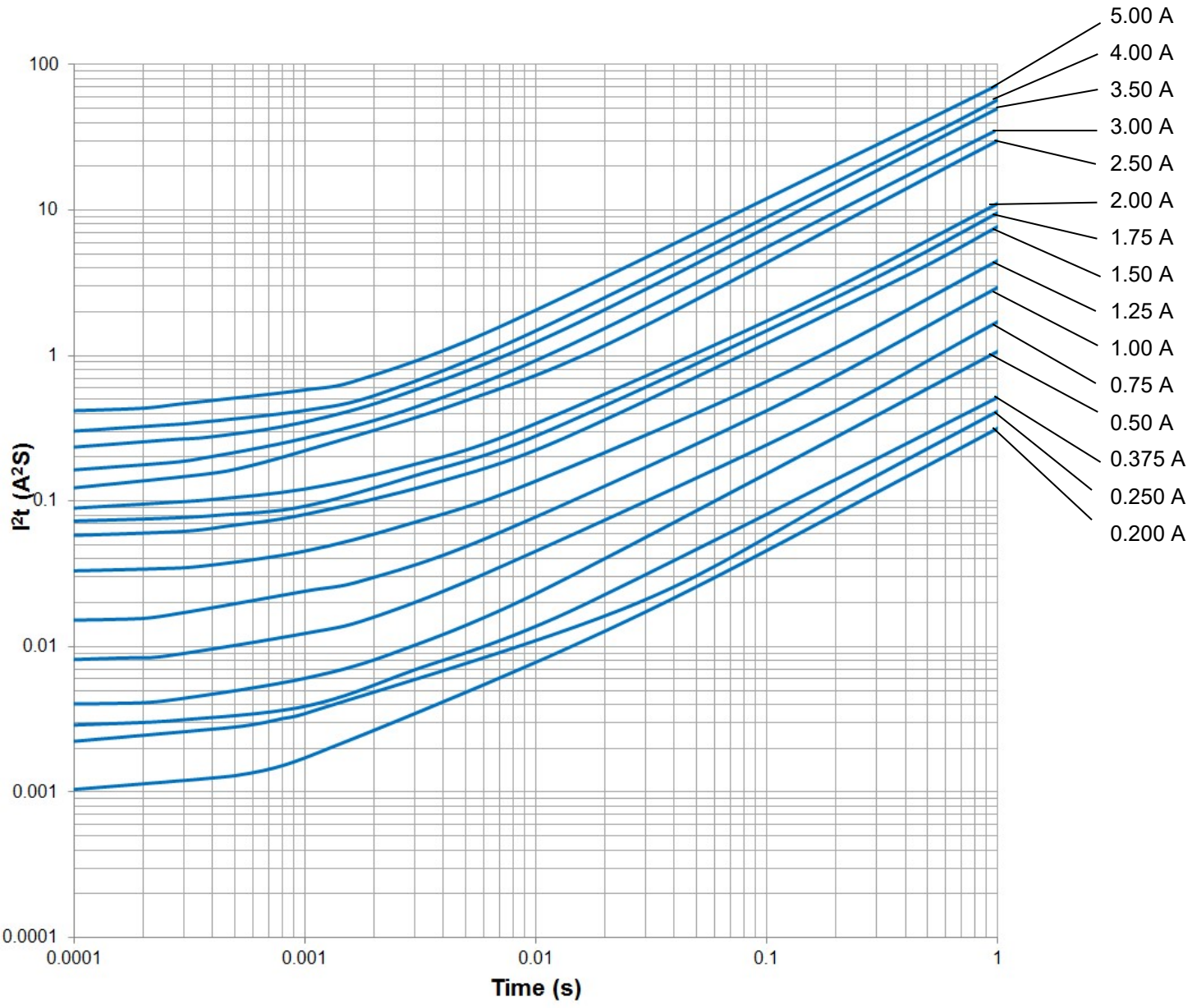
Average Pre-arcing Time Curves:



TF-FUSE® Thin Film Surface Mount Fuses

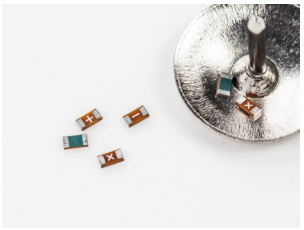
FF Series (Very Fast Acting), 0402 Size

Average I^2t vs. t Curves:



TF-FUSE® Thin Film Surface Mount Fuses

FF Series (Very Fast Acting), 0603 Size



Features:

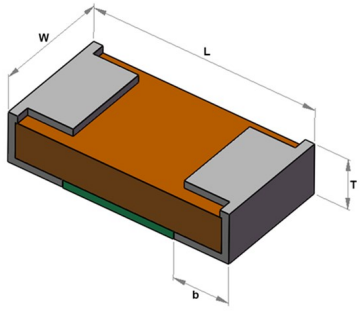
- Very fast acting at 200% overload current levels
- Low DCR
- High inrush current withstanding capability
- Fiberglass enforced epoxy fuse body
- Copper termination with nickel and tin plating
- Halogen free, RoHS compliance and lead-free

Clearing Time Characteristics:

% of Current Rating	Opening Time at 25°C
100%	4 hours min.
200%	5 seconds max.
300%	0.2 second max.

Shape and Dimensions:

Unit	Inch	mm
Length (L)	0.063 ± 0.004	1.60 ± 0.10
Width (W)	0.032 ± 0.004	0.81 ± 0.10
Thickness (T)	0.012 ± 0.004	0.30 ± 0.10
Termination bandwidth (b)	0.014 ± 0.004	0.36 ± 0.10



Applications:

- Panel
- Note book
- Toy
- HDD
- Finger Print
- Smart lock
- Battery Pack
- IoT

Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Typical Ratings and Characteristics:

Operating temperature: -55 to +90°C

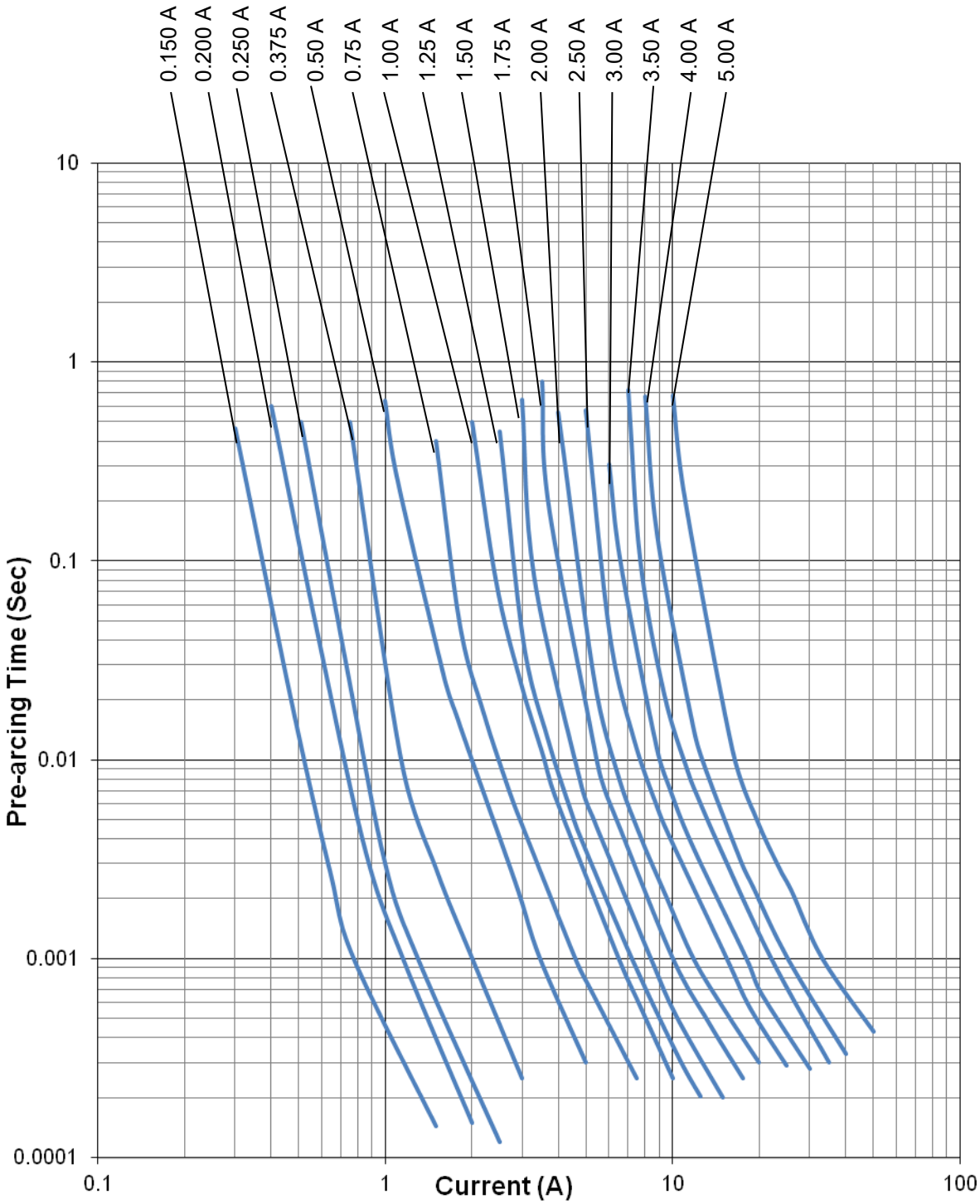
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Rating	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Marking
T0603FF0150TM	0.15	65	50A@35Vdc/ac 13A@65Vdc	2.2	0.0006	·
T0603FF0200TM	0.2	65		1.3	0.0014	··
T0603FF0250TM	0.25	65		1.1	0.0016	⁚
T0603FF0375TM	0.375	65		0.48	0.004	···
T0603FF0500TM	0.5	65		0.185	0.012	I
T0603FF0750TM	0.75	65		0.112	0.021	—
T0603FF1000TM	1	65		0.069	0.042	+
T0603FF1250TM	1.25	65	35A@35V dc/ac 13A@65Vdc	0.048	0.052	×
T0603FF1500TM	1.5	65		0.037	0.071	II
T0603FF1750TM	1.75	35	35A@35Vdc/ac 50A@24Vdc/ac	0.031	0.1	=
T0603FF2000TM	2	35		0.026	0.14	⫧
T0603FF2500TM	2.5	35		0.021	0.24	H
T0603FF3000TM	3	35		0.0176	0.33	III
T0603FF3500TM	3.5	35		0.0148	0.49	HH
T0603FF4000TM	4	35		0.0125	0.63	□
T0603FF5000TM	5	35		0.0095	1.1	O

[1] Measured at ≤ 10% of rated current and 25℃ ambient . [2] Melting I^2t at 0.001 sec.

TF-FUSE® Thin Film Surface Mount Fuses

FF Series (Very Fast Acting), 0603 Size

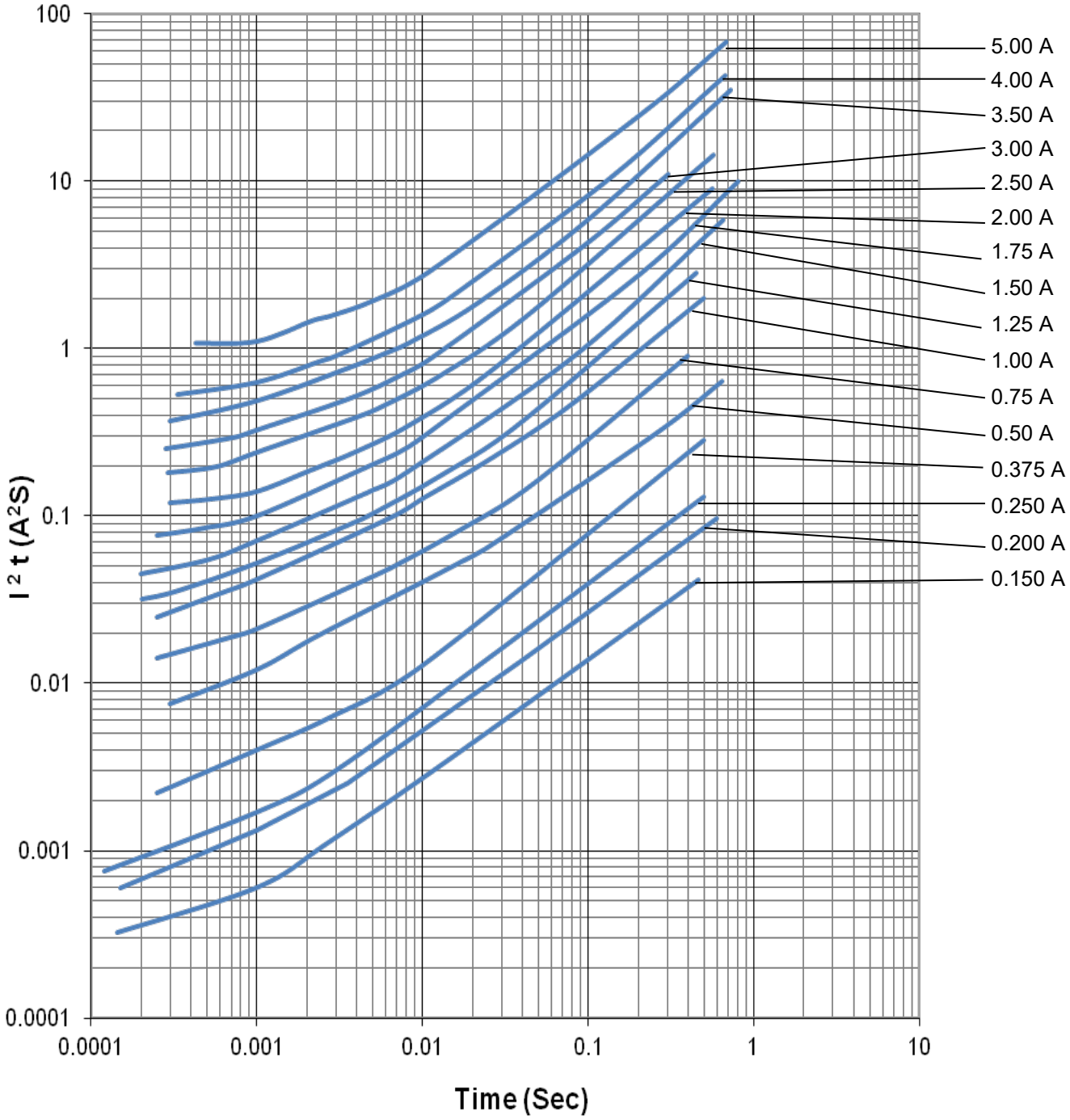
Average Pre-arcing Time Curves:



TF-FUSE® Thin Film Surface Mount Fuses

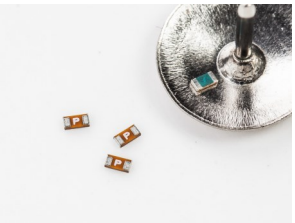
FF Series (Very Fast Acting), 0603 Size

Average I^2t vs. t Curves:



TF-FUSE® Thin Film Surface Mount Fuses

HI Series (High Inrush), 0603 Size



Features:

- Low DCR
- High inrush current withstanding capability
- Fiberglass enforced epoxy fuse body
- Copper termination with nickel and tin plating
- Halogen free, RoHS compliance and lead-free

Clearing Time Characteristics:

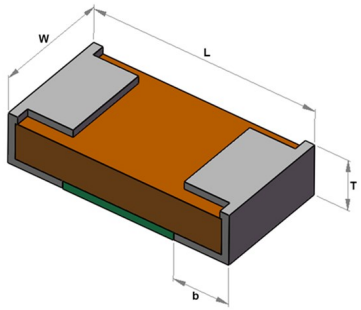
% of Current Rating	Opening Time at 25°C	
100%	4 hours min.	
200%	1 second min.	60 seconds max.
1000%	0.0002 second min.	0.02 second max.

Shape and Dimensions:

Unit	Inch	mm
Length (L)	0.063 ± 0.004	1.60 ± 0.10
Width (W)	0.032 ± 0.004	0.81 ± 0.10
Thickness (T)	0.014 ± 0.004	0.36 ± 0.10
Termination bandwidth (b)	0.014 ± 0.004	0.36 ± 0.10

Applications:

- Power tools
- DC-DC convert
- Panel
- PC
- Server
- Battery pack
- Set top box



Agency Approval:

Recognized Under the Components Program of UL.
File Number: E232989.

Typical Ratings and Characteristics:

Operating temperature: -55 to +90°C

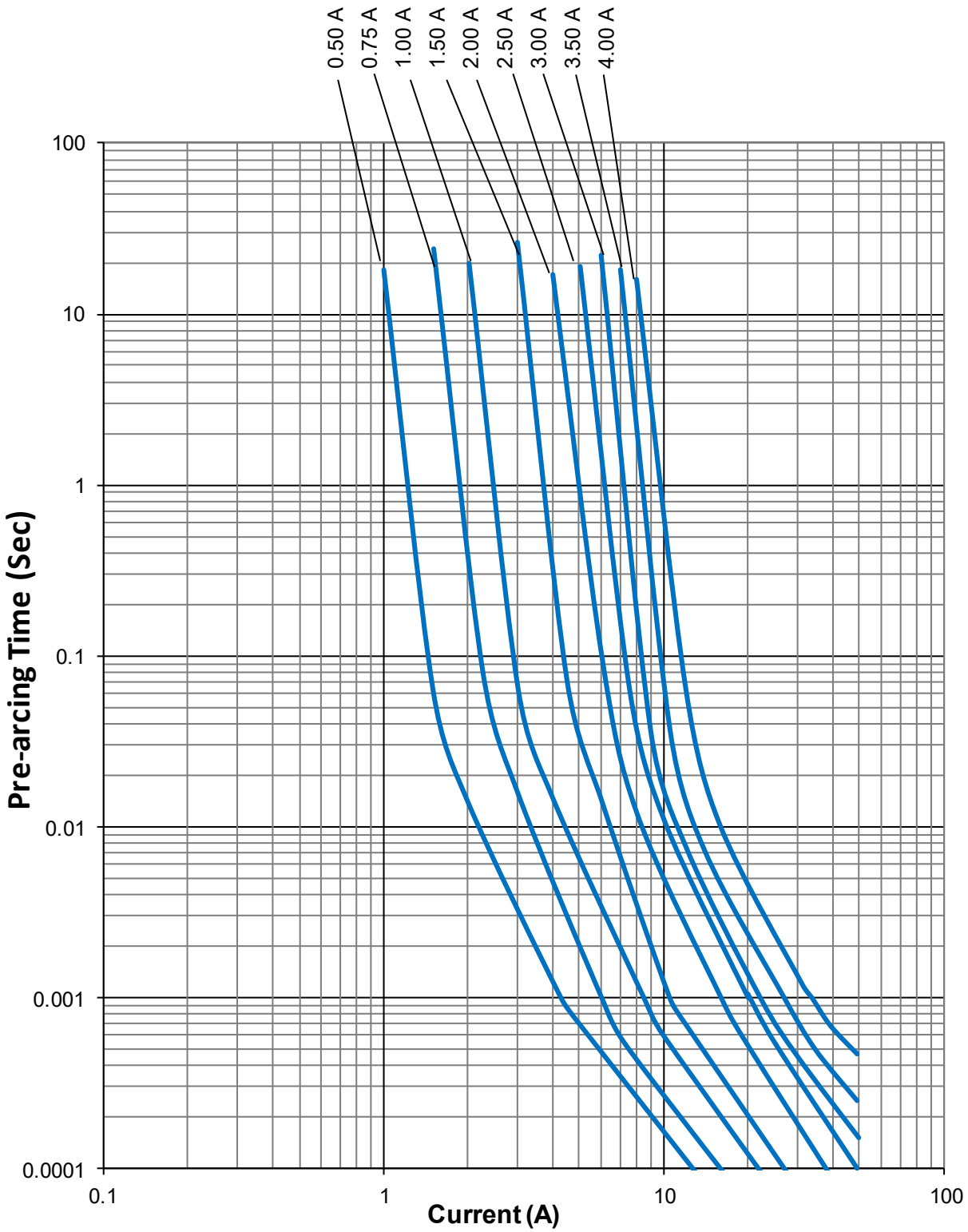
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Rating	Nominal Cold DCR (Ω)[1]	Nominal I^2t $(A^2s)^2$	Marking
T0603HI0500TM	0.50	65	50A@35Vdc/ac 13A@65Vdc	0.1550	0.019	C
T0603HI0750TM	0.75	65		0.0830	0.036	D
T0603HI1000TM	1.00	65		0.0500	0.052	E
T0603HI1500TM	1.50	65		0.0290	0.110	T
T0603HI2000TM	2.00	35	35A@35Vdc/ac 50A@24Vdc/ac	0.0200	0.310	F
T0603HI2500TM	2.50	35		0.0165	0.400	J
T0603HI3000TM	3.00	35		0.0140	0.600	L
T0603HI3500TM	3.50	35		0.0120	0.800	N
T0603HI4000TM	4.00	35		0.0095	1.200	P

[1] Measured at ≤ 10% of rated current and 25℃ ambient .
[2] Melting I^2t at 0.001 sec.

TF-FUSE® Thin Film Surface Mount Fuses

HI Series (High Inrush), 0603 Size

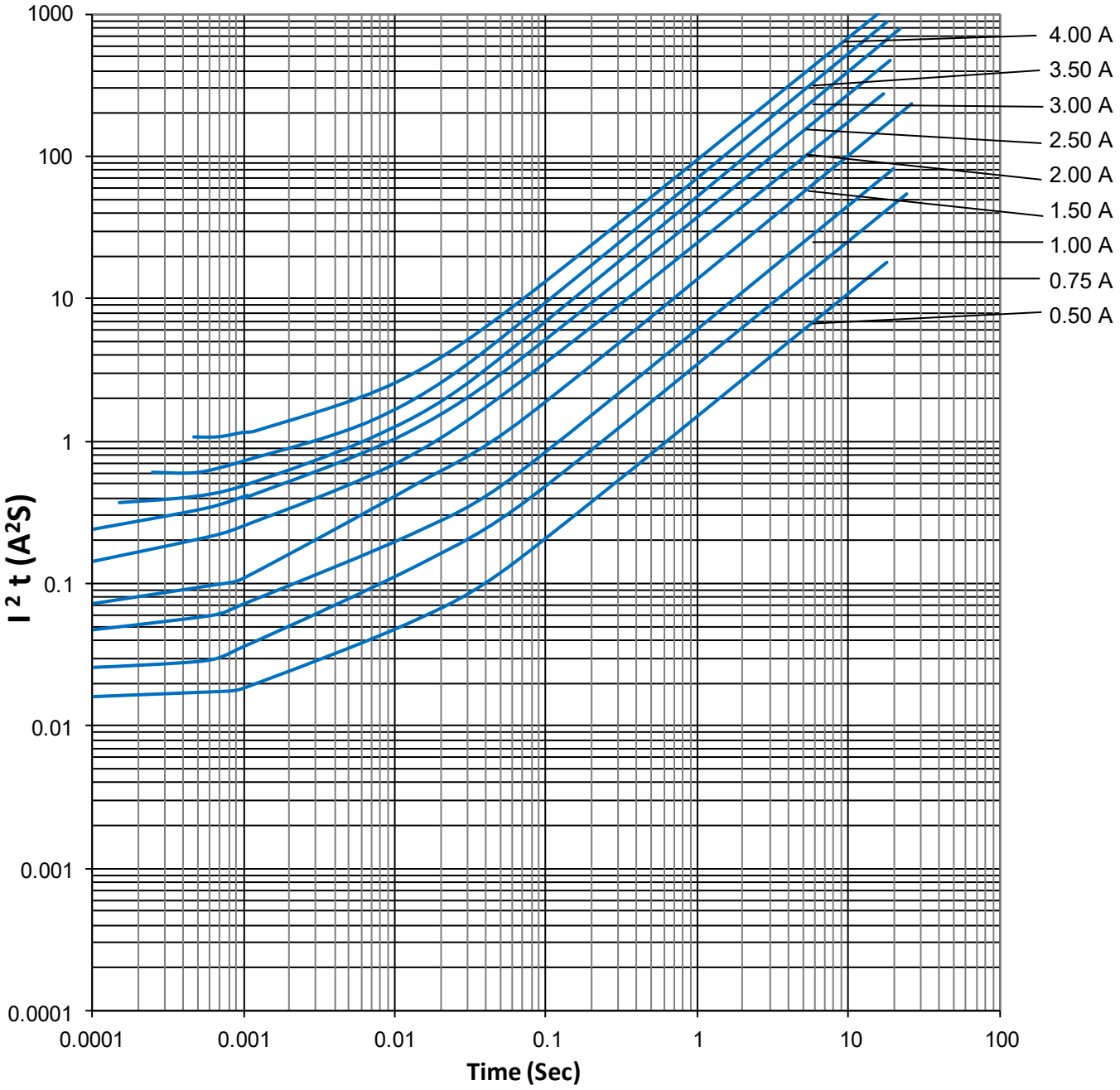
Average Pre-arcing Time Curves:



TF-FUSE® Thin Film Surface Mount Fuses

HI Series (High Inrush), 0603 Size

Average I^2t vs. t Curves:



AirMatrix® Surface Mount Fuses

Product Identification:

AF2 1.00 V125 T M
(1) (2) (3) (4) (5)

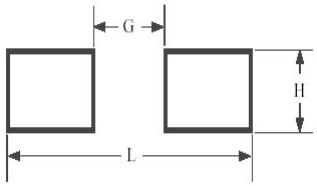
(1) Series Code: AF2
(2) Current Rating Code: 1.00—1.00A
(3) Voltage Rating Code: V125—125VDC
(4) Package Code: T - Tape & Reel, B - Bulk
(5) Marking Code: M - With Marking

AF 1206 F 2.00 T M
(1) (2) (3) (4) (5) (6)

(1) Series Code: AF—AF Series, MF—MF Series
(2) Size Code: Standard EIA Chip Sizes
(3) Time/Current Characteristic: F
(4) Current Rating: 2.00—2.00A
(5) Package Code: T - Tape & Reel, B - Bulk
(6) Marking Code: M - With Marking

Recommended Land Pattern:

	AF2		AF1206		MF2410	
	Inch	mm	Inch	mm	Inch	mm
L	0.338	8.60	0.173	4.40	0.338	8.60
G	0.118	3.00	0.059	1.50	0.118	3.00
H	0.124	3.15	0.071	1.80	0.110	2.80



Packaging:

Chip Size	Parts on 7 inch (178 mm) Reel
2410 (6125)	2,000
1206 (3216)	3,500

Storage:

The maximum ambient temperature shall not exceed 35°C . Storage temperatures higher than 35°C could result in the deformation of packaging materials.
The maximum relative humidity recommended for storage is 75%. High humidity with high temperature can accelerate the oxidation of the solder plating on the termination and reduce the solderability of the components.
Sealed vacuum foil bags with desiccant should only be opened prior to use.
The products should not be stored in areas where harmful gases containing sulfur or chlorine are present.

AirMatrix® Surface Mount Fuses

Fuse Selection and Temperature De-rating Guideline:

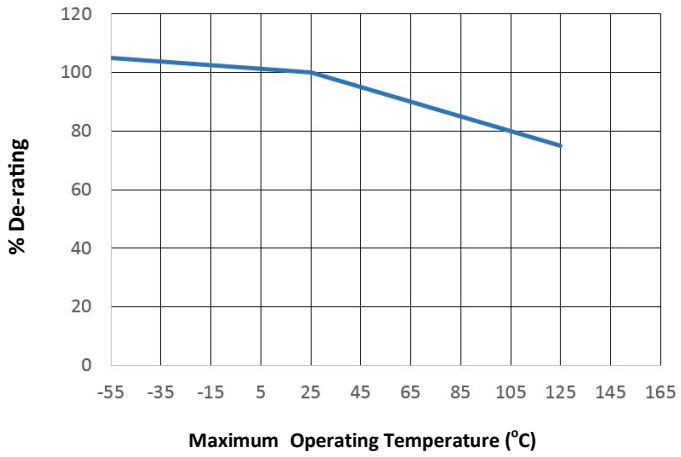
The ambient temperature affects the current carrying capacity of fuses. When a fuse is operating at a temperature higher than 25°C, the fuse shall be "de-rated".

To select a fuse from the catalog, the following rule may be followed:

Catalog Fuse Current Rating = Nominal Operating Current / 0.75 / % De-rating at the maximum operating temperature.

Example: At maximum operating temperature of 65°C, % De-rating is 90%. The nominal operating current is 4 A. The current rating for fuse selected from the catalog shall be:

4 / 0.75 / 90% = 5.9 or 6.3 A.



Environmental Tests:

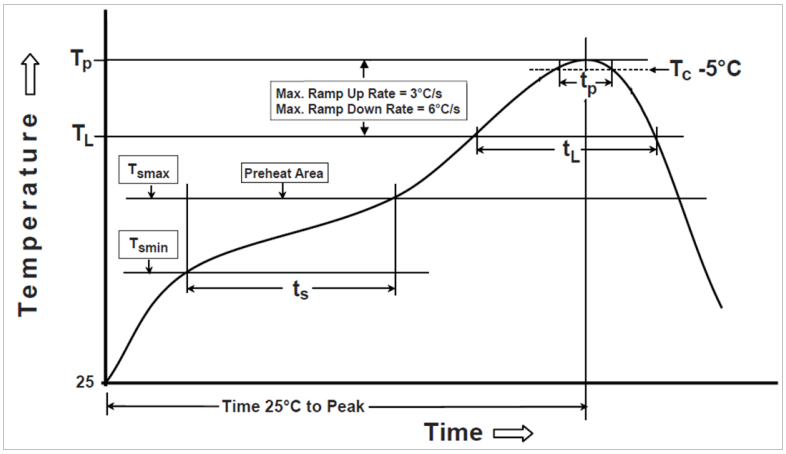
No.	Reliability Test	Test Condition and Requirement	Test Reference
1	Bend	2 mm bend, DCR change within ±20% (±10% for≤1A), no mechanical damage.	IEC60068-2-21
2	Solderability	245°C , 5 seconds, new solder coverage ≥95%	MIL-STD-202 Method 208
3	Soldering Heat Resistance	260°C, 10 seconds, 20% DCR change max. (10% for ≤ 1 A), new solder coverage 75% minimum	MIL-STD-202 Method 210
4	Life	80% rated current (75% for <1A), 2000 hours, ambient temperature (from +20°C to 30° C), voltage drop change within ±10%	Refer to AEM QIQ106
5	Thermal Shock	-65°C to +125°C, 100 cycles, DCR change ≤ ±10%, no mechanical damage	MIL-STD-202 Method 107
6	Mechanical Vibration	5 – 3000 Hz, 0.4 inch double amplitude or 30 G peak, DCR change ≤ ±10%, no mechanical damage	MIL-STD-202 Method 204
7	Mechanical Shock	1500 G, 0.5 milliseconds, half-sine shocks, DCR change ≤ ±10%, no mechanical damage	MIL-STD-202 Method 213
8	Salt Spray	5% salt solution, 48 hour exposure, DCR change ≤ ±10%, no excessive corrosion	MIL-STD-202 Method 101
9	Moisture Resistance	10 cycles, DCR change ≤ ±10%, no excessive corrosion	MIL-STD-202 Method 106

Moisture Sensitivity Level 1

AirMatrix® Surface Mount Fuses

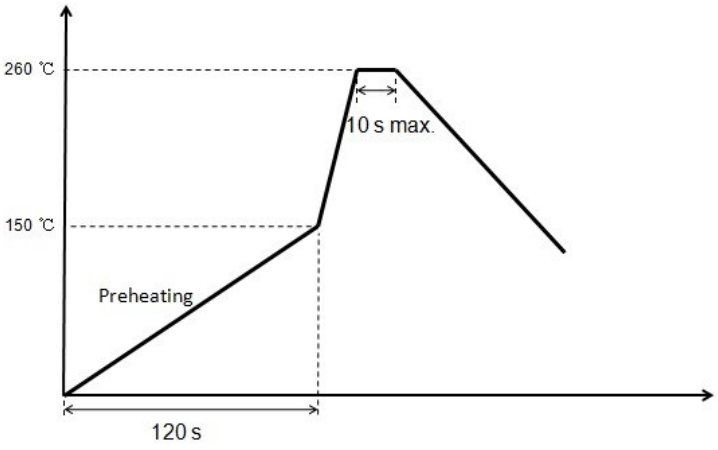
Soldering Temperature Profile:

* Recommended Temperature Profile for Reflow Soldering



Profile Feature	Pb-Free Assembly
Preheat/Soak	
Temperature Min (T_{smin})	150°C
Temperature Max(T_{smax})	200°C
Time(t_s) from (T_{smin} to T_{smax})	60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature(T_L)	217°C
Time(t_L) maintained above T_L	60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

* Recommended Temperature Profile for Wave Soldering



AirMatrix® Surface Mount Fuses

AF Series, 2410 Size

Features:

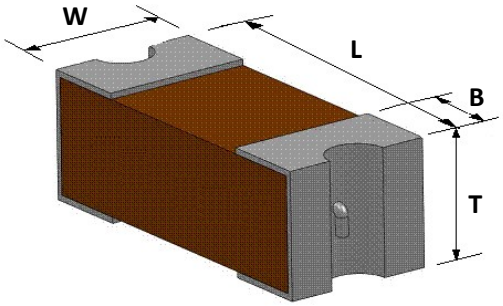
- Fast acting at 200% overload current level
- Excellent inrush current withstanding capability
- Fiberglass enforced epoxy fuse body
- Copper or copper alloy composite fuse link
- Copper termination with nickel and tin plating
- Halogen free, RoHS compliant and 100% lead-free
- Operating temperature range: -55°C to +125°C (with de-rating)

Clearing Time Characteristics:

% of Current Rating	Clearing Time at 25°C	
100%	4 hours min.	
200%(0.50~10.0 A)	0.01 seconds min.	5 seconds max.
200%(12.0~20.0 A)	0.01 seconds min.	20 seconds max.

Shape and Dimensions:

Unit	Inch	mm
L	0.240 ± 0.006	6.10 ± 0.15
W	0.098 ± 0.006	2.49 ± 0.15
T	0.085 ± 0.008	2.16 ± 0.20
B	0.053 ± 0.015	1.35 ± 0.38



Application Fields:

- Power Supply, e.g. DC/DC converters, DC/AC inverters, Backlight drivers
- Consumer Electronics, e.g. LCD TVs, PDP, DVDs, PCM
- Communication Technology, e.g. Telecom systems, Networking, Modems, Routers, Changers, Base stations
- Office Automation Electronics
- IT Products, e.g. LCD monitors, Notebooks, PC servers
- Power Tool
- Medical device
- Lighting

Agency Approval:

- Recognized Under the Components Program of Underwriters Laboratories. File Number: E232989
- PSE Certificate No: JD60132863（1-2A), JD60136813 (2.5-15A)
- TUV File Number: 50209083 (0.5-2A)，50425086 (2.5-15A), 50425127 (20A)
- CQC No.: CQC11012065955

AirMatrix® Surface Mount Fuses

AF Series, 2410 Size

Ordering Information:

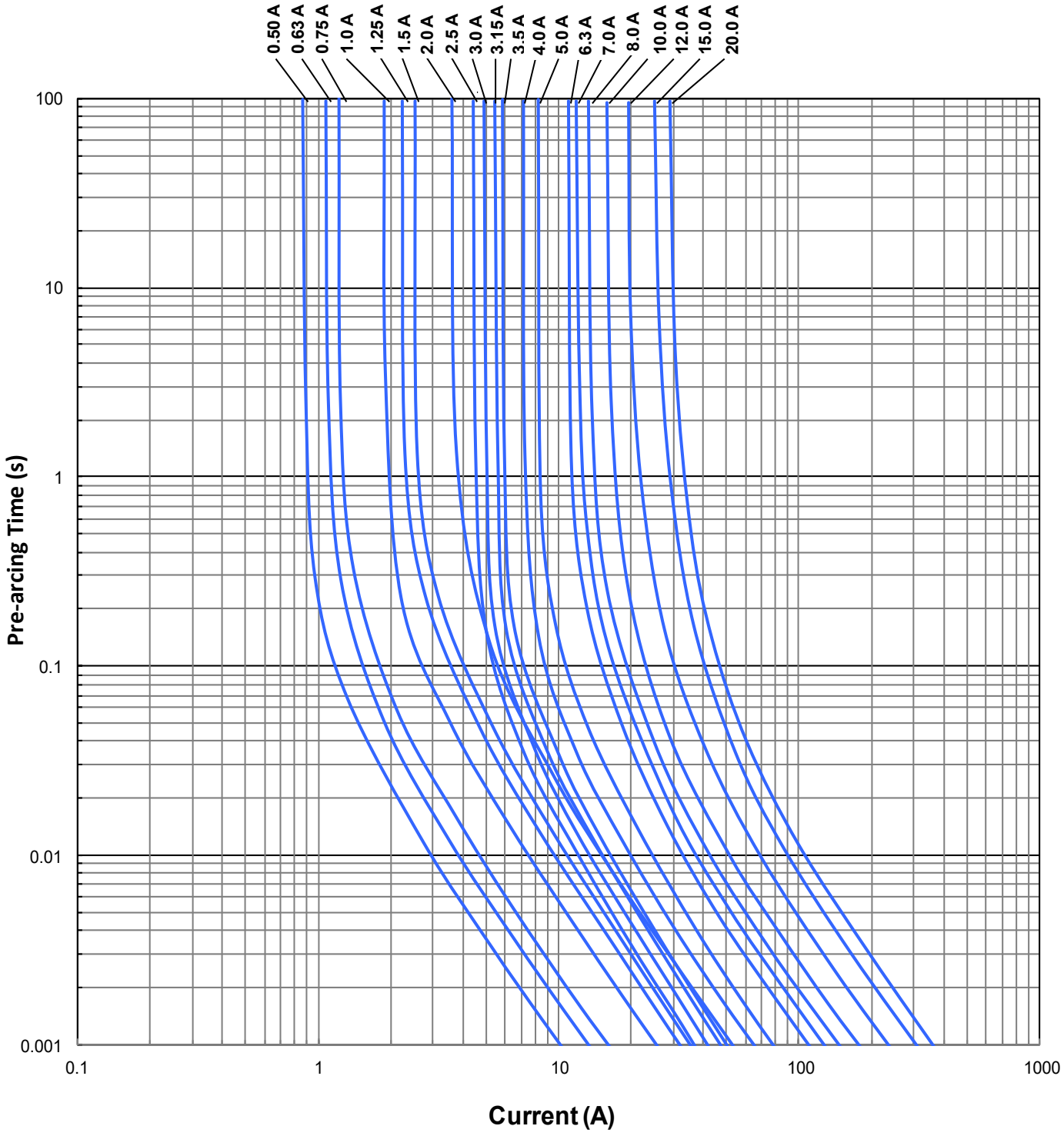
Part Number	Current Rating (A)	Voltage Rating (V)		Interrupting Rating	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)[2]	Agency Approval				Marking (Optional)[3]
		AC	DC				UL	PSE	TUV	CQC	
AF2-0.50V125TM	0.5	250	125	**TUV:** **0.5 ~ 2 A** *100A @ 250VAC* *50A @ 125VDC* **2.5 ~ 10 A** *50A @ 125VDC* **15 ~ 20 A** *50A @ 65VDC* **CQC:** **0.5A、1A、2A** *100A @ 250VAC* *50A @ 125VDC* **PSE:** **1 ~ 2A** *100A @ 250VAC* *50A @ 125VDC* **2.5 ~ 10A** *50A @ 125VDC* **15A** *50A @ 65VDC* **UL:** **0.5 ~ 2A** *100A @ 250VAC* **2.5 ~8A** *50A @ 125VAC* ***10A*** *300A @ 32VDC* *50A @ 125VDC* *35A @ 125VAC* ***12 ~ 15A*** *300A @ 32VDC* *50A @ 65VDC* *50A @ 65VAC* ***20A*** *300A @ 32VDC* *100A @ 65VDC* *50A @ 65VAC*	0.231	0.10	√		√	√	C
AF2-0.63V125TM	0.63				0.174	0.16	√		√		S
AF2-0.75V125TM	0.75				0.148	0.23	√				D
AF2-1.00V125TM	1.0				0.093	0.59	√	√	√	√	E
AF2-1.25V125TM	1.25				0.07	0.96	√	√	√		F
AF2-1.50V125TM	1.5				0.062	1.19	√	√			G
AF2-2.00V125TM	2.0				0.042	2.75	√	√	√	√	I
AF2-2.50V125TM	2.5	125			0.031	1.21	√	√	√		J
AF2-3.00V125TM	3.0				0.0249	1.73	√	√	√		K
AF2-3.15V125TM	3.15				0.0232	2.2	√	√	√		V
AF2-3.50V125TM	3.5				0.022	2.5	√				L
AF2-4.00V125TM	4.0				0.0172	4.1	√	√	√		M
AF2-5.00V125TM	5.0				0.0143	5.9	√	√	√		N
AF2-6.30V125TM	6.3				0.01	12.5	√	√	√		O
AF2-7.00V125TM	7.0				0.0094	14.2	√				P
AF2-8.00V125TM	8.0				0.0086	20.3	√	√	√		R
AF2-10.0V125TM	10.0				0.0066	29.2	√	√	√		Q
AF2-12.0V065TM	12.0	65	65		0.0053	49.2	√				X
AF2-15.0V065TM	15.0				0.0038	102.5	√	√	√		Y
AF2-20.0V065TM	20.0				0.0034	126.2	√		√		Z

1. Measured at ≤ 10% rated current and 25°C ambient.
2. Melting I^2t at 0.001 second pre-arcing time.
3. White Marking Character Code.

AirMatrix® Surface Mount Fuses

AF Series, 2410 Size

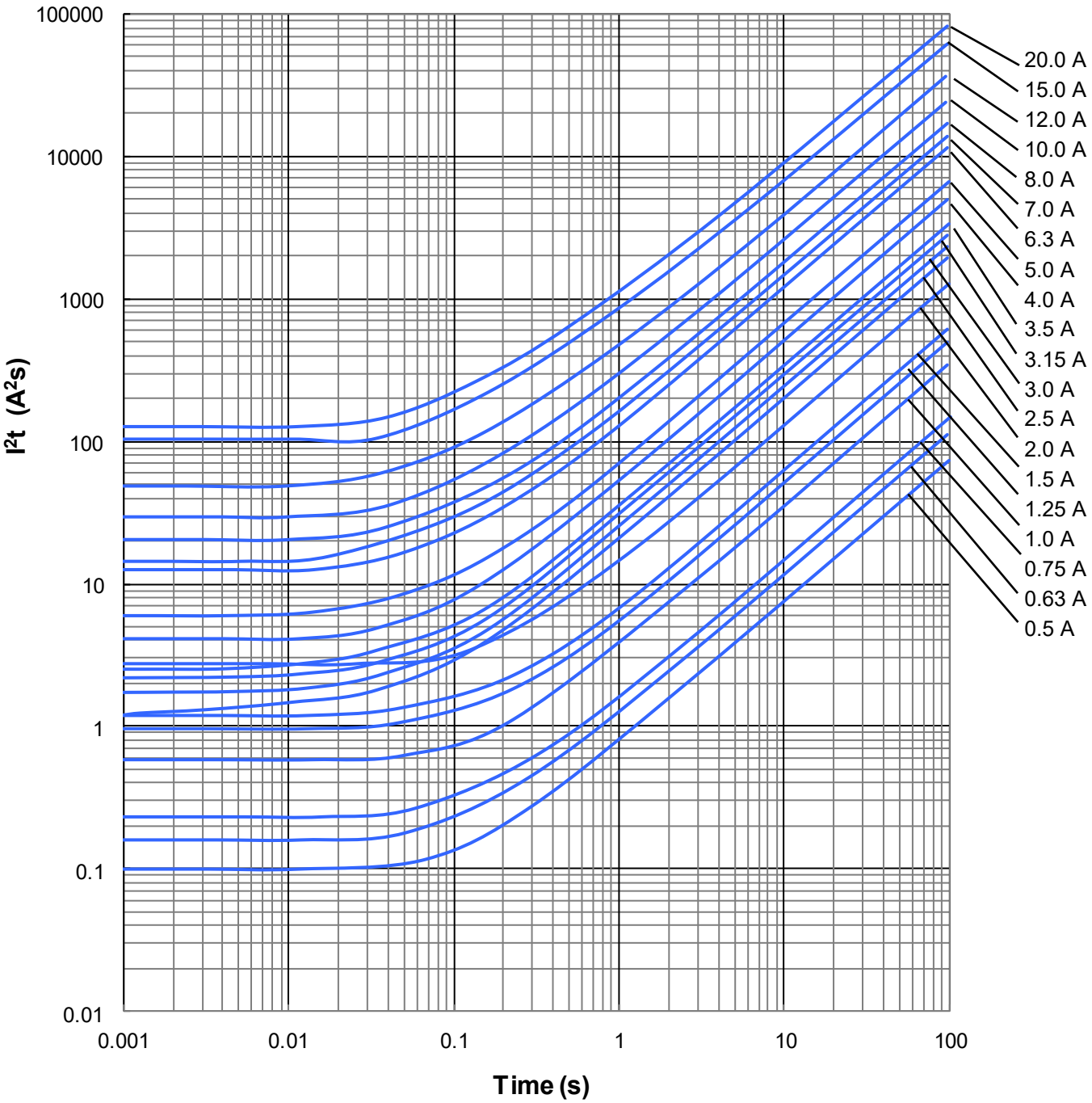
Average Pre-arcing Time Curves:



AirMatrix® Surface Mount Fuses

AF Series, 2410 Size

Average I^2t vs. t Curves:



AirMatrix® Surface Mount Fuses

AF Series, 1206 Size

Features:

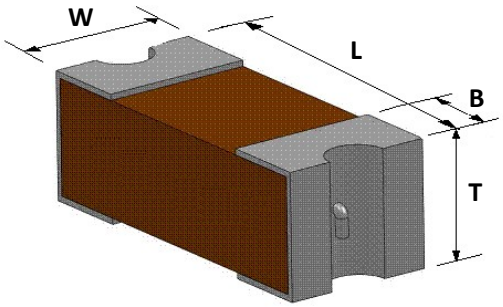
- Fast acting at 250% overload current level
- Excellent inrush current withstanding capability
- Extremely thin body for space saving
- Much safer with wire-in-air design
- Fiberglass enforced epoxy fuse body
- Copper termination with nickel and tin plating
- Operating temperature range: -55°C to +125 °C (with de-rating)
- 100% lead-free

Clearing Time Characteristics:

% of Current Rating	Clearing Time at 25°C	
	Min.	Max.
100%	4 hour	
250%		5 seconds

Shape and Dimensions:

Unit	Inch	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 + 0.012 / -0.004	1.60 + 0.30 / -0.20
T	0.042 ± 0.006	1.08 ± 0.15
B	0.033 ± 0.012	0.85 ± 0.30



Application Fields:

- Notebook
- Backlight Driver
- DC/DC Converter
- Low voltage lighting power
- Automotive electronics
- Power adapter
- Panel
- Server
- Battery pack
- Medical Device

Agency Approval:

- Recognized Under the Components Program of Underwriters Laboratories. File Number: E232989
- TUV File Number: 50425087 (1.5-8A), 50425128 (10-15A)

AirMatrix® Surface Mount Fuses

AF Series, 1206 Size

Ordering Information:

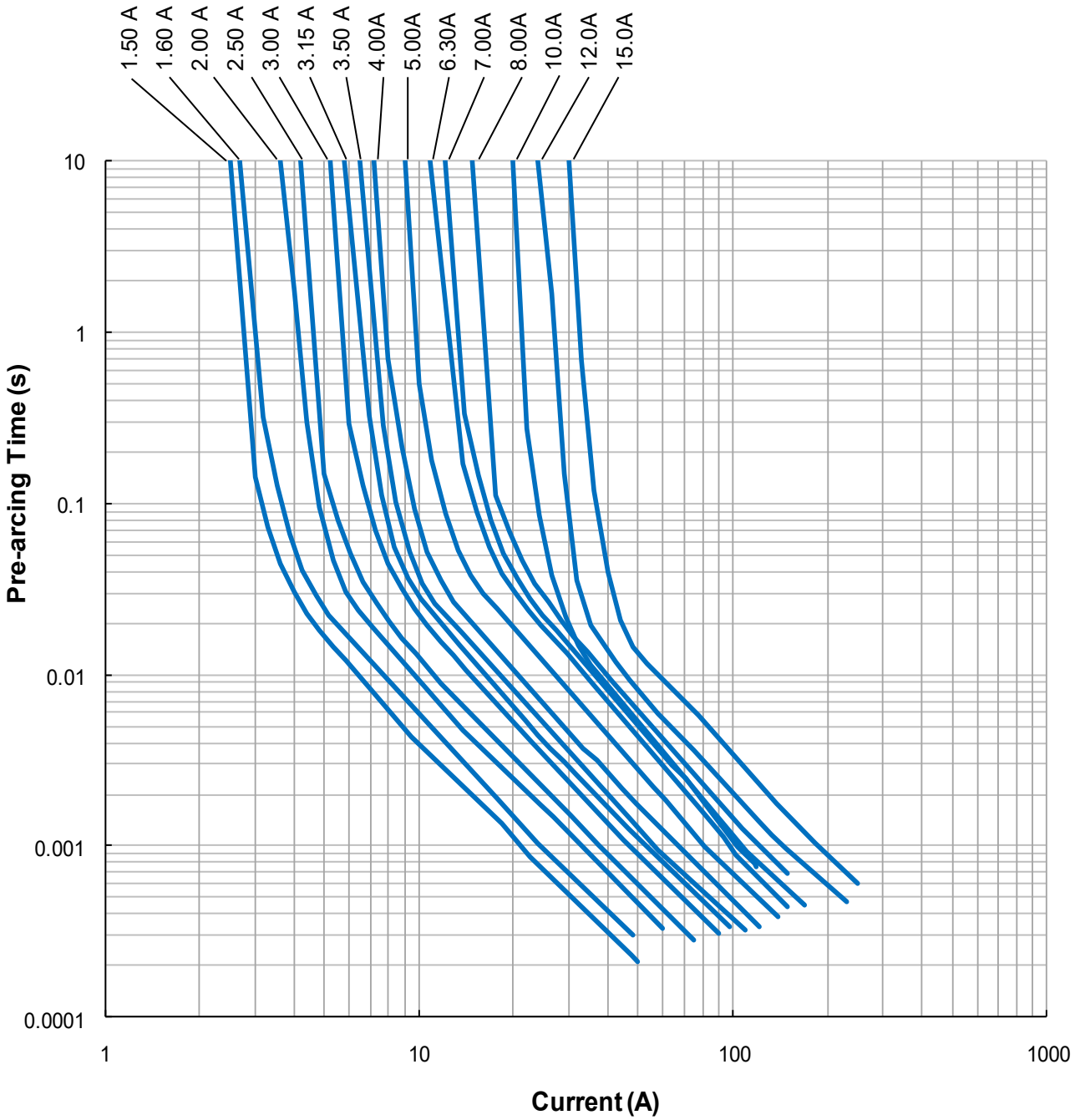
Part Number	Current Rating (A)	Marking (White)	Voltage Rating (Vdc)	Interrupting Rating	Nominal Cold DCR (Ω)[1]	Nominal I^2t (A^2s)	Agency Approval (TUV)
AF1206F1.50TM	1.50	G	65	50A@65Vdc	0.050	0.37	√
AF1206F1.60TM	1.60	T			0.043	0.52	√
AF1206F2.00TM	2.00	I			0.032	0.88	√
AF1206F2.50TM	2.50	J			0.028	1.1	√
AF1206F3.00TM	3.00	K			0.022	1.9	√
AF1206F3.15TM	3.15	V			0.020	2.2	√
AF1206F3.50TM	3.50	L			0.018	2.6	
AF1206F4.00TM	4.00	M			0.016	3.3	√
AF1206F5.00TM	5.00	N	32	50A@32Vdc	0.013	5.4	√
AF1206F6.30TM	6.30	O			0.010	8.9	√
AF1206F7.00TM	7.00	P			0.0092	10.4	
AF1206F8.00TM	8.00	R			0.0084	13.5	√
AF1206F10.0TM	10.0	Q			0.0050	11.2	√
AF1206F12.0TM	12.0	X			0.0041	15.0	
AF1206F15.0TM	15.0	Y			0.0035	24.5	√

1. Resistance is measured at ≤10% of rated current and 25℃ ambient.
2. Melting I^2t is calculated at 0.001 second pre-arcing time.

AirMatrix® Surface Mount Fuses

AF Series, 1206 Size

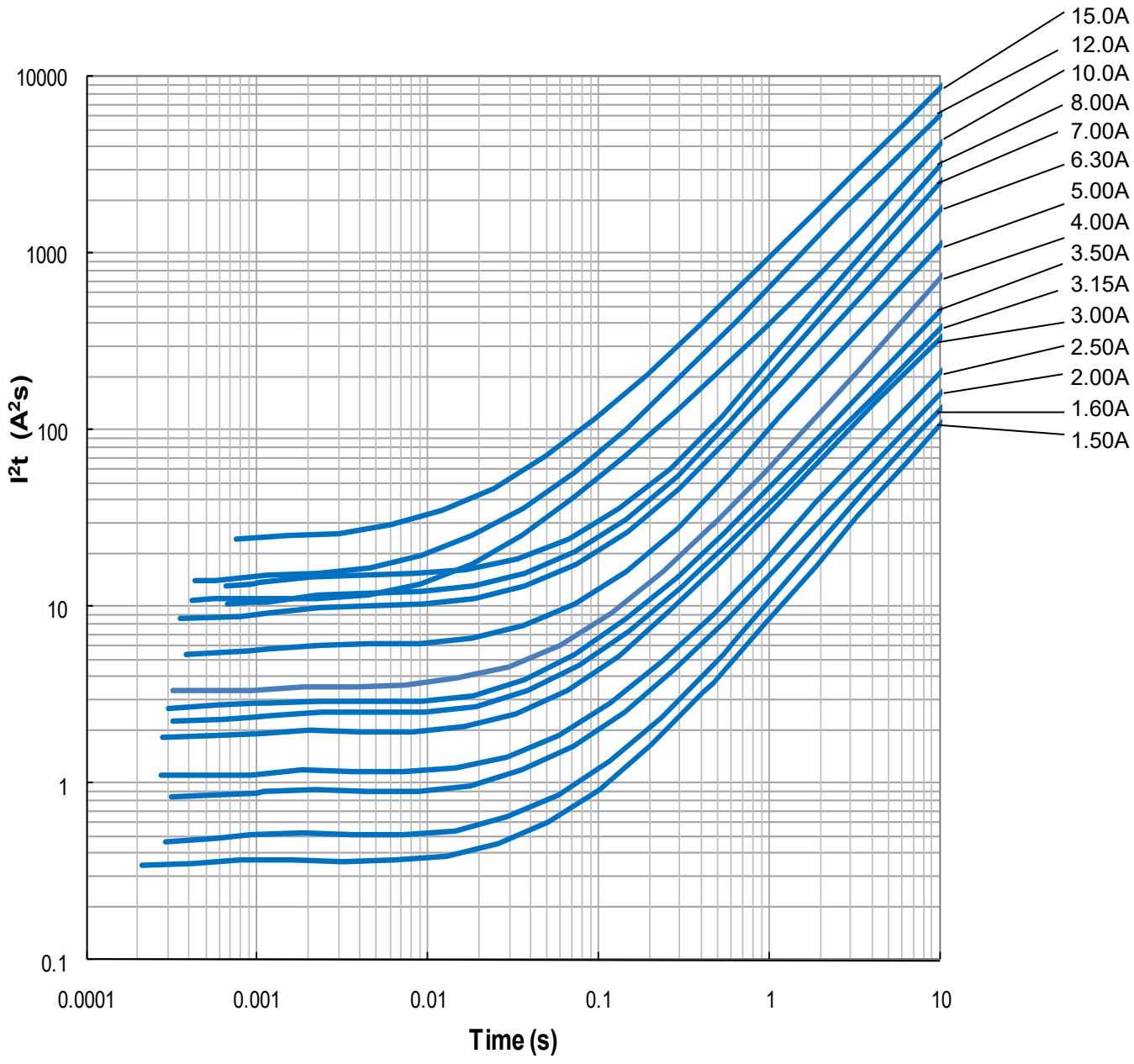
Average Pre-arcing Time Curves:



AirMatrix® Surface Mount Fuses

AF Series, 1206 Size

Average I^2t vs. t Curves:



AirMatrix® Surface Mount Fuses

MF Series, 2410 Size

Features:

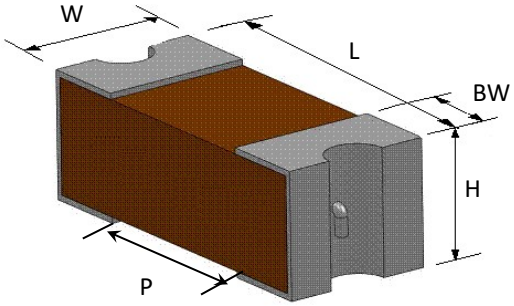
- Extremely small size with 250 VAC rating
- Surface mount fuses in AC applications
- Excellent inrush current withstanding capability
- Fiberglass enforced epoxy fuse body
- Copper termination with nickel and tin plating
- 100% lead-free
- Operating temperature range: -55°C to +125 °C (with de-rating)
- Compliant with IEC 60127-4

Clearing Time Characteristics:

% of Current Rating	Clearing Time at 25°C	
	Min.	Max.
125%	1 hour	
200%		120 seconds
1000%	0.001 seconds	0.01 seconds

Shape and Dimensions:

	Inch	mm
L	0.240 ± 0.006	6.10 ± 0.15
W	0.098 ± 0.006	2.49 ± 0.15
H	0.085 ± 0.008	2.16 ± 0.20
BW	0.053 ± 0.015	1.35 ± 0.38
P	⩾ 0.118	⩾ 3.00



Application Fields:

- Power tools
- DC-DC convert
- Power adapter
- Panel
- Server
- Battery pack
- Medical
- Lighting
- Industrial Equipment
- White Goods

Agency Approval:

Agency	File No.
UL	E232989
CQC	CQC11012065956
KC	SU05038-12001/12002
PSE	JD 60130890
VDE	40034853

AirMatrix® Surface Mount Fuses

MF Series, 2410 Size

Ordering Information:

Part Number	Current Rating (A)	Voltage Rating (Vac)	Interrupting Ratings	Nominal Cold DCR (Ω)[1]	Voltage Drop Max. (mV)[2]	Nominal I^2t (A^2s)[3]	Marking (Black)
MF2410F0.500TM	0.50	250	100A @ 250Vac	0.206	166	0.11	C
MF2410F0.630TM	0.63	250		0.148	144	0.20	S
MF2410F0.800TM	0.80	250		0.109	139	0.35	H
MF2410F1.000TM	1.00	250		0.084	129	0.62	E
MF2410F1.250TM	1.25	250		0.065	128	1.00	F
MF2410F1.600TM	1.60	250		0.049	127	1.80	T
MF2410F2.000TM	2.00	250		0.038	123	3.00	I

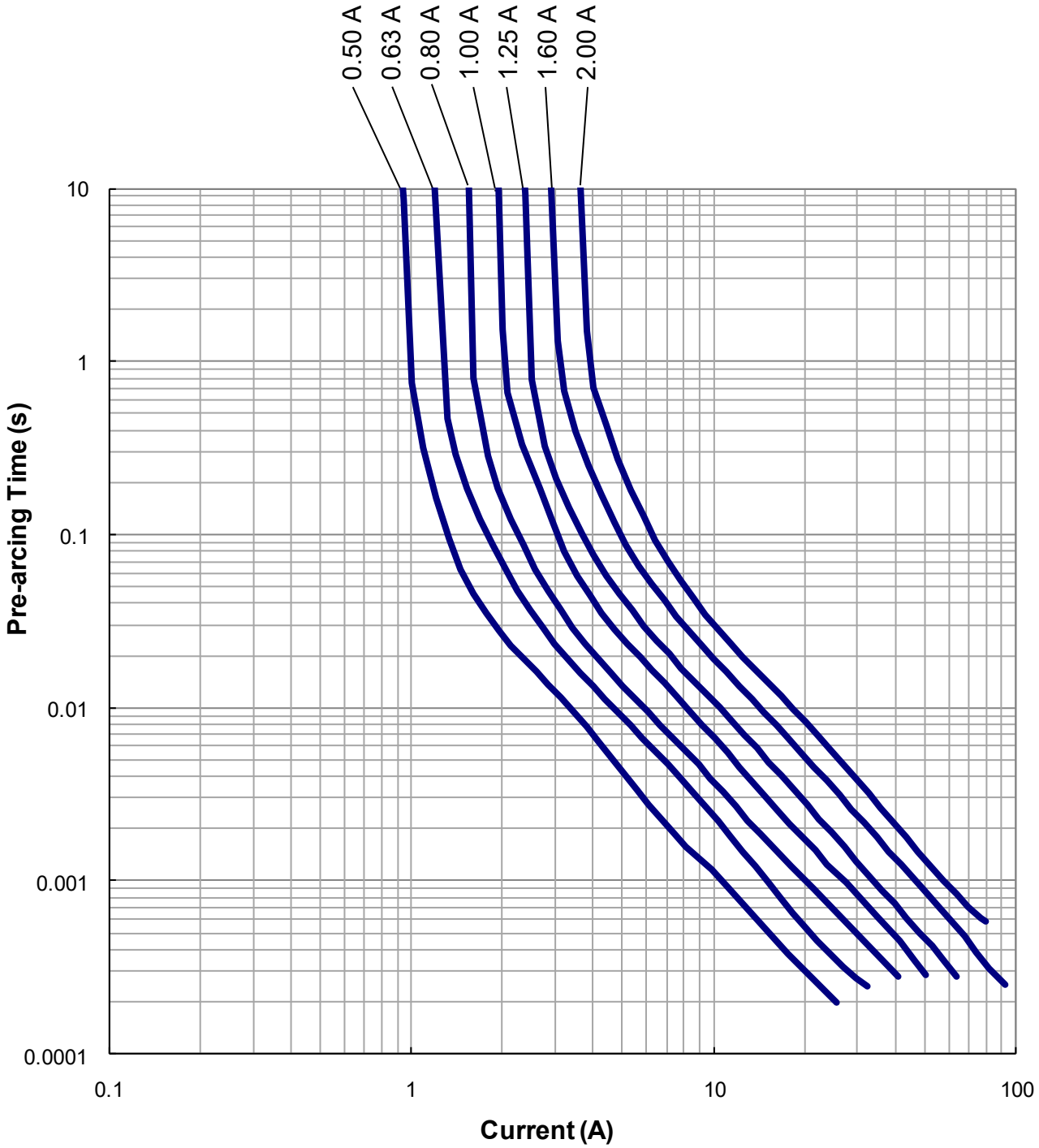
Notes:

1. Resistance is measured at ≤10% of rated current and 25℃ ambient.
2. Voltage drop is measured at 100% of rated current.
3. Melting I^2t is calculated at 0.001 second pre-arcing time.

AirMatrix® Surface Mount Fuses

MF Series, 2410 Size

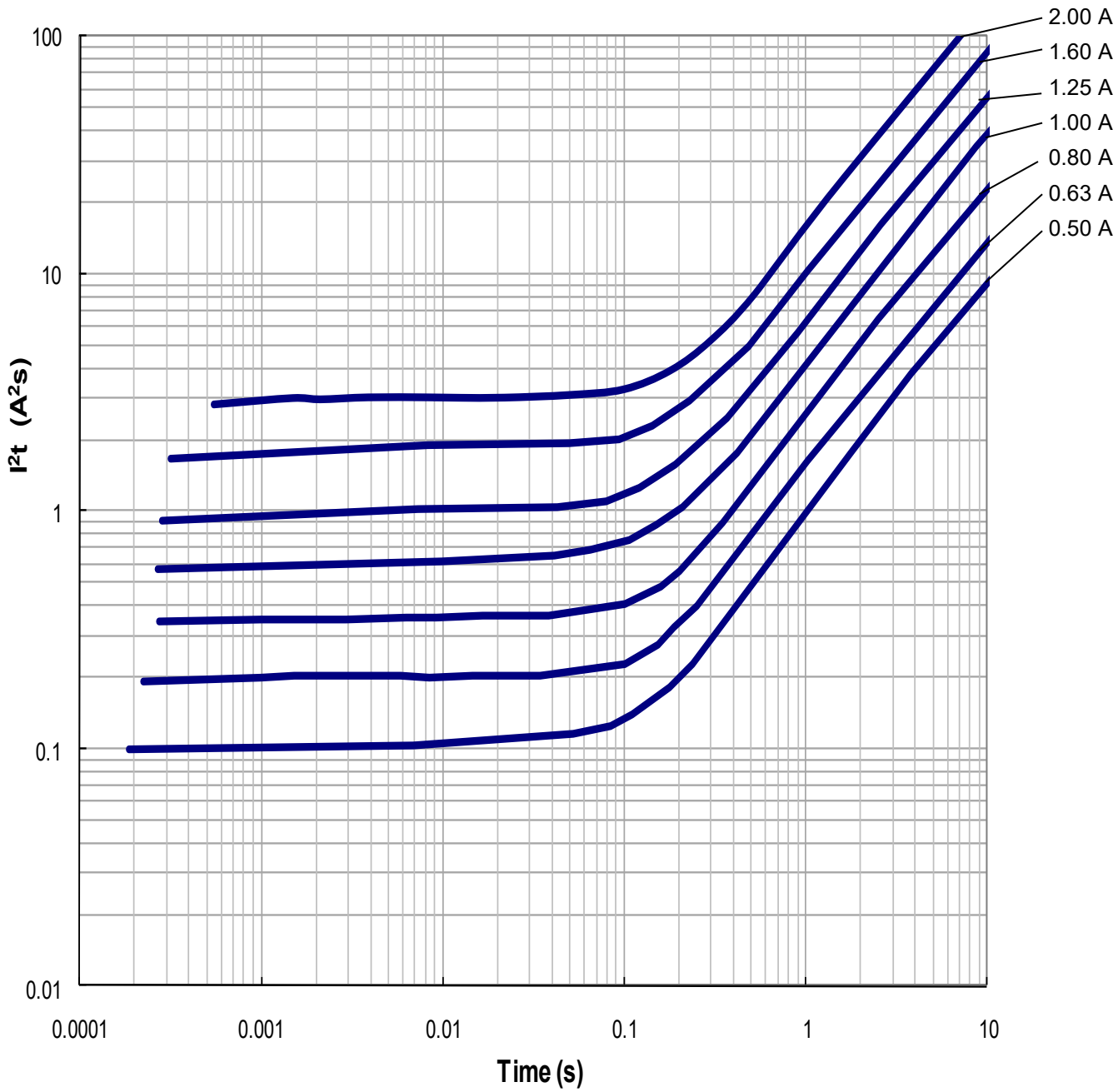
Average Pre-arcing Time Curves:



AirMatrix® Surface Mount Fuses

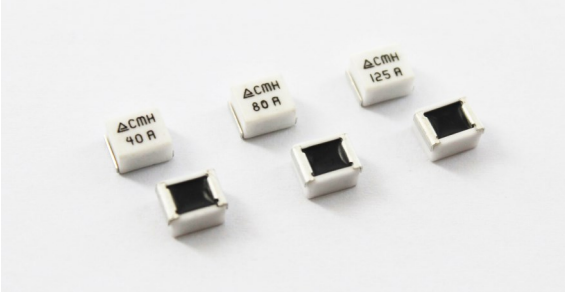
MF Series, 2410 Size

Average I^2t vs. t Curves:



High Power Surface Mount Fuse

CM2822H Series



Features:

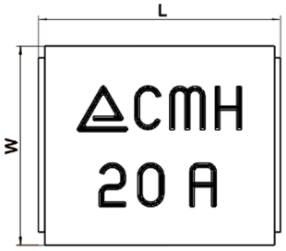
- High safety with ceramic body and special arc-extinguishing filler
- High interrupting current ratings for high power protection
- Single small case size for current rating from 20A to 125A
- High reliability for long time operation
- Automotive grade with AEC-Q200 qualification
- Halogen free, RoHS compliant and 100% lead-free

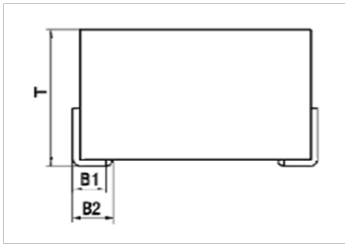
Clearing Time Characteristics:

% of Current Rating	Clearing Time at 25°C	
	Min.	Max.
100%	4 hours	
250%		60 seconds

Shape and Dimensions:

Unit	Inch	mm
L	0.287 ± 0.012	7.3 ± 0.3
W	0.228 ± 0.008	5.8 ± 0.2
T	0.165 ± 0.008	4.2 ± 0.2
B1	0.051 ± 0.012	1.3 ± 0.3
B2	0.063 ± 0.012	1.6 ± 0.3





Applications:

- Server Systems
- Routers and switches
- Telecom DC/DC Power
- Drones
- Power tools
- Battery and BMS

Agency Approval:

Recognized Under the Components Program of Underwriters Laboratories. File Number: E507943.

Ordering Information:

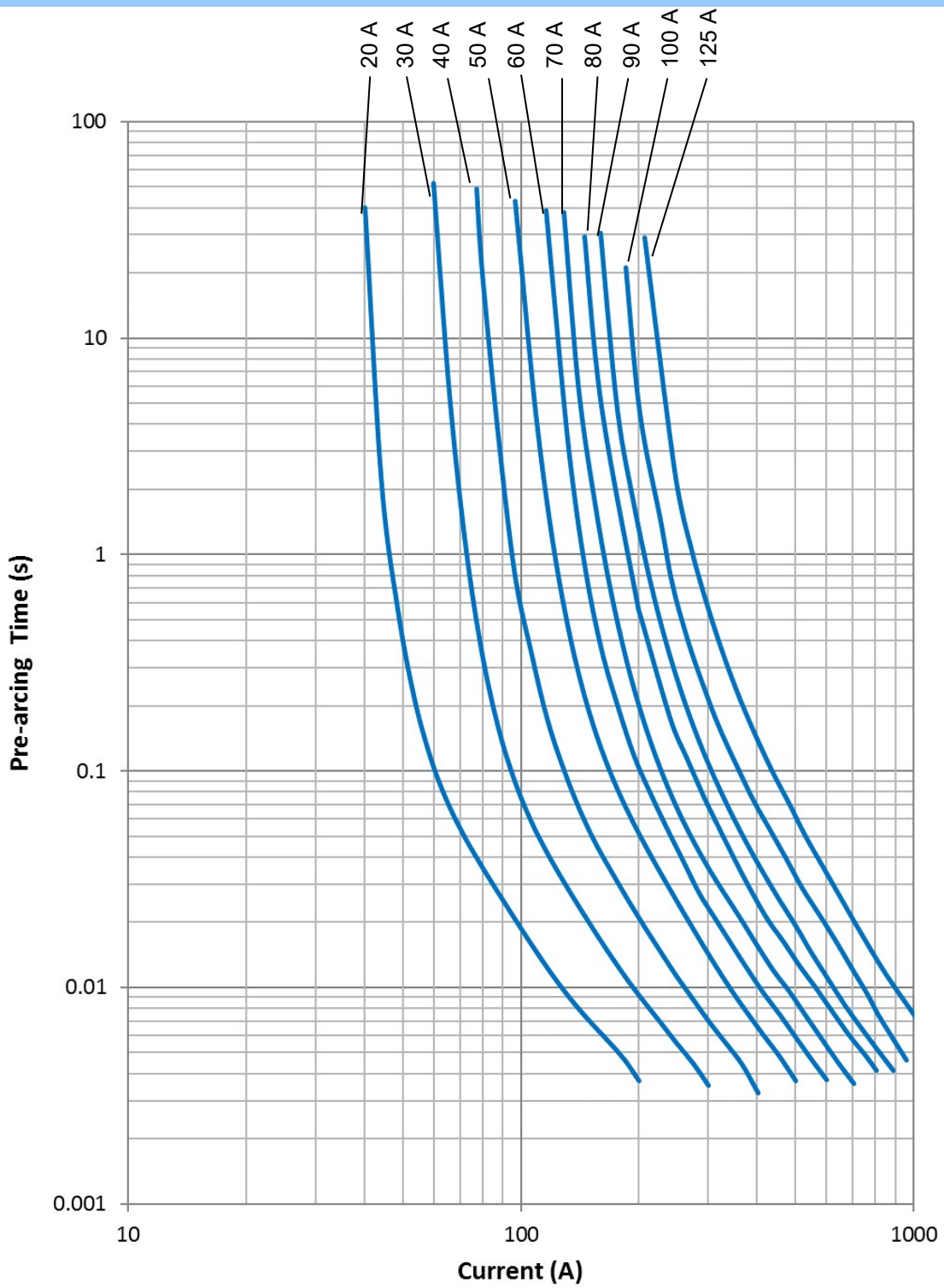
Part Number	Current Rating (A)	Voltage Rating (Vdc)	Interrupting Rating	Nominal DCR (mΩ)[1]	Nominal I^2t (A^2s)[2]	Marking[4]
CM2822H20A0T	20	125	300A @125Vdc 1,000A @ 75Vdc[3] 1,500A @ 48Vdc[3]	2.1	120	CMH 20 A
CM2822H30A0T	30			1.35	270	CMH 30 A
CM2822H40A0T	40			1.05	400	CMH 40 A
CM2822H50A0T	50			0.85	600	CMH 50 A
CM2822H60A0T	60	75	1,000A @ 75Vdc[3] 1,500A @ 48Vdc[3]	0.74	900	CMH 60 A
CM2822H70A0T	70			0.61	1,400	CMH 70 A
CM2822H80A0T	80			0.53	2,000	CMH 80 A
CM2822H90A0T	90			0.48	2,400	CMH 90 A
CM2822H100AT	100			0.44	3,600	CMH 100 A
CM2822H125AT	125			0.38	6,000	CMH 125 A

1. Measured at ≤10% rated current and 25 °C ambient
2. Melting I2t at 10X In
3. Time constant of interrupting test less than 0.1ms
4. Black marketing character code or laser marking code

High Power Surface Mount Fuse

CM2822H Series

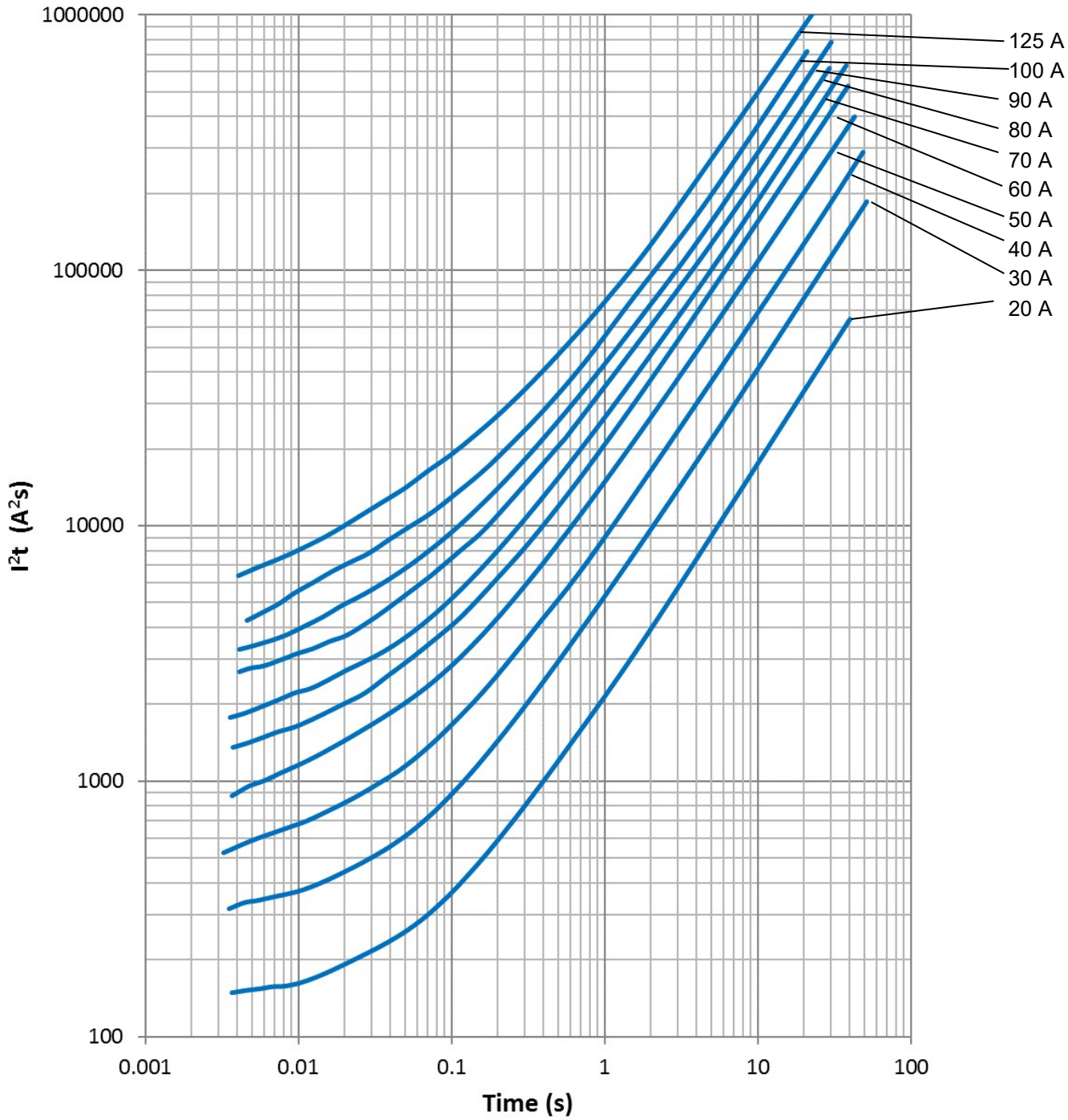
Clearing Time vs. Current Curves:



High Power Surface Mount Fuse

CM2822H Series

Average I^2t vs. t Curves:



High Power Surface Mount Fuse

CM2822H Series

Product Identification:

CM 2822 H 20A0 T
(1) (2) (3) (4) (5)

(1) **Product Code:** CM-Commercial Molding Fuse

(2) **Size code: L x W (inch):** the first two digits - L (length), the last two digits - W (width)

(3) **Series code:** H

(4) **Current rating code**: e.g. 20A0: 20.0A

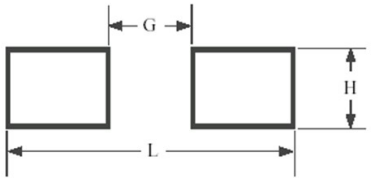
(5) **Package code:** T - Tape & Reel, B - Bulk

Marking: Top Line: AEM Logo; **CMH**: CM2822H Series

Bottom Line: Current Rating Code

Recommended Land Pattern:

Chip Size	2822 (7358)
L Inch (mm)	0.386 (9.8)
G Inch (mm)	0.173 (4.4)
H Inch (mm)	0.228 (5.8)

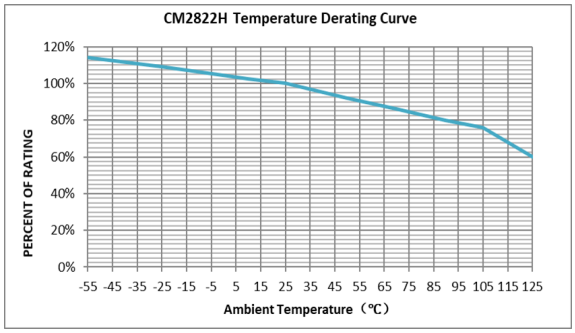


Reliability Tests:

No.	Reliability Test	Test Condition and Requirement	Referenced International Standard
1	Bend	2 mm bend, DCR change within ±20%, no mechanical damage	IEC60068-2-21
2	Solderability	245°C for 5 seconds, new solder coverage ≥95%	MIL-STD-202 Method 208
3	Soldering Heat Resistance	260°C, 10 seconds, DCR change within ±20%, new solder coverage 75% minimum, no mechanical damage	MIL-STD-202 Method 210
4	Terminal Strength	Gradually apply 1.8 kg force to the bottom of the part for 60 seconds, DCR change within ±20%, no mechanical damage	AEC Q200-006
5	Life	80% rated current, 2000 hours, ambient temperature from +20°C to 30°C, voltage drop change within ±20%	MIL-STD-202 Method 108
6	Thermal Shock	-65°C to + 125°C, 100 cycles, DCR change within ±20°C, no mechanical damage	MIL-STD-202 Method 107
7	Mechanical Vibration	5-3000Hz, 0.4 inch double amplitude or 30G peak, DCR change within ±20°C, no mechanical damage	MIL-STD-202 Method 204
8	Mechanical Shock	1500 G, 0.5 milliseconds, half-sine shocks, DCR change within ±20%, no mechanical damage	MIL-STD-202 Method 213
9	Salt Spray	5% salt solution, 48 hour exposure, DCR change within ±20%, no excessive corrosion	MIL-STD-202 Method 101
10	Moisture Resistance	10 cycles, DCR change within ±20%, no excessive corrosion.	MIL-STD-202 Method 106

Fuse Selection and Temperature De-rating Guideline:

The ambient temperature affects the current carrying capacity of fuses. When a fuse is operating at a temperature higher than 25℃, the fuse shall be “de-rated” according to the de-rating curve.



Packaging:

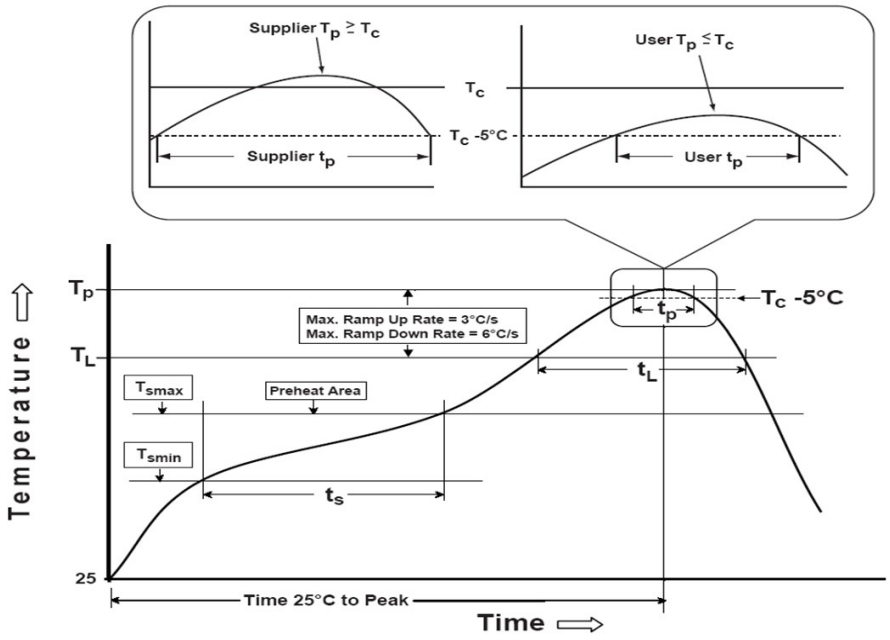
Chip Size	Parts on 13 inch (330 mm) Reel
2822	1,000 pcs

High Power Surface Mount Fuse

CM2822H Series

Recommended Temperature Profile for Reflow Soldering:

Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150°C 200°C 60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L) Time(t_L) maintained above T_L	217°C 60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	



Recommended conditions for hand soldering:

1. Appropriate temperature (max.) of soldering iron tip/soldering time (max.): 280°C /10 s or 350°C / 3 s

2. Using hot air rework station with tip that can melt 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.

Storage:

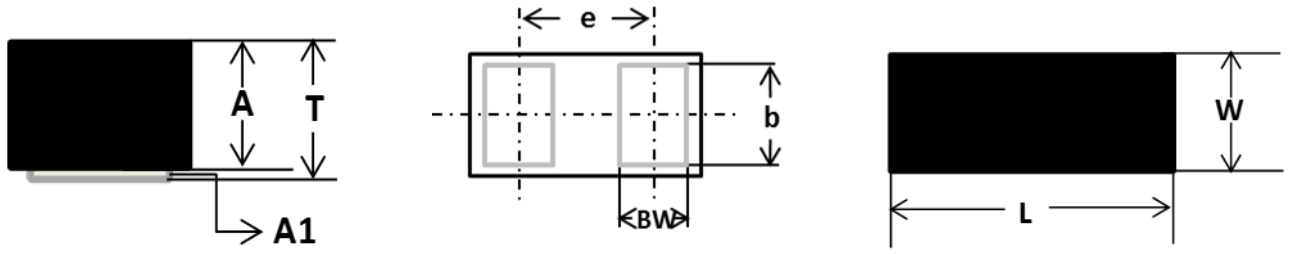
1. The maximum ambient temperature shall not exceed 35°C . Storage temperatures higher than 35°C could result in the deformation of packaging materials.
2. The maximum relative humidity recommended for storage is 75%. High humidity with high temperature can accelerate the oxidation of the solder plating on the termination and reduce the solderability of the components.
3. The products shall not be stored in areas where harmful gases containing sulfur or chlorine are present.
4. MSL=1

Surface Mount TVS Diodes

Quick Index:

Surface Mount TVS Diodes

Shape and Dimensions:



Package	Size inch/(mm)							
	L	W	T	BW	b	e	A	A1
0201 (DN0603)	0.024±0.002 (0.60±0.05)	0.013±0.002 (0.32±0.05)	0.012±0.002 (0.30±0.05)	0.006±0.002 (0.15±0.05)	0.010±0.002 (0.25±0.05)	0.015 (0.38)	0.011±0.002 (0.29±0.05)	0.0004 (0.01)
0402 (DFN1006)	0.039±0.002 (1.00±0.05)	0.024±0.002 (0.60±0.05)	0.020±0.002 (0.50±0.05)	0.014±0.002 (0.35±0.05)	0.020±0.002 (0.50±0.05)	0.026 (0.65)	0.019±0.002 (0.49±0.05)	0.0004 (0.01)

Packaging Information:

Package	Tape & Reel Quantity (piece)	Marking
0201 (DFN0603)	15,000	I
0402 (DFN1006)—TS04021C05V100	10,000	E5
0402 (DFN1006)—TS04021C05VR30	10,000	S

Storage Conditions:

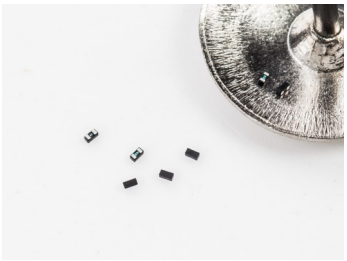
Storage Time: 12 months max

Storage Temperature : 5°C to 30°C

Relative Humidity: < 60% RH

Surface Mount TVS Diodes

ESD Protection Diode, TS02011C05V3R0



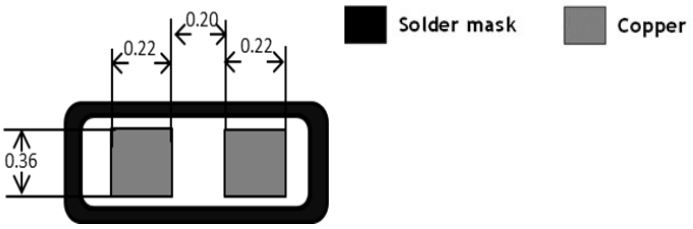
Applications:

- Cellular handsets and accessories
- Portable electronics
- Computers and peripherals
- Communication systems
- Audio and video equipment

Features:

- Bi-directional ESD protection of one line
- Low capacitance (3 pF typical)
- IEC 61000-4-2, level 4 (ESD) protection
- Ultra small SMD special package (0201)
- Pb-Free, Halogen free/BFR free and RoHS compliant
- Operating temperature range –55°C~+125°C
- Storage temperature range -55°C~+150°C

Recommended Foot Print Dimensions:



Electrical Characteristics (@25˚C):

Characteristic	Condition	Value		
		Min.	Typical	Max.
ESD per IEC61000-4-2 Direct Discharge			±8 kV	
ESD per IEC61000-4-2 Air Discharge			±15 kV	
Peak Pulse Power (P_{PK})			75 W	
Reverse Stand-Off Voltage (V_{RWM})				5 V
Reverse Breakdown Voltage (V_{BV})	I_{BV} = 1mA	5.6 V		9 V
Clamping Voltage (V_{CL})	I_{PP} = 1A, t_P = 8/20µs			12 V
	I_{PP} = 5A, t_P = 8/20µs			15 V
Junction Capacitance (C_J)	V_{RWM} = 0V, f = 1MHz		3 pF	
Reverse Leakage Current (I_{RM})	V_{RWM} = 5V			1 µA

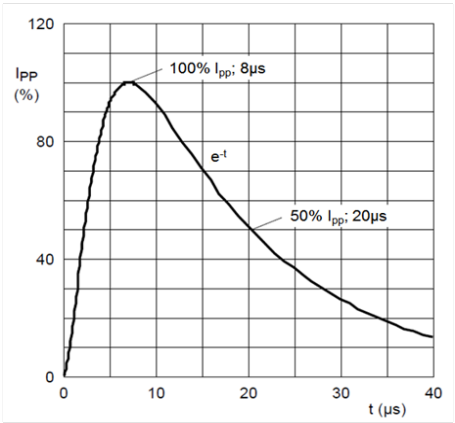


Fig. 1
8/20µs pulse waveform
according to IEC 61000-4-5

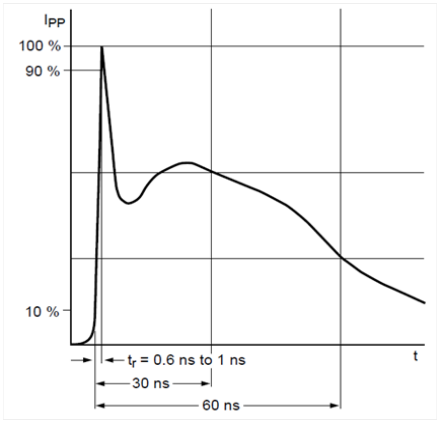


Fig. 2
ESD pulse waveform
according to IEC 61000-4-2

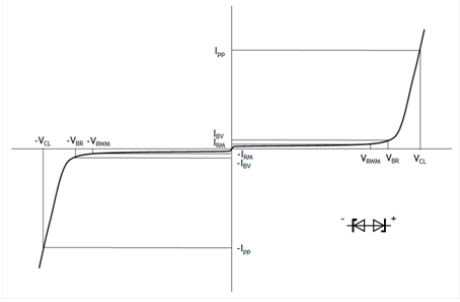
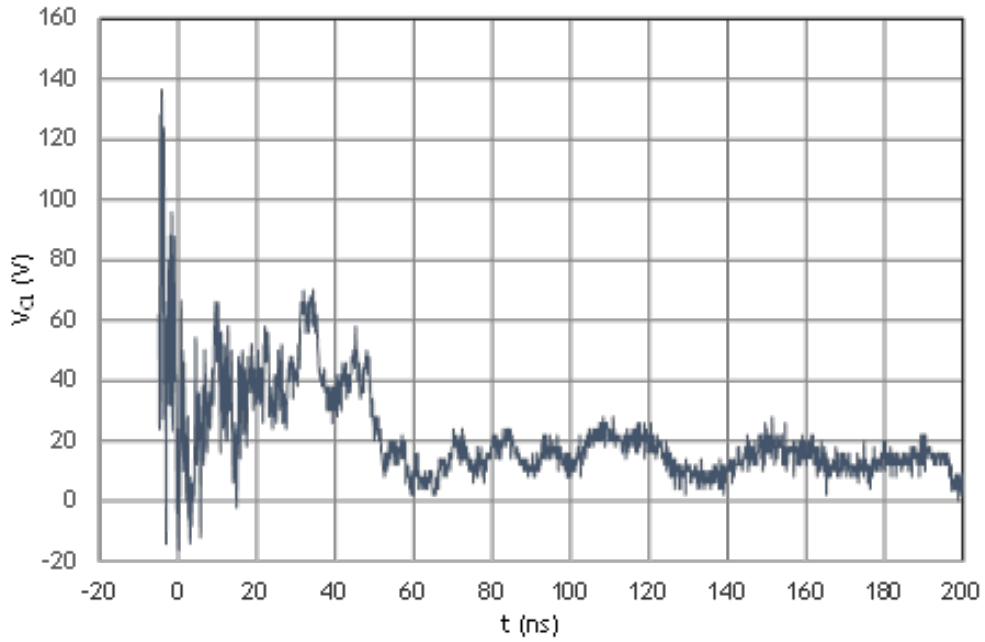


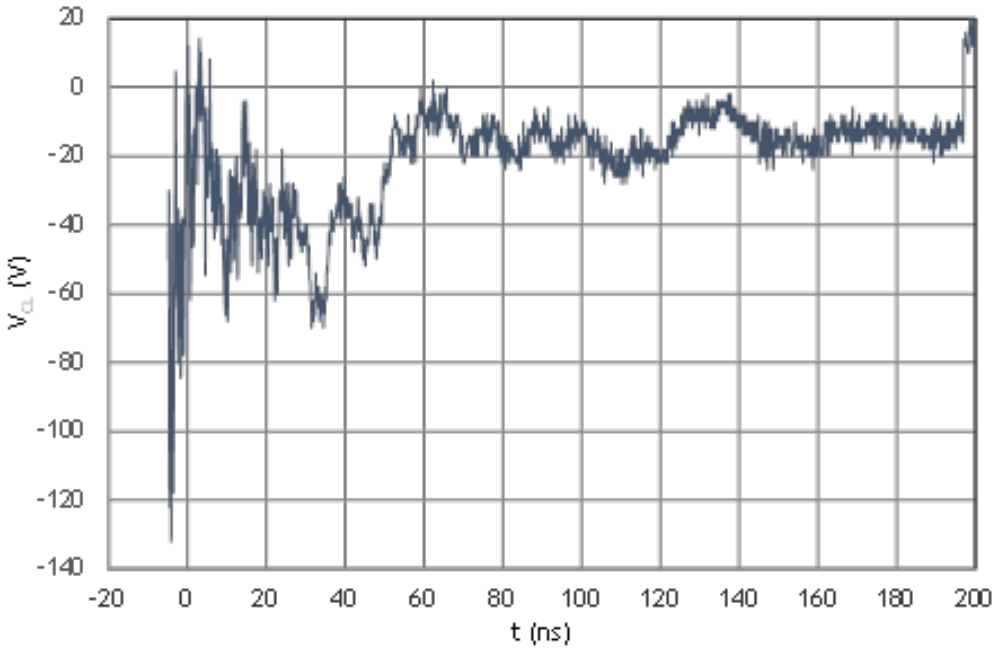
Fig. 3
V-I characteristics for bidirectional ESD protection diode

Surface Mount TVS Diodes

ESD Protection Diode, TS02011C05V3R0

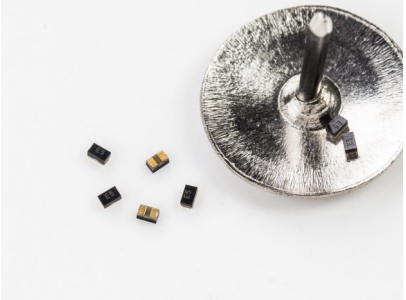
Clamped Pulse Waveform per IEC61000-4-2 Level 4, ±8kv Direct Discharge:





Surface Mount TVS Diodes

ESD Protection Diode, TS04021C05V100



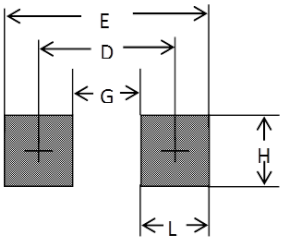
Applications:

- Cellular handsets and accessories
- Portable electronics
- Computers and peripherals
- Communication systems
- Audio and video equipment

Features:

- Bi-directional ESD protection of one line.
- IEC 61000-4-2, level 4 (ESD) protection
- Ultra small SMD special packages (0402)
- Pb-Free, Halogen free and RoHS compliant
- Operating junction temperature -55°C~+125°C
- Storage temperature range -55°C~+150°C

Recommended Foot Print Dimensions:



Unit	Inch	mm
L	0.020	0.50
G	0.010	0.25
H	0.028	0.70
D	0.030	0.75
E	0.049	1.25

Electrical Characteristics (@25˚C):

Characteristic	Condition	Value		
		Min.	Typical	Max.
ESD per IEC61000-4-2 Direct Discharge			±8 kV	
ESD per IEC61000-4-2 Air Discharge			±16 kV	
Peak Pulse Power (P_{PK})	t_P = 8/20μs		75 W	
Maximum Peak Pulse Current (I_{PP})	t_P = 8/20μs		5 A	
Reverse Stand-Off Voltage (V_{RWM})				5 V
Reverse Breakdown Voltage (V_{BV})	I_{BV} = 1mA	6 V		
Clamping Voltage (V_{CL})	I_{PP} = 1A, t_P = 8/20μs			9 V
	I_{PP} = 5A, t_P = 8/20μs			15 V
Junction Capacitance (C_J)	V_{RWM} = 0V, f = 1MHz		10 pF	
Reverse Leakage Current (I_{RM})	V_{RWM} = 5V			2 μA

Surface Mount TVS Diodes

ESD Protection Diode, TS04021C05V100

Electrical Characteristics (@25˚C):

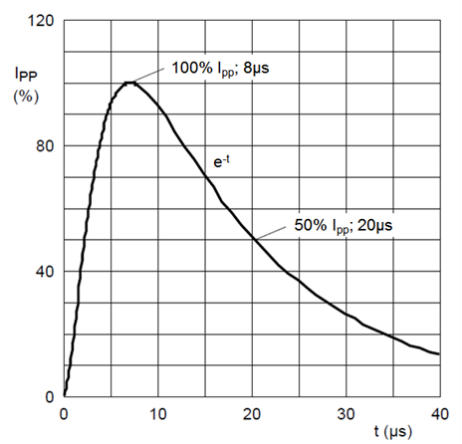


Fig. 1
8/20µs pulse waveform
according to IEC 61000-4-5

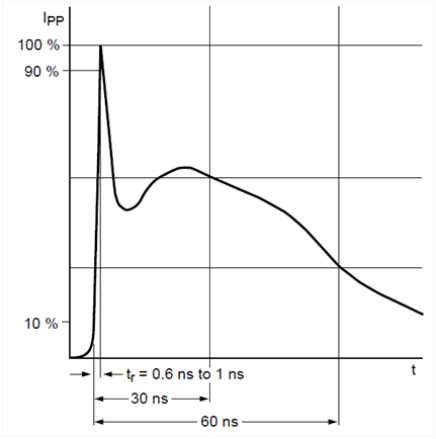


Fig. 2
ESD pulse waveform
according to IEC 61000-4-2

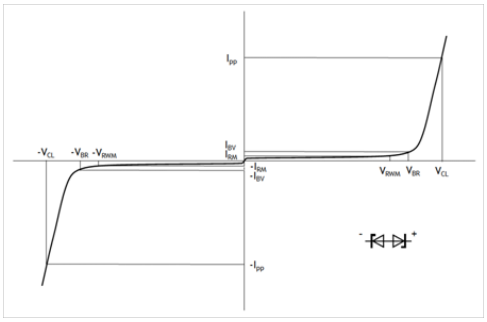


Fig. 3
V-I characteristics for bidirectional ESD protection diode

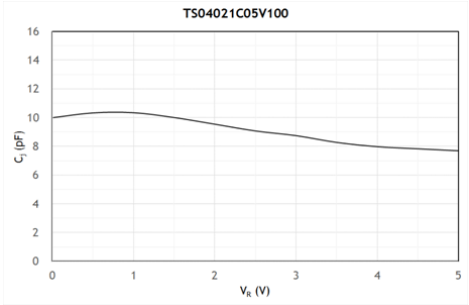


Fig. 4
Junction capacitance as a function of reverse voltage; typical value

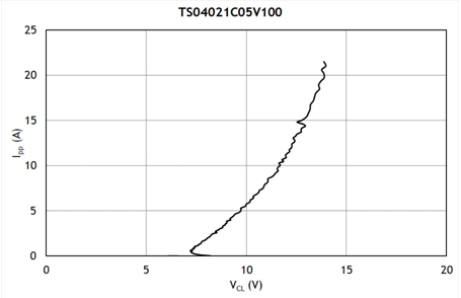


Fig. 5
Dynamic resistance with positive clamping voltage t_p = 10ns; Transmission Line Pulse (TLP)

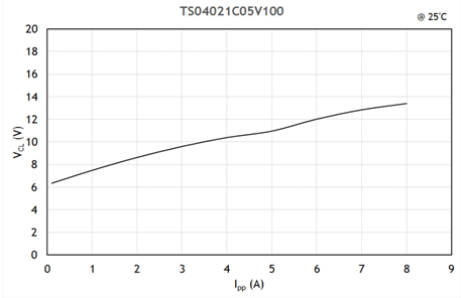
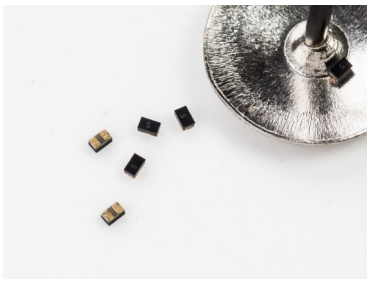


Fig. 6
Clamping voltage (V_{CL}) as a function of peak current (I_{pp}); t_P = 8/20µs

Surface Mount TVS Diodes

Ultra Low Capacitance ESD Protection Diode, TS04021C05VR30



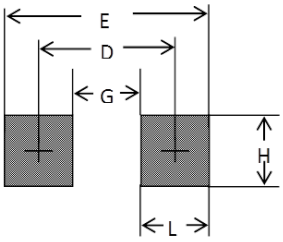
Applications:

- Cellular handsets and accessories
- Portable electronics
- Notebooks, desktops and servers
- HDMI1.3/1.4, PCI express, SATA, USB 2.0, DVI, display port
- High-speed data lines

Features:

- Bi-directional ESD protection of one line.
- IEC 61000-4-2, level 4 (ESD) protection
- IEC61000-4-4 (EFT) rating - 40A (5/50μs)
- IEC61000-4-5 (Lightning) rating - 24A (8/20μs)
- Low capacitance (0.3pF typical)
- Ultra small SMD special packages (0402)
- Pb−Free, Halogen free and RoHS compliant
- Operating junction temperature -55°C~+125°C
- Storage temperature range -55°C~+150°C

Recommended Foot Print Dimensions:



Unit	Inch	mm
L	0.020	0.50
G	0.010	0.25
H	0.028	0.70
D	0.030	0.75
E	0.049	1.25

Electrical Characteristics (@25˚C):

Characteristic	Condition	Value		
		Min.	Typical	Max.
ESD per IEC61000-4-2 Direct Discharge			±8 kV	
ESD per IEC61000-4-2 Air Discharge			±16 kV	
Peak Pulse Power (P_{PK})	t_P = 8/20μs		30 W	
Reverse Stand-Off Voltage (V_{RWM})				5 V
Reverse Breakdown Voltage (V_{BV})	I_{BV} = 1mA	6.0 V	7.8 V	
Clamping Voltage (V_{CL})	I_{PP} = 1A, t_P = 8/20μs			14 V
Junction Capacitance (C_J)	V_{RWM} = 0V, f = 1MHz		0.3 pF	
Reverse Leakage Current (I_{RM})	V_{RWM} = 5V			1 μA

Surface Mount TVS Diodes

Ultra Low Capacitance ESD Protection Diode, TS04021C05VR30

Electrical Characteristics (@25˚C):

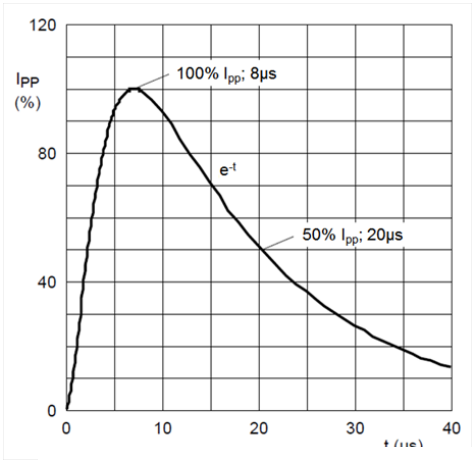


Fig. 1
8/20µs pulse waveform
according to IEC 61000-4-5

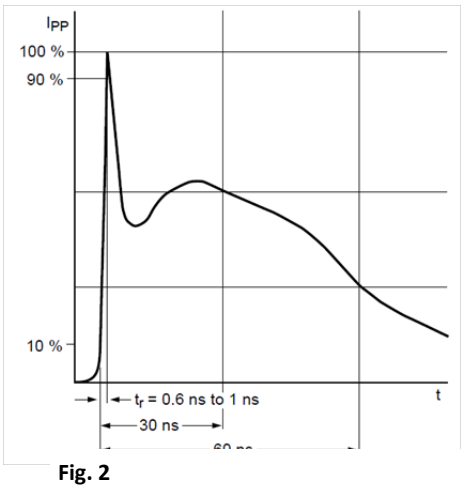


Fig. 2
ESD pulse waveform
according to IEC 61000-4-2

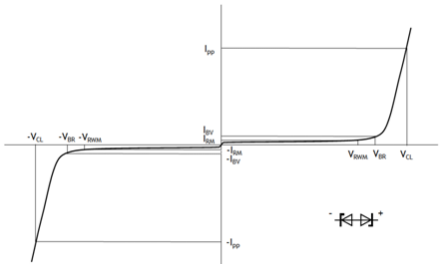


Fig. 3
V-I characteristics for bidirectional ESD protection diode

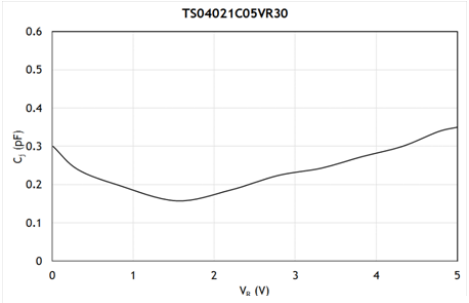


Fig. 4
Junction capacitance as a function of reverse voltage; typical value

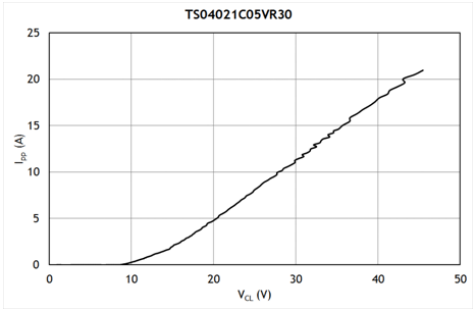


Fig. 5
Dynamic resistance with positive clamping voltage t_p = 10ns; Transmission Line Pulse (TLP)

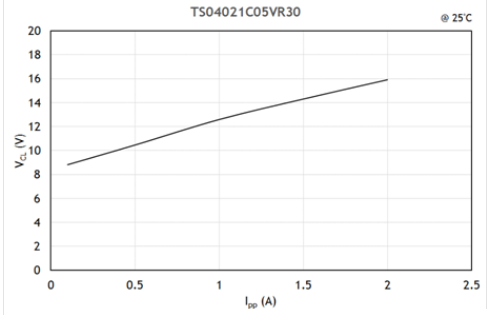


Fig. 6
Clamping voltage (V_{CL}) as a function of peak current (I_{pp}); t_P = 8/20µs

Over Voltage Protection Devices

Quick Index:

Surface Mount Multilayer Varistors

Product Identification:

MLV 0402 ES 012V 0100 N

(1) (2) (3) (4) (5) (6)

(1) Series Code:
- **MLV** – Surface Mount Multilayer Varistor
- **MVA** -- MLV Array

(2) Size Code:
- Standard EIA Chip Size

(3) Application Code:
- **ES** – Electro-static Discharge Protection
- **NA** – Normal Surge Protection
- **HA** – High Surge Protection

(4) Max. Working Voltage:
- **012V** – 12 V

(5) Capacitance for ES Series:
- **0100** – 100 pF
- **02R5** – 2.5 pF

Peak Current for HA/NA Series: **0100** – 100 A

(6) Capacitance Tolerance for ES Series:
- **N** – ± 30%
- **P** – **Special**
- **B** – Bulk

Operating Temperatures:

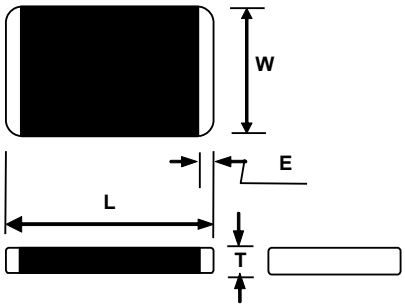
-55ºC to +85ºC for size 0603 or smaller

-55ºC to +125ºC for size 0805 or larger

Surface Mount Multilayer Varistors

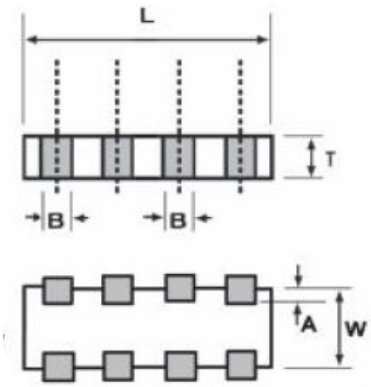
Shape and Dimensions:

MLV Series



Size	L (mm)	W (mm)	T (mm)	E (mm)
0201	0.60 ± 0.03	0.30 ± 0.03	0.30 ± 0.03	0.30 ± 0.03
0402	1.00 ± 0.10	0.50 ± 0.10	0.50 ± 0.10	0.25 ± 0.10
0603	1.60 ± 0.15	0.80 ± 0.15	0.90 max.	0.30 ± 0.10
0805	2.00 ± 0.20	1.25 ± 0.15	1.00 max.	0.30 ± 0.10
1206	3.20 ± 0.20	1.60 ± 0.15	1.20 max.	0.50 ± 0.20
1210	3.20 ± 0.20	2.50 ± 0.20	1.50 max.	0.50 ± 0.20
1812	4.50 ± 0.20	3.20 ± 0.20	2.00 max.	0.60 ± 0.20
2220	5.70 ± 0.20	5.00 ± 0.20	3.00 max.	0.60 ± 0.20

ESD Array



Size	0508	0612
L (mm)	2.00 ± 0.20	3.20 ± 0.20
W (mm)	1.25 ± 0.20	1.60 ± 0.15
T (mm)	0.80 max.	0.95 max.
A (mm)	0.20 ± 0.10	0.20 ± 0.10
B (mm)	0.25 ± 0.05	0.40 ± 0.15

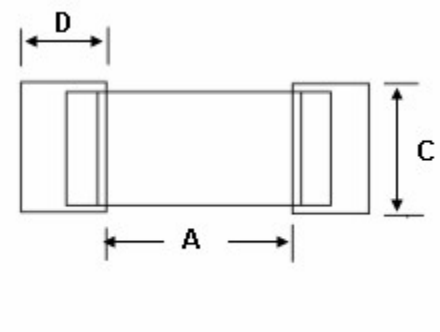
Terms and Definitions:

Term	Definition
Max. Working Voltage	Maximum steady-state DC operating voltage with typical leakage current less than 50 μA
Varistor Voltage（BDV）	Breakdown DC voltage measured at current of 1 mA
Max. Clamping Voltage	Maximum peak voltage across the part, measured at a specified pulse current and wave-form
Surge Current	Maximum peak current with the specified 8/20 μs waveform without
Surge Shift △ V/V	The change of varistor voltage after applying the specified surge current
Energy Absorption	Maximum energy dissipated with a specified 10/1000 μs waveform
Typical Capacitance	Capacitance measured with voltage bias less than 0.5 V_{RMS} at 1 KHz or 1 MHz
Nonlinear Exponentα	α=（log（$V_{1mA}/V_{0.1mA}$）/ log（$I_{V1mA}/I_{V0.1mA}$））
Leakage Current	Typical leakage current at 25 °C＜ 50 μA; Maximum leakage 200 μA.
Cut-off Frequency	The frequency of -3 dB insertion loss

Surface Mount Multilayer Varistors

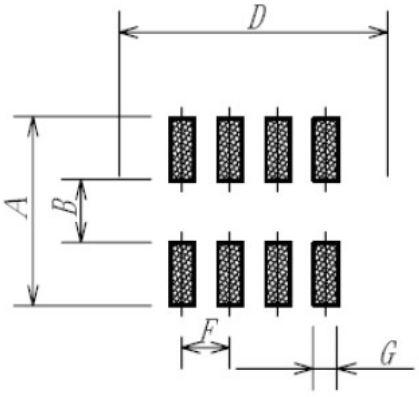
Recommended Land Patterns:

MLV Series



Size	Solder pad layout		
	A (mm)	C (mm)	D (mm)
0201	0.25~0.35	0.20~0.30	0.25~0.35
0402	0.4~0.6	0.5~0.6	0.5~0.7
0603	0.9~1.2	0.6~1.0	0.8~1.2
0805	1.0~1.5	1.2~1.5	1.0~1.4
1206	1.8~2.5	1.2~1.8	1.0~1.4
1210	1.8~2.5	2.2~3.0	1.0~1.4
1812	2.5~3.3	2.8~3.6	1.2~1.8
2220	3.8~4.6	4.8~5.5	1.2~1.8

ESD Array Series



Size	A (mm)	B (mm)	D (mm)	F (mm)	G (mm)
0508	2.10	0.40	2.50	0.50	0.35
0612	2.60	0.80	3.60	0.80	0.50

Surface Mount Multilayer Varistors

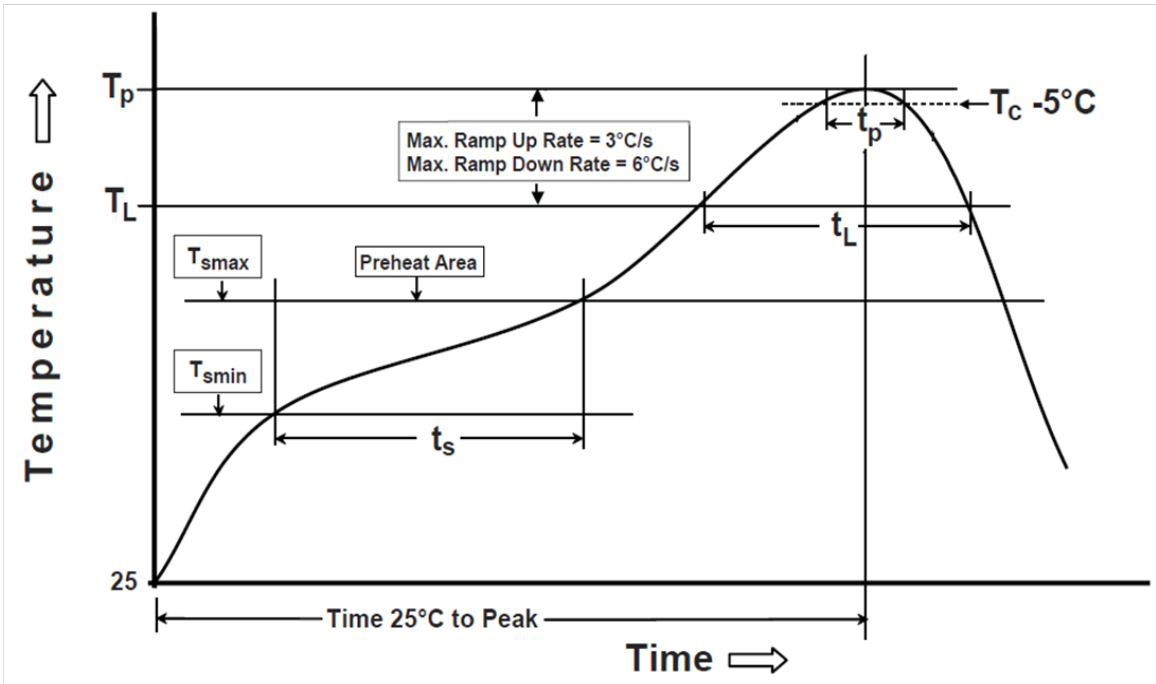
Environmental Tests:

No.	Test	Requirement	Test condition	Test reference
1	Soldering heat resistance	BDV change ≤ ±10% No mechanical damage	One dip at 260°C for 5 sec.	MIL-STD-202 Method 210 IEC 60068-2-20
2	Solderability	New solder coverage ≥ 80%	One dip at 255°C for 5 sec. Non-active flux	MIL-STD-202 Method 208 IEC 60068-2-20
3	Maximum surge current	BDV change ≤ ±10% No mechanical damage	100 pulses of 8/20 μs with maximum surge current and 30 sec. interval at 25°C and 30 ~ 65% RH	CECC 42000 IEC 1051-1 Test 4.5
4	Maximum surge energy	BDV change ≤ ±10% No mechanical damage	100 pulses of 10/1000 μs with maximum surge current and 90 sec. interval at 25°C and 30 ~ 65% RH	CECC 42000
5	Thermal cycling	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	5 cycles between -40°C and 125ºC with 30 min. dwell time at the temperature extremes and 60 min. dwell time at 25°C	CECC 42000 IEC 60068-2-14
6	Low temperature resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	1000 hr at -50°C	IEC 60068-2-1
7	Low temperature load resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	1000 hr at -50°C with working voltage applied	IEC 60068-2-1
8	High temperature resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	1000 hr at 150°C	MIL-STD-202 Method 108 CECC 42000
9	High temperature load resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	1000 hr at 85°C with working voltage applied	CECC 42000
10	Humidity resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	500 hr at 40°C and 90 ~ 95% RH	MIL-STD-202 Method 103 IEC 60068-2-3 CECC 42000;
11	Humidity load resistance	BDV change ≤ ±10% No mechanical damage Leakage current ≤ 200 μA	500 hr at 40°C and 90 ~ 95% RH with working voltage applied	MIL-STD-202 Method 103 IEC 60068-2-3 CECC 42000
12	ESD contact test*	Varistor voltage change > 115% working voltage	Contact electrostatic discharge 100 times with 1 second intervals at 8 KV (Level 4) and polarity: +,-	IEC 61000-4-2
13	ESD air test*	Varistor voltage change > 115% working voltage	Air contact electrostatic discharge 100 times with 1 second intervals at 15 KV (Level 4) and polarity:+,-	IEC 61000-4-2

* For ES series only.

Surface Mount Multilayer Varistors

Soldering Temperature Profile:



Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150°C 200°C 60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217°C 60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

Surface Mount Multilayer Varistors

ESD Protection (ES) Series

Features:

- Fast Response < 0.5 ns
- Low Working Voltage 5 V
- Low Capacitance
- Low Leakage Current < 1 μA
- Low Clamping Voltage

Application Fields:

- Cell Phones
- Digital Cameras
- PDAs
- MP3
- Notebooks

Part Number	Working Voltage (Max)	Clamping Voltage (Max)	Leakage Current (Max)	Typical Capacitance Value (1 MHz)	Tolerance of Cap.
	DC(V)	(V)	ILDC(μA)	C (pF)	(%)
MLV0402ES005V0100N	5.5	55	1	100	± 30
MLV0402ES005V0056N	5.5	55	1	56	± 30
MLV0402ES005V0033N	5.5	55	1	33	± 30
MLV0402ES005V0022N	5.5	55	1	22	± 30
MLV0402ES005V0010N	5.5	60	1	10	± 30
MLV0402ES005V0005P	5.5	76	1	5	5~9 pF
MLV0402ES012V0100N	12	55	1	100	± 30
MLV0402ES012V0056N	12	55	1	56	± 30
MLV0402ES012V0033N	12	55	1	33	± 30
MLV0402ES012V0022N	12	55	1	22	± 30
MLV0402ES012V0010N	12	60	1	10	± 30
MLV0402ES012V0005P	12	80	1	5	5~9 pF
MLV0402ES024V0003N	24	120	1	3	± 30
MLV0402ES024V02R5P	24	198	1	2.5	2~4 pF
MLV0402ES024V00R8P	24	200	1	0.8	0.8~1.5 pF
MLV0603ES005V0100N	5.5	55	1	100	± 30
MLV0603ES005V0056N	5.5	55	1	56	± 30
MLV0603ES005V0033N	5.5	55	1	33	± 30
MLV0603ES005V0022N	5.5	55	1	22	± 30
MLV0603ES005V0010N	5.5	60	1	10	± 30
MLV0603ES005V0005P	5.5	76	1	5	5~9 pF
MLV0603ES012V0100N	12	55	1	100	± 30
MLV0603ES012V0056N	12	55	1	56	± 30
MLV0603ES012V0033N	12	55	1	33	± 30
MLV0603ES012V0022N	12	55	1	22	± 30
MLV0603ES012V0010N	12	60	1	10	± 30
MLV0603ES012V0005P	12	80	1	5	5~9 pF
MLV0603ES024V0003N	24	120	1	3	± 30
MLV0603ES024V02R5P	24	198	1	2.5	2~4 pF
MLV0603ES024V00R8P	24	200	1	0.8	0.8~1.5 pF
MLV0805ES005V0100N	5.5	50	1	100	± 30
MLV0805ES005V0056N	5.5	50	1	56	± 30

Surface Mount Multilayer Varistors

Normal Surge Protection (NA) Series

Features:

- Fast Response < 0.5 ns
- Low Capacitance
- Low Clamping Voltage and High Energy Absorption

Application Fields:

- Telecommunications
- Automotive Systems
- Data Systems
- Power Supplies

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance Ref.
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 kHz (pF)
MLV0402NA006V0020	4	5.5	8 (7.5~10.5)	20	1	20	0.05	200
MLV0402NA009V0020	6	9	12 (10.2~13.8)	20	1	23	0.05	135
MLV0402NA011V0020	8	11	15 (12.8~17.3)	20	1	25	0.05	75
MLV0402NA014V0020	11	14	18 (15.3~20.7)	20	1	30	0.05	50
MLV0402NA018V0020	14	18	24 (21.6~26.4)	20	1	39	0.05	45
MLV0603NA006V0030	4	5.5	8 (7.5~10.5)	30	1	20	0.1	360
MLV0603NA009V0030	6	9	12 (10.2~13.8)	30	1	23	0.1	300
MLV0603NA014V0030	11	14	18 (15.3~20.7)	30	1	30	0.1	210
MLV0603NA018V0030	14	18	24 (21.6~26.4)	30	1	39	0.1	160
MLV0603NA022V0030	17	22	27 (24.3~29.7)	30	1	44	0.1	145
MLV0603NA030V0030	25	30	39 (35.1~42.9)	30	1	65	0.1	110
MLV0603NA038V0030	30	38	47 (42.3~51.7)	30	1	77	0.1	90
MLV0805NA006V0080	4	5.5	8 (7.5~10.5)	80	1	20	0.1	1400
MLV0805NA009V0080	6	9	12 (10.2~13.8)	80	1	23	0.1	650
MLV0805NA011V0100	8	11	15 (12.75~17.25)	100	1	25	0.2	410
MLV0805NA014V0100	11	14	18 (15.3~20.7)	100	1	30	0.2	350
MLV0805NA018V0100	14	18	24 (21.6~26.4)	100	1	39	0.2	300
MLV0805NA022V0100	17	22	27 (24.3~29.7)	100	1	44	0.2	250
MLV0805NA026V0100	20	26	33 (29.7~36.3)	100	1	54	0.3	220
MLV0805NA030V0100	25	30	39 (35.1~42.9)	100	1	65	0.3	200
MLV0805NA038V0100	30	38	47 (42.3~51.7)	100	1	77	0.3	150
MLV0805NA045V0080	35	45	56 (50.4~61.6)	80	1	90	0.3	110
MLV1206NA006V0100	4	5.5	8 (7.5~10.5)	100	1	20	0.2	3100
MLV1206NA014V0100	11	14	18 (15.3~20.7)	100	1	30	0.3	800
MLV1206NA018V0100	14	18	24 (21.6~26.4)	100	1	38	0.3	620
MLV1206NA022V0100	17	22	27 (24.3~29.7)	100	1	44	0.4	700
MLV1206NA026V0100	20	26	33 (29.7~36.3)	100	1	54	0.5	480
MLV1206NA030V0100	25	30	39 (35.1~42.9)	100	1	65	0.6	400

Surface Mount Multilayer Varistors

Normal Surge Protection (NA) Series

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 kHz (pF)
MLV1206NA038V0100	30	38	47 (42.3~51.7)	100	1	77	0.7	260
MLV1206NA045V0100	35	45	56 (50.4~61.6)	100	1	90	0.8	230
MLV1206NA056V0100	40	56	68 (61.2~74.8)	100	1	110	1.0	200
MLV1206NA065V0100	50	65	82 (73.8~90.2)	100	1	135	0.5	175
MLV1206NA085V0100	60	85	100 (90~110)	100	1	165	0.6	150
MLV1210NA006V0250	4.5	5.5	8 (7.5~10.5)	250	2.5	20	0.5	5200
MLV1210NA018V0250	14	18	24 (21.6~26.4)	250	2.5	38	0.8	1150
MLV1210NA022V0250	17	22	27 (24.3~29.7)	250	2.5	44	1.0	1720
MLV1210NA026V0250	20	26	33 (29.7~36.3)	250	2.5	54	1.2	610
MLV1210NA030V0250	25	30	39 (35.1~42.9)	250	2.5	65	1.4	920
MLV1210NA038V0250	30	38	47 (42.3~51.7)	250	2.5	77	1.6	780
MLV1210NA045V0250	35	45	56 (50.4~61.6)	250	2.5	90	2.0	400
MLV1210NA056V0250	40	56	68 (61.2~74.8)	250	2.5	110	2.3	300
MLV1210NA085V0200	60	85	100 (90~110)	200	2.5	165	1.4	210
MLV1812NA018V0500	14	18	24 (21.6~26.4)	500	5	38	1.7	2000
MLV1812NA030V0500	25	30	39 (35.1~42.9)	500	5	65	2.9	2500
MLV1812NA038V0500	30	38	47 (42.3~51.7)	500	5	77	3.5	2200
MLV1812NA045V0500	35	45	56 (50.4~61.6)	500	5	90	4.2	1000
MLV2220NA018V1000	14	18	24 (21.6~26.4)	1000	10	38	3.1	8500
MLV2220NA030V1000	25	30	39 (35.1~42.9)	1000	10	65	5.5	3900
MLV2220NA038V1000	30	38	47 (42.3~51.7)	1000	10	77	6.3	4600
MLV2220NA056V1000	40	56	68 (61.2~74.8)	1000	10	110	8.8	4000

Surface Mount Multilayer Varistors

High Surge Protection (HA) Series

Features:

- Fast Response < 0.5 ns
- Low Capacitance
- Low Clamping Voltage and High Energy Absorption

Application Fields:

- Telecommunications
- Automotive Systems
- Data Systems
- Power Supplies

Ordering Information:

Part Number	Working Voltage (max)		Breakdown Voltage	Peak Current (max)	Clamping Voltage (max)		Energy Absorption (max)	Typical Capacitance
	AC (V_{RMS})	DC (V)	1 mA (V)	8/20 μs (A)	(A)	(V)	10/1000 μs (J)	1 kHz (pF)
MLV1206HA014V0200	11	14	18 (15.3~20.7)	200	1	30	0.5	1200
MLV1206HA018V0200	14	18	24 (21.6~27.0)	200	1	39	0.5	780
MLV1206HA022V0200	17	22	27 (24.3~29.8)	200	1	44	0.7	750
MLV1206HA026V0200	20	26	33 (29.7~36.3)	200	1	54	1.0	700
MLV1206HA030V0200	25	30	39 (35.1~42.9)	200	1	65	1.0	510
MLV1206HA038V0200	30	38	47 (42.3~51.7)	200	1	77	1.1	440
MLV1210HA014V0400	11	14	18 (15.3~20.7)	400	2.5	30	1.2	2000
MLV1210HA018V0400	14	18	24 (21.6~27.0)	400	2.5	39	1.4	1600
MLV1210HA022V0400	17	22	27 (24.3~29.8)	400	2.5	44	1.7	1500
MLV1210HA026V0400	20	26	33 (29.7~36.3)	400	2.5	54	1.9	880
MLV1210HA030V0400	25	30	39 (35.1~42.9)	400	2.5	65	1.7	800
MLV1210HA038V0400	30	38	47 (42.3~51.7)	400	2.5	77	2.0	530
MLV1812HA018V0800	14	18	24 (21.6~27.0)	800	5	38	2.3	3500
MLV1812HA030V0800	25	30	39 (35.1~42.9)	800	5	65	3.7	2350
MLV1812HA038V0800	30	38	47 (42.3~51.7)	800	5	77	4.2	1600
MLV1812HA045V0800	35	45	56 (50.4~61.6)	800	5	90	4.2	1200
MLV2220HA014V1200	11	14	18 (15.3~20.7)	1200	10	30	5.4	10500
MLV2220HA018V1200	14	18	24 (21.6~27.0)	1200	10	39	5.8	8500
MLV2220HA022V1200	17	22	27 (24.3~29.8)	1200	10	44	7.2	8300
MLV2220HA030V1200	25	30	39 (35.1~42.9)	1200	10	65	9.6	6000
MLV2220HA038V1200	30	38	47 (42.3~51.7)	1200	10	77	12.0	4000
MLV2220HA045V1200	35	45	56 (50.4~61.6)	1200	10	90	12.0	3500

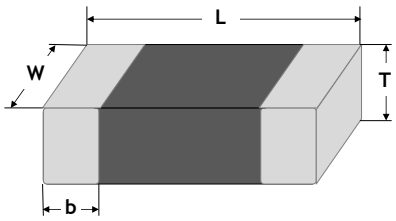
Surface Mount Multilayer Varistors
High Voltage (HV) Series

Features:

- Bidirectional and symmetrical V/I characteristics Low Capacitance
- Meet IEC61000-4-2 Standard
- Large withstanding surge current capability - 400~500A (@8/20μs)
- Multilayer construction provides higher power dissipation

Shape and Dimensions:

Unit (mm)	Length (L)	Width (W)	Thickness (T)	Termination bandwidth (b)
MLV3220HV240V0500	8.1±0.30	5.0±0.30	1.7±0.30	0.8 +0.5/-0.1
MLV3220HV270V0500				
MLV3220HV390V0500			2.2±0.30	
MLV3220HV430V0450				
MLV3220HV470V0400				



Product Identification:

MLV	3220	HV	270V	0500
Category Code **MLV** = Multilayer Varistor	**Size Code** **Inch** (mm) **3220** (8153)	**Application Code** **HV** = High Voltage	**Breakdown Voltage Code** **390V** = 390V **430V** = 430V **470V** = 470V	**Surge Current Code** **0400** = 400A **0450** = 450A **0500** = 500A

Electrical Characteristics:

Operating temperature: -55 to +85°C

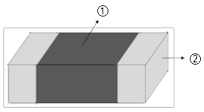
Part Number	Size	Working Voltage		Breakdown Voltage[1] @1mA (V)	Clamping Voltage[2]		Surge Current[3] @8/20μs (A)	Energy (J)	Capacitance[4] @1kHz (pF)
		Vac	Vdc		A	V			
MLV3220HV240V0500	3220	150	200	240 (±10%)	10	390	500	> 14.5	380
MLV3220HV270V0500		175	225	270 (±10%)		450	500	> 16.0	340
MLV3220HV390V0500		250	330	390 (±10%)		647	500	> 20.0	125
MLV3220HV430V0450		275	369	430 (±10%)		705	450	> 21.0	120
MLV3220HV470V0400		300	385	470 (±10%)		775	400	> 21.6	115

[1] The breakdown voltage was measured at 1 mA current.
[2] The clamping voltage was measured at standard current 3220 (10A).
[3] The surge current was tested at 8/20 μs waveform.
[4] The capacitance value only for customer reference, it's not formal specification.

Surface Mount Multilayer Varistors
High Voltage (HV) Series

Construction and Materials:

Body ①	Termination ②
ZnO	Ag/Ni/Sn

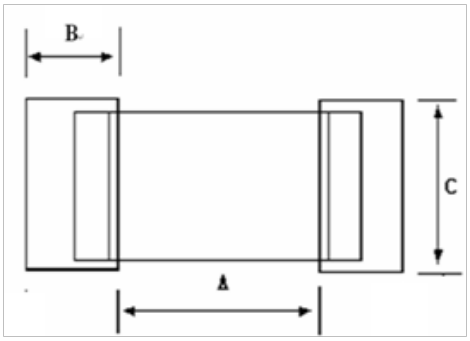


Packaging:

Chip Size	Parts on 7 inch (178mm) Reel
3220	1,000

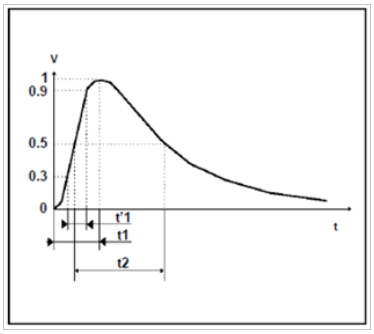
Recommended Foot Print Dimensions:

Size	A (mm)	B (mm)	C (mm)
3220	6.2~7.0	1.6~2.6	4.8~5.8



Surge Waveform:

Severity Level	t1 (=1.67t'1)	t2
1	8 μs	20 μs

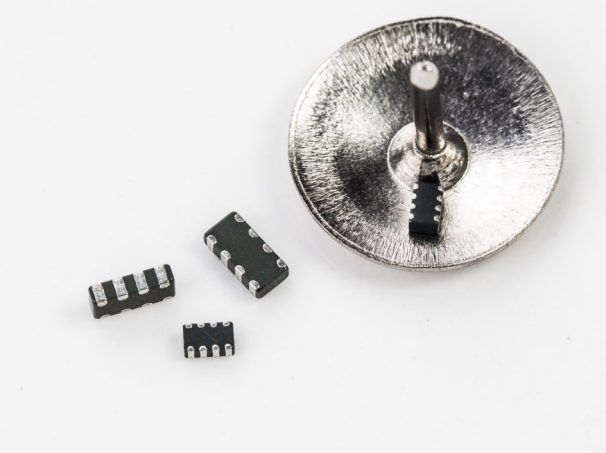


Environmental Test:

Test item	Test condition	Requirement
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Storage	* Temperature : 125±2°C * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Load	* Temperature : 85±2°C * Rated working voltage applied * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Load	* Temperature : 85±2°C * Rated working voltage applied * Time : 1000±2 hours * Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage

Surface Mount Multilayer Varistors

ESD Array Series



Features:

- Low Leakage Current
- Low Leakage Inductance and Fast Response
- Four Varistors in a chip
- Minimizing Crosstalk between Adjacent Circuits

Application Fields:

- ESD protection
- ECU protection
- I/O Protection
- LCD Display

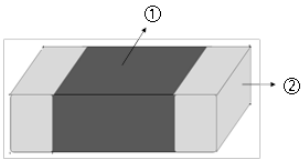
Ordering Information:

Part Number	Working Voltage (Max.)	Breakdown Voltage	Clamping Voltage (Max.)	Leakage Current (Max.)	Insulation Resistance (Min.)	Typical Capacitance Value (1 MHz)	Tolerance of Cap.
	DC(V)	(V)	(V)	(μA)	(MΩ)	(pF)	(%)
MVA0508L4V005C0010N	5	24	60	1.0	10	10	± 30
MVA0612L4V018C0120N	18	28	50	1.0	10	120	± 30

High Surge Protection Devices

Construction and Materials:

Body ①	Termination ②
Nano special ceramic	Ag/Ni/Sn



Packaging:

Chip Size	Parts on 7 inch (178mm) Reel
0806	2, 000
1206	2,000
1210	1,500
1812	500
2220	500
3220	500

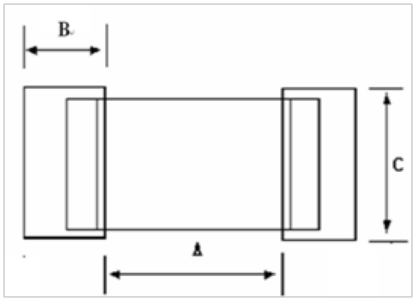
Environmental Test:

Test item	Test condition	Requirement
High Temperature Storage	*Temperature : 125±2°C * Time : 1000±2 hours *Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
Low Temperature Storage	*Temperature : -40±2°C * Time : 1000±2 hours *Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
Temperature Cycle	* Step 1 : -40±3°C for 30±3min * Step 2 : 25°C for 1 hour * Step 3 : 125±3°C for 30±3min * Step 4 : 25°C for 1 hour * Number of cycle : 5 times *Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
High Temperature Load	*Temperature : 85±2°C * Rated working voltage applied * Time : 1000±2 hours *Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage
Damp Heat Load/Humidity Load	*Temperature : 40±2°C * Humidity : 90~95% RH * Rated working voltage applied * Time : 500±2 hours *Test after placing in ambient temperature for 24 hours	* Breakdown voltage change : within ±10% * No mechanical damage

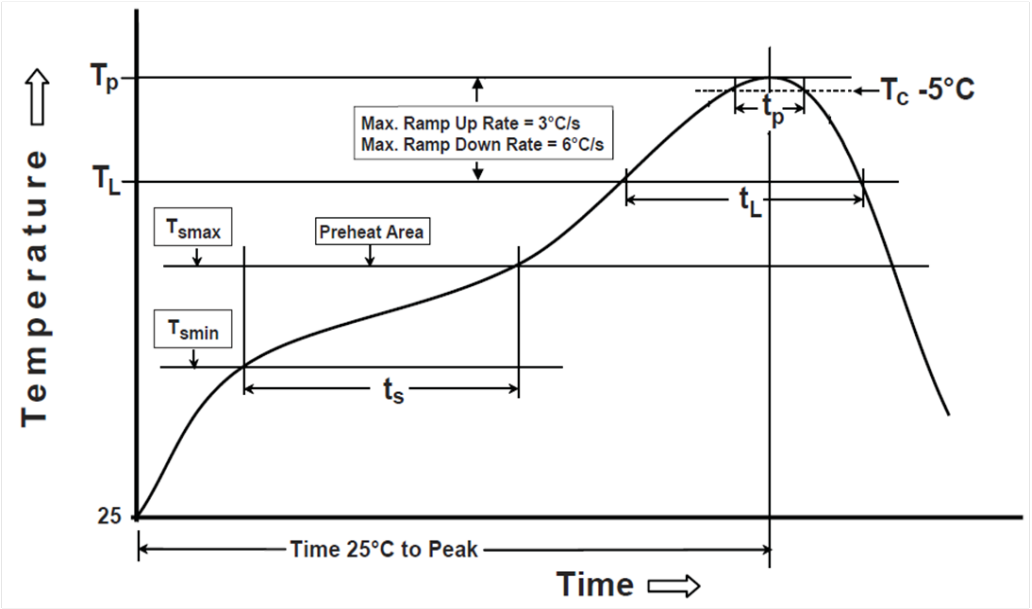
High Surge Protection Devices

Recommended Foot Print Dimensions:

Size	A (mm)	B (mm)	C (mm)
0806	1.2~1.6	0.8~1.2	1.6~2.2
1206	1.8~2.5	1.2~1.8	1.5~2.0
1210	1.8~2.5	1.3~2.0	2.2~3.0
1812	2.5~2.9	1.6~2.0	3.2~3.6
2220	3.8~4.6	1.3~2.2	4.8~5.5
3220	6.2~7.0	1.6~2.6	4.8~5.8



Recommended Reflow Soldering Profile:



Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150°C 200°C 60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217°C 60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (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.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

High Surge Protection Devices

Super High Voltage (SV) Series

Features:

- SMD type body size 0806, 1206, 1208, 1210, 1812, 2220 and 3220
- Bidirectional and symmetrical V/I characteristics
- Meet IEC61000-4-5 Standard
- Large withstanding surge voltage capability - 0.5~2KV (@1.2/50μs, 2Ω)
- Large withstanding surge current capability - 100~1000A (@8/20μs)
- Multilayer construction provides higher power dissipation
- RoHS compliant

Application Fields:

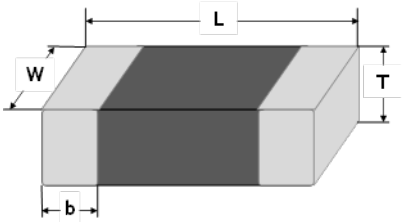
- LED lighting
- Power board
- Base station
- AC power supply
- Industrial equipment and controllers

Agency Approval:

Recognized under the components program of UL and CSA
File number: E475014

Shape and Dimensions:

Unit (mm)	0806	1206	1210	1812	2220	3220
Length (L)	2.20±0.20	3.20+0.60/-0.20	3.20+0.60/-0.20	4.50+0.60/-0.20	6.00+0.70/-0.30	8.10+0.70/-0.30
Width (W)	1.70±0.20	1.60+0.40/-0.20	2.50+0.40/-0.20	3.20+0.50/-0.20	5.30+0.50/-0.30	5.30+0.60/-0.30
Thickness (T)	1.80 Max.	1.90 Max.	2.60 Max.	3.50 Max.	3.60 Max.	3.70 Max.
Termination bandwidth (b)	0.25±0.10	0.50±0.20	0.50±0.25	0.50+0.35/-0.10	0.50+0.35/-0.10	0.80+0.50/-0.10



Product Identification:

HSP	2220	SV	390V	0800
Category Code	**Size Code**	**Application Code**	**Breakdown Voltage Code**	**Surge Current Code**
HSP = High Surge Protection Device	**Inch** 0806 1206 1210 1812 2220 3220	**SV** = Super High Voltage	**240V** = 240V **270V** = 270V **390V** = 390V **430V** = 430V **470V** = 470V	**0100** = 100A **0200** = 200A **0350** = 350A **0500** = 500A **0800** = 800A **1000** = 1000A

High Surge Protection Devices

Super High Voltage (SV) Series

Electrical Characteristics:

Operating temperature: -55 to +85°C

Part Number	Size	Working Voltage		Breakdown Voltage[1] @1mA (V)	Clamping Voltage[2] (V)	Surge Voltage[3] @1.2/50μs, 2Ω (kV)	Surge Current[3] @8/20μs (A)		Energy Max. @10/1000μs (J)	Capacitance[4] @1kHz (pF)	Safety Certification	
		Vac	Vdc			1 time	1 time	15 times			UL[5]	CSA[6]
HSP0806SV240V0200	0806	150	200	240 (±10%)	395	0.5	200	100	4.4	95	Pending	
HSP0806SV430V0100	0806	275	350	430 (±10%)	705	0.5	100	100	4.3	45	Pending	
HSP1206SV240V0350	1206	150	200	240 (±10%)	395	0.5	350	200	7.7	180	Pending	
HSP1210SV390V0200	1210	250	320	390 (±10%)	647	0.5	200	100	7.2	105	√	
HSP1210SV470V0250	1210	300	385	470 (±10%)	775	0.5	250	150	11.9	100	Pending	
HSP1210SV470V0500	1210	300	385	470 (±10%)	775	1.0	500	250	23.8	190	Pending	
HSP1812SV270V0500	1812	175	225	270 (±10%)	450	1.0	500	250	22.0	275	√	
HSP1812SV470V0500	1812	300	385	470 (±10%)	775	1.0	500	250	23.0	200	√	√
HSP1812SV430V0800	1812	275	350	430 (±10%)	705	2.0	800	500	38.0	340	√	√
HSP1812SV470V0800	1812	300	385	470 (±10%)	775	2.0	800	500	38.0	310	√	√
HSP2220SV270V0500	2220	175	225	270 (±10%)	450	1.0	500	250	13.8	390	Pending	
HSP2220SV390V0500	2220	250	320	390 (±10%)	647	1.0	500	250	19.8	235	√	
HSP2220SV430V0500	2220	275	350	430 (±10%)	705	1.0	500	250	21.6	215	√	
HSP2220SV470V0500	2220	300	385	470 (±10%)	775	1.0	500	250	23.7	195	√	
HSP2220SV240V0800	2220	139	195	240 (±10%)	295	2.0	800	500	21.0	430	Pending	
HSP2220SV390V0800	2220	250	320	390 (±10%)	647	2.0	800	500	31.8	320	√	
HSP2220SV430V0800	2220	275	350	430 (±10%)	705	2.0	800	500	34.7	305	√	√
HSP2220SV470V0800	2220	300	385	470 (±10%)	775	2.0	800	500	38.0	290	√	√
HSP3220SV430V1000	3220	275	350	430 (±10%)	705	2.0	1000	500	46.8	490	Pending	
HSP3220SV470V1000	3220	300	385	470 (±10%)	775	2.0	1000	500	51.5	450	Pending	

[1] The breakdown voltage was measured at 1 mA current.
[2] The clamping voltage was measured at standard current 1210 (2.5A), 1812 (5A), 2220 (10A) and 3220 (10A).
[3] The surge voltage was tested at 1.2/50 μs waveform and 2Ω. The surge current was tested at 8/20 μs waveform.
[4] The capacitance value only for customer reference, it's not formal specification.
[5] The UL safety approval complies with standard UL1449 3rd.
[6] The CSA safety approval complies with standard CSA C22.2 No. 8.

High Surge Protection Devices

Super High Current (SC) Series

Features:

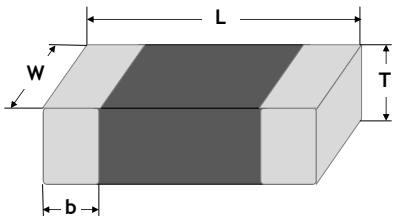
- SMD type – 1206~2220 sizes
- Bidirectional and symmetrical V/I characteristics
- Meet IEC61000-4-5/K21 standard
- Large withstanding surge current capability à 500~8000A (@8/20μs)
- Excellent low leakage current <15μA
- Multilayer construction provides higher power dissipation
- RoHS compliant

Application Fields:

- Telecom equipment RJ45, LAN connector, Ethernet
- Outdoor/Indoor AP/IAD
- Security system IP CAM
- Low voltage power line
- Base station

Shape and Dimensions:

Unit (mm)	1206	1210	1812	2220
Length (L)	3.2 +0.6/-0.2	3.2 +0.6/-0.2	4.5 +0.6/-0.2	6.0 +0.7/-0.3
Width (W)	1.6 +0.4/-0.2	2.5 +0.4/-0.2	3.2 +0.5/-0.2	5.3 +0.5/-0.3
Thickness (T)	1.90 Max.	2.60 Max.	3.50 Max.	3.60 Max.
Termination band-width (b)	0.5±0.20	0.5±0.25	0.5 +0.35/-0.1	0.5 +0.35/-0.1



Product Identification:

HSP	1206	SC	012V	0500
Category Code	**Size Code**	**Application Code**	**Breakdown Voltage Code**	**Surge Current Code**
HSP = High Surge Protection Device	**Inch** 1206 1210 1812 2220	**SC** = Super High Current	**012V** = 12V **024V** = 24V **047V** = 47V **056V** = 56V **075V** = 75V **082V** = 82V	**0500** = 500A **1000** = 1000A **2000** = 2000A **3000** = 3000A **5000** = 5000A **8000** = 8000A

Surge Waveform:

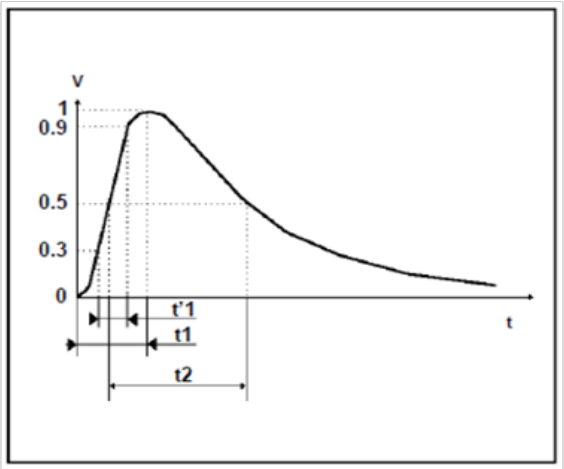


Fig. 1 8/20 μs surge definition

Severity Level	t1 (=1.67t'1)	t2
1	8 μs	20 μs

High Surge Protection Devices

Super High Current (SC) Series

Electrical Characteristics:

Part Number	Size	Working Voltage		Breakdown Voltage @1mA (V) [1]	Clamping Voltage (V) [2]	Surge Current @ 8/20μs (A) [3]
		VAC	VDC			
HSP1206SC012V0500	1206	6	9	12 (12~20)	<25	500
HSP1206SC024V0500	1206	14	18	24 (±10%)	<45	500
HSP1206SC047V0500	1206	30	38	47 (±10%)	<85	500
HSP1206SC075V0500	1206	48	60	75 (±10%)	<100	500
HSP1210SC024V1000	1210	14	18	24 (±10%)	<45	1000
HSP1210SC047V1000	1210	30	38	47 (±10%)	<85	1000
HSP1210SC075V1000	1210	48	60	75 (±10%)	<100	1000
HSP1812SC047V2000	1812	30	38	47 (±10%)	<85	2000
HSP1812SC075V2000	1812	48	60	75 (±10%)	<100	2000
HSP2220SC047V5000	2220	30	38	47 (±10%)	<85	5000
HSP2220SC047V8000	2220	30	38	47 (±10%)	<85	8000
HSP2220SC075V3000	2220	48	60	75 (±10%)	<100	3000

[1] The breakdown voltage was measured at 1 mA current
[2] The clamping voltage was measured at standard current 1206 (1A), 1210 (2.5A), 1812 (5A) and 2220 (10A)
[3] The surge current was tested at 8/20 μs waveform

Part Number	Non-linear Coefficient (α)	Leakage Current (μA)		Capacitance [4] @ 1kHz (pF)	Response Time (T_{rise})	Operating Temperature (°C)
		Before Surge Test	After Surge Test			
HSP1206SC012V0500	20	<10	<80	3500	< 1ns	-55 to +125
HSP1206SC024V0500	20	<10	<80	2300		
HSP1206SC047V0500	30	<10	<80	690		
HSP1206SC075V0500	30	<10	<80	300		
HSP1210SC024V1000	20	<15	<80	2300		
HSP1210SC047V1000	30	<10	<80	1550		
HSP1210SC075V1000	30	<10	<80	930		
HSP1812SC047V2000	30	<15	<80	2100		
HSP1812SC075V2000	30	<15	<80	1650		
HSP2220SC047V5000	35	<15	<80	9900		
HSP2220SC047V8000	35	<15	<80	7500		
HSP2220SC075V3000	40	<15	<80	2000		

[4] The capacitance value only for customer reference, it's not formal specification

High Surge Protection Devices

Super High Network (SN) Series

Features:

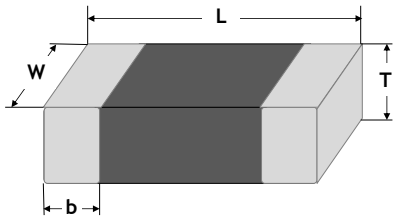
- Bidirectional and symmetrical V/I characteristics
- Meet IEC61000-4-5/K21 standard
- Large withstanding surge voltage capability: 4~6KV (@10/700μs)
- Excellent low leakage current <10μA
- Multilayer construction provides higher power dissipation

Application Fields:

- Telecom equipment RJ45, LAN connector, Ethernet
- Outdoor/Indoor AP/IAD
- Security system IP CAM
- Low voltage power line DC12V, AC24V, PoE
- ADSL/XDSL telecom equipment
- VOIP phones
- PoE modules
- HUB switch
- Other Networks

Shape and Dimensions:

Unit (mm)	1206	1210
Length (L)	3.2 +0.6/-0.2	3.2 +0.6/-0.2
Width (W)	1.6 +0.4/-0.2	2.5 +0.4/-0.2
Thickness (T)	1.90 Max.	2.60 Max.
Termination band-width (b)	0.5±0.20	0.5±0.25



Product Identification:

HSP	1206	SN	012V	4000
Category Code	**Size Code**	**Application Code**	**Breakdown Voltage Code**	**Surge Voltage Code**
HSP = High Surge Protection Device	**Inch** (mm) **1206** (3216) **1210** (3225)	**SN** = Super High Network	**012V** = 12V **047V** = 47V **075V** = 75V	**4000** = 4kV **6000** = 6kV

Surge Waveform:

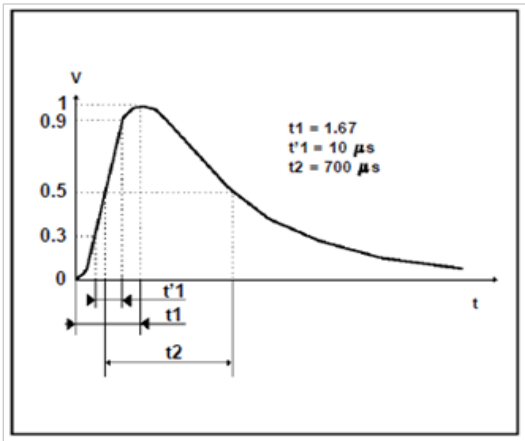


Fig. 1 CCITT 7 10/700 μs surge definition

Severity Level	t1 (=1.67t'1)	t2
1	10 μs	700 μs

High Surge Protection Devices

Super High Network (SN) Series

Electrical Characteristics:

Part Number	Size	Working Voltage		Breakdown Voltage @1mA (V) [1]	Clamping Voltage (V) [2]	Surge Current @ 10/700μs (A) [3]	Surge Voltage (kV)
		VAC	VDC				
HSP1206SN012V4000	1206	6	9	12 (12~20)	< 30	100	4
HSP1206SN012V6000	1206	6	9	12 (12~20)	< 30	150	6
HSP1210SN047V4000	1210	30	38	47 (±10%)	< 75	100	4
HSP1210SN047V6000	1210	30	38	47 (±10%)	<75	150	6
HSP1210SN075V4000	1210	48	60	75 (±10%)	< 100	100	4
HSP1210SN075V6000	1210	48	60	75 (±10%)	< 100	150	6

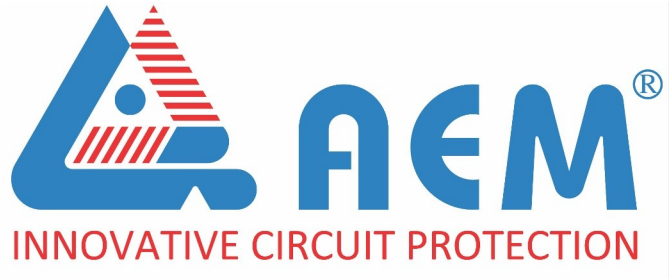
[1] The breakdown voltage was measured at 1 mA current.
[2] The clamping voltage was measured at standard current 1206(1A) and 1210 (2.5A).
[3] The surge current was tested at 10/700 μs waveform, Ri=40Ω. Common-mode testing is to test all data lines while the GND.

Part Number	Non-linear Coefficient (α)	Leakage Current (μA)		Capacitance [4] @ 1kHz (pF)	Response Time (T_{rise})	Operating Temperature (°C)
		Before Surge Test	After Surge Test			
HSP1206SN012V4000	20	10	80	3200	< 1ns	-55 to +125
HSP1206SN012V6000	20	10	80	3850		
HSP1210SN047V4000	30	10	80	1400		
HSP1210SN047V6000	30	10	80	1670		
HSP1210SN075V4000	30	10	80	1000		
HSP1210SN075V6000	30	10	80	1300		

[4] The capacitance value only for customer reference, it's not formal specification.

Disclaimer

Specifications are subject to change without notice. AEM products are designed for specific applications and should not be used for any purpose (including, without limitation, automotive, aerospace, medical, life-saving applications, or any other application which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property) not expressly set forth in applicable AEM product documentation. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Warranties granted by AEM shall be deemed void for products used for any purpose not expressly set forth in applicable AEM product documentation. AEM shall not be liable for any claims or damages arising out of products used in applications not expressly intended by AEM as set forth in applicable AEM product documentation. The sale and use of AEM products is subject to AEM terms and conditions of sale. Please refer to AEM's website for updated catalog and terms and conditions of sale.



AEM Components (Suzhou) Co., Ltd

461 Zhongnan Street,
China-Singapore Suzhou Industrial Park
Jiangsu, P. R. China, 215026

Tel: 86-512-6258-0028
Fax: 86-512-6258-0018
Email: sales@aemchina.com

AEM Components (USA), Inc.

6670 Cobra Way, San Diego, CA 92121, USA

Tel: 1-858-750-6100
Fax: 1-858-481-1123
Email: sales@aemcomponents.com