BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses

6125TD Series, Time Delay

Description

- Time Delay surface mount fuse capable of replacing glass tube fuses in certain applications
- Environmentally rugged, complies with EIA-IS-722 Standard
- Solder Immersion Compatible
- Targeted for Consumer Electronics

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
100%	4 Hours Minimum
200%	1 Second Minimum
200%	2-4 Seconds Typical
200%	60 Seconds Maximum

Agency Information

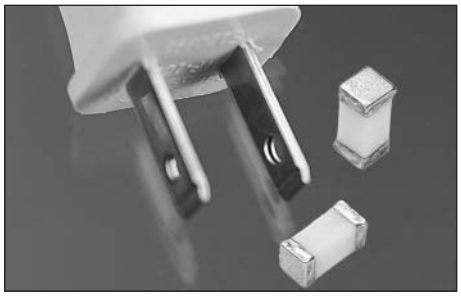
- UL Recognition Guide & File numbers: JDYX2 & E19180.
- CSA Component Acceptance: 053787 C 000 & Class No: 1422 30.

Environmental Data

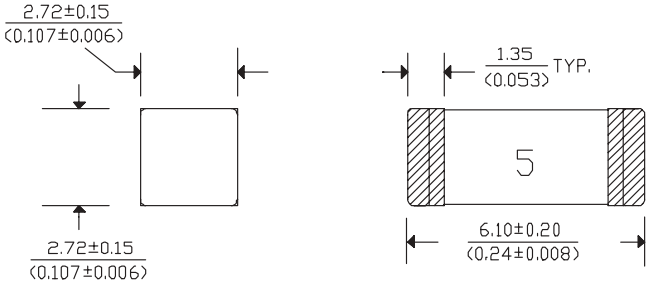
- Life Test: MIL-STD-202, Method 108A, Test Condition D
- Load Humidity: MIL-STD-202, Method 103B
- Moisture Resistance: MIL-STD-202, Method 106E
- Thermal Shock: MIL-STD-202, Method 107D, air-to-air
- Case Resistance: EIA/IS-722
- Resistance to Dissolution of Metallization: ANSI J-STD-002, Test D
- Mechanical Shock: MIL-STD-202, Method 213B, Test Condition A
- High Frequency Vibration: MIL-STD-202, Method 204D, Test Condition D
- Resistance to Solvents: MIL-STD-202, Method 215A

Ordering

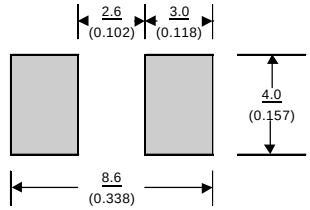
- Specify product code and packaging code



Dimensions mm/(inches)



Land Pattern



Soldering Method

- Wave Immersion: 260°C, 3 sec max.
- Infrared: 260°C, 30 sec max.

SPECIFICATIONS

Product Code	Voltage Rating		Interrupting Rating*		DC Cold Resistance** (ohms)			Typical Melting	Typical Voltage
	AC	DC	125VAC	60VDC	min.	typ.	max.	I²t†	Drop‡
6125TD500mA	125V	60V	50A	50A	.3350	.4025	.4700	0.716	245 mV
6125TD750mA	125V	60V	50A	50A	.2000	.2350	.2700	1.07	250 mV
6125TD1A	125V	60V	50A	50A	.1350	.1680	.2000	2.88	256 mV
6125TD1.5A	125V	60V	50A	50A	.0550	.0630	.0700	2.35	125 mV
6125TD2A	125V	60V	50A	50A	.0380	.0480	.0580	9.45	133 mV
6125TD2.5A	125V	60V	50A	50A	.0280	.0350	.0420	16.2	130 mV
6125TD3A	125V	60V	50A	50A	.0225	.0263	.0300	15.3	97 mV
6125TD3.5A	125V	60V	50A	50A	.0170	.0195	.0220	14.5	95 mV
6125TD4A	125V	60V	50A	50A	.0160	.0185	.0210	38.8	106 mV
6125TD5A	125V	60V	50A	50A	.0115	.0133	.0150	34.4	100 mV
6125TD7A	125V	60V	50A	50A	.0073	.0087	.0100	90.2	99 mV

* AC Interrupting Rating (Measured at designated voltage, 100% power factor); DC Interrupting Rating (Measured at designated voltage, time constant of less than 50 microseconds, battery source)

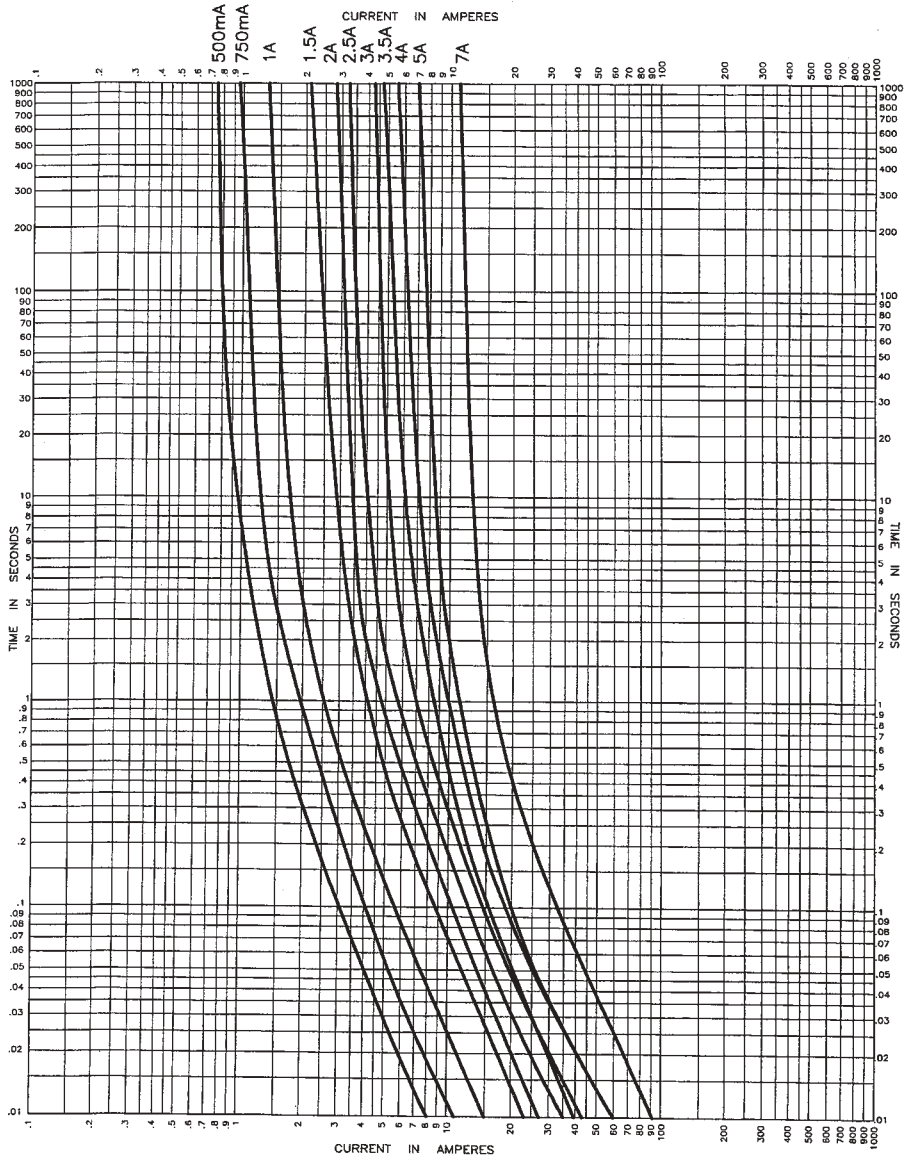
** DC Cold Resistance (Measured at 10% of rated current)

† Typical Melting I^2t (Measured with a battery bank at rated DC voltage, 10x-rated current (not to exceed IR), time constant of calibrated circuit less than 50 microseconds)

‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

TIME CURRENT CURVE



PACKAGING CODE	
Packaging Code	**Description**
SP2	50 piece sample
TR1	Standard Package: (This is an insert) 1000 pieces of fuses on 12mm tape-and-reel on a 7 inch (177mm) reel per EIA Standard 481

OC-2530 Rev. M 5/03

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Bussmann
The Power to Protect.

COOPER Bussmann

TCP™ Series
Telecom Circuit Protector

Description

- The first and most reliable surface mount telecom circuit protector designed to protect against power cross faults and comply with all surge requirements.
- Allows compliance with telecom regulatory standards including Bellcore GR 1089, UL 1950/60950, and FCC part 68. Application circuit testing is recommended.
- Eliminates the need for a current limiting resistor.
- Protects against overcurrent conditions found in telecom tip and ring applications.
- RoHS Compliant version available (-R option)

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
100%	4 Hours Minimum
250%	1 Second Minimum
250%	4-10 Seconds Typical
250%*	120 Seconds Maximum
300%	10 Seconds Maximum

* If the device does not open at 250% within 120 seconds, increase current to 300% of amp rating. Device must open in 10 seconds max.

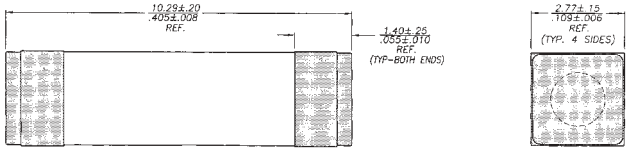
Agency Information

- UL Recognition Card: JDYX2/E19180
- CSA Component Certification Record and Class No.: 053787C000, 1422 30

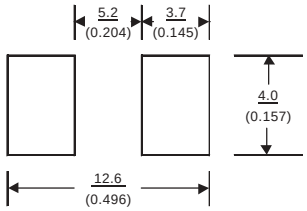
Environmental Data

- Life Test: MIL-STD-202, Method 108A, Test Condition D
- Load Humidity: MIL-STD-202, Method 103B
- Moisture Resistance: MIL-STD-202, Method 106E
- Thermal Shock: MIL-STD-202, Method 107D, air-to-air
- Case Resistance: EIA/IS-722
- Resistance to Dissolution of Metallization: ANSI J-STD-002, Test D
- Mechanical Shock: MIL-STD-202, Method 213B, Test Condition A
- High Frequency Vibration: MIL-STD-202, Method 204D, Test Condition D
- Resistance to Solvents: MIL-STD-202, Method 215A

Dimensions mm/(inches)



Land Pattern



Soldering Method

- Wave Immersion: 260°C, 3 sec max.
- Infrared: 240°C, 30 sec max.

LIGHTNING SURGE SPECIFICATIONS

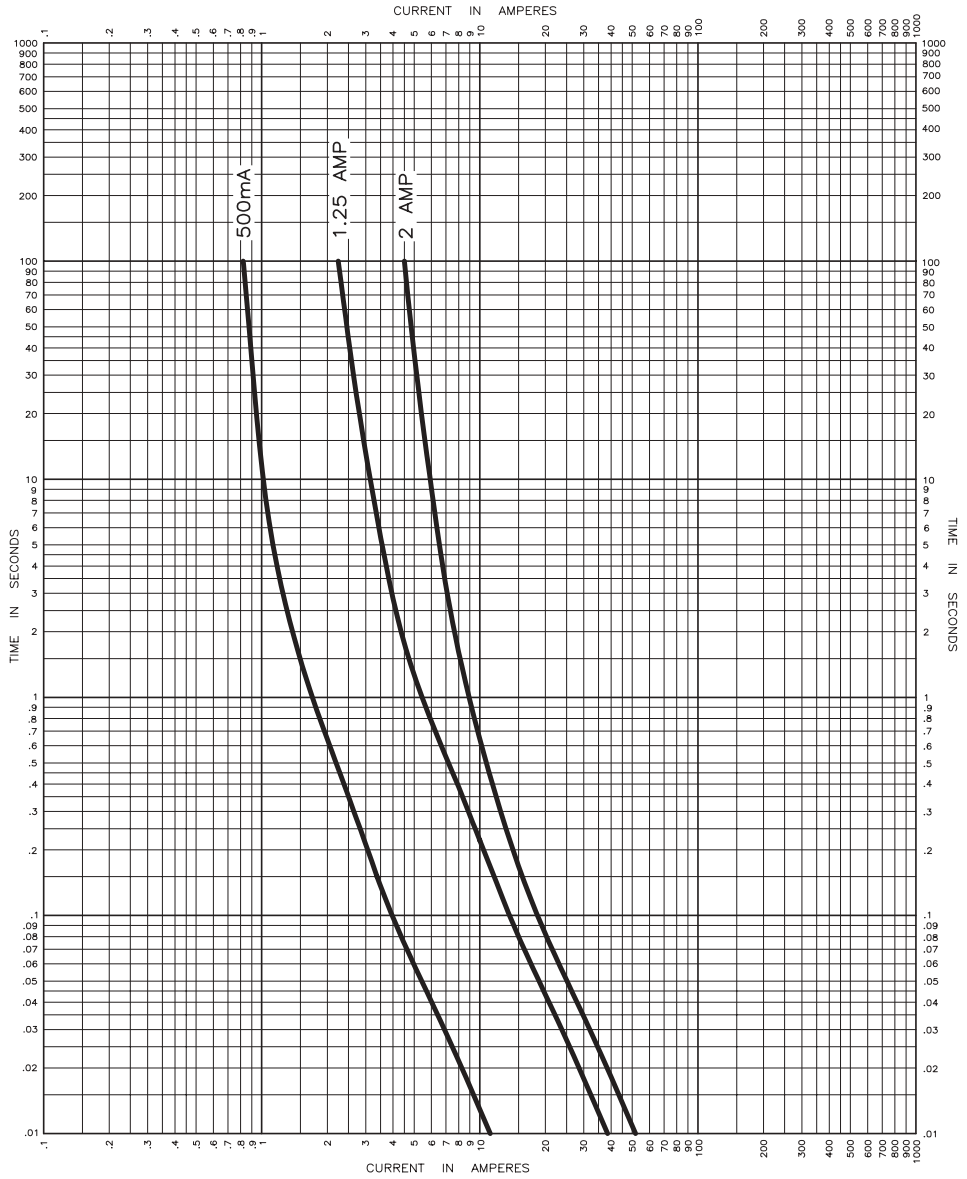
Surge Specification	Surge	Repetitions	Waveform (µSec.)	Current (A)	Voltage (V)	Performance Requirement
TCP 500mA tested						
FCC 47 Part 68	Longitudinal Type B	2	5x320	37.5	N/A	Fuse cannot open
FCC 47 Part 68	Metallic Type A	2	10x560	100	800	Fuse must open safely
Surge out		25	10x160	65	N/A	Fuse cannot open
TCP 1.25A and TCP2A tested						
FCC 47 Part 68	Longitudinal Type A	2	10x160	100 per fuse	1500	Fuse cannot open
FCC 47 Part 68	Metallic Type B	2	10x560	100	800	Fuse cannot open
Bellcore GR-1089-CORE	First Level Lightning	50	10x1000	100	1000	Fuse cannot open
Bellcore GR-1089-CORE	First Level Lightning	50	2x10	500	2500	Fuse cannot open
Surge out		1	10x160	160	N/A	Fuse cannot open
Surge out		1	10x560	115	N/A	Fuse cannot open

ELECTRICAL AND POWER CROSS SPECIFICATIONS

Product Code	Voltage Rating AC	Interrupting Rating*		DC Cold Resistance** (ohms)			Typical Melting I^2t†	Maximum Total Clearing	Typical Voltage Drop‡	Alpha Code Marking	
		250VAC	600VAC	min.	typ.	max.				1st Code	2nd Code
TCP500mA	250 V	50 A	40 A	0.420	0.530	0.640	1.3 A^2s	100 A^2s	471mV	F	R***
TCP1.25A	250 V	50 A	60 A	0.070	0.090	0.110	22.2 A^2s	100 A^2s	150mV	J	
TCP2A	250 V	50 A	60 A	0.050	0.075	0.100	30 A^2s	100 A^2s	205mV	N	

* AC Interrupting Rating (Measured at designated voltage, 100% power factor)
** DC Cold Resistance (Measured at 10% of rated current)
*** On RoHS Compliant Version (-R option)
† Typical Melting I^2t (Measured with a battery bank at 60V DC, 10x-rated current, time constant of calibrated circuit less than 50 microseconds)
‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

TIME CURRENT CURVE



OPTIONS	
Option Code (Suffix)	**Description**
-R	RoHS Compliant Version (Sn plating w/ Ni barrier)

PACKAGING CODE	
Packaging Code	**Description**
TR2	2500 pieces of fuses on 24mm tape-and-reel on 13 inch (330mm) reel per EIA Standard 481, 8mm pitch

Visit us on the web at:
www.CooperET.com

Datasheet: 98076
6/15/04 - SB04124

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Singapore 159303
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Fax: +65 270 4160

BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses 1025T Series

Time Lag, Low Breaking Capacity

Description

- Designed to IEC 127-4
- Surface Mount fuse, time lag
- Solder Immersion Compatible
- Overcurrent protection of systems up to 250VAC

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
125%	1 Hours Minimum
200%	2 Minutes Maximum
200%	1 Second Minimum
1000%	0.01 -- 0.1 Seconds

Approvals

- Designed to IEC 127, Sheet 4 (approval pending)

Environmental Data

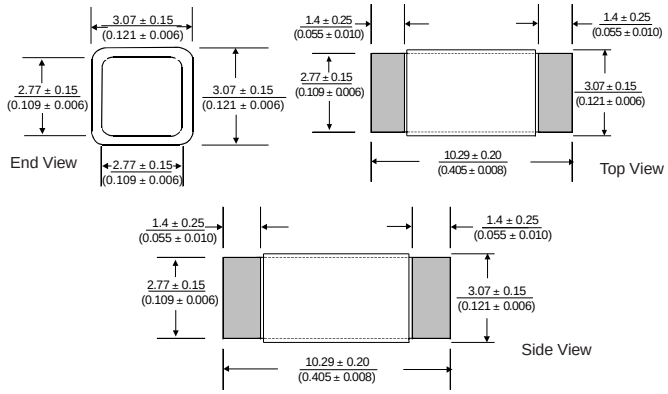
- Termination Strength: IEC 127-4 Clause 8.3.2
- Soldered Joints: IEC 127-1 Clause 8.5
- Solderability: IEC 127-4 Clause 8.6.2 subjected to Test Td of IEC-68-2-58 with the following conditions; Aging: none. Immersion conditions: exceeds IEC 127-4. Depth of immersion: entire metal surface. Flux type: non-activated. Solder type: 60% tin and 40% lead according to IEC 68-2-20, Appendix B.
- Resistance to Soldering Heat: IEC 127-4 Clause 8.7 subjected to Test Td of IEC 68-2-58 with the following conditions; Aging: none. Immersion conditions: 260°C ± 5°C, 10 seconds ± 1 sec. Depth of immersion: 10mm. Flux type: activated. Solder type: 60% tin and 40% lead
- Insulation Resistance: IEC 127-4, Clause 9.3.3 (resistance ≥ 0.1Mohms)

Ordering

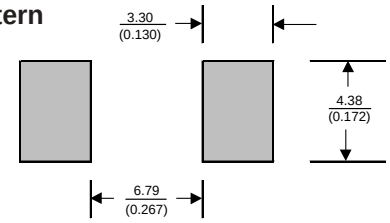
- Specify product code and packaging code

Dimensions mm/(inches)

Drawing Not to Scale



Land Pattern



Soldering Method

- Wave Immersion: 260°C, 10 sec max.
- Infrared: 260°C, 30 sec max.

SPECIFICATIONS

Product Code	Voltage Rating		Interrupting Rating*		DC Cold Resistance** (ohms)			Typical Melting I²t†	Typical Voltage Drop‡	Max. Voltage Drop‡	Marking Code
	AC	DC	250VAC	125VDC	min.	typ.	max.				
1025T250mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	800	Dt
1025T500mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	600	Ft
1025T800mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	400	KKt
1025T1A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	300	Ht
1025T1.6A	250V	125V	100A	50A	0.064	0.074	0.083	12.26	155 mV	300	MMt
1025T2A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	300	Nt
1025T2.5A	250V	125V	100A	50A	0.045	0.048	0.051	32.91	TBD	300	Ot
1025T3.15A	250V	125V	100A	50A	0.030	0.034	0.038	54.98	184 mV	300	Qt
1025T4A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	300	St
1025T5A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	300	Tt
1025T6.3A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	300	OOt

* AC Interrupting Rating (Measured at designated voltage, greater than 95% power factor); DC Interrupting Rating (Measured at designated voltage, time constant of the calibrated circuit is less than 1 millisecond, battery source)

** DC Cold Resistance (Measured at ≤10% of rated current)

† Typical Melting I²t (Measured with a battery bank at rated DC voltage, 10x-rated current, not to exceed IR, time constant of calibrated circuit less than 50 microseconds)

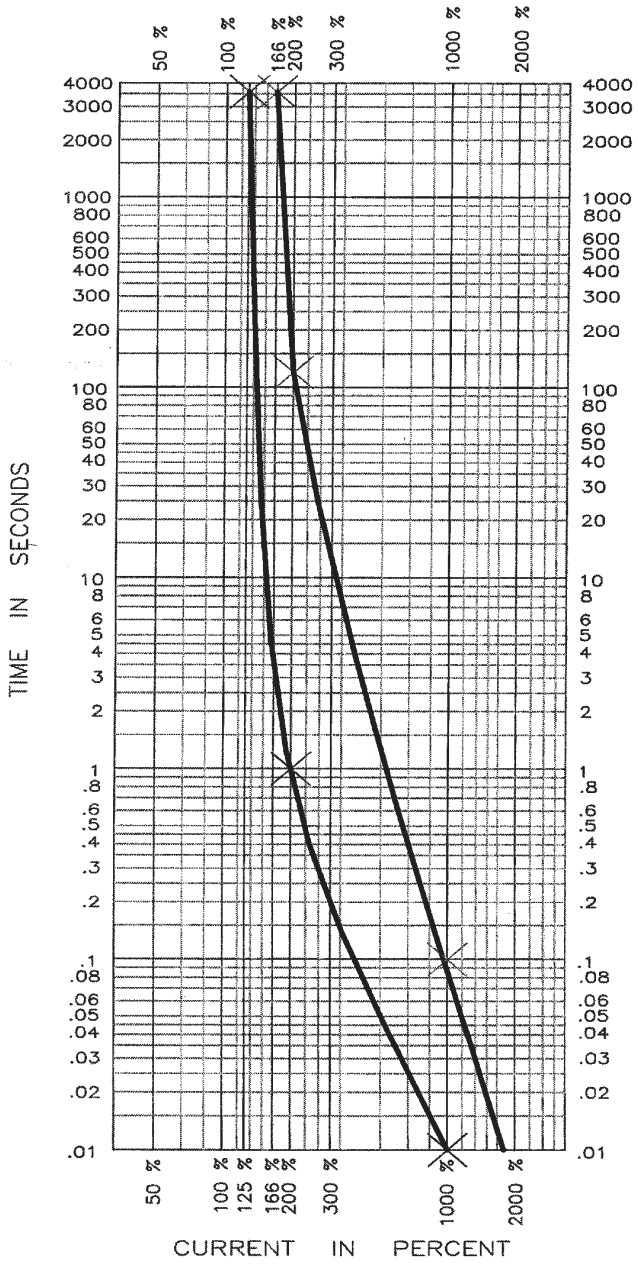
‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

• Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

Brick™ Fuses 1025T Series

Time Lag, Low Breaking Capacity

TIME CURRENT CURVE



	PACKAGING CODE
Packaging Code	**Description**
TR2	2,500 pieces of fuses on 24mm tape-and-reel on 13 inch (330mm) reel per EIA Standard 481
TR3	50 pieces of fuses on 24mm tape packaged in a plastic box per EIA Standard 481

OC-2536 Rev. XF 5/03

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BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses 1025F Series
Fast Acting, Low Breaking Capacity

Description

- Surface mount fuse, fast acting
- Designed to IEC 127-4
- Surface Mount
- Solder Immersion Compatible
- Overcurrent protection of systems up to 250 VAC

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
125%	1 Hour Minimum
200%	2 Minutes Maximum
1000%	0.001 - 0.01 Seconds

Approvals

- Designed to IEC 127, Sheet 4 (approval pending)

Environmental Data

- Termination Strength: IEC 127-4 Clause 8.3.2
- Soldered Joints: IEC 127-1 Clause 8.5
- Solderability: IEC 127-4 Clause 8.6.2
- Resistance to Soldering Heat: IEC 127-4 Clause 8.7
- Insulation Resistance: IEC 127-4 Clause 9.3.3

Soldering Method

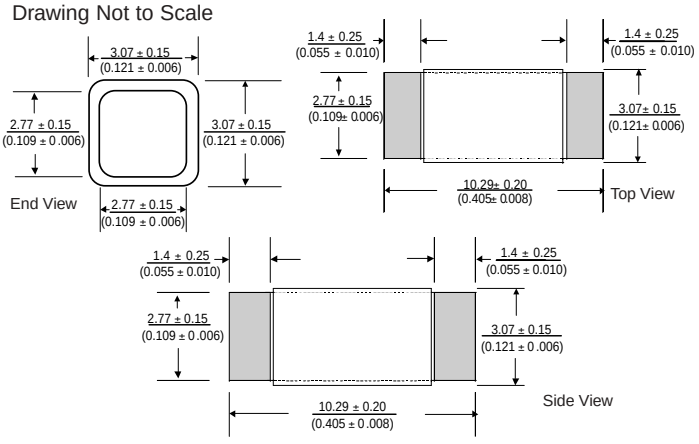
- Wave Immersion: 260°C, 10 sec max.
- Infrared: 260°C, 30 sec max.

Ordering

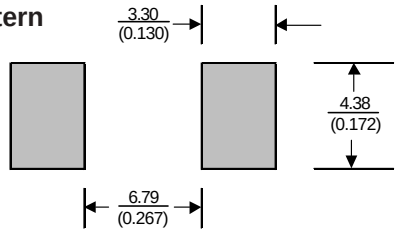
- Specify product code and packaging code

Dimensions mm/(inches)

Drawing Not to Scale



Land Pattern



SPECIFICATIONS

Product Code	Voltage Rating		Interrupting Rating*		DC Cold Resistance** (ohms)			Typical Melting	Typical Voltage	Marking Code
	AC	DC	250VAC	125VDC	min.	typ.	max.	I²t†	Drop‡	
1025F250mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	D f
1025F500mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	F f
1025F800mA	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	KK f
1025F1A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	H f
1025F1.6A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	MM f
1025F2A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	N f
1025F2.5A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	O f
1025F3.15A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	Q f
1025F4A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	S f
1025F5A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	T f
1025F6.3A	250V	125V	100A	50A	TBD	TBD	TBD	TBD	TBD	OO f

* AC Interrupting Rating (Measured at designated voltage, greater than 95% power factor); DC Interrupting Rating (Measured at designated voltage, time constant of the calibrated circuit is less than 1 millisecond, battery source)

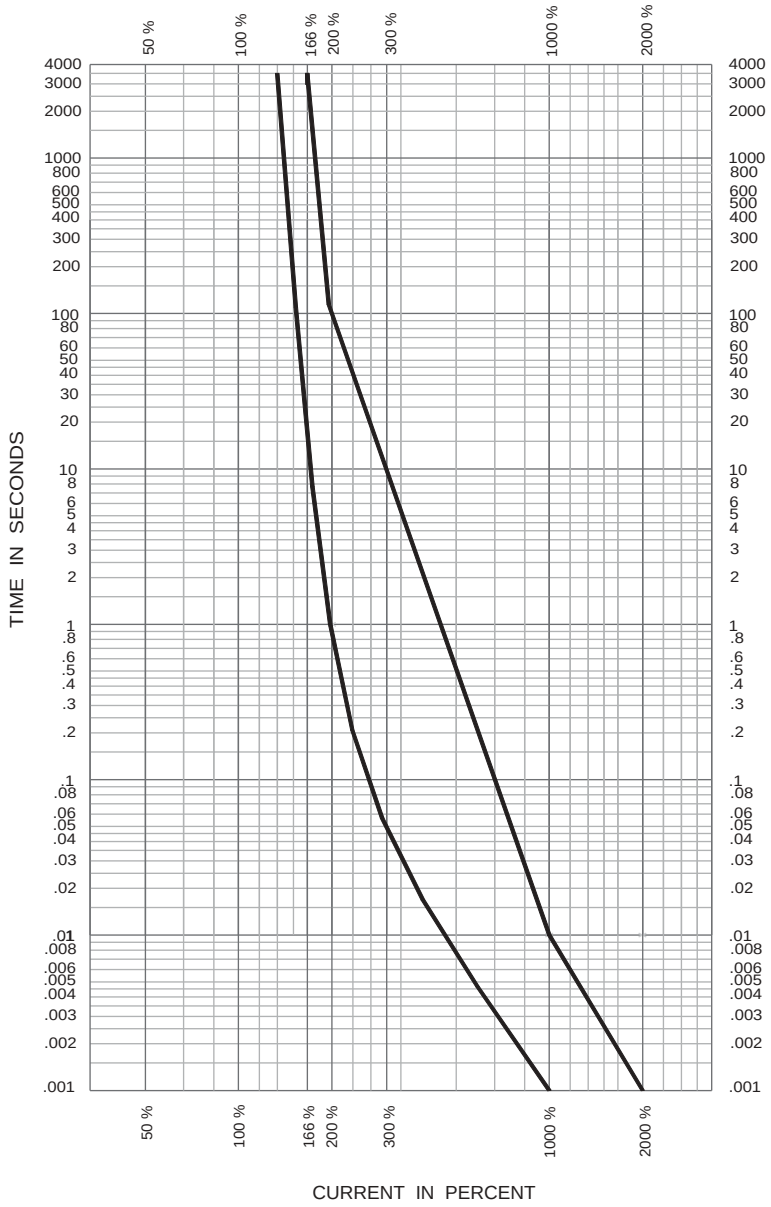
** DC Cold Resistance (Measured at ≤10% of rated current)

† Typical Melting I²t (Measured with a battery bank at 10x-rated current, not to exceed IR, time constant of calibrated circuit less than 50 microseconds)

‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

• Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

TIME CURRENT CURVE



	PACKAGING CODE
Packaging Code	**Description**
TR2	2500 pieces of fuses on 24mm tape-and-reel on a 13 inch (330mm) reel per EIA Standard 481
TR3	50 pieces of fuses on 24mm tape packaged in a plastic box per EIA Standard 481

OC-2548 Rev. X2 5/03

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BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses

6125FA Series, Fast Acting

Description

- Surface Mount
- Environmentally rugged, complies with the EIA-IS-722 Standard
- Solder Immersion Compatible
- Targeted for Consumer Electronics
- Overcurrent protection of systems up to 125VAC/DC
- Wire-in-air design

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
100%	4 Hours Minimum
200%	5 Seconds Maximum

Agency Information

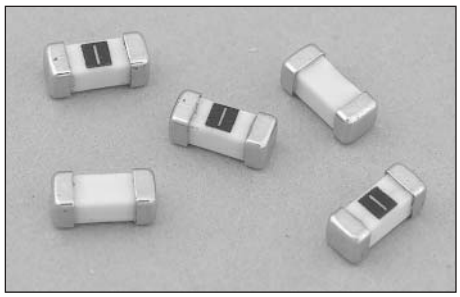
- UL Listed Guide and File Numbers (250mA-12A): JDYX & E195337
- UL Recognized Guide and File Numbers (15A): JDYX2 & E195337
- CSA Component Acceptance: 053787 C 000 & Class No: 1422 30

Environmental Data

- Shock: MIL-STD-202, Method 213, Test Condition 1 (100 G's peak for 6 milliseconds)
- Vibration: MIL-STD-202, Method 201 (10-55 Hz, 0.06 inch, total excursion)
- Salt Spray: MIL-STD-202, Method 101, Test Condition B (48 hrs)
- Insulation Resistance: MIL-STD-202, Method 302, Test Condition A (After Opening) 10,000 ohms minimum
- Resistance to Solder Heat: MIL-STD-202, Method 210, Test Condition F (20 sec, at 260° C)
- Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65° C to +125° C)

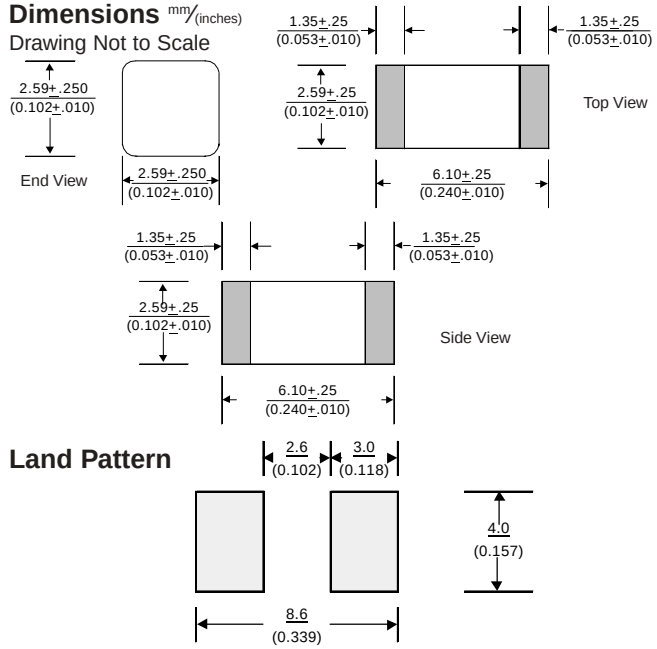
Ordering

- Specify product code and packaging code



Dimensions mm/(inches)

Drawing Not to Scale



Land Pattern

Soldering Method

- Wave Solder: 260°C, 10 sec max. (MIL-STD-202, Method 210)
- Infrared Reflow: 260°C, 30 sec max.

SPECIFICATIONS

Product Code	Voltage Rating AC	Voltage Rating DC	Voltage Rating DC	Interrupting Rating* 125V AC	Interrupting Rating* 125V DC	Interrupting Rating* 86V DC	Resistance (ohms)** Typ.	Typical Melt I²t†	Typical Voltage Drop (V)‡
6125FA250mA	125V	125V	86V	50A	300A	10,000A	0.65	0.01	0.30
6125FA375mA	125V	125V	86V	50A	300A	10,000A	0.36	0.03	0.25
6125FA500mA	125V	125V	86V	50A	300A	10,000A	0.24	0.06	0.22
6125FA750mA	125V	125V	86V	50A	300A	10,000A	0.15	0.07	0.17
6125FA1A	125V	125V	86V	50A	300A	10,000A	0.11	0.14	0.17
6125FA1.25A	125V	125V	86V	50A	300A	10,000A	0.09	0.24	0.16
6125FA1.5A	125V	125V	86V	50A	300A	10,000A	0.07	0.41	0.15
6125FA2A	125V	125V	86V	50A	300A	10,000A	0.05	0.80	0.15
6125FA2.5A	125V	125V	86V	50A	300A	10,000A	0.038	1.4	0.14
6125FA3A	125V	125V	86V	50A	300A	10,000A	0.028	2.4	0.13
6125FA3.5A	125V	125V	86V	50A	300A	10,000A	0.025	3.3	0.13
6125FA4A	125V	125V	86V	50A	300A	10,000A	0.022	4.4	0.13
6125FA5A	125V	125V	86V	50A	300A	10,000A	0.016	7.8	0.12
6125FA6.3A	125V	125V	86V	50A	300A	10,000A	0.012	14.0	0.12
6125FA7A	125V	125V	86V	50A	300A	10,000A	0.011	19.0	0.114
6125FA10A	125V	N/A	86V	50A	N/A	10,000A	0.007	44	0.107
6125FA12A	125V	N/A	86V	50A	N/A	10,000A	0.006	69	0.103
6125FA15A	N/A	N/A	86V	N/A	N/A	10,000A	0.004	124	0.098

* AC Interrupting Rating (Measured at designated voltage, 100% power factor); DC Interrupting Rating (Measured at designated voltage, time constant of less than 50 microseconds, battery source)

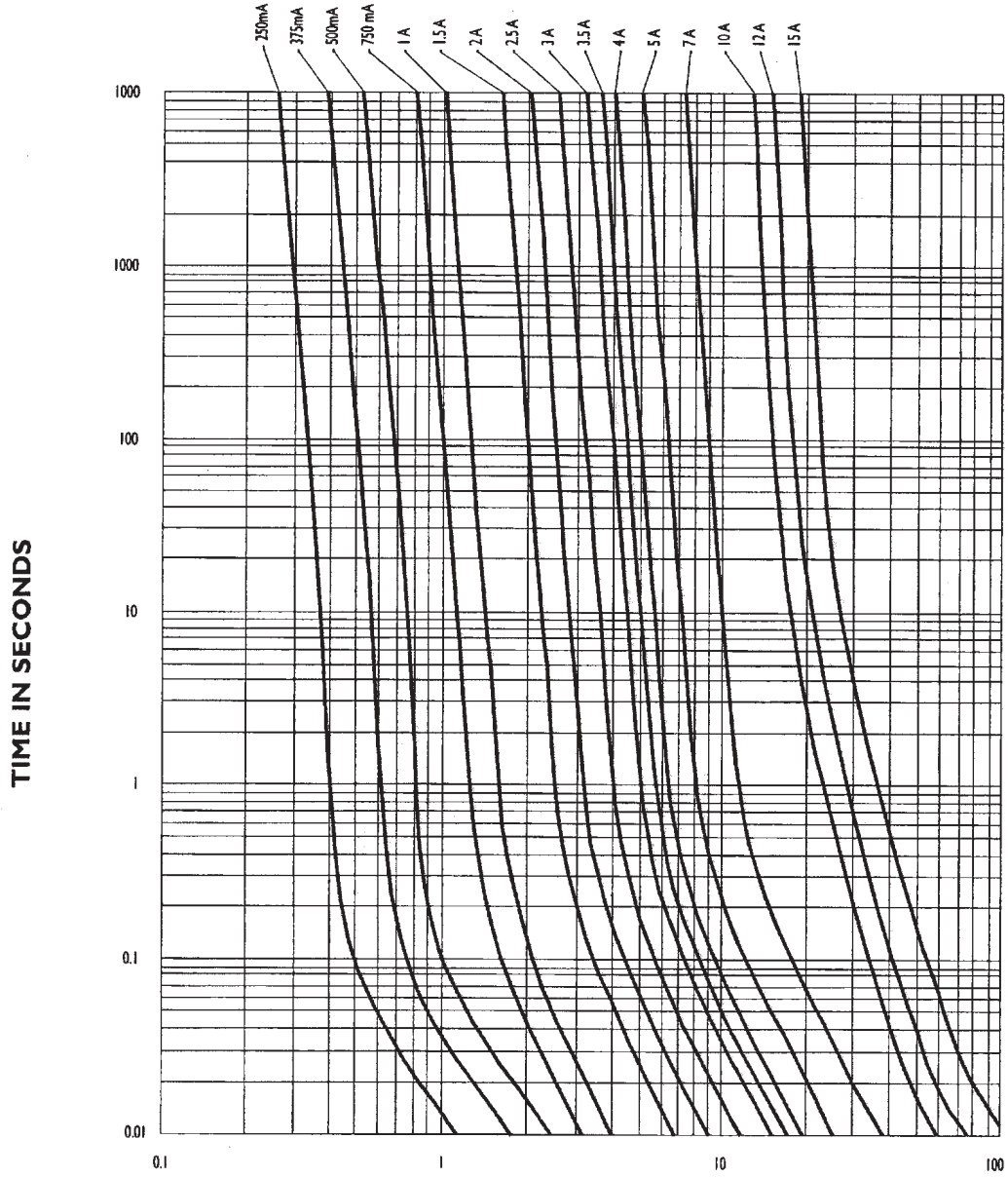
** DC Cold Resistance (Measured at 10% of rated current)

† Typical Melting I^2t (Measured with a battery bank at rated DC voltage, 10x-rated current, time constant of calibrated circuit less than 50 microseconds)

‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

TIME CURRENT CURVE



PACKAGING CODE	
Packaging Code	**Description**
SP2	50 piece sample
TR2	5000 pieces of fuses on 12mm tape-and-reel on a 13 inch (330mm) reel per EIA Standard 481

OC-2531 Rev. I 5/03

Visit us on the Web at www.cooperET.com

3601 Quantum Boulevard Boynton Beach, Florida 33426-8638
Tel: +1-561-752-5000 Toll Free: +1-888-414-2645 Fax: +1-561-742-1178

BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses

1025FA Series, Fast Acting

Description

- Surface Mount
- Environmentally rugged, satisfies the EIA/IS-722 Standard
- Solder Immersion Compatible
- Targeted for Consumer Electronics

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
100%	4 Hours Minimum
200% (250mA-5A)	5 Seconds Maximum
250% (250mA-5A fuse)	1 Second Maximum
200% (7A-15A fuse)	20 Seconds Maximum
250% (7A-15A fuse)	4 Seconds Maximum

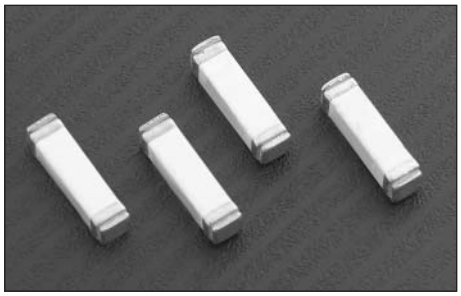
Note: 30vde constant current source required for 200% overload tests on 250ma-1a.

Agency Information

- UL Recognition Guide & File numbers: JDYX2 & E19180 (250mA - 15A)
- CSA Component Acceptance: File # 053787 C000, Class # 1422 30

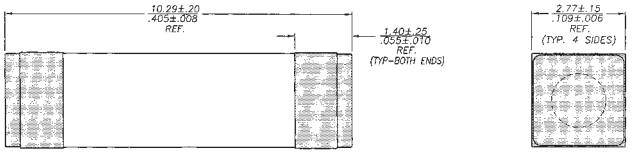
Environmental Data

- Life Test: MIL-STD-202, Method 108A, Test Condition D
- Load Humidity: MIL-STD-202, Method 103B
- Moisture Resistance: MIL-STD-202, Method 106E
- Terminal Strength: MIL-STD-202, Method 211A
- Thermal Shock: MIL-STD-202, Method 107D, air-to-air
- Case Resistance: EIA/IS-722
- Resistance to Dissolution of Metallization: ANSI J-STD-002, Test D
- Mechanical Shock: MIL-STD-202, Method 213B with exceptions per EIA/IS-722 Standard
- High Frequency Vibration: MIL-STD-202, Method 204D, Test Condition D
- Resistance to Solvents: MIL-STD-202, Method 215A

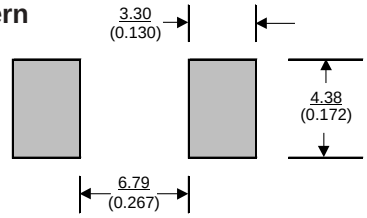


Dimensions mm/(inches)

Drawing Not to Scale



Land Pattern



Soldering Method

- Wave Solder: 260°C, 10 sec max.
- Infrared Reflow: 260°C, 30 sec max.

Ordering

- Specify product code and packaging code

SPECIFICATIONS

Product Code	Voltage Rating		Interrupting Rating*			DC Cold Resistance** (ohms)	Typical Melting	Typical Voltage	Marking Code‡‡	
	AC	DC	250VAC	125VDC	60VDC	Typical	I²t†	Drop‡	1st & 2nd	3rd
1025FA250mA	250V	125V	50A	50A	-	5.0000	0.1212	2019 mV	AD	U, T or S
1025FA500mA	250V	125V	50A	50A	-	1.2000	0.0415	1500 mV	AF	
1025FA750mA	250V	125V	50A	50A	-	0.6000	0.143	880 mV	AG	
1025FA1A	250V	125V	50A	50A	-	0.3000	1.750	560 mV	AH	
1025FA1.5A	250V	125V	50A	50A	-	0.1040	1.460	260 mV	AK	
1025FA2A	250V	125V	50A	50A	-	0.0800	6.086	258 mV	AN	
1025FA2.5A	250V	125V	50A	50A	-	0.0510	8.48	232 mV	AO	
1025FA3A	250V	125V	50A	50A	-	0.0390	18.15	205 mV	AP	
1025FA3.5A	250V	125V	50A	50A	-	0.0300	17.83	185 mV	AR	
1025FA4A	250V	125V	50A	50A	-	0.0270	23.32	190 mV	AS	
1025FA5A	250V	125V	50A	50A	-	0.0200	38.74	180 mV	AT	
1025FA7A	250V	60V	50A	50A	-	0.0116	138	150 mV	AU	
1025FA10A	250V	60V	50A	50A	-	0.0076	457	146 mV	AW	
1025FA12A	250V	60V	50A	-	50A	0.0550	498	120 mV	AX	
1025FA15A	250V	60V	50A	-	50A	0.0041	1451	110 mV	AY	

* AC Interrupting Rating (Measured at designated voltage, 100% power factor random closing); DC Interrupting Rating (Measured at designated voltage, time constant of less than 50 microseconds, battery source)

** DC Cold Resistance (Measured at ≤10% of rated current)

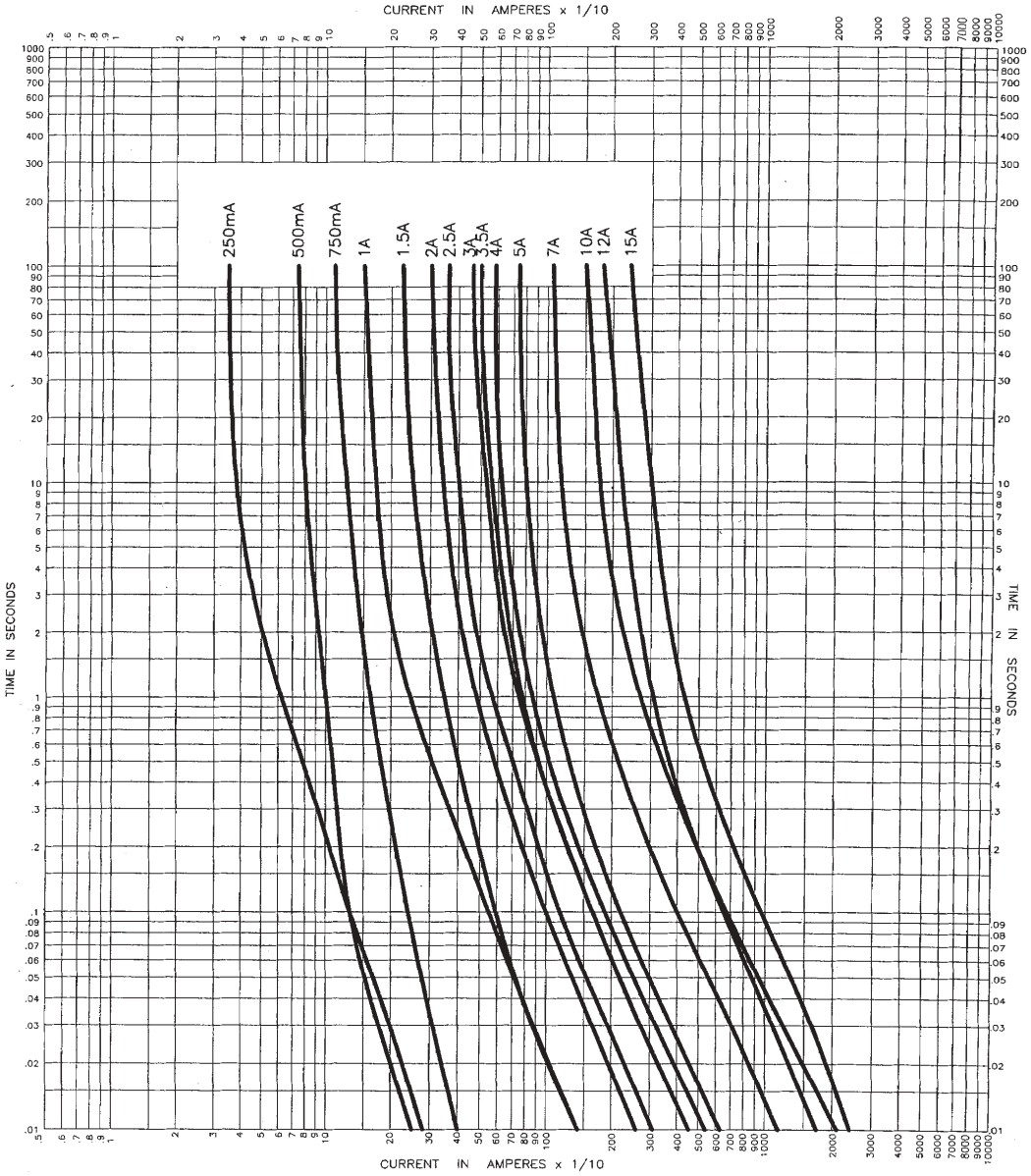
† Typical Melting I²t (Measured with a battery bank at rated DC voltage, 10x-rated current, but not exceeding the interrupting rating. Time constant of calibrated circuit less than 50 microseconds). Test current not to exceed interrupting rating of 50A.

‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

‡‡ Marking Code - 3rd (U = USA, T = Taiwan and S = China)

• Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

TIME CURRENT CURVE



	PACKAGING CODE
Packaging Code	**Description**
SP1	50 piece sample
TR2	2,500 pieces of fuses on 24mm tape-and-reel on 13 inch (330mm) reel per EIA Standard 481

OC-2538 Rev. X6 5/03

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BUSSMANN electronic fuses

COOPER Bussmann

Brick™ Fuses

1025TD Series, Time Delay

Description

- Surface Mount
- Environmentally rugged, satisfies the EIA/IS-722 Standard
- Solder Immersion Compatible
- Targeted for Consumer Electronics

ELECTRICAL CHARACTERISTICS	
% of Amp Rating	**Opening Time**
100%	4 Hours Minimum
200%	1 Second Minimum
200%	60 Seconds Maximum
250% *	10 Seconds Maximum

* If fuse does not open @ 200% in 60 seconds, raise current to 250% and the fuse must open in 10 seconds maximum.

Agency Information

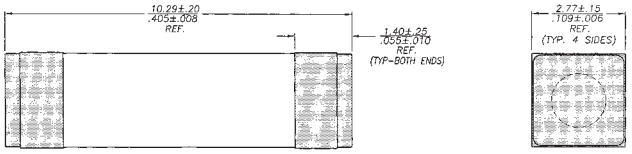
- UL Recognition Guide & File numbers: JDYX2 & E19180 (250mA - 5A)
- CSA Component Acceptance: File # 053787 C000, Class # 1422 30

Environmental Data

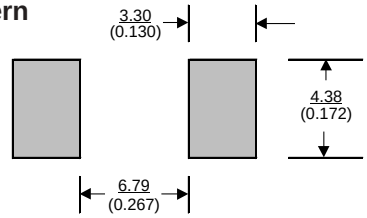
- Life Test: MIL-STD-202, Method 108A, Test Condition D
- Load Humidity: MIL-STD-202, Method 103B
- Moisture Resistance: MIL-STD-202, Method 106E
- Terminal Strength: MIL-STD-202, Method 211A
- Thermal Shock: MIL-STD-202, Method 107D, air-to-air
- Case Resistance: EIA/IS-722
- Resistance to Dissolution of Metallization: ANSI J-STD-002, Test D
- Mechanical Shock: MIL-STD-202, Method 213B with exceptions per EIA/IS-722 Standard
- High Frequency Vibration: MIL-STD-202, Method 204D, Test Condition D
- Resistance to Solvents: MIL-STD-202, Method 215A

Dimensions mm/(inches)

Drawing Not to Scale



Land Pattern



Ordering

- Specify product code and packaging code

Soldering Method

- Wave Immersion: 260°C, 10 sec max.
- Infrared: 260°C, 30 sec max.

SPECIFICATIONS

Product Code	Voltage Rating		Interrupting Rating*		DC Cold Resistance** (ohms)	Typical Melting	Typical Voltage	Marking Code‡‡	
	AC	DC	250VAC	125VDC	Typical	I²t†	Drop‡	1st & 2nd	3rd
1025TD250mA	250V	125V	50A	50A	4.200	0.128	1900 mV	DD	U, T or S
1025TD500mA	250V	125V	50A	50A	0.5500	1.47	455 mV	DF	
1025TD750mA	250V	125V	50A	50A	0.317	0.93	400 mV	DG	
1025TD1A	250V	125V	50A	50A	0.2030	9.91	387 mV	DH	
1025TD1.5A	250V	125V	50A	50A	0.1025	11.79	310 mV	DK	
1025TD2A	250V	125V	50A	50A	0.0680	17.27	250 mV	DN	
1025TD2.5A	250V	125V	50A	50A	0.0420	16.51	201 mV	DO	
1025TD3A	250V	125V	50A	50A	0.0330	42.74	184 mV	DP	
1025TD3.5A	250V	125V	50A	50A	0.0270	43.33	180 mV	DR	
1025TD4A	250V	125V	50A	50A	0.0220	66.96	152 mV	DS	
1025TD5A	250V	125V	50A	50A	0.0160	88.38	145 mV	DT	

* AC Interrupting Rating (Measured at designated voltage, 100% power factor random closing); DC Interrupting Rating (Measured at designated voltage, time constant of the calibrated circuit is less than 50 microseconds, battery source)

** DC Cold Resistance (Measured at ≤10% of rated current)

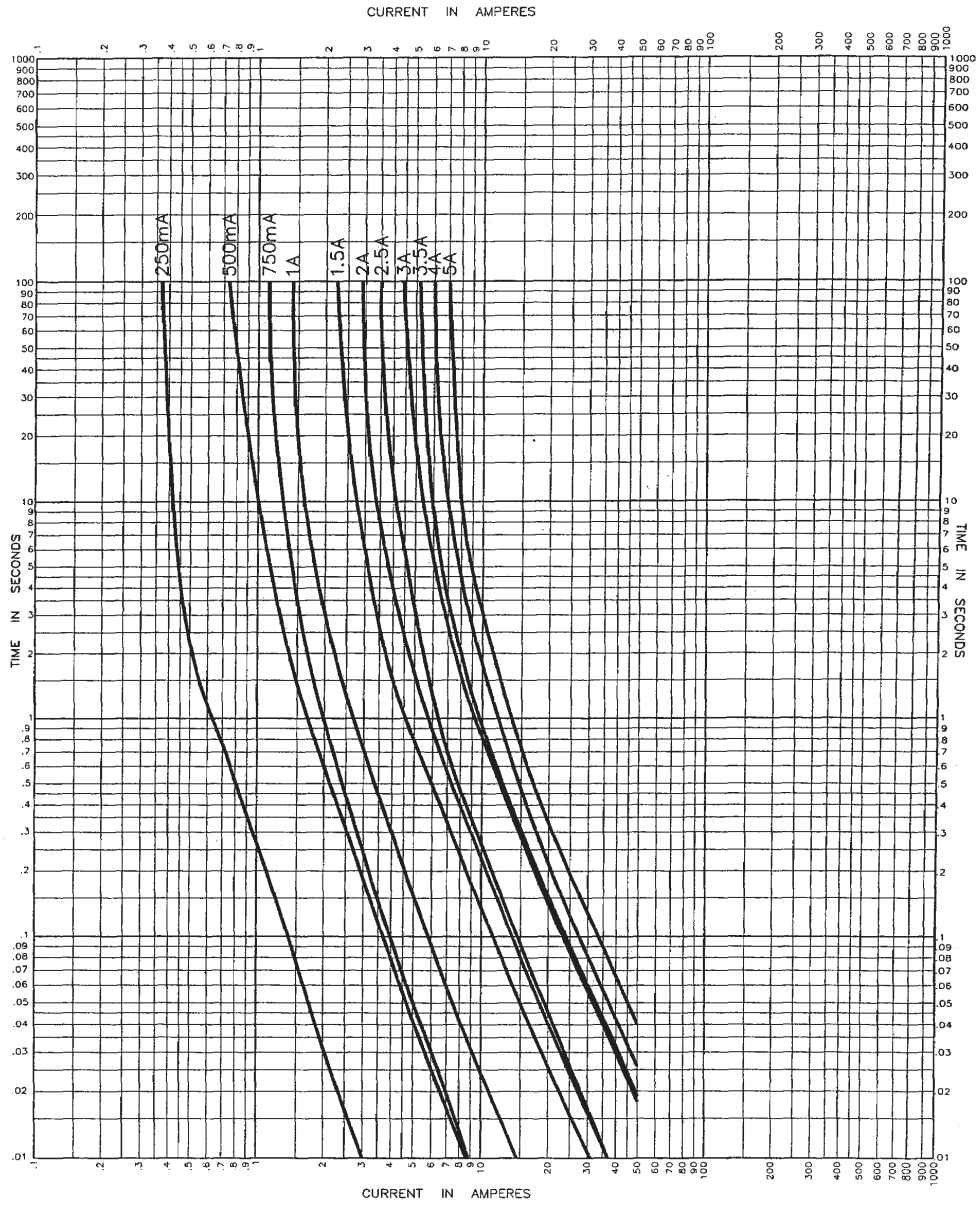
† Typical Melting I²t (Measured with a battery bank at rated DC voltage, 10x-rated current, time constant of calibrated circuit less than 50 microseconds)

‡ Typical Voltage Drop (Measured at rated current after temperature stabilizes)

‡‡ Marking Code - 3rd (U = USA, T = Taiwan and S = China)

• Device designed to carry rated current for four hours minimum. An operating current of 80% or less of rated current is recommended, with further derating required at elevated ambient temperatures.

TIME CURRENT CURVE



	PACKAGING CODE
Packaging Code	**Description**
SP1	50 piece sample
TR2	2,500 pieces of fuses on 24mm tape-and-reel on 13 inch (330mm) reel per EIA Standard 481

OC-2537 Rev. XH 5/03

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COOPER Bussmann

Engineering Product Specification

TCP ™
Telecom Circuit Protector

Rev. #	Revision Description	Date	Author	Appr
L	Redraw the Maximum Offset of Tube to make it legible. Correct the minimum tube size from .103"SQ to .101"SQ. Add comment to indicate the cap and tube SQ sizes are minimum dimensions. Update UL card to indicate 2A. Remove the ink color from the alpha mark spec. Add the alpha mark designations for the China and Costa Rica facilities. Update mfgr info.	2/21/01	VK	DB
K	Rename TCP1.251A product to TCP2A. No change in electrical characteristics. Add China facility.	8/23/00	VK	DB
J	Add 1.251A version. Add ISO registration information. Change alpha code: 500mA from A to F and 1.25A from B to J.	6/8/00	DR	EC
I	Detail marking specification in section 7.	4/28/00	DR	EC
H	Add maximum total clearing I^2t in section 5.5.	1/19/00	DR	EC
G	Added nickel flash. Added cold resistance for TCP-500mA (min 0.541, typ 0.614, max. 0.686) Added typ. Melt I^2t (500mA=1.3a^2sec, 1.25A=22.2 a^2sec). Added typ. Voltage drop on 500mA(471mV), changed voltage drop of 1.25A to 205mV. Added TCC for both ratings. Changed max. temp from 85°C to 125°C. Added max. tube offset drawing.	10/99	CR	EC
F	5.2.1 Changed .500mA 600v int. rating to 40A; 5.4 Added DC cold resistance for TCP1.25 min-0.107, type -0.128, max. -0.150; 5.6 Added 0.205 typ voltage drop to TCP 1.25A; 6.1 Added UL Recognition card; 6.2 Added CSA component acceptance card; 12 Removed copper from wire, plate end plates and mark in flow chart.	9/99	CR	EC
E	Changed area code, removed Nickel flash on post plating, removed marking of fuse	6/99	CR	EC
D	Changed Interrupting Rating to 60A, changed Time vs. Current requirement for 1.25A, & removed specification data results.	4/99	DG	EC
C	Added new logo and disclaimer	1/99	DG	EC
B	Final for prerelease	3/98	EC	EC
A	Original	2/18	EC	EC

Table of Contents

1.SCOPE

1.1 This Specification applies to Bussmann TCP series protectors.

2. MANUFACTURER AND PRODUCTION FACILITY

2.1 Manufacturer

Cooper Electronic Technologies
3601 Quantum Boulevard
Boynton Beach, FL 33426
Phone: (561) 752-5000
Fax: (561) 742-0134

2.2 Production Facility

1) Bussmann
114 Old State Road
Ellisville, MO 63021 (USA)

2) NO. 59-12, 9 Lin
Ta Tsuo Li, Chu Nan Chen
Mia LiHsien, Taiwan, R.O.C

3) Xin Min Industrial Estate
Changan DongGuan
Guangdong Province China

4) 1K M Al Este Del Aeropurto
Juan Santamarita, Zona Franca
Saret, Edificio B-05
Rio Segundo Alajuela, Costa Rica

2.3 ISO Registration

1) ISO 9002, File Number A4916
2) ISO 9001, File Number A6444
3) ISO 9002, Certificate No. Q2273
4) ISO 9002, File Number A7346

3. CATALOG SYMBOL AND PART NUMBERING SYSTEM

3.1 Catalog Symbol

3.1.1 Example TR1/TCP500mA

TR1/	TCP	500mA
↓	↓	↓
1	2	3

1. Packaging Code: TR1/
2. Series Number: TCP
3. Ampere Rating: 500mA

3.2 Part Numbering System

3.2.1 Packaging Code

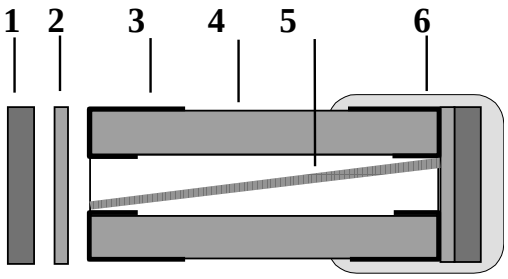
Packaging Code	Description
SP1/	10 Fuses in Tape in a Plastic Bag (Engineering Samples)
SP2/	50 Fuses in Tape with a Leader and Trailer in a Plastic Box (Engineering Samples)
TR1/	1000 Fuses in Tape and Reel (13 inch [330 mm] reel)
TR2/	2500 Fuses in Tape and Reel (13 inch [330 mm] reel)

3.2.2 Ampere Rating

Catalog Symbol	Description
TCP500mA	500mA Fuse
TCP1.25A	1.25A Fuse
TCP2A	2A Fuse

4. MECHANICAL SPECIFICATIONS

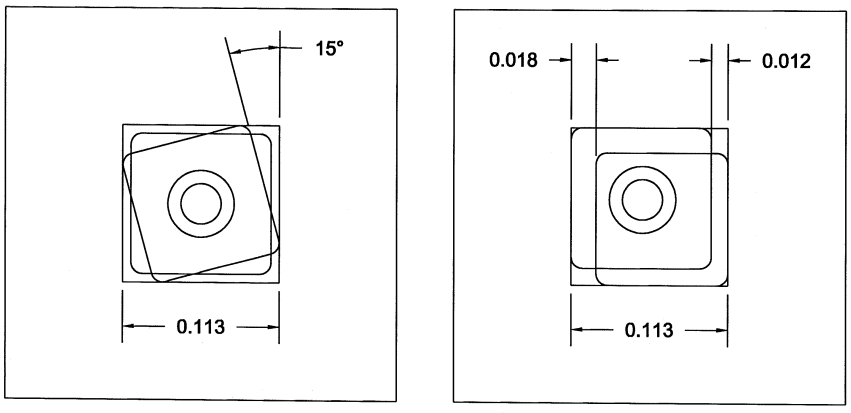
4.1 Construction (drawing not to scale)



1. End plate
2. High temperature solder preform
3. Metallization of ceramic body
4. Ceramic body
5. Fuse element
6. End termination overcoat on both ends (Nickel Flash, Tin/Lead Overcoat)

4.1.2 Maximum Offset of Tube

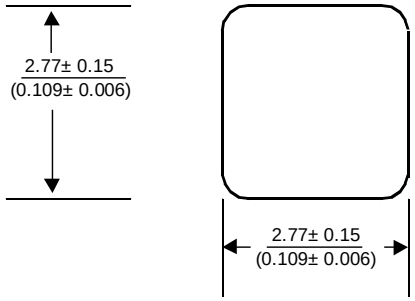
MINIMUM MATERIAL CONDITIONS
FIXTURE OPENING .112±.001



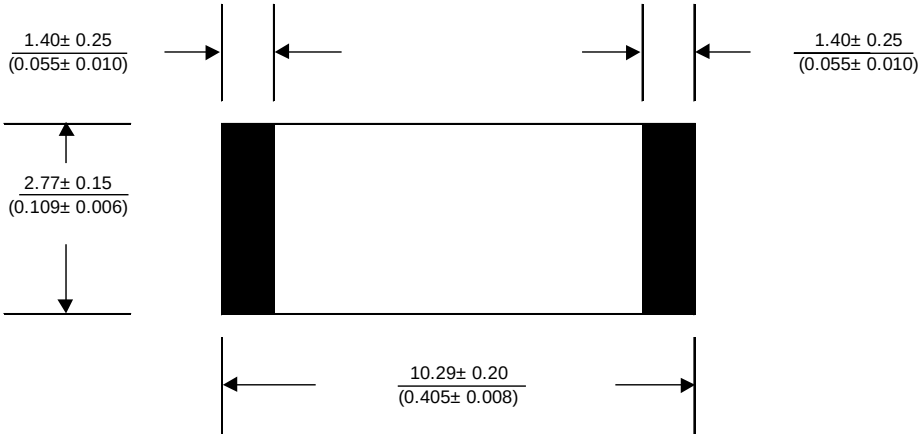
CAP SIZE IS .095"SQ. MINIMUM
TUBE SIZE IS .101"SQ. MINIMUM

4.2 Dimensions (drawings not to scale)

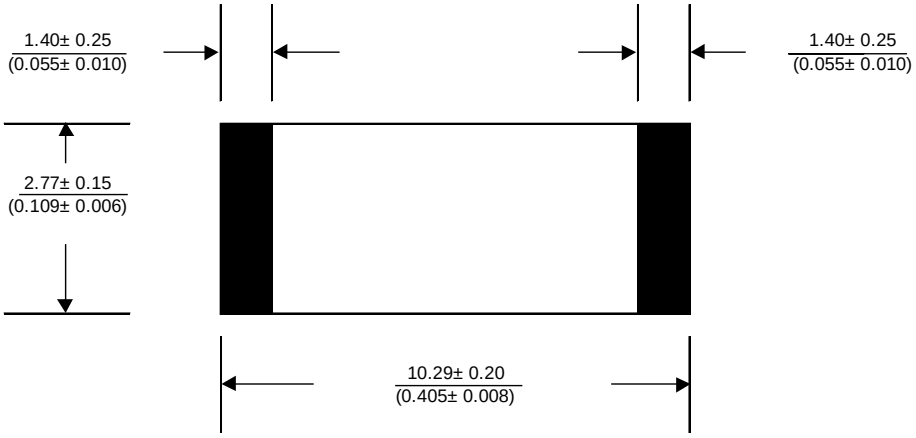
4.2.1 End View mm (inches)



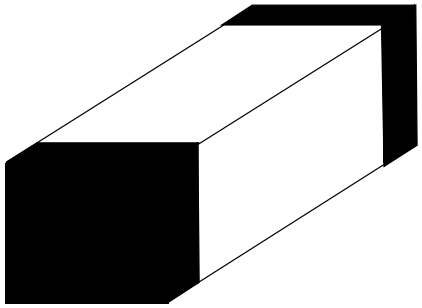
4.2.2 Top View mm (inches)



4.2.3 Side View mm (inches)



4.2.4 Orthogonal View



5. ELECTRICAL SPECIFICATIONS

5.1 Voltage Rating

Catalog Symbol	Voltage Rating AC
TCP500mA	250 V
TCP1.25A	250 V
TCP2A	250 V

5.2 Interrupting Rating

5.2.1 AC Interrupting Rating (Measured at designated voltage, 100% power factor)

Catalog Symbol	Interrupting Rating AC	
	250 V	600 V*
TCP500mA	50 A	40A
TCP1.25A	50 A	60 A
TCP2A	50 A	60 A

*600V, 60A Interrupting ratings test were performed by closing the circuit between 50° and 70° on the voltage wave.

5.3 Time vs. Current Characteristic (Measured with a Kepco constant current power supply)

5.3.1 For TCP500mA and TCP1.25A

% of Amp Rating	Opening Time
100%	4 Hours Minimum
250%	1 Second Minimum
250%	4 -10 Seconds Typical
250%	120 Seconds Maximum
300%*	10 Seconds Maximum

*If the device does not open at 250% within 120 seconds, increase current to 300% of amp rating. Device must open in 10 seconds maximum.

5.3.2 For TCP2A

Current Level	Opening Time
2.2A**	30 minutes minimum
7A	opens before Bussmann MDL-2
25A	opens before Bussmann MDL-2
40A	opens before Bussmann MDL-2

% of Amp Rating	Opening Time
100%	4 Hours Minimum
250%	1 Second Minimum
250%	4 -10 Seconds Typical
250%	120 Seconds Maximum
300%*	10 Seconds Maximum

*If the device does not open at 250% within 120 seconds, increase current to 300% of amp rating. Device must open in 10 seconds maximum.

** The TCP2A may have a maximum temperature rise of 100°C after carrying 2.2A for thirty minutes.

5.4 DC Cold Resistance (Measured at 10% of rated current)

Catalog Symbol	Resistance (ohms)		
	Min.	Typ.	Max.
TCP500mA	0.420	0.530	0.640
TCP1.25A	0.107	0.128	0.150
TCP2A	0.050	0.075	0.100

5.5 I^2t

5.5.1 Typical Melt I^2t is measured with a battery bank at 60V DC, 10x-rated current, time constant of calibrated circuit less than 50 microseconds.

5.5.2 Maximum Total Clearing is measured on a 40A, 600V AC, unity power factor circuit.

Catalog Symbol	Typical Melt I^2t	Maximum Total Clearing I^2t
TCP500mA	1.3 A^2s	100 A^2s
TCP1.25A	22.2 A^2s	100 A^2s
TCP2A	30 A^2s	100 A^2s

5.6 Typical Voltage Drop (Measured at rated current after temperature stabilizes)

Catalog Symbol	Typical Voltage Drop
TCP500mA	471mV
TCP1.25A	205mV
TCP2A	205mV

5.7 Surge Specifications

a) TCP 500mA tested to surge requirements listed below

Surge Specification	Surge	Repetitions	Waveform (μSec.)	Current (A)	Voltage (V)	Performance Requirement
FCC 47 Part 68	Longitudinal Type B	2	5x320	37.5	N/A	Fuse cannot open
FCC 47 Part 68	Metallic Type A	2	10x560	100	800	Fuse must open safely
Surge Out		25	10x160	65	N/A	Fuse cannot open

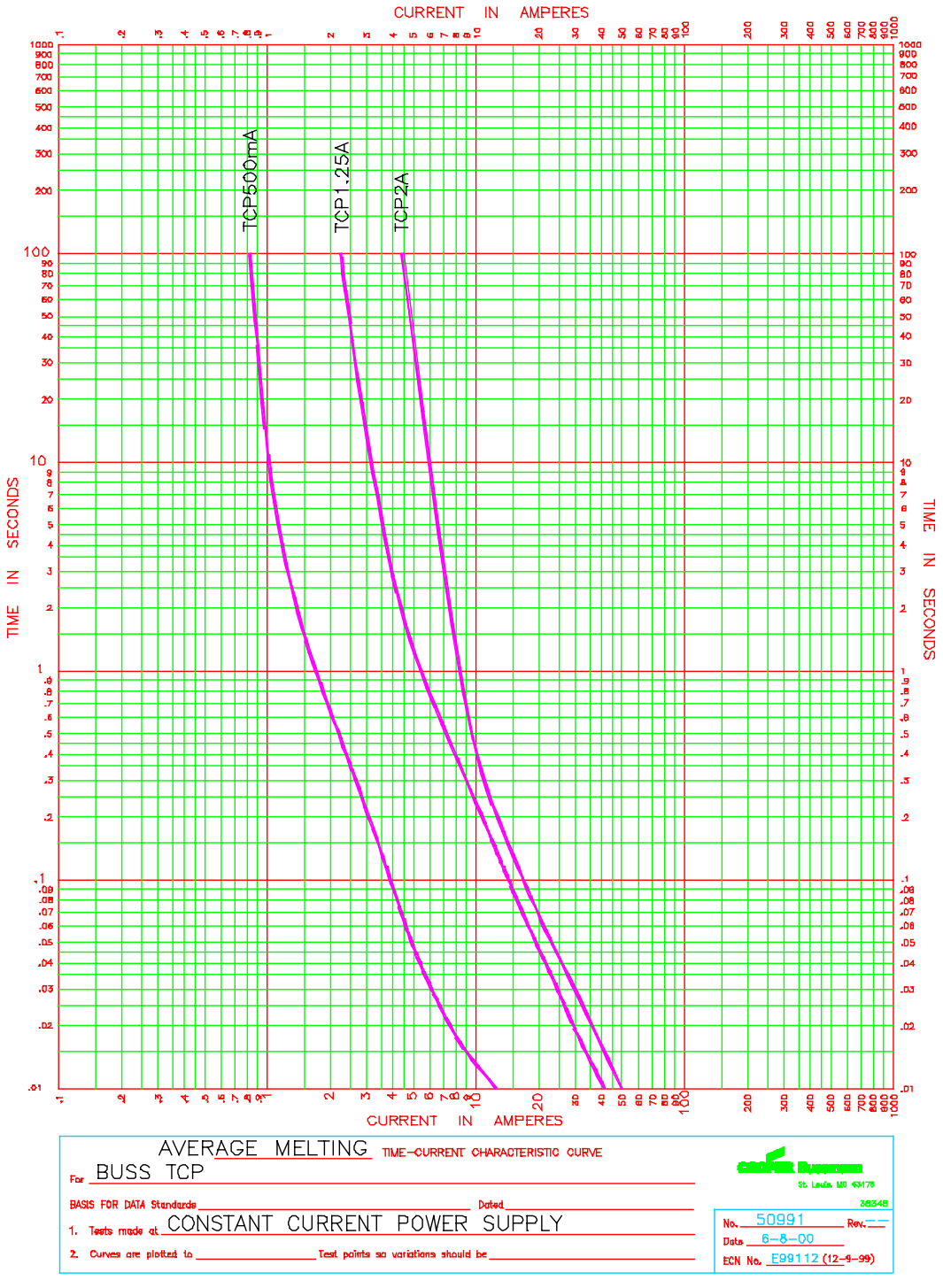
b) TCP1.25A and TCP2A tested to surge specifications listed below

Surge Specification	Surge	Repetitions	Waveform (μSec.)	Current (A)	Voltage (V)	Performance Requirements
FCC 47 Part 68	Longitudinal Type A	2	10x160	100 per fuse	1500	Fuse cannot open
FCC 47 Part 68	Metallic Type B	2	10x560	100	800	Fuse cannot open
Bellcore GR-1089-CORE	First Level Lighting	50	10x1000	100	1000	Fuse cannot open
Bellcore GR-1089-CORE	First Level Lighting	50	2x10	500	2500	Fuse cannot open
Surge Out		1	10x160	160	N/A	Fuse cannot open
Surge Out		1	10x560	115	N/A	Fuse cannot open

5.8 Maximum Temperature Rise (Measured at rated current after temperature stabilizes)

Catalog Symbol	Maximum Temperature Rise
TCP500mA	≤ 75 °C (135°F)
TCP1.25A	≤ 75 °C (135°F)
TCP2A	≤ 75 °C (135°F)

5.9 Time Current Curve:



6. STANDARDS and APPROVALS

6.1 UL Recognition Card (JDYX2 / E19180)

Underwriters Laboratories Inc.®

Cat. No. SFT, 0-5A, 125 ac/dc; Cat. No. SFT, 5.1-10A, 60 V ac/90 V dc; Cat. No. SFT, 12.5A, 48 V ac.
Cat. No. 3216FF, 1/4-3A, 32 V ac, 63 V dc; Cat No. 3216FF, 4-7.5A V ac/dc; Cat. No. 3216LV, 0-1.5A, 125 V ac/dc; Cat. No. 3216-1J0289, rated 0.2A, 125 V ac/dc; Cat. Nos. 1206CP, 1206FA, rated 0.25-3A, 32 V dc.
Cat. No. 1608FF, 250 ma-4A, 24 V dc.
Cat. No. 0603FA, 0.25-5A, 24 V dc.
Circuit protectors. Cat. No. 3216CP, 1/4-5A, 24 V dc, 4-5A, 32 V ac, 32 dc.
Cat. No. ETF, 0.080-6.3A, 250 V ac.
Micro. Cat. No. EFF, 0.05-6.3A, 250 V ac.
Cat. No. TEL, 350 MA, 600 V dc.
Telecom circuit protectors. Cat. No. TCP, rated 500 mA-1.25A, 250 V ac 600 V ac; Cat. No. TCP2A, rated 2A, 250V ac, 600V ac.
+These fuses may be provided with the suffix letter "B" after the catalog number and before the amp rating.
Marking: Company name or trademark "Buss", rating and catalog or type designation on smallest shipping container.

See General Information Preceding These Recognitions
For use only in equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

579980001 Page 2 of 2 JDYX2/E19180
January 2, 2001

6.1.1 Marking The UL Recognition symbol appears on the label affixed to the packaging container.

6.2 CSA Component Acceptance Card (500mA and 1.25A)
2A is approved, but the card has not been updated

Certification Record No: 053787 C 000

Class No: 1422 30

TCP	0.500mA - 1.25A 600V ac max	250% - 2 min	IR250-50A, 1.0pF IR600-40A, 1.0pF
KAA	0-30A, 130V ac	-	IR130-80kA

Notes:

1. NOT FOR BRANCH CIRCUIT WIRING OR PROTECTION. Must be evaluated in the end use application.
2. Short circuit ratings are or may be other than those found in Table 4 of CSA Std No 59.2.

Raj

DQD No. 548-Rev B

Page 3

6.2.1 Marking The CSA symbol appears on the label affixed to the packaging container

7. MARKING SPECIFICATION

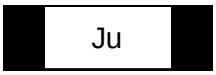
7.1 A two letter alpha code will be marked on the body of the fuse.
The first letter will indicate the ampere rating. The second letter will indicate the manufacturing facility.

7.1.1 Table of alpha code marking

Ampere Rating	1st position alpha code
TCP500mA	F
TCP1.25A	J
TCP2A	N

Manufacturing Facility Location	2nd position alpha code
USA	u
Taiwan	t
China	s
Costa Rica	c

7.1.2 Example of a TCP1.25A manufactured in the USA.



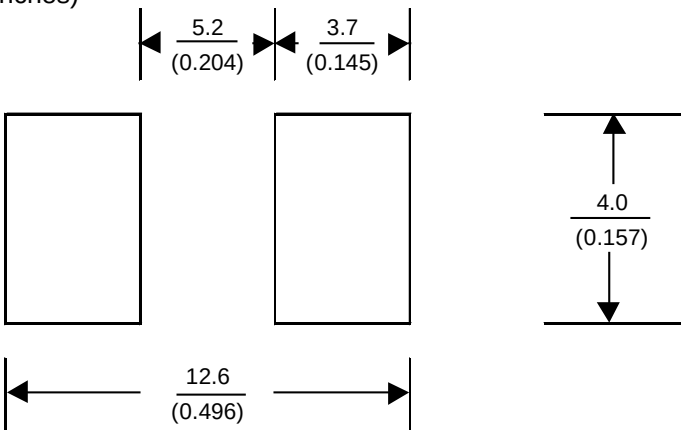
J = 1.25A
u = manufactured in USA

8. SOLDERING METHOD

8.1 Wave Immersion
- 8.1.1 Reservoir Temperature: 260° C (500°F)
- 8.1.2 Time in Reservoir: 3 Seconds Maximum

8.2 Infrared
- 8.2.1 Temperature: 240° C (464 °F)
- 8.2.2 Time: 30 Seconds Maximum

9. LAND PATTERN mm
(inches)

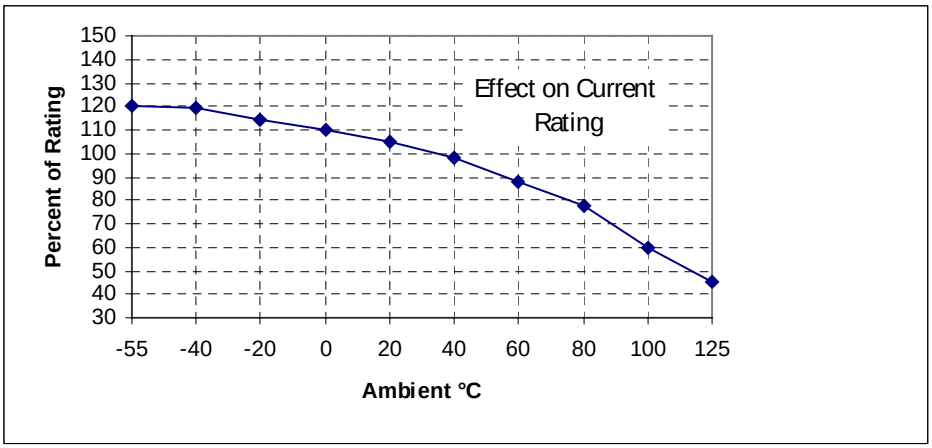


10. TEMPERATURE DERATING CURVE

10.1 Normal Operating Temperature: 25°C ± 2°C (77 °F ± 3.6 °F)

10.2 Maximum Operating Temperature: -55°C to 125°C with proper correction factor applied

10.2.2 Chart of correction factor for TCP500mA and TCP1.25A



10.2.3 Chart of correction factor for TCP2A to be created

10.3 Storage Temperature: -55°C to 125°C (-67° F to 185°F)

11. PACKAGING SPECIFICATION

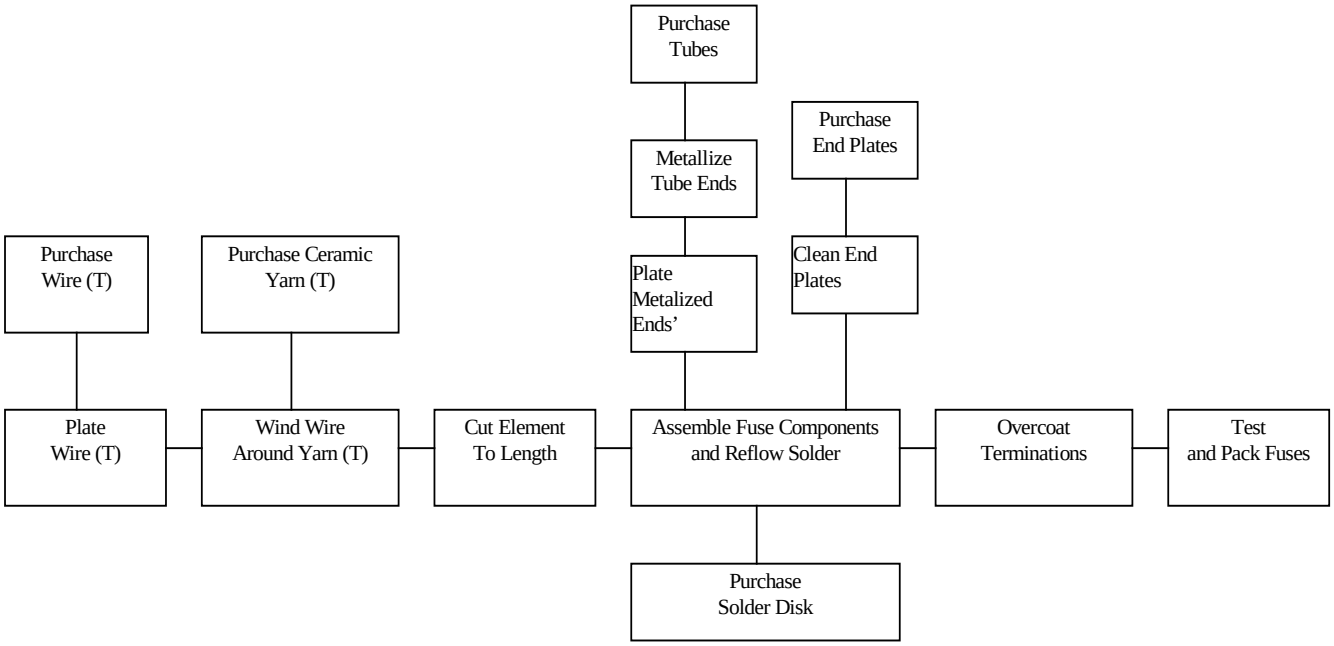
11.1 SP1/: 10 pieces of fuses on 24mm tape, 8 mm pitch per EIA Standard 481, packaged in a plastic bag

11.2 SP2/: 50 pieces of fuses on 24mm tape, 8 mm pitch per EIA Standard 481, packaged in a plastic box

11.3 TR1/: 1000 pieces of fuses on 24mm tape and reeled on a 13 inch (330 mm) reel per EIA Standard 481, 8 mm pitch

11.4 TR2/: 2500 pieces of fuses on 24mm tape and reeled on a 13 inch (330 mm) reel per EIA Standard 481, 8 mm pitch

12. PROCESS FLOW CHART



13. ENVIRONMENTAL (RELIABILITIY / QUALIFICATION) DATA

13.1 Life Test:
MIL-STD-202, Method 108A, Test Condition D

13.2 Load Humidity Test:
MIL-STD-202, Method 103B except:
13.2.1 Environmental chamber 85%±2% relative humidity at 85°C±2°C
13.2.2 100% of rated DC current, at any voltage less than or equal to rated voltage for 1000 hours
13.2.3 At 168h, 504h, and completion of test, the power is turned off. Resistance readings are taken after temperature stabilization. Change in resistance from the original value is calculated and recorded. $\Delta R<10\%$.
13.2.4 After 1000 hours is completed, samples are split into two equal lots.
13.2.5 One group is tested to the non-destructive 100% Current Carry Test. After current carry test is complete, half of the samples are subjected to the Maximum Current Carry Test with the remaining samples subjected to the Time Current Characteristic Curve Generation.
13.2.6 The other group is tested to the destructive Current Overload Test.

13.3 Moisture Resistance Test:
MIL-STD-202, Method 106E except:
13.3.1 Samples are placed in a temperature/moisture chamber and subjected to 50 cycles.
13.3.2 Temperature and humidity measurements are recorded at 0 cycles, 25 cycles, and 50 cycles.
13.3.3 At the completion of 50 cycles.
Samples are stabilized at 25°C±5°C for a minimum of 15 minutes and a maximum of 24 hours. The change in resistance from the original value is calculated and recorded. $\Delta R<10\%$,
13.3.4 One cycle is:
1) Start at 90-100% RH and 25°±2°C
2) Ramp up to 65°C±2°C within 2 ½ hours
3) Remain at 65°C±2°C for 3 hours
4) Ramp down to 25°C±2C within 2 ½ hours with 80-100% RH
5) Ramp back up to 65°C±2°C within 2 ½ hours with 90-100% RH
6) Remain at 65°C±2°C for 3 hours
7) Ramp down to 25°C±2°C within 2 ½ hours with 80-100% RH
8) Remain at 25°C±2°C for 8 hours with 90-100% RH

13.3.5 Samples are split into two equal lots
13.3.6 One set is tested to the non-destructive 100% Current Carry Test. After completion, the samples are subjected to the Time Current Characteristic Curve Generation.
13.3.7 The other set is subjected to the destructive Current Overload Test

13.4 Terminal Strength Test:
Downward force is applied to cause a 1mm deflection for 1 minute (no physical evidence of mechanical or physical damage, change in resistance < 5%)

13.5 Thermal Shock Test:

MIL-STD-202, Method 107D, air-to-air except:

13.5.1 Samples are placed in a temperature chamber and subjected to 200 air-to-air cycles of the following:

1) Hold -55°C±2°C for 30±5 minutes
2) Transfer to 125°C±2°C within 0.5 minutes
3) Hold 125°C±2°C for 30±5 minutes
4) Transfer to -55°C±2°C within 0.5 minutes
5) Repeat cycle 200 times

13.5.2 At completion of 200 cycles, resistance readings taken after temperature stabilization (25°C±5°C for 15 minutes minimum to 24 hours maximum)

13.5.3 Samples divided into two equal lots of twenty

13.5.4 One set is tested to the non-destructive 100% current carry test. After completion, the samples are subjected to the Time Current Characteristic Curve Generation.

13.5.5 The other set is subjected to the destructive Current Overload Test.

13.6 Maximum Current Carry Test

13.6.1 Performed after the non-destructive Load Humidity and 100% Current Carry Tests (same samples used)

13.6.2 At the completion of the 100% Current Carry Test, the current is increased by 10% of the current rating of the fuse. Increase occurs every 15 minutes until the fuse opens. Temperature is monitored constantly.

13.7 Case Resistance Test

EIS/IS-722

13.8 Resistance to Dissolution of Metallization Test

ANSI J-STD-002, Test D

13.9 Mechanical Shock Test

MIL-STD-202, Method 213B, Test Condition A, except:

13.9.1 Test boards mounted to a shock test fixture, which in turn was mounted to the table of the shock machine.

13.9.2 Shock machine calibrated for the required shock pulse.

13.9.3 Samples subjected to eighteen impacts, three impacts in each of the three mutually perpendicular axis. Each shock pulse approximated a half-sine wave shape with a magnitude of 50 g's for 11±1 milliseconds.

13.9.4 High frequency vibration test is performed after the mechanical shock test is completed. After the high-frequency vibration test, the samples undergo the 100% current carry test and the Current overload tests.

13.10 High Frequency Vibration Test

MIL-STD-202, Method 204D, Test Condition D, except:

13.10.1 Test boards mounted to a shock test fixture, which in turn was mounted to the table of the shock machine.

13.10.2 Samples subjected to a simple harmonic motion having an amplitude of 20g peak ± 20%.

13.10.3 Vibration frequency is varied logarithmically from 10 to 2,000 Hz.

13.10.4 Cycle is performed 12 times in each of the three mutually perpendicular directions.

13.10.5 At the completion of the last cycle, resistance readings are taken after temperature stabilization. The change in resistance from the original value is calculated and recorded.

13.10.6 After the vibration test is completed, the samples undergo the non-destructive 100% current carry test and then the destructive Current Overload Test.

13.11 Resistance to Solvents Test

MIL-STD-202, Method 215A

Note:

Due to the similarities of constructions for TCP1.25A and TCP2A, environmental tests were performed on TCP1.25A only.

14. END