

Surface Mount Fuses

	PAGE
Surface Mount Fuses	
   466 series, SlimLine™ Lead-Free 1206, Very Fast-Acting Fuse	364-365
433 series, SlimLine™ 1206, Very Fast-Acting Fuse.	366
   429 series, High Current- Lead-Free 1206, Very Fast-Acting Fuse	367
   468 series, SlimLine™ Lead-Free 1206, Slo-Blo® Fuse	368
430 series, 1206, Slo-Blo® Fuse	369
   467 series, SlimLine™ Lead-Free 0603, Very Fast-Acting Fuse	370-371
434 series, SlimLine™ 0603, Very Fast-Acting Fuse.	372
   435 series, SlimLine™ Lead-Free 0402, Very Fast-Acting Fuse	373
 451/453 series, NANO ²⁰ Very Fast-Acting Fuse.	374
 452/454 series, NANO ²⁰ Slo-Blo® Fuse	375
 455 series, NANO ²⁰ UMF Fast-Acting Fuse.	376
 154 series, SMF OMNI-BLOK® Fuse Block	377
 464 series, NANO ²⁰ 250V UMF Fast-Acting Fuse	378
 465 series, NANO ²⁰ 250V UMF Time Lag Fuse	379
 461 series, TeleLink® Fuse.	380-382
 459/460 series, PICO® SMF Fuse	383
202 series, FLAT-PAK® Fast-Acting Fuse	384
203 series, FLAT-PAK® Slo-Blo® Fuse	385
446/447 series, EBF Fuse Fast-Acting	386

Surface Mount Fuses

Lead-Free Thin-Film

RoHS **Pb** **SlimLine™ Lead-Free 1206** Very Fast Acting Fuse 466 Series

NEW

UL

CS

- RoHS compliant and Lead-Free.
- For new designs of 7 amp please consult 429 series.
- Product is compatible with lead-free solders and higher temperature profiles.
- Current ratings available up to 5A.
- High performance materials provide improved performance in elevated ambient temperature applications.
- Product is marked on top surface with code to allow amperage rating identification without testing.
- Low profile for height sensitive applications.
- Flat top surface for pick-and-place operations.
- Element covering material is resistant to industry standard cleaning operations.
- Mounting pad and electrical performance is identical to Littelfuse 429 and 433 Series products.
- Alloy based element construction provides superior inrush withstand characteristics (I^2t) over ceramic or glass based 1206 chip fuse products.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862

INTERRUPTING RATINGS:

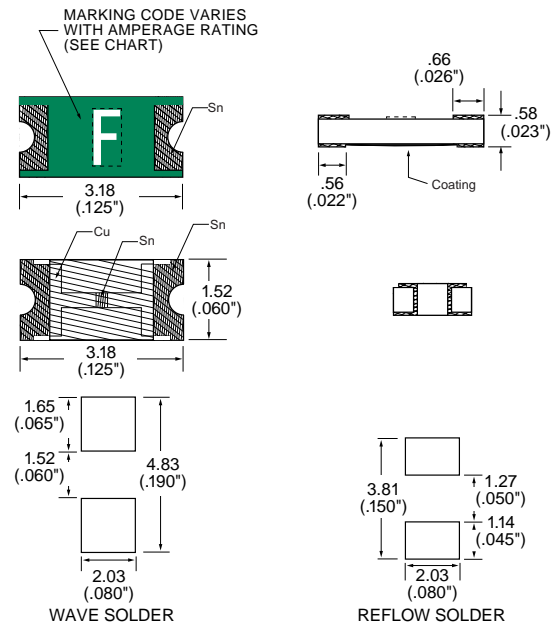
0.125 – .375A	50A at 125 V AC/DC
0.5 – 2A	50A at 63 V AC/DC
2.5 – 3A	50A at 32 V AC/DC
4 – 5A	35A at 24 V AC/DC

PHYSICAL SPECIFICATIONS:

Materials: Body: Advanced High Temperature Substrate
Terminations: 100% Copper/Nickel/Tin
Element Cover Coat: Conformal Coating



Reference Dimensions:



Soldering Parameters(see page 3 for soldering profile):

Wave Solder — 260°C, 10 seconds max
Reflow Solder — 260°C, 30 seconds max

Surface Mount Fuses

Lead-Free Thin-Film

RoHS **Pb** **SlimLine™ Lead-Free 1206** Very Fast Acting Fuse 466 Series

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C - + 90°C.

Vibration: Per MIL-STD-202F.

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C and up to 260°C, maximum

Thermal Shock: Withstands 5 cycles of -55° to 125°C.

PACKAGING SPECIFICATIONS:

8mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

PATENTED

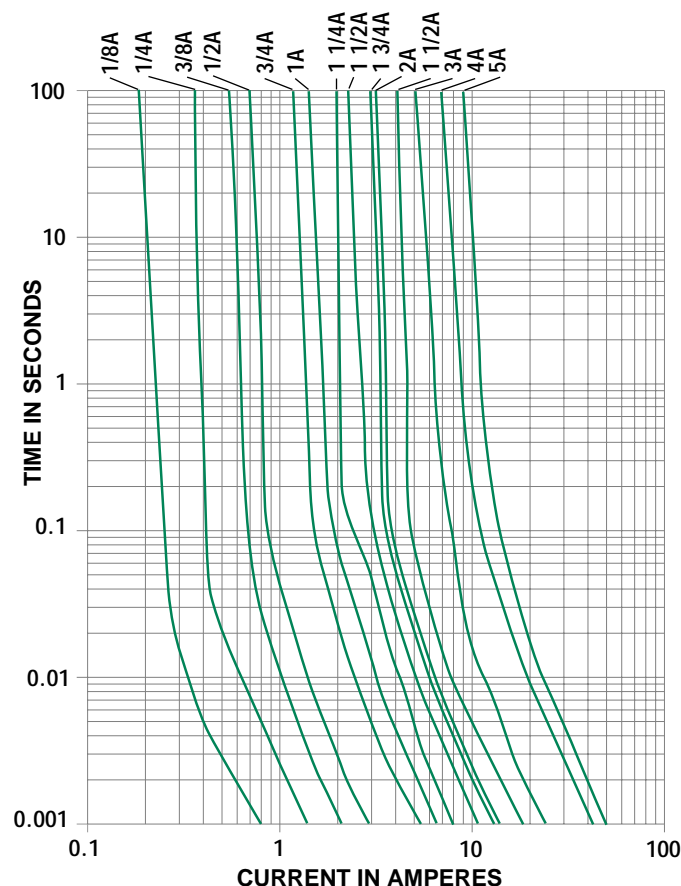
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Marking Code	Voltage Rating	Nominal Resistance Cold Ohms ¹	Melting I ² t (A ² Sec.) ²
0466.125	.125	B	125	4.000	0.00040
0466.200	.2	C	125	1.150	0.00055
0466.250	.25	D	125	0.690	0.0010
0466.375	.375	E	125	0.350	0.0028
0466.500	.5	F	63	0.220	0.0060
0466.750	.75	G	63	0.105	0.0276
0466 001.	1	H	63	0.072	0.0423
0466 1.25	1.25	J	63	0.056	0.0640
0466 01.5	1.5	K	63	0.046	0.1103
0466 1.75	1.75	L	63	0.037	0.1323
0466 002.	2	N	63	0.031	0.2326
0466 02.5	2.5	O	32	0.023	0.3516
0466 003.	3	P	32	0.020	0.5760
0466 004.	4	S	24	0.014	1.024
0466 005.	5	T	24	0.011	1.600

¹ Measured at 10% of rated current, 25°C.

² Measured at rated voltage.

Average Time Current Curves



Surface Mount Fuses

Thin-Film Surface Mount

SlimLine™ 1206 Very Fast-Acting Fuse 433 Series



- For new designs of 7 amp please consult 429 series.
- The SlimLine 1206 fuse is an extremely small, low profile design (1206 chip size) utilizing thin-film technology to achieve precise control of electrical characteristics.
- The lower height profile produces a flat surface for improved performance in pick-and-place operations and an alternate solution for height critical application.
- Mounting pad and electrical specification are identical to the popular 429 Series specifications.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

0.125 – .375A	50 A @ 125 V AC/DC
0.5 – 2A	50 A @ 63 V AC/DC
2.5 – 3A	50 A @ 32 V AC/DC
4 – 5A	50 A @ 24 V AC/DC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: –55°C to 90°C. Consult temperature derating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Per MIL-STD-202F.

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Shelf Life (Solderability): 1 year min.

Thermal Shock: Withstands 5 cycles of –55° to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate

Terminations: Copper/Nickel/Tin-Lead (95/5)

Cover Coat: Conformal Coating

Soldering Parameters(refer to page 5 for soldering profile):

Wave Solder — 260°C, 10 seconds maximum

Infrared Solder — 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

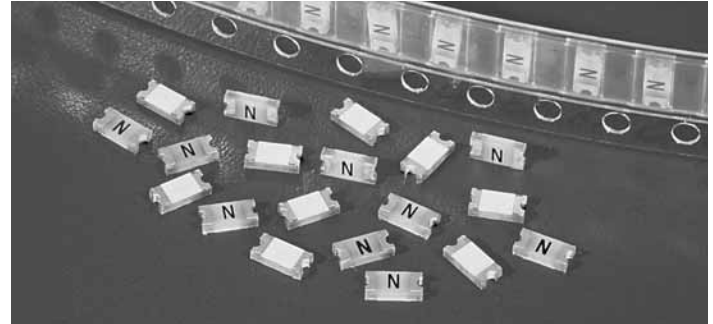
PATENTED

ORDERING INFORMATION:

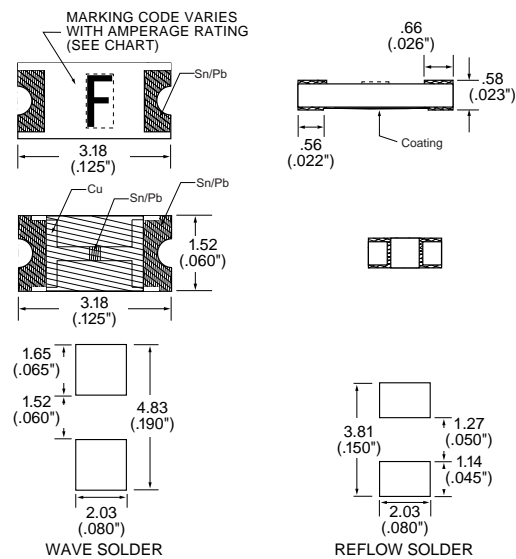
Catalog Number	Ampere Rating	Marking Code	Voltage Rating	Nominal Resistance Cold Ohms ¹	Melting I ² t (A ² Sec.) ²
0433.125	.125	B	125	3.45	0.00040
0433.200	.200	C	125	0.938	0.00055
0433.250	.250	D	125	0.625	0.0010
0433.375	.375	E	125	0.375	0.0028
0433.500	.50	F	63	0.2405	0.0060
0433.600	.60	.6	63	0.2100	0.0131
0433.750	.75	G	63	0.1370	0.0170
0433.800	.80	.8	63	0.1225	0.0305
0433.001.	1.0	H	63	0.09950	0.0350
0433 1.25	1.25	J	63	0.07475	0.0650
0433 01.5	1.5	K	63	0.06250	0.125
0433 1.75	1.75	L	63	0.05000	0.150
0433 002.	2.0	N	63	0.03975	0.230
0433 02.5	2.5	O	32	0.03065	0.50
0433 003.	3.0	P	32	0.02625	0.70
0433 004.	4.0	S	24	0.014	1.024
0433 005.	5.0	T	24	0.011	1.600

¹ Measured at 10% of rated current, 25°C.

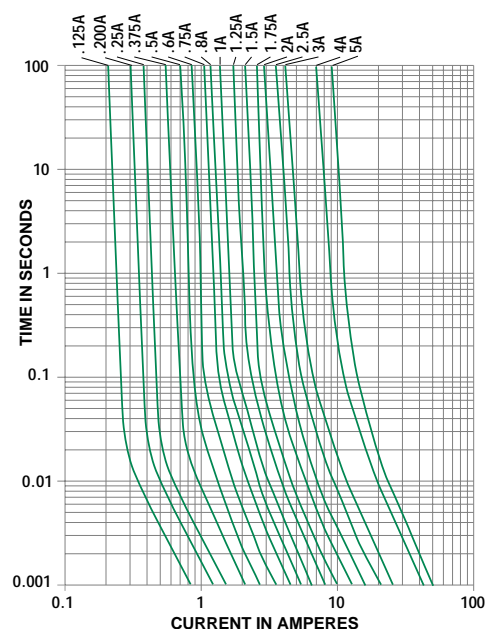
² Measured at rated voltage.



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Thin-Film Surface Mount

RoHS High Current 1206 Very Fast-Acting Fuse 429 Series



- RoHS compliant and Lead-Free 7A device available-add 'L' suffix to catalog number
- For new designs up to 5A please consult the 433 or 466 Series

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

7A 35 amperes at rated voltage, VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature derating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Withstands 10–55 Hz per MIL-STD-202F, Method 201A and 10-2000 Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.

Insulation Resistance (After Opening): Greater than 10 KOhm.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of -55° to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate

Terminations:

Standard Device: Copper/Nickel/Tin-Lead (95/5)

RoHS Compliant Device: 100% Copper/Nickel/Tin

Cover Coat: Conformal Coating

Soldering Parameters:

Reflow Solder — 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 3,000 per reel, add packaging suffix, WRM.

Options: For RoHS Compliant and lead-free devices add the letter 'L' to end of packaging suffix. Example: 0429007.WRML (RoHS Compliant 7A, 3,000 per reel).

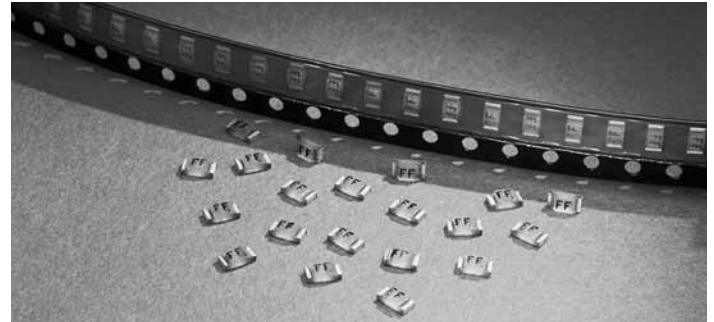
ORDERING INFORMATION:

For Low-Current Designs Use 433 or 466 Series.

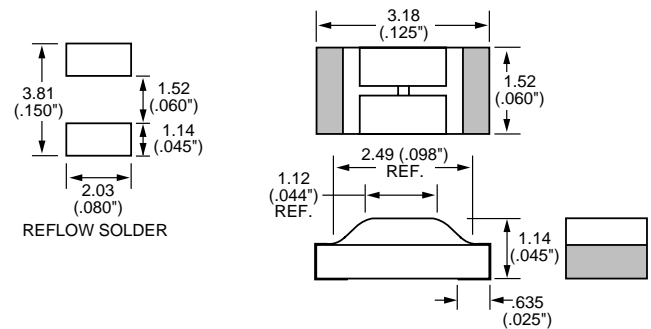
Catalog Number	Ampere Rating	Marking Code	Nominal Voltage Rating	Nominal Resistance Cold Ohms ¹	Melting I ² t (A ² Sec.) ²
429.125	0.125	FB	125	2.30000	0.00020
429.200	0.200	FC	125	0.93800	0.00055
429.250	0.250	FD	125	0.62500	0.00100
429.375	0.375	FE	125	0.37500	0.00280
429.500	0.500	FF	63	0.24050	0.0060
429.750	0.75	FG	63	0.13700	0.0170
429.001	1.00	FH	63	0.09950	0.035
429.007	7.0	FU	24	0.00925	3.60
429.007L	7.0	7	24	0.00925	3.60

¹ Measured at 10% of rated current, 25°C.

² Measured at rated voltage.

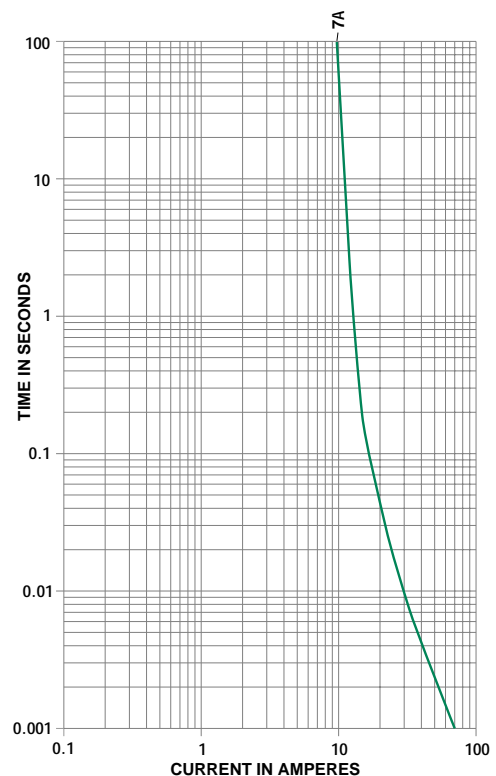


RECOMMENDED PAD LAYOUTS



PATENTED

Average Time Current Curves



Surface Mount Fuses

RoHS **Pb** **Lead-Free SlimLine™ 1206** Slo-Blo® Fuse 468 Series



- Complies with electronic industry environmental standards for lead reduction.
- Product is compatible with lead-free solders and higher temperature profiles.
- Time delay feature withstands high in-rush currents and prevents nuisance openings.
- Package is visually distinct from fast-acting version for easy identification.
- Top side marking allows visual verification of amperage rating.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time @ 25°C
100%	4 hours, Minimum
200%	1 sec., Min. ; 120 sec., Max.
300%	0.05 sec., Min. ; 1.5 sec., Max.
800%	0.0015 sec., Min. ; .05 sec., Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

1.0A - 1.5A	50 amperes at 63 VAC/VDC
2.0A	35 amperes at 63 VAC/VDC
3.0A	50 amperes at 32 VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Withstands 10-55 Hz per MIL-STD-202F, Method 201A and 10-2000 Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.

Insulation Resistance (After Opening): Greater than 10,000 Ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of -50°C to +125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: 100% Tin
Cover Coat: Conformal Coating

Soldering Parameters:

Reflow Solder: 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

PATENTED

ORDERING INFORMATION:

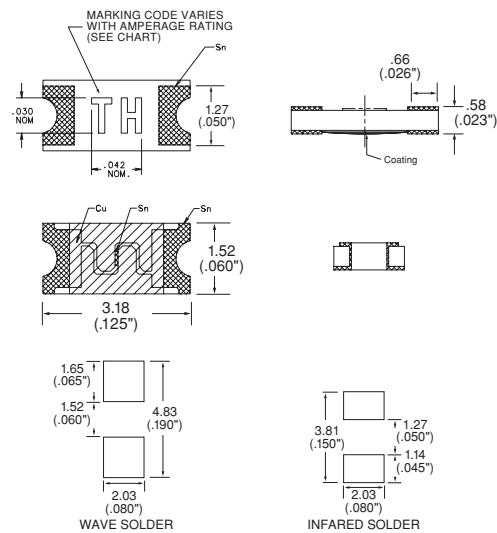
Catalog Number	Amperage Rating (A)	Marking Code	Voltage Rating (V)	Nom. Cold Resistance Cold Ohm ¹	Nominal Melting I ² t (A ² sec) ²
0468 001.	1.0	TH	63	0.079	0.127
0468 01.5	1.5	TK	63	0.044	0.288
0468 002.	2.0	TN	63	0.0325	0.506
0468 003.	3.0	TP	32	0.0195	1.270

¹Measured at 10% of rated current, 25°C.

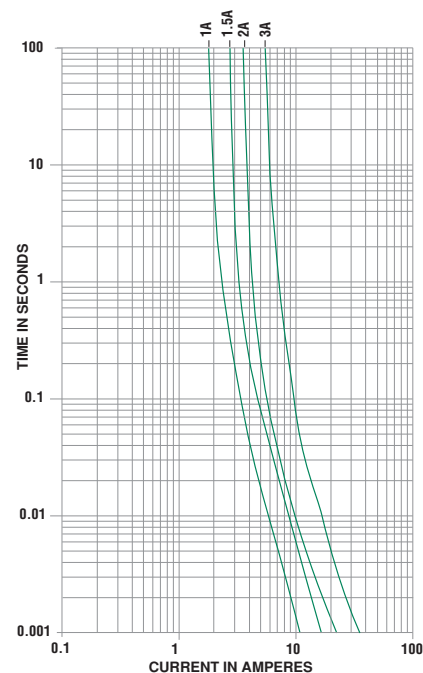
²Measured at rated voltage.



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Thin-Film Surface Mount

1206 Slo-Blo® Fuse 430 Series



- For RoHS compliant and Lead-Free designs use 468 series
- Time delay feature withstands high in-rush currents and prevents nuisance openings.
- Package is visually distinct from fast-acting version for easy identification.
- Top side marking allows visual verification of amperage rating.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time @ 25°C
100%	4 hours, Minimum
200%	1 sec., Min. ; 120 sec., Max.
300%	0.1 sec., Min. ; 3 sec., Max.
800%	0.002 sec., Min. ; .05 sec., Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

0.5A - 1.5A	50 amperes at 63 VAC/VDC
2A	35 amperes at 63 VAC/VDC
3A	50 amperes at 32 VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature derating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Withstands 10-55 Hz per MIL-STD-202F, Method 201A and 10-2000 Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.

Insulation Resistance (After Opening): Greater than 10,000 Ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of -50°C to +125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (95/5)
Cover Coat: Conformal Coating

Soldering Parameters(see page 3 for soldering profiles):

Reflow Solder: 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 3,000 per reel, add packaging suffix, WR.

PATENTED

ORDERING INFORMATION:

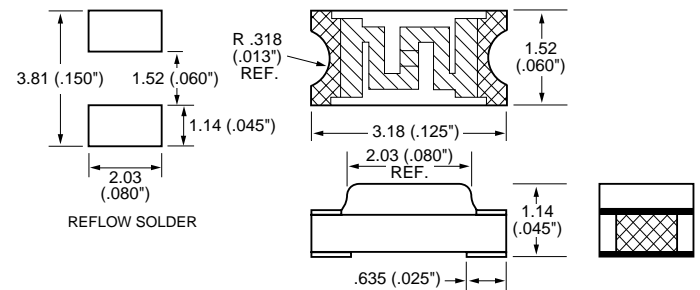
Catalog Number	Ampere Rating (A)	Marking Code	Voltage Rating (V)	Nom. Cold Resistance Cold Ohm ¹	Nominal Melting I ² t (A ² sec) ²
0430.500	0.5	TF	63	.250	0.0305
0430 001.	1.0	TH	63	.097	0.144
0430 01.5	1.5	TK	63	.056	0.298
0430 002.	2.0	TN	63	.039	0.494
0430 003.	3.0	TP	32	.020	1.33

¹Measured at 10% of rated current, 25°C.

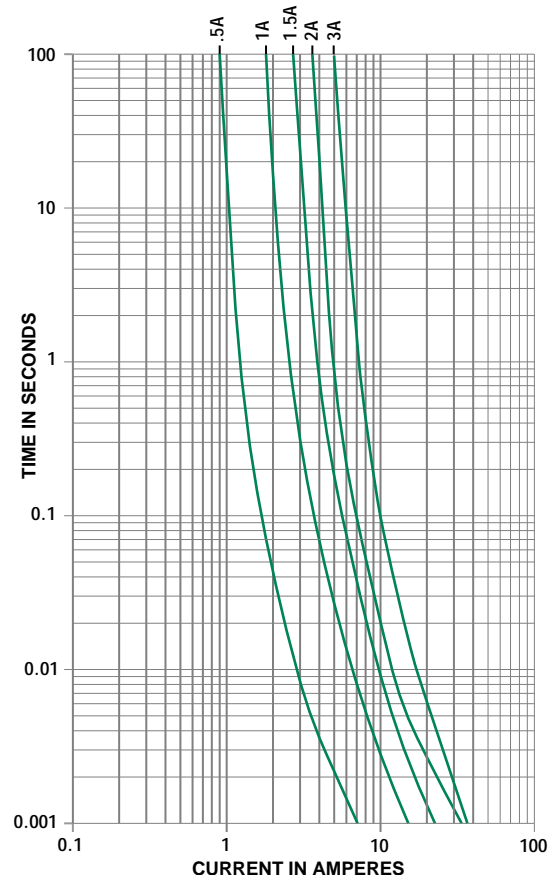
²Measured at rated voltage.



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Lead-Free Thin-Film

RoHS **Pb** **SlimLine™ Lead-Free 0603** Very Fast-Acting Fuse 467 Series

NEW

UL

SP

- RoHS compliant and Lead-Free.
- Product is compatible with lead-free solders and higher temperature profiles.
- High performance materials provide improved performance in elevated ambient temperature applications.
- Product is marked on top surface with code to allow amperage rating identification without testing.
- Low profile for height sensitive applications.
- Flat top surface for pick-and-place operations.
- Element covering material is resistant to industry standard cleaning operations.
- Mounting pad and electrical performance is identical to Littelfuse 431 and 434 Series products.
- Alloy based element construction provides superior inrush withstand characteristics (I^2t) over ceramic or glass based 0603 fuse products.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862

INTERRUPTING RATINGS:

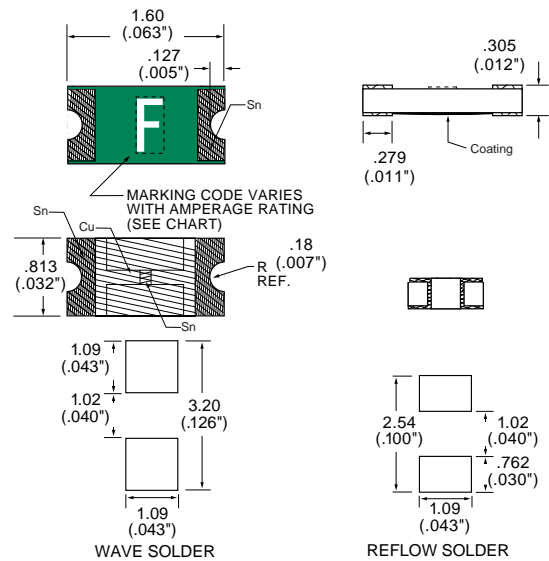
0.25 – 1A 50A at 32V AC/DC
1.25 – 5A 35A at 32V AC/DC

PHYSICAL SPECIFICATIONS:

Materials: Body: Advanced High Temperature Substrate
Terminations: 100% Copper/Nickel/Tin
Element Cover Coat: Conformal Coating



Reference Dimensions:



Soldering Parameters(see page 3 for typical soldering profile):

Wave Solder — 260°C, 10 seconds max
Reflow Solder — 260°C, 30 seconds max

Surface Mount Fuses

Lead-Free Thin-Film

RoHS **Pb** **SlimLine™ Lead-Free 0603** Very Fast-Acting Fuse 467 Series

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C - + 90°C

* For operation above 90°C contact Littelfuse

Vibration: Per MIL-STD-202F

Insulation Resistance (After Opening):

Greater than 10,000 ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum

Thermal Shock: Withstands 5 cycles of -55° to 125°C

PACKAGING SPECIFICATIONS:

8mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 5,000 per reel, add package suffix, NR.

Patents: Patented

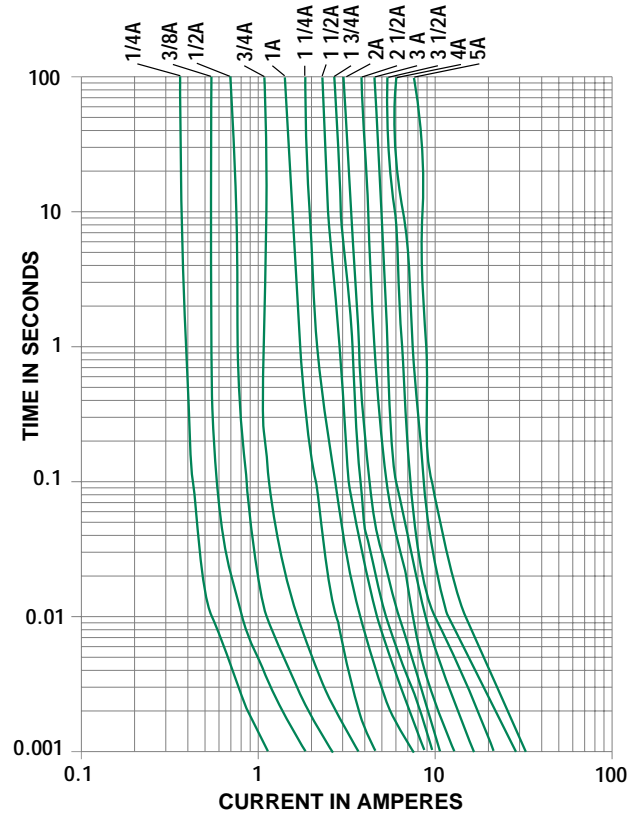
Ordering Information:

Catalog Number	Ampere Rating	Marking Code	Nominal Voltage Rating	Nominal Resistance ¹ (Ω)	Melting I ² t (A ² Sec.) ²
0467.250	.25	D	32	0.435	0.0030
0467.375	.375	E	32	0.275	0.0053
0467.500	.5	F	32	0.180	0.0087
0467.750	.75	G	32	0.112	0.0171
0467.001.	1	H	32	0.062	0.0212
0467 1.25	1.25	J	32	0.050	0.0518
0467 01.5	1.5	K	32	0.040	0.0766
0467 1.75	1.75	L	32	0.028	0.0903
0467 002.	2	N	32	0.024	0.1103
0467 02.5	2.5	O	32	0.020	0.1440
0467 003.	3	P	32	0.016	0.2403
0467 03.5	3.5	R	32	0.013	0.4306
0467 004.	4	S	32	0.011	0.5760
0467 005.	5	T	32	0.0085	0.9000

¹ Measured at 10% of rated current, 25°C.

² Measured at rated voltage.

Average Time Current Curves



Surface Mount Fuses

Thin-Film Surface Mount

SlimLine™ 0603 Very Fast-Acting Fuse 434 Series



- For RoHS compliant and Lead-Free designs use 467 series.
- The SlimLine 0603 fuse is an extremely small, low profile design (0603 chip size) utilizing thin-film technology to achieve precise control of electrical characteristics.
- The lower height profile produces a flat surface for improved performance in pick-and-place operations and an alternate solution for height critical applications.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

.25–1A 50 A @ 32 V AC/DC
1.25–5A 35 A @ 32 V AC/DC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: –55°C to 90°C. Consult temperature derating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Per MIL-STD-202F.

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance To Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of –55°C to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (95/5)
Cover Coat: Conformal Coating

Soldering Parameters(see page 3 for typical soldering profile):

Wave Solder — 260°C, 10 seconds maximum
Reflow Solder— 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

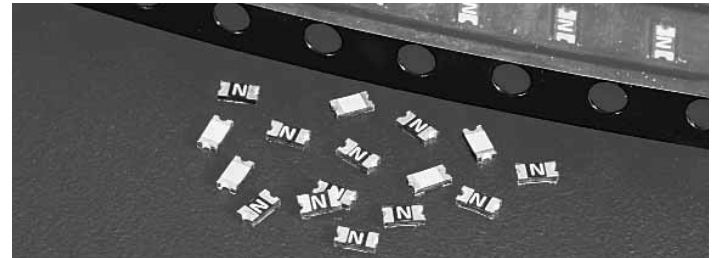
PATENTED:

ORDERING INFORMATION:

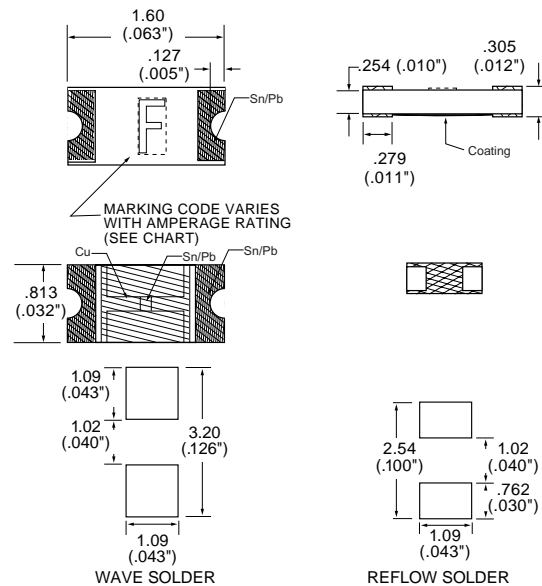
Catalog Number	Ampere Rating	Marking Code	Voltage Rating	Nominal Resistance Cold Ohm ¹	Melting I ² t (A ² Sec.) ²
0434.250	.25	D	32	0.375	0.0030
0434.375	.375	E	32	0.265	0.0053
0434.500	.5	F	32	0.193	0.0087
0434.680	.68	X	32	0.125	0.0109
0434.750	.75	G	32	0.114	0.0171
0434.001	1	H	32	0.072	0.0210
0434 1.25	1.25	J	32	0.054	0.0320
0434 01.5	1.5	K	32	0.048	0.0526
0434 1.75	1.75	L	32	0.039	0.0661
0434 002	2	N	32	0.036	0.104
0434 02.5	2.5	O	32	0.028	0.175
0434 003	3	P	32	0.023	0.198
0434 03.5	3.5	R	32	0.019	0.265
0434 004	4	S	32	0.017	0.352
0434 005	5	T	32	0.013	1.297

¹ Measured at 10% of rated current, 25°C.

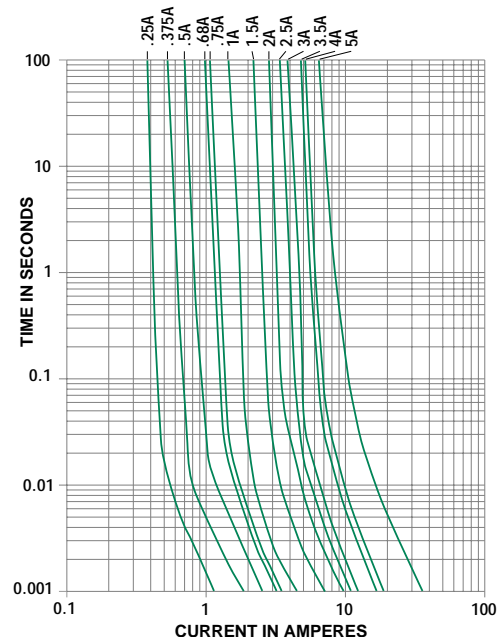
² Measured at rated voltage.



Reference Dimensions:



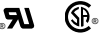
Average Time Current Curves



Surface Mount Fuses

Thin-Film Surface Mount

RoHS **Pb** **SlimLine™ Lead-Free 0402** Very Fast-Acting Fuse 435 Series



- RoHS compliant and Lead-Free
- The SlimLine 0402 fuse is the world's smallest fuse available.
- Ideal for space sensitive applications including disc drives and handheld devices including mobile phones, cameras and personal communication devices.
- The low profile flat surface and full-faced termination are designed for superior performance in surface mount assembly processes.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS: 35A @ 32 VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature derating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Per MIL-STD-202F.

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance To Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of -55°C to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate

Terminations: 100% Copper/Nickel/Tin

Cover Coat: Conformal Coating

Soldering Parameters(see page 3 for typical soldering profile):

Reflow Solder— 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Paper Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 10,000 per reel, add packaging suffix, KR.

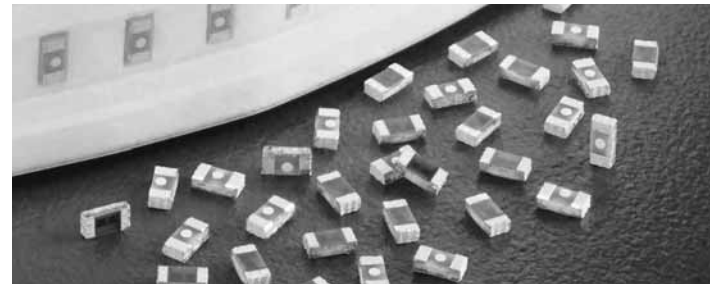
PATENTED

ORDERING INFORMATION:

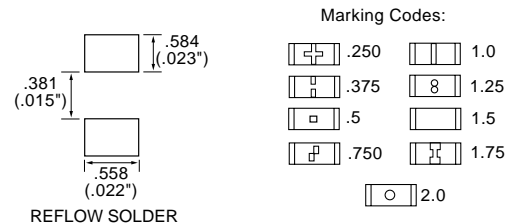
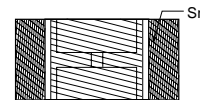
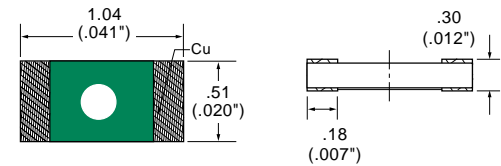
Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohm ¹	Nominal Melting I ² t (A ² Sec.)
0435.250	.25	32	0.220	0.0025
0435.375	.375	32	0.185	0.0035
0435.500	.5	32	0.150	0.0053
0435.750	.75	32	0.105	0.012
0435.001.	1	32	0.072	0.020
0435 1.25	1.25	32	0.060	0.035
0435 01.5	1.5	32	0.047	0.056
0435 1.75	1.75	32	0.038	0.075
0435 002.	2	32	0.030	0.100

¹ Measured at 10% of rated current, 25°C.

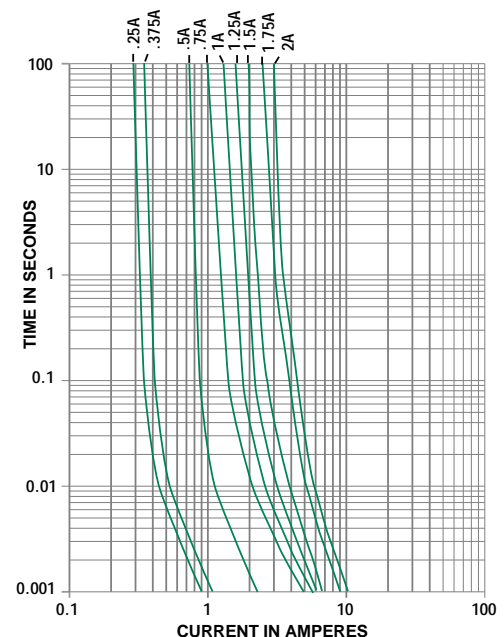
² Measured at rated voltage.



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Subminiature Surface Mount

RoHS NANO² FUSE Very Fast-Acting 451/453 Series



The Nano² SMF Fuse is a very small, square surface mount fuse that is also available in a surface mount holder.

- 451 Series **RoHS Compliant** version now available, use ordering suffix 'L' (see example on data sheet).

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
100%	1/16–15	4 hours, Minimum
200%	1/16–10	5 seconds, Maximum
	12–15	20 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by METI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

1/16 – 8A	50 amperes at 125 VAC/VDC 300 amperes at 32 VDC
10A	35 amperes at 125 VAC/50 amperes at 125 VDC 300 amperes at 32 VDC
12A – 15A	50 amperes at 65 VAC/VDC 300 amperes at 24 VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: –55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Salt Spray: MIL-STD-202, Method 101, Test Condition B.

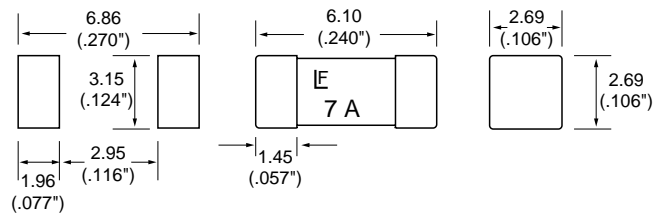
Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A, (10,000 ohms minimum).

Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition B (10 sec. at 260°C).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (–65 to 125°C).

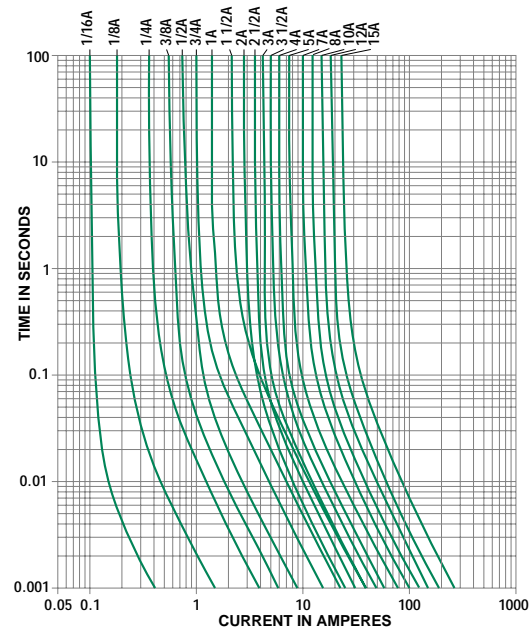
Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90–98 RH), Heat (65°C).

Tin-Lead Plated Catalog #	Silver Plated Catalog #	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
—	R451.062	0.062	125	5.50	0.00019
—	R451.080	0.080	125	4.05	0.00033
—	R451.100	0.100	125	3.10	0.00138
—	R451.125	0.125	125	1.70	0.00286
R451.160	0453.160	0.160	125	1.80	0.00306
R451.200	0453.200	0.200	125	1.40	0.00652
R451.250	0453.250	0.250	125	1.05	0.01126
R451.315	0453.315	0.315	125	0.78	0.0231
R451.375	0453.375	0.375	125	0.610	0.0425
R451.400	0453.400	0.400	125	0.560	0.0484
R451.500	0453.500	0.500	125	0.420	0.0795
R451.630	0453.630	0.630	125	0.305	0.143
R451.750	0453.750	0.750	125	0.245	0.185
R451.800	0453.800	0.800	125	0.212	0.271
R451.001.	0453.001.	1.0	125	0.153	0.459
R451 1.25	0453 1.25	1.25	125	0.0780	0.664
R451 01.5	0453 01.5	1.5	125	0.0630	0.853
R451 01.6	0453 01.6	1.6	125	0.0580	1.060
R451 002.	0453 002.	2.0	125	0.0367	0.530
R451 02.5	0453 02.5	2.5	125	0.0286	1.029
R451 003.	0453 003.	3.0	125	0.0227	1.650
R451 3.15	0453 3.15	3.15	125	0.0215	1.920
R451 03.5	0453 03.5	3.5	125	0.0200	2.469
R451 004.	0453 004.	4	125	0.0160	3.152
R451 005.	0453 005.	5	125	0.0125	5.566
R451 06.3	0453 06.3	6.3	125	0.0096	9.17
R451 007.	0453 007.	7	125	0.0090	10.32
R451 008.	0453 008.	8	125	0.0077	20.23
R451 010.	0453 010.	10	125	0.0056	26.46
R451 012.	0453 012.	12	65	0.0049	47.97
R451 015.	0453 015.	15	65	0.0037	97.82



Recommended pad layout

Average Time Current Curves



PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
Terminations: Tin-Lead Alloy
RoHS Compliant Terminations: Gold over Nickel Plated Caps(451)
Silver Plated Caps(453)

Soldering Parameters(see page 2 for typical soldering profile):

Wave Solder — 260°C, 10 seconds maximum
Reflow Solder — 260°C, 30 seconds maximum

Solderability: MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481-1 (IEC 286, part3); 1,000 pieces per reel, add packaging suffix, MR; 5,000 per reel, add packaging suffix NR.

Options: For RoHS Compliant 451 series add the letter 'L' to end of packaging suffix. Example: R451001.MRL (RoHS Compliant 1A, 1,000 per reel).

PATENTED

Refer to pg. 374 for SMF Omni-Blok® Holder, Series 154 000.

Surface Mount Fuses

Subminiature Surface Mount

RoHS NANO²® Slo-Blo® Fuse 452/454 Series



The NANO² Slo-Blo fuse has enhanced inrush withstand characteristics over the NANO² Fast-Acting fuse. The unique time delay feature of this fuse design helps solve the problem of nuisance "opening" by accommodating inrush currents that normally cause a fast-acting fuse to open.

- 452 Series **RoHS Compliant** version now available, use ordering suffix 'L' (see example on data sheet).

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Min. ; 60 seconds, Max.
300%	0.2 seconds, Min. ; 3 seconds, Max.
800%	0.02 seconds, Min. ; 0.1 seconds, Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

50 amperes at 125 VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz, .06 in. total excursion).

Salt Spray: MIL-STD-202, Method 101, Test Condition B (48 hrs.).

Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A, (10,000 ohms minimum).

Resistance to Soldering Heat: MIL-STD-202, Method 210, (3 sec. at 260°C).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C).

Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65°C).

PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
Terminations: Tin-Lead Alloy
RoHS Compliant Terminations: Gold over Nickel Plated Caps(452)
Silver Plated Caps(454)

Soldering Parameters:

Wave Solder — 260°C, 3 seconds maximum

Reflow Solder — 260°C, 30 seconds maximum

Solderability: MIL-STD-202, Method 208.

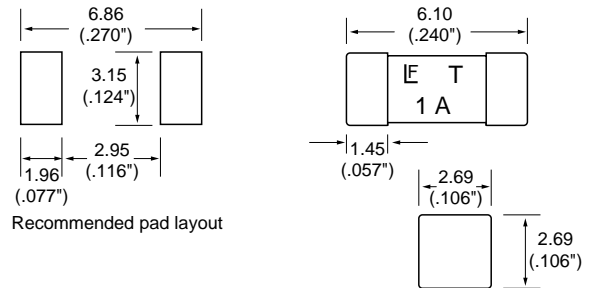
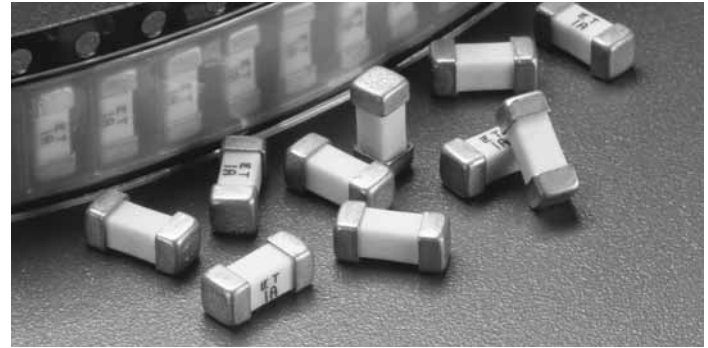
PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481-1 (IEC 286, part3); 1,000 pieces per reel, add packaging suffix, MR; 5,000 per reel, add packaging suffix NR.

Options: For RoHS Compliant 452 series add the letter 'L' to end of packaging suffix. Example: 0452001.MRL (RoHS Compliant 1A, 1,000 per reel).

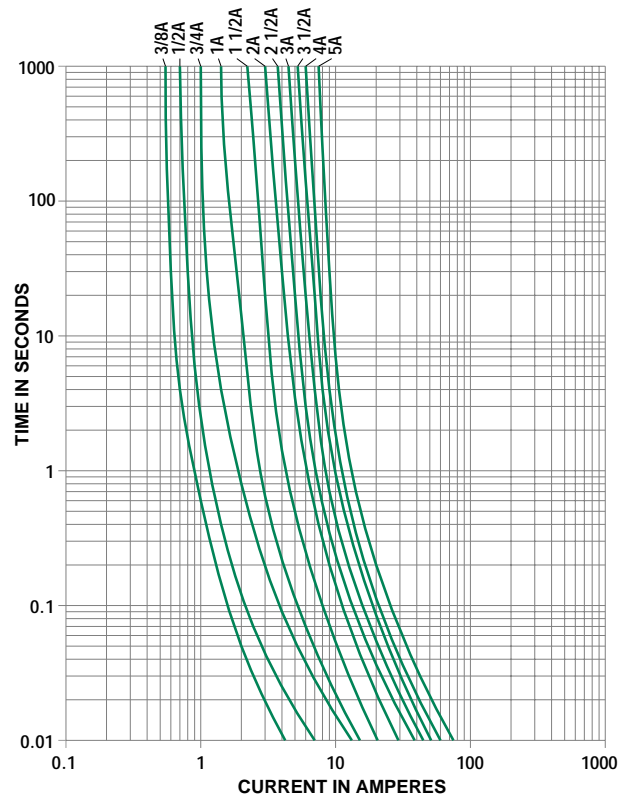
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ORDERING INFORMATION:

Tin-Lead Plated Catalog #	Silver Plated Catalog #	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
R452.375	0454.375	3/8	125	1.20	0.101
R452.500	0454.500	1/2	125	0.700	0.240
R452.750	0454.750	3/4	125	0.360	0.904
R452 001.	0454 001.	1	125	0.225	1.98
R452 01.5	0454 01.5	1 1/2	125	0.0930	3.65
R452 002.	0454 002.	2	125	0.0625	8.20
R452 02.5	0454 02.5	2 1/2	125	0.0450	15.0
R452 003.	0454 003.	3	125	0.0340	20.16
R452 03.5	0454 03.5	3 1/2	125	0.0224	26.53
R452 004.	0454 004.	4	125	0.0186	34.40
R452 005.	0454 005.	5	125	0.0136	53.72



Average Time Current Curves



Refer to pg. 271 for SMF Omni-Blok® Holder, Series 154 000T.

Surface Mount Fuses

Subminiature Surface Mount

RoHS NANO²® UMF Fast-Acting Fuse 455 Series



- The Nano² UMF Fuse is a very small, square surface mount fuse design.
- Designed to International (IEC) Standards for use globally.
- Meets IEC 60127-4 UMF specifications for Fast-Acting Fuses
- **RoHS Compliant** version now available, use ordering suffix 'L' (see example on data sheet).

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
125%	1 hour, Minimum
200%	2 minutes, Maximum
1000%	0.001 sec, Min ; .01 sec Max

AGENCY APPROVALS: Listed to IEC 60127-4, Universal Modular Fuse-Links (UMF), 125V.

AGENCY FILE NUMBERS: UL E184655.

INTERRUPTING RATINGS: 50 amperes at 125 VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Salt Spray: MIL-STD-202, Method 101, Test Condition B.

Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A, (10,000 ohms minimum).

Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition B (10 sec. at 260°C).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C).

Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65°C).

PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
Terminations: Tin-Lead Alloy
RoHS Compliant Terminations: Gold over Nickel Plated Caps

Soldering Parameters:

Wave Solder — 260°C, 10 seconds maximum

Reflow Solder — 260°C, 30 seconds maximum

Solderability: MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481-1 (IEC 286, part3); 1,000 pieces per reel, add packaging suffix, MR; 5,000 per reel, add packaging suffix NR.

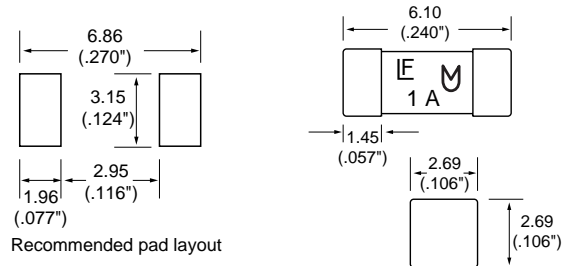
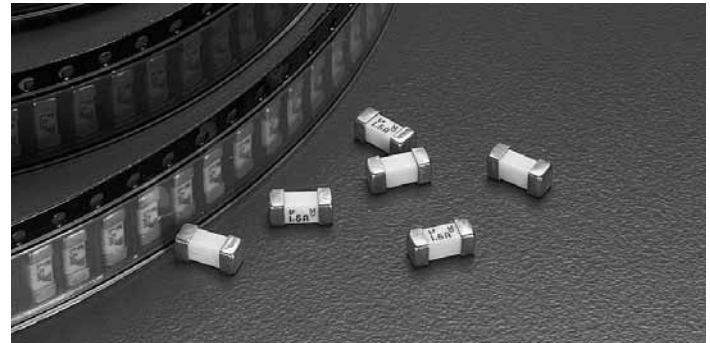
Options: For RoHS Compliant devices add the letter 'L' to end of packaging suffix. Example: 0455001.NRL (RoHS Compliant 1A, 5,000 per reel).

PATENTED

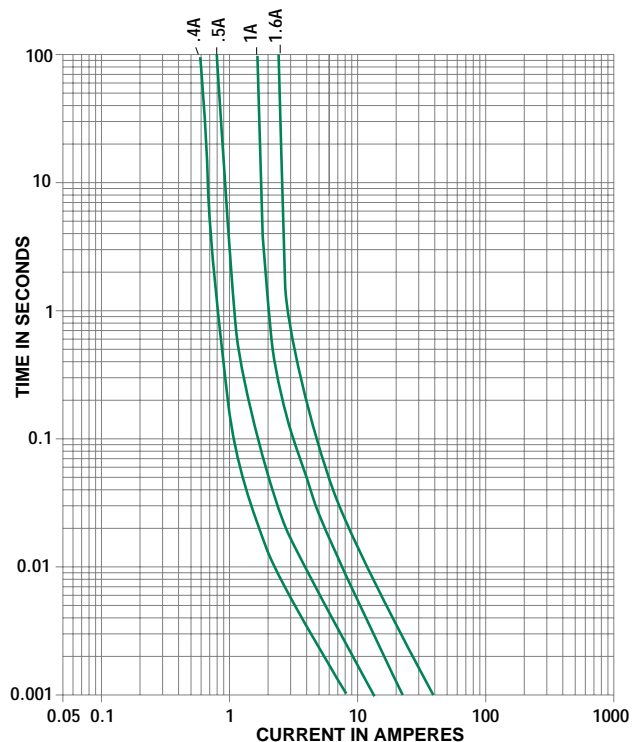
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Cold Resistance (Ohms) ¹	Nominal Melting Pt (A ² sec)
0455.400	0.4	125	0.420	0.0795
0455.500	0.5	125	0.305	0.143
0455 001.	1.0	125	0.078	0.645
0455 01.6	1.6	125	0.0532	1.060

¹Measured at 10% of rated current, 25°C.



Average Time Current Curves



Surface Mount Fuses

For NANO²⁰ Surface Mount Fuses

RoHS SMF OMNI-BLOK[®] Fuse Block Molded Base Type 154 Series



The **RoHS Compliant** SMF Omni-Blok[®] Fuseholder permits quick and easy replacement of Nano²⁰ SMF surface mount fuses. The fuse block and pre-installed fuse combination can be placed on the PC board in one efficient manufacturing operation. Fuse replacement is accomplished without exposing the PC board to the detrimental effects of solder heat. Refer to notes 1 and 2, below, for fuse/fuseholder combinations available.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: 8 Amperes, 125 Volts.

Molded Parts: Thermoplastic (94V0).

Terminals: Tin Plated Beryllium Copper.

Ambient Temperature: -55°C to +125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Thermal Shock: MIL-STD-202, Method 107, Condition A (200 cycles: 30 minutes at -55°C, 30 minutes at 125°C).

Soldering Parameters (Fuse Installed):

Reflow — 154 000: 500°F (230°C), 30 sec.
154 000T: 445°F (230°C), 30 sec.

Solderability: MIL-STD-202, Method 208.

Packaging: 16mm Tape and Reel for use with automatic pick and place equipment per EIA Standard 481; 1,500 per reel, add suffix DR.

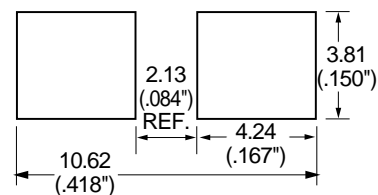
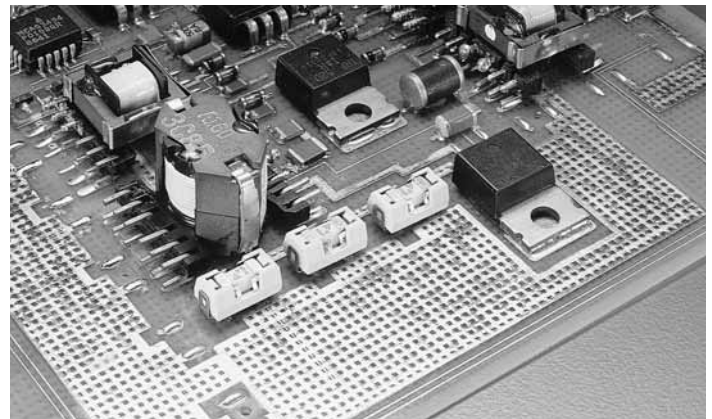
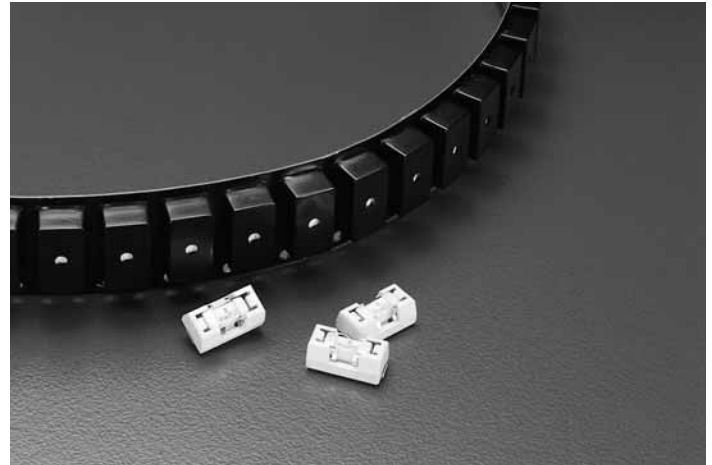
PATENTED ORDERING INFORMATION:

With Very Fast-Acting Fuse Installed		
Catalog Number	Ampere Rating	Fuse Furnished ¹
154.062	1/16	0451.062
154.125	1/8	0451.125
154.250	1/4	0453.250
154.375	3/8	0453.375
154.500	1/2	0453.500
154.750	3/4	0453.750
154 001	1	0453 001.
154 01.5	1.5	0453 01.5
154 002	2	0453 002.
154 02.5	2.5	0453 02.5
154 003	3	0453 003.
154 03.5	3.5	0453 03.5
154 004	4	0453 004.
154 005	5	0453 005.
154 007	7	0453 007.
154 008	8	0453 008.
154 010	10	0453 010.

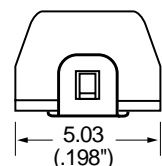
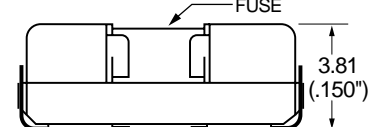
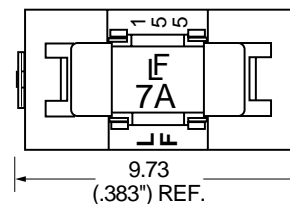
With Slo-Blo [®] Fuse Installed		
Catalog Number	Ampere Rating	Fuse Furnished ²
154.375T	3/8	0454.375
154.500T	1/2	0454.500
154.750T	3/4	0454.750
154 001T	1	0454 001.
154 01.5T	1½	0454 01.5
154 002T	2	0454 002.
154 02.5T	2½	0454 02.5
154 003T	3	0454 003.
154 03.5T	3½	0454 03.5
154 004T	4	0454 004.
154 005T	5	0454 005.

¹ 453 Series Fuse has silver plated end caps, installed to accommodate solder reflow process. Use either 451 or 453 Series for replacement purposes, page 371.

² 454 Series Fuse has silver plated end caps, installed to accommodate solder reflow process. Use either 452 or 454 Series for replacement purposes, page 372.



Recommended Pad Layout



10

SURFACE MOUNT FUSES

Surface Mount Fuses

Subminiature Surface Mount

RoHS NANO²® 250V UMF FUSE Fast-Acting 464 Series



- The Surface Mount Nano² 250V UMF product family complies with IEC Publication IEC 60127-4-Universal Modular Fuse-Links [UMF]. This IEC standard has been accepted by UL/CSA making it the first global fuse standard.
- The Nano² 250V UMF fuse family is based on the proven NANO² Fuse product technology.
- Product is **RoHS Compliant** and compatible with lead-free solders and higher temperature profiles.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
125%	1 hour, Minimum
200%	2 minutes, Maximum
1000%	0.001 sec, Min ; 0.01 sec Max

AGENCY APPROVALS: Listed to IEC 60127-4, Universal Modular Fuse-Links (UMF), 250V. UL Listed. Approved by METI and CCC. K and VDE

AGENCY FILE NUMBERS: UL E184655. METI NBK30502-E184655a,b.

INTERRUPTING RATINGS: 100 amperes at 250VAC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition A.

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Insulation Resistance (After Opening): IEC60127-4 (0.1MΩ min @ 500VDC).

Resistance to Soldering Heat: IEC60127-4.

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C, 5 cycles).

Moisture Resistance: MIL-STD-202, Method 106

PHYSICAL SPECIFICATIONS:

Materials: Body: High Performance Ceramic
Terminations: Silver plated brass.

Soldering Parameters:

Wave Solder — 260°C, 10 seconds maximum

Reflow Solder — 260°C, 30 seconds maximum

Solderability: IEC60127-4.

PACKAGING SPECIFICATIONS: 24mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 1,500 per reel, add packaging suffix, DR.

PATENTED

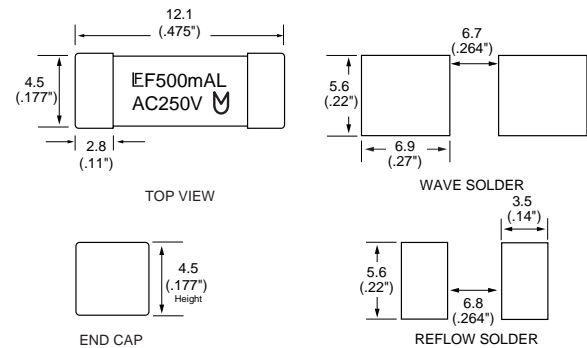
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Cold Resistance (Ohms)	Nominal Melting I ² t (A ² sec)
0464.500	0.5	250	0.283	0.3
0464 001.	1.0	250	0.100	0.8
0464 1.25	1.25	250	0.059	1.2
0464 01.6	1.6	250	0.048	1.9
0464 002.	2.0	250	0.038	2.8
0464 02.5	2.5	250	0.032	4.5
0464 3.15	3.15	250	0.024	9.4
0464 004.	4.0	250	0.018	15.1
0464 005.	5.0	250	0.014	23.1
0464 06.3	6.3	250	0.011	40.0

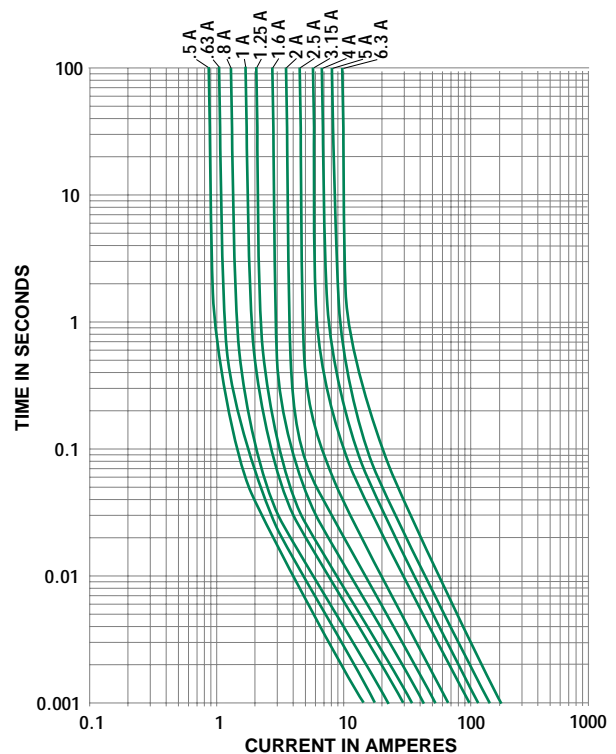
*For information and availability of additional ratings please contact Littelfuse



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Subminiature Surface Mount

RoHS NANO²® 250V UMF FUSE Time Lag 465 Series



- The Surface Mount Nano² 250V UMF product family complies with IEC Publication IEC 60127-4-Universal Modular Fuse-Links [UMF]. This IEC standard has been accepted by UL/CSA making it the first global fuse standard.
- The Nano² 250V UMF fuse family is based on the proven NANO² Fuse product technology.
- Product is **RoHS Compliant** and compatible with lead-free solders and higher temperature profiles.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
125%	1 hour, Minimum
200%	2 minutes, Maximum
1000%	0.01 sec, Min ; 0.1 sec Max

AGENCY APPROVALS: Listed to IEC 60127-4, Universal Modular Fuse-Links (UMF), 250V. UL Listed. Approved by METI and CCC. K and VDE .

AGENCY FILE NUMBERS: UL E184655. METI NBK30502-E184655a,b.

INTERRUPTING RATINGS: 100 amperes at 250VAC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition A.

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Insulation Resistance (After Opening): IEC60127-4 (0.1MΩ min @ 500VDC).

Resistance to Soldering Heat: IEC60127-4.

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C, 5 cycles).

Moisture Resistance: MIL-STD-202, Method 106

PHYSICAL SPECIFICATIONS:

Materials: Body: High Performance Ceramic
Terminations: Silver plated brass.

Soldering Parameters:

Wave Solder — 260°C, 10 seconds maximum

Reflow Solder — 260°C, 30 seconds maximum

Solderability: IEC60127-4.

PACKAGING SPECIFICATIONS: 24mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 1,500 per reel, add packaging suffix, DR.

PATENTED

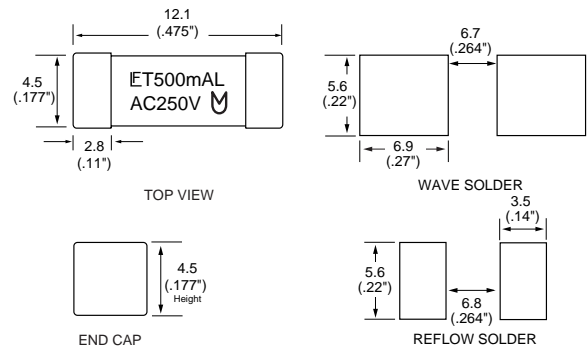
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Cold Resistance (Ohms)	Nominal Melting I ² t (A ² sec)
0465 001.	1.0	250	0.107	2.8
0465 1.25	1.25	250	0.083	5.6
0465 01.6	1.6	250	0.056	9.2
0465 002.	2.0	250	0.039	14.9
0465 02.5	2.5	250	0.026	21.0
0465 3.15	3.15	250	0.021	31.7
0465 004.	4.0	250	0.016	48.4
0465 005.	5.0	250	0.0130	87.0
0465 06.3	6.3	250	0.0088	144.4

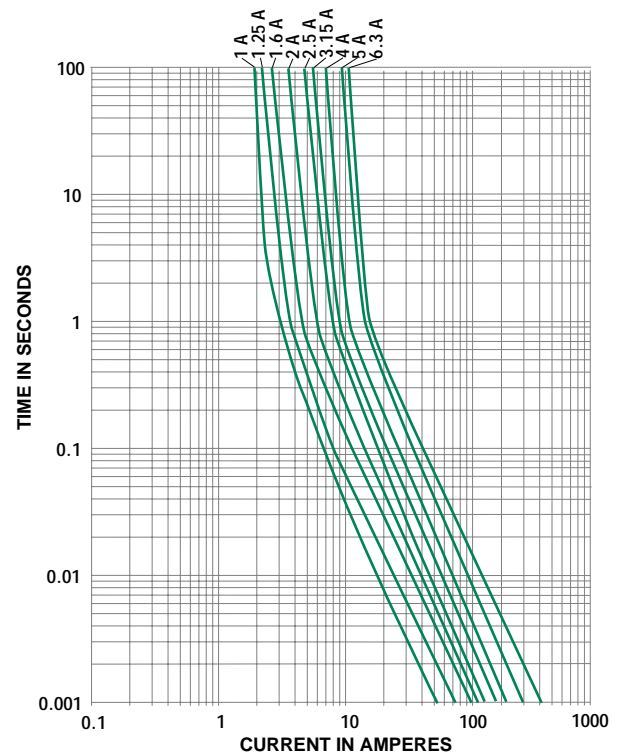
*For information and availability of additional ratings please contact Littelfuse



Reference Dimensions:



Average Time Current Curves



10

SURFACE MOUNT FUSES

Surface Mount Fuses

Miniature Surface Mount

RoHS TeleLink® Fuse 461 Series



- Surface mount surge resistant Slo-Blo® fuse.
- Meets UL 60950 3rd Edition power cross requirements stand alone.
- Designed to allow compliance with Telcordia GR-1089-CORE and TIA-968-A (formerly FCC Part 68) Surge Specifications.
- Provides coordinated protection with Littelfuse SIDACTor® Protection Thyristors without series resistors.
- Ideal for use in telecommunication equipment including line cards, modems, fax machines, phones, answering machines, caller ID devices and other products connected to phone network.
- 2A rating has improved temperature rise performance under 2.2A surge current testing when compared with 1.25A rating.
- Product is **RoHS Compliant** and compatible with lead-free solders and higher temperature profiles when ordered with Standard Silver Plated Brass Caps.
- Standard product is **RoHS Compliant** and compatible with lead-free solders and higher temperature profiles.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

Littelfuse: UL E10480
CSA LR29862

Teccor: UL E191008
CSA LR702828

PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
RoHS Compliant Terminations: Silver Plated Brass Caps
Terminations: Tin-Lead Alloy also available, add suffix, T.

Soldering Parameters:

Reflow Solder — 260°C, 30 seconds maximum.
Wave Solder — 260°C, 3 seconds maximum.

PACKAGING SPECIFICATIONS: 24mm Tape and Reel per EIA-RS481-2, (IEC 286 part 3); 2500 fuses per reel, add suffix, ER.

ORDERING INFORMATION:

Telecom Nano ² Catalog Number	Teccor TeleLink Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
0461.500	F0500T	0.5	600	.560	.840 ¹
0461 1.25	F1250T	1.25	600	.110	16.5 ¹
0461 002.	F1251T	2.00	600	.050	17.5 ¹

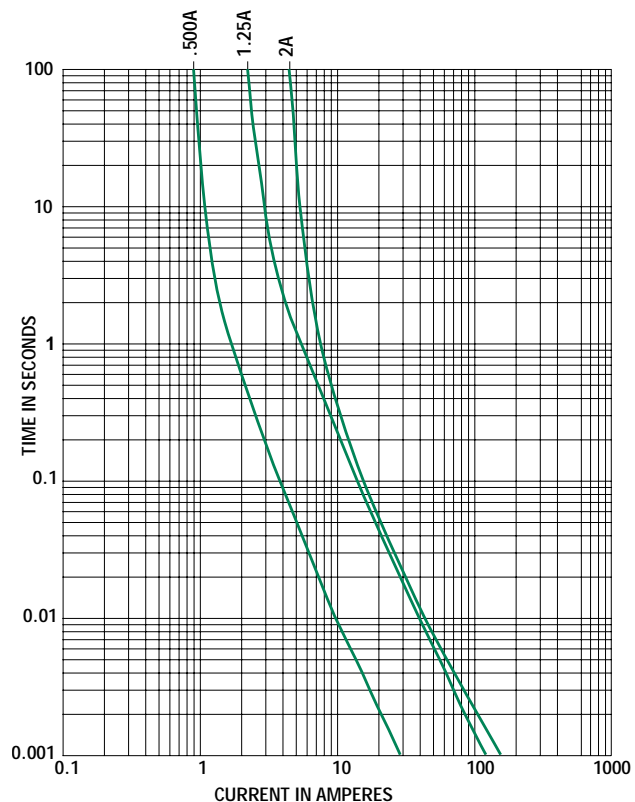
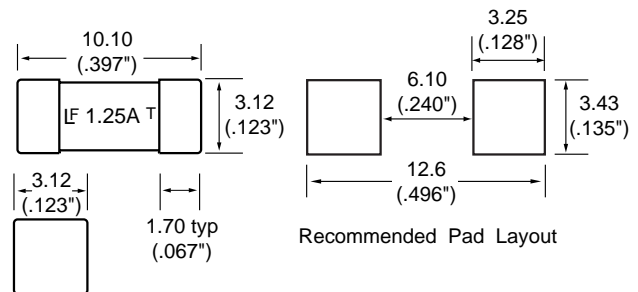
Notes:

¹ I²t is calculated at 10 msec or less. I²t at 10 times rated current has a typical value of: 24 A²sec (2.0A), 22 A²sec (1.25A), 1.3 A²sec (0.5A).

- Typical inductance < 40nH up to 500 MHz.
- Resistance changes 0.5% for every °C.
- Resistance is measured at 10% rated current.



Reference Dimensions:



Surface Mount Fuses

Miniature Surface Mount

RoHS TeleLink® Fuse 461 Series



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Min.
250%	1 Second, Min. ; 120 Seconds, Max.

INTERRUPTING RATINGS:
60 amperes at 600 VAC.

GR 1089 Inter-building requirements

GR 1089 1st level lighting surge inter-building
(Equipment under test can not be damaged & must continue to operate properly)

Surge	Minimum Peak Voltage (V)	Minimum Peak Current (A)	Max Rise/Min. Decay (μs)	Repetitions Each Polarity	Fuse Choices
1	600	100	10/1000	25	1.25, 2.0
2	1000	100	10/360	25	1.25, 2.0
3	1000	100	10/1000	25	1.25, 2.0
4	2500	500	2/10	10	1.25, 2.0
5	1000	25	10/360	5	0.5, 1.25, 2.0

If sufficient series resistance is used, then the 0.5 fuse may be used in test conditions 1-4.

GR 1089 2nd level lightning surge telecom port (Equipment under test shall not become a fire, fragmentation, or electrical safety hazard)

Surge	Minimum Peak Voltage (V)	Minimum Peak Current (A)	Max Rise/Min. Decay (μs)	Repetitions Each Polarity	Fuse Choices
1	5000	500	2/10	1	0.5, 1.25, 2.0
alternative	5000	5000/8=625	8/20	1	0.5, 1.25, 2.0

The 0.5 fuse will open during these test conditions. The 1.25 & 2.0 will not open thus providing operational compliance.

GR 1089 AC power fault 1st level inter-building
(fuse not allowed to open)

Test	Vrms	Short Circuit Current (A)	Duration	Primary Protector	Fuse Choices
1	50	.33	15 min.	removed	1.25, 2.0
2	100	.17	15 min	removed	1.25, 2.0
3	200, 400, 600	1	60 x 1 sec.	removed	1.25, 2.0
4	1000	1	60 x 1 sec.	operative	1.25, 2.0
5	Diagram	Diagram	60 x 5 sec.	removed	1.25, 2.0
6	600	0.5	30s	removed	1.25, 2.0
7	440	2.2	5 x 2 sec.	removed	1.25, 2.0
8	600	3	1.1 sec.	removed	1.25, 2.0
9	1000	5	0.4 sec.	in place	1.25, 2.0

GR 1089 AC power fault 2nd level (fuse can open but must open in a safe and controlled manner)

Test Circuit	Vrms	Short (A)	Duration	Fuse
1	120, 277	25	15 min.	0.5, 1.25, 2.0
2	600	60	5 sec.	0.5, 1.25, 2.0
3	600	7	5 sec.	0.5, 1.25, 2.0
4	100-600	2.2	15 min..	0.5, 1.25, 2.0
5	Diagram	Diagram	15 min.	0.5, 1.25, 2.0

Fuse must open before wiring simulator fuse (MDL 2.0).

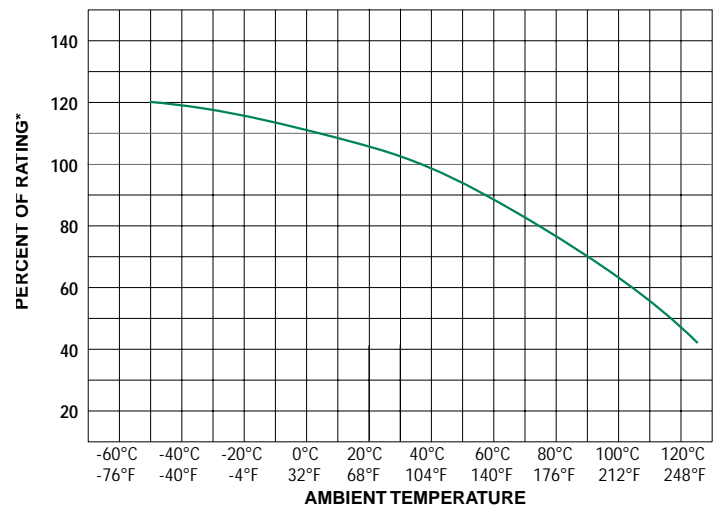
Maximum Temperature Rise:

Telecom Nano ² Fuse	Temperature Reading
04611.25	≤ 82°C (180°F)
0461002.	≤ 50°C (122°F)

• Higher Currents and PCB layout designs can affect this parameter. Readings are measured at rated current after temperature stabilizes.

Temperature Derating Curve

Operating Temperature is -55°C to +125°C with proper correction factor applied



• Ambient temperature effects are in addition to the normal derating.

Surface Mount Fuses

Miniature Surface Mount

RoHS TeleLink® Fuse 461 Series



TIA –968-A (formerly FCC Part 68) Surge Waveforms (fuse can not open during type B events)

Surge	Voltage (V)	Waveform (μs)	Current (A)	Waveform (μs)	Reps	Recommended Fuse
Metallic A	800	10 x 560	100	10 x 560	1 ea. polarity	1.25
Longitudinal A	1500	10 x 160	200	10 x 160	1 ea. polarity	1.25
Metallic B	1000	9 x 720	25	5 x 320	1 ea. polarity	1.25
Longitudinal B	1500	9 x 720	37.5	5 x 320	1 ea. polarity	1.25

For the type A events the 0.5 fuse will open, providing non-operational compliance. The 1.25 & 2.0 will not open, providing for operational compliance with TIA-968-A type A surge events.

UL 60950 requirements

UL60950 (EN 60950) (formerly UL 1950) Power Cross (L = longitudinal, M = metallic)

Test Number	Voltage (V)	Current (A)	Time	Fuse Choices
L1	600	40	1.5 sec.	0.5, 1.25, 2.0
L2	600	7	5 sec.	0.5, 1.25, 2.0
L3	600	2.2	30 min.	0.5, 1.25, 2.0
L4	200	2.2	30 min.	0.5, 1.25, 2.0
L5	120	25	30 min.	0.5, 1.25, 2.0
M1	600	40	1.5 sec.	0.5, 1.25, 2.0
M2	600	7	5 sec.	0.5, 1.25, 2.0
M3	600	2.2	30 min.	0.5, 1.25, 2.0
M4	600	2.2	30 min.	0.5, 1.25, 2.0

Selection of test number depends on current limiting & fire enclosure/spacing of end product

- 26 AWG line cord removes L1/M1 test requirement
- L5 conducted only if product does not pass section 6.1.2
- L2,M2,L3,M3,L4,M4 conducted if not in a fire enclosure

Fuse must open before the wiring simulator fuse (MDL 2.0).

UL60950 (EN 60950) (formerly UL 1950)

Impulse Test & Steady-state electric strength test

Test	Voltage (V)	Current (A)	Waveform	Repetitions	Fuse Choices
Impulse					
For handheld units	2500	62.5	10 x 700μs	± 10 w/60 sec. rest	0.5, 1.25, 2.0
Non handheld	1500	37.5	10 x 700μs	± 10 w/60 sec. rest	0.5, 1.25, 2.0
Steady-State					
For handheld units	1500		60Hz		0.5, 1.25, 2.0
Non handheld	1000		60Hz		0.5, 1.25, 2.0

Surface Mount Fuses

Subminiature Surface Mount

PICO® SMF 459 and 460 Series Fuses

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz, .06 in. total excursion).

Salt Spray: MIL-STD-202, Method 101, Test Condition B (48 hrs.).

Insulation Resistance (After Opening): MIL-STD-202, Method 302, (10,000 ohms minimum at 100 volts).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C).

Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65°).

PHYSICAL SPECIFICATIONS:

Materials: Body: Molded Thermoplastic

Terminations: 100% Tin Plated Copper(459 Series)

Tin-Lead Plated Copper(460 Series)

Solderability: MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481-1 (IEC 286, part 3); 500 per reel, add packaging suffix, UR.



PICO® SMF

Very Fast-Acting Type Fuse 459 Series



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Maximum
300%	0.1 second, Maximum

459 SERIES AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

459 SERIES INTERRUPTING RATINGS:

50 amperes at 125 VAC.

300 amperes at 125 VDC.

Soldering Parameters:

Wave Solder — 260°C, 10 seconds maximum

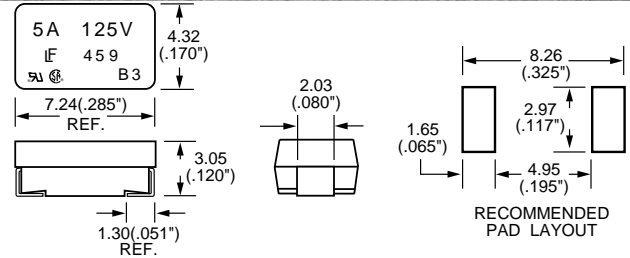
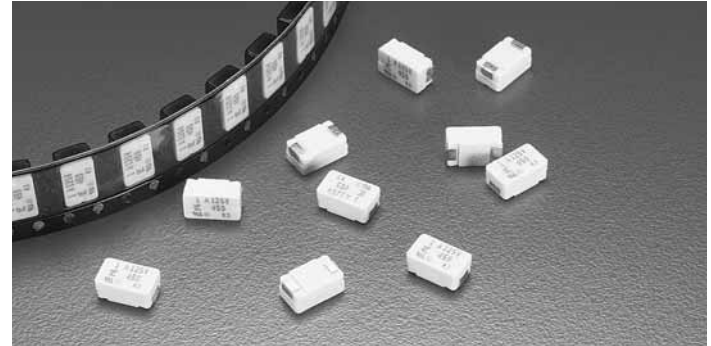
Reflow Solder — 260°C, 30 seconds maximum

Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition F (10 sec. at 260°C).

PATENTED

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
0459.062	1/16	125	7.0	0.000075
0459.125	1/8	125	1.70	0.00163
0459.250	1/4	125	0.665	0.0106
0459.375	3/8	125	0.395	0.0254
0459.500	1/2	125	0.280	0.0546
0459.750	3/4	125	0.175	0.155
0459 001	1	125	0.125	0.281
0459 01.5	1½	125	0.0800	0.650
0459 002	2	125	0.0468	0.421
0459 02.5	2½	125	0.0350	0.721
0459 003	3	125	0.0290	1.23
0459 03.5	3½	125	0.0240	1.65
0459 004	4	125	0.0200	2.35
0459 005	5	125	0.0155	3.90



PICO® SMF

Slo-Blo® Type Fuse 460 Series



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Min. ; 120 seconds, Max.
300%	0.2 second, Min. ; 3 seconds, Max.
800%	0.02 second, Min. ; 0.1 second, Max.

460 SERIES AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by METI from 1 through 5 amperes.

460 SERIES INTERRUPTING RATINGS:

50 amperes at 125 VAC.

50 amperes at 125 VDC.

Soldering Parameters:

Wave Solder — 260°C, 3 seconds maximum

Reflow Solder — 230°C, 30 seconds maximum

Resistance to Soldering Heat: MIL-STD-202, Method 210 (3 sec. at 260°C)

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
0460.500	1/2	125	1.19	0.210
0460.750	3/4	125	0.497	0.760
0460 001	1	125	0.280	2.01
0460 01.5	1½	125	0.116	3.94
0460 002	2	125	0.071	7.60
0460 02.5	2½	125	0.052	13.0
0460 003	3	125	0.038	21.0
0460 03.5	3½	125	0.024	26.8
0460 004	4	125	0.0194	35.0
0460 005	5	125	0.0133	54.8

Surface Mount Fuses

Subminiature Surface Mount & Dip Types

FLAT-PAK® Fast Acting Fuse 202 Series



• For new designs please use the 464 Series, NANO® 250V UMF Fuse.

Fast-Acting and Slo-Blo® Fuse versions of the Flat-Pak® Fuse designs are available. Both designs are available in either a gull-wing surface mount package or a DIP configuration for through-hole mounting. These fuse designs feature a 250 VAC rating in a low profile, rectangular package.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATING:

50 amperes at 250 VAC.

ENVIRONMENTAL SPECIFICATION:

Operating Temperature: -55°C to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Thermoplastic

Terminations: Tin/Lead Plated Copper

Soldering Parameters:

Wave Solder — 260°C, 3 seconds maximum.

Reflow Solder — 215°C, 30 seconds maximum.

Solderability: MIL-STD-202, Method 208.

Cleaning: Board washable in most common solvents.

PACKAGING SPECIFICATIONS:

SMF Fuses — 24mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 500 per reel.

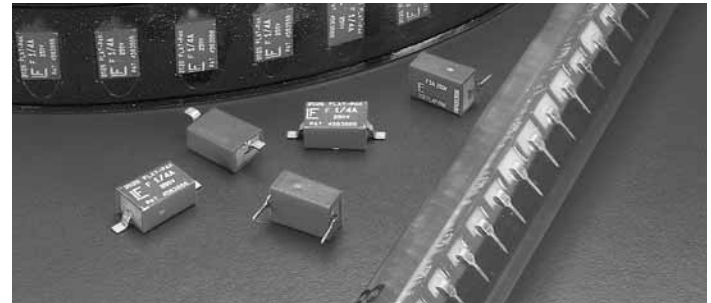
DIP Fuses — Antistatic magazine, 100 per magazine.

PATENTED

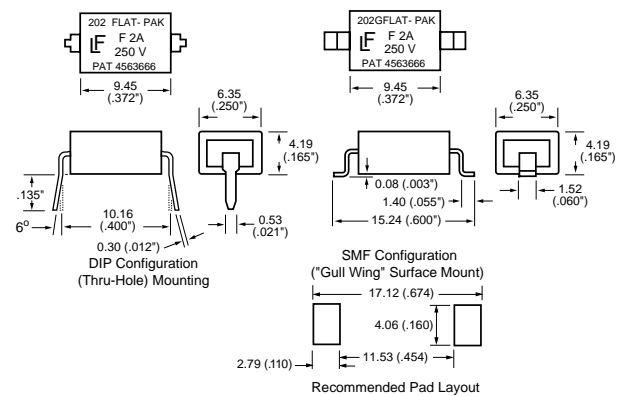
ORDERING INFORMATION

Catalog Number	Catalog ¹ Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
202.062	202.062G	1/16	250	7.90	0.000220
202.125	202.125G	1/8	250	2.45	0.00180
202.250	202.250G	1/4	250	0.880	0.0147
202.500	202.500G	1/2	250	0.298	0.0363
202.750	202.750G	3/4	250	0.166	0.0980
202.001	202.001G	1	250	0.119	0.192
202.015	202.015G	1 1/2	250	0.0701	0.540
202.002	202.002G	2	250	0.0469	1.07
202.025	202.025G	2 1/2	250	0.0455	1.76
202.003	202.003G	3	250	0.0327	1.71
202.004	202.004G	4	250	0.0244	3.00
202.005	202.005G	5	250	0.0174	4.68

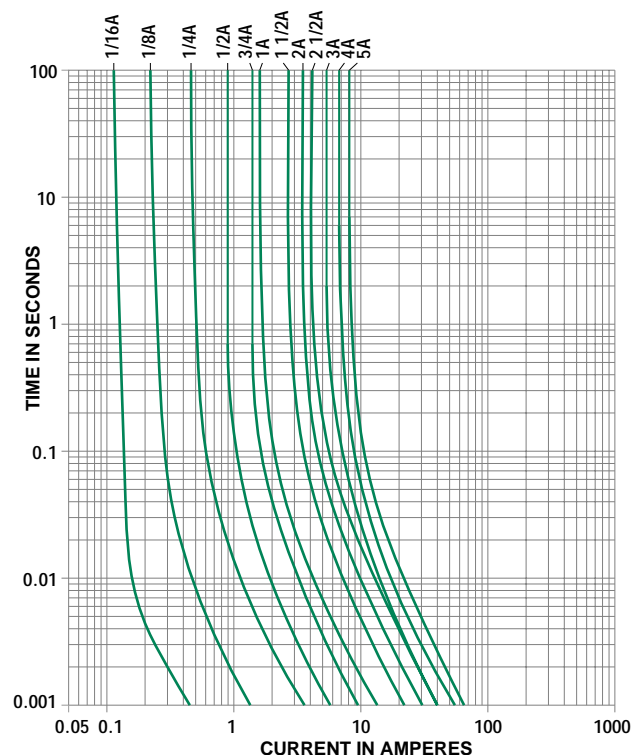
¹ SMF fuse marking includes the letter "G" next to the series number indicating "Gull-Wing".



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

Subminiature Surface Mount & Dip Types

FLAT-PAK® Slo-Blo® Fuse 203 Series



• For new designs please use the 465 Series, NANO® 250V UMF Fuse.
Fast-Acting and Slo-Blo® Fuse versions of the Flat-Pak Fuse designs are available. Both designs are available in either a gull-wing surface mount package or a DIP configuration for through-hole mounting. These fuse designs feature a 250 VAC rating in a low profile, rectangular package.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Minimum
	30 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATING:

50 amperes at 250 VAC.

ENVIRONMENTAL SPECIFICATION:

Operating Temperature: -55°C to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Thermoplastic

Terminations: Tin/Lead Plated Copper

Soldering Parameters:

Wave Solder — 260°C, 3 seconds maximum.

Reflow Solder — 215°C, 30 seconds maximum.

Solderability: MIL-STD-202, Method 208.

Cleaning: Board washable in most common solvents.

PACKAGING SPECIFICATIONS:

SMF Fuses — 24mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 500 per reel.

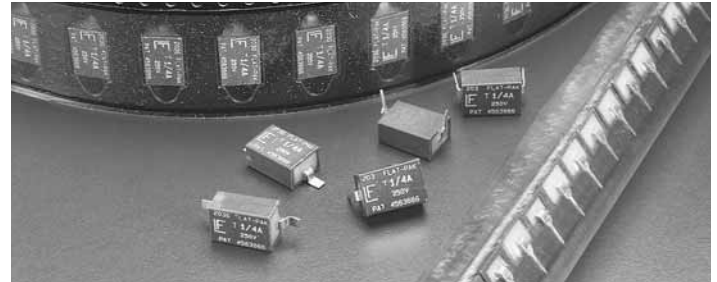
DIP Fuses — Antistatic magazine, 100 per magazine.

PATENTED

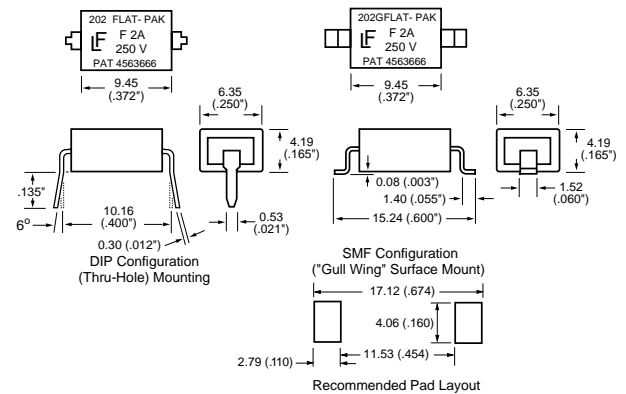
ORDERING INFORMATION

Catalog Number	Catalog ¹ Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I ² t A ² Sec.
203.250	203.250G	1/4	250	1.36	0.0126
203.500	203.500G	1/2	250	0.433	0.112
203.750	203.750G	3/4	250	0.158	0.327
203.001	203.001G	1	250	0.0755	0.328
203.015	203.015G	1 1/2	250	0.0390	0.850
203.002	203.002G	2	250	0.0345	1.70
203.025	203.025G	2 1/2	250	0.0237	2.87
203.003	203.003G	3	250	0.0197	4.40
203.004	203.004G	4	250	0.0148	8.75
203.005	203.005G	5	250	0.0124	14.7

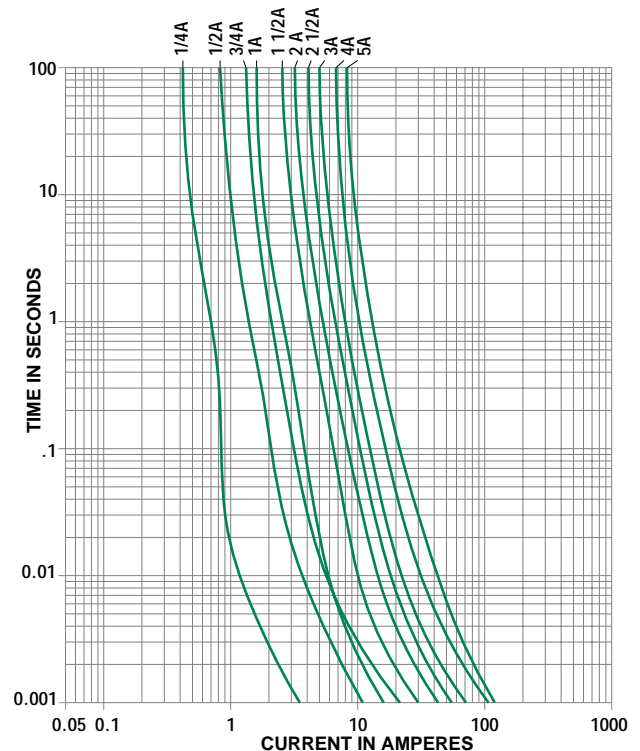
¹SMF fuse marking includes the letter "G" next to the series number indicating "Gull-Wing".



Reference Dimensions:



Average Time Current Curves



Surface Mount Fuses

350 Volt Surface Mount Fuse

EBF Fuse Fast-Acting Type 446/447 Series



- Ideal for use in electronic lighting ballast, power supply and power inverter applications.
- Rated for use in 125, 250, 277 and 350 VAC circuits.
- Based on the proven reliability of the automotive MINI® Fuse; available from 2 through 10 amperes.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	0.15 sec. Min., 5 Sec. Max

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and CSA Certified. Approved by METI to 5 amperes.

AGENCY FILE NUMBERS: UL: E71611, CSA LR 29862.

INTERRUPTING RATINGS: 100 amperes at 350 VAC, 50 amperes at 125 VDC and 450 amperes at 60VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -40°C to +125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Plastic Body

Terminations: Tin-Lead (95/5) plated Zn, Ni barrier

Soldering Parameters:

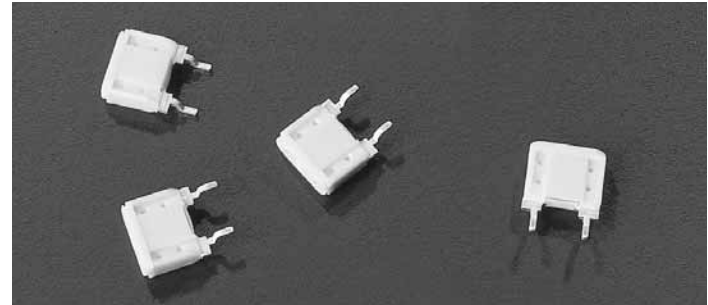
- Reflow Solder — 235°C, 5 seconds maximum.
- No-clean process recommended.
- Wave Solder — Not recommended.
- Non-plated terminal surfaces may not meet MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS:

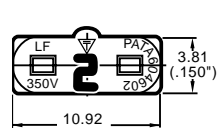
- 24mm Tape and Reel per EIA-RS481 (Equivalent to IEC 286, part 3); 800 fuses per reel, add packaging suffix, ZR.
- Shelf Life: Up to 1 year in Factory sealed packaging.

ORDERING INFORMATION:

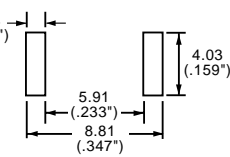
Catalog Number	Ampere Rating (A)	Voltage Rating (VAC)	Nominal Cold Resistance(Ω)	Nominal Melting I ² t (A ² sec)
0446 002.	2	350	0.0560	2.8
0446 003.	3	350	0.0340	9.4
0446 004.	4	350	0.0240	17
0446 005.	5	350	0.0180	25
0446 07.5	7.5	350	0.0110	68
0446 010.	10	350	0.0073	93



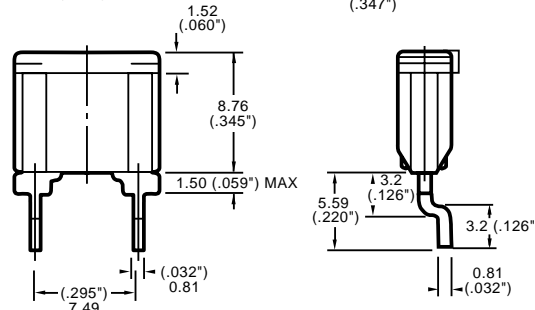
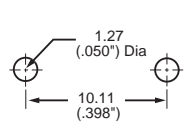
Reference Dimensions (Inches):



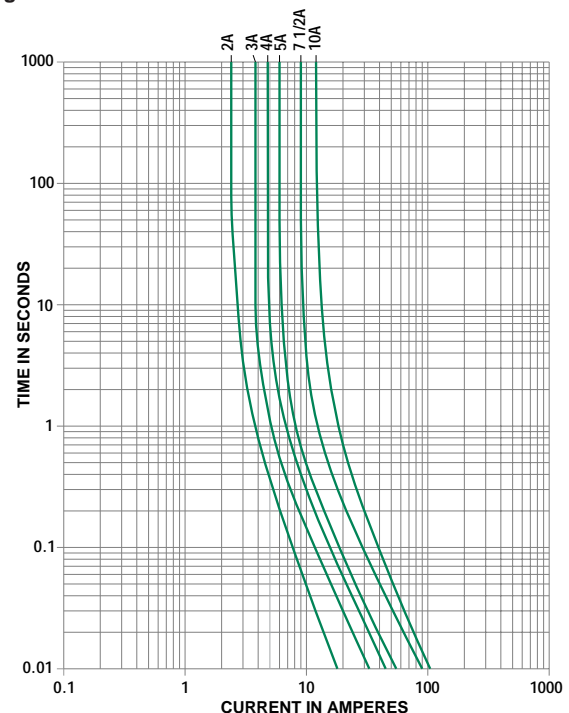
Recommended Pad Layout:



447 Mounting Holes:



Average Time Current Curves



EBF Fuse Fast-Acting Type 447 Series



- Through-hole version of the 446 series.

ELECTRICAL CHARACTERISTICS: Same as 446 Series.

Dimensions: Contact Littelfuse for specifications.

Soldering Parameters: Contact Littelfuse for soldering parameters.

Inside terminal face of each lead is non-plated zinc. Non-plated zinc terminal faces may not meet MIL-STD-202, method 208. To ensure that the fuse is acceptable for the application, appropriate application testing should be performed.

Packaging Specifications: Bulk Pack (4,000 pieces per pack)