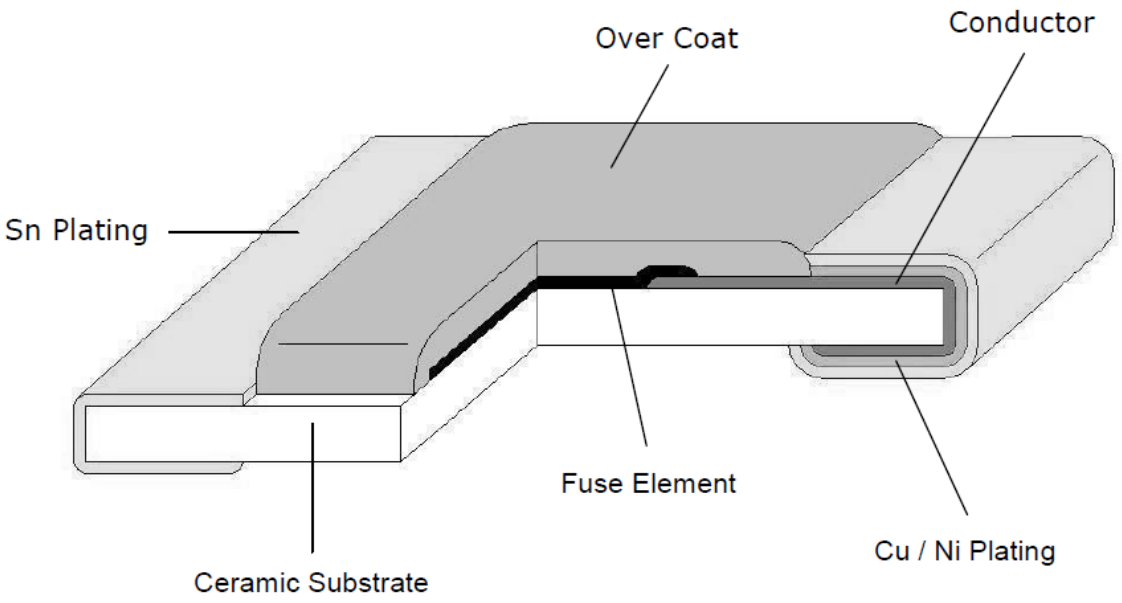
1. Scope

This specification applies for the fuse series of thin film chip fuse made by TA-I.

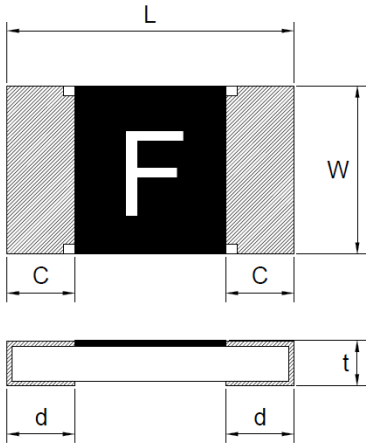
2. Construction



3. Type Designation

CPS	06	V5	T	R50
	Size	Rate Voltage	Packaging	Rate Current
Chip Fuse	06:0603(1608) 12:1206(3216)	V6:63V V5:50V V3:32V	T: Paper Tape (5K)	R50:0.5A 1R0:1A

4. Dimensions



Type (Inch Size code)	Dimensions (mm)				
	L	W	C	d	t
CPS06 (0603)	1.6±0.1	0.80±0.10	0.3±0.2	0.35±0.2	0.45±0.10
CPS12 (1206)	3.1±0.1	1.55±0.10	0.5±0.3	0.50±0.2	0.60±0.10

Unit: mm

5. Applications and ratings

Part Designation	Marking	Rated Current	Fusing Time	Resistance(mΩ) Tolerance±25%	Rated Voltage	Breaking Capacity	Body Temperature rising
CPS06V5TR50	F	0.50A	Open within 1~120sec. at 200% rated current	264	DC 50V	DC50V 50A	<75℃ at 100% rated current
CPS06V3TR63	I	0.63A		200	DC 32V	DC32V 50A	
CPS06V3TR80	K	0.80A		143			
CPS06V3T1R0	L	1.00A		83			
CPS06V3T1R25	M	1.25A		54			
CPS06V3T1R50	P	1.50A		42			
CPS06V3T1R60	N	1.60A		40			
CPS06V3T2R0	S	2.00A		28			
CPS06V3T2R50	T	2.50A		21.5			
CPS06V3T3R00	3	3.00A		18			
CPS06V3T3R15	U	3.15A		16			
CPS06V3T4R0	W	4.00A		13			
CPS06V3T5R0	Y	5.00A		9.5			
CPS06V3T6R0	6	6.00A		6			

*Resistance valve was measured with less than 10% of rated current

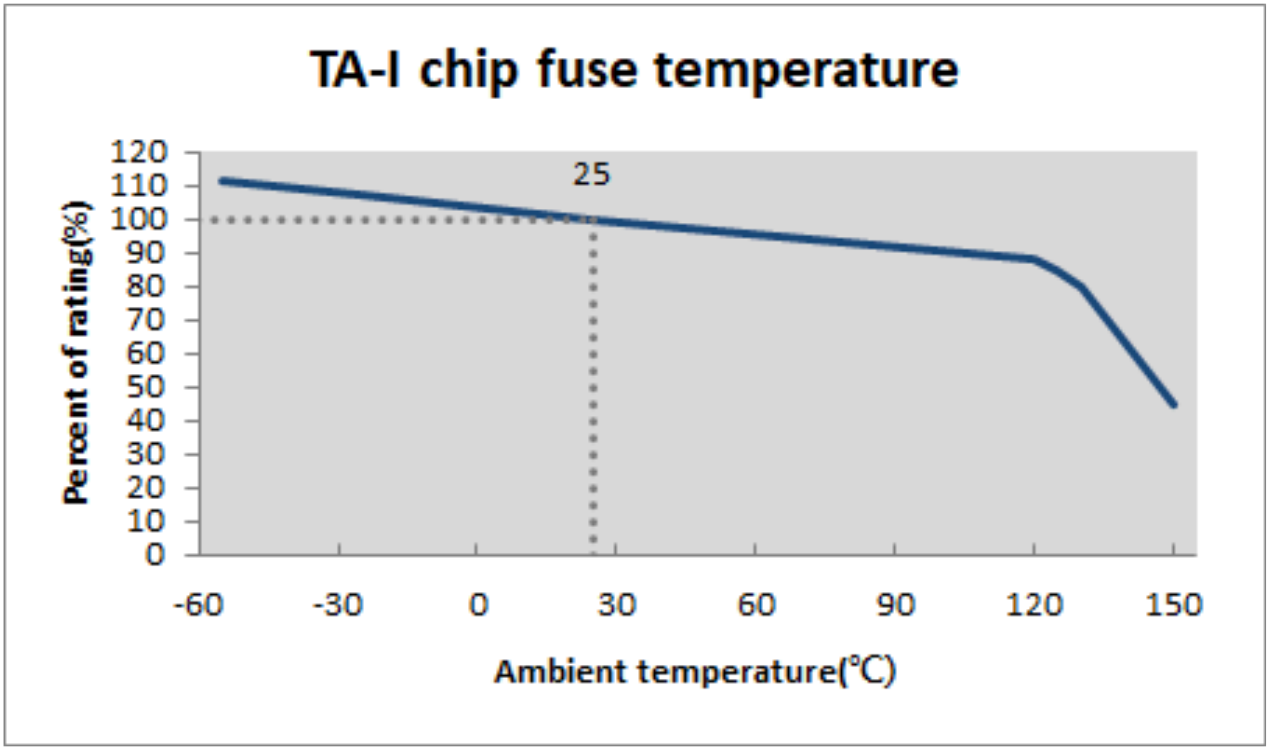
Part Designation	Marking	Rated Current	Fusing Time	Resistance(mΩ) Tolerance±25%	Rated Voltage	Breaking Capacity	Body Temperature rising
CPS12V6TR50	F	0.50A	Open within 1~120sec. at 200% rated current	738.5	DC 63V	DC63V 50A	<75℃ at 100% rated current
CPS12V6TR80	K	0.80A		215			
CPS12V6T1R0	L	1.00A		163.5			
CPS12V6T1R25	M	1.25A		100			
CPS12V6T1R50	P	1.50A		68.5			
CPS12V6T2R0	S	2.00A		48.5			
CPS12V3T2R50	T	2.50A		35	DC 32V	DC32V 50A	
CPS12V3T3R00	3	3.00A		27			
CPS12V3T4R0	W	4.00A		14			
CPS12V3T5R0	Y	5.00A		11			
CPS12V3T7R0	Z	7.00A		7.5			

*Resistance valve was measured with less than 10% of rated current

6 Temperature Derating Curve

6.1 Normal Ambient Temperature: 25℃

6.2 Operating Temperature: -55℃~150℃, with proper derating factor as below:



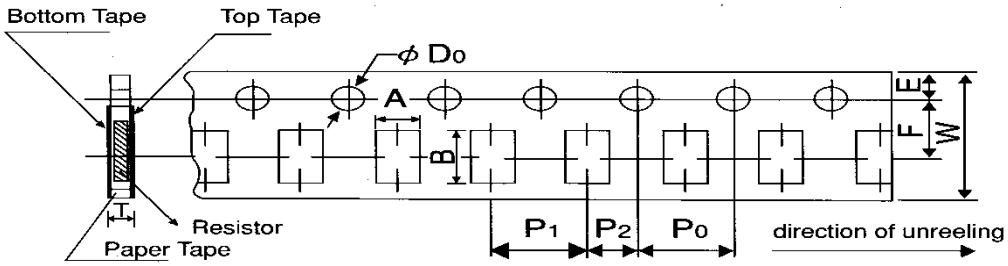
7 Reliability Tests

No.	Parameter	Reference Standard	Test Method	Requirement
#1	Solderability	J-STD-002,	Aging 4 hours at 155 °C dry heat Lead-free solder bath at (1) Method B1: 245 ±5℃ solder, 5±0.5 sec dwell. (2) Method D: 260 ±5℃ solder, 30 ±0.5 sec dwell.	95% coverage minimum
#2	Resistance to solder Heat	MIL-STD-202 Method 210	Condition K: 250±5℃ solder, 30±5 sec dwell.Time above 217℃, 60~150 sec.	±10%
#3	Mechanical Shock	MIL-STD-202, Method 213,	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms)	±10%
#4	Vibration	MIL-STD-202, Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. (Note: Test from 10-2000 Hz.)	±10%
#5	Terminal Strength	AEC-Q200-006	Force of 1.8kg for 1206/0603 Force of 1.0kg for 0402	±10%
#6	High Temperature Storage	MIL-STD-202, Method 108	With exemptions 1000 hrs. @ T=150°C. Unpowered.	±20%
#7	Temperature Cycling	JESD22-A-104	1000 Cycles (-40°C to +125°C), 30min maximum dwell time at each temperature extreme. Measurement at 24±4 hours after test conclusion.	±10%
#8	Humidity Bias	MIL-STD-202, Method 103	1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating current. Measurement at 24±2 hours after test conclusion.	±10%
#9	Operational Life	MIL-STD-202 Method 108	1000 hours TA=85°C at 70% rated current. Measurement at 24±2 hours after test conclusion	±10%
#10	Resistance to Solvent	MIL-STD-202 Method 215	a:Isopropyl Alcohol：Mineral Spirits= 1：3 b:Terpene Defluxer c:Deionized water：Propylene Glycol： Monomethyl Ether：monoethanolamine = 42：1：1	No evident damages on protective coating
#11	Board Flex (Bending)	AEC-Q200-005	3mm deflection	±10%
#12	Carrying capacity	UL248-14	Rated current ,4hr	±10%
#13	Fusing Time	UL248-14	200% of its rated current	1~120 sec
#14	Interrupting Ability	UL248-14	After the fuse is interrupted, rated voltage applied for 30sec again	No mechanical damages
#15	Temperature Rise	UL248-14	100% of its rated current, Measure of surface temperature	ΔT<75℃
#16	Residual Resistance	UL248-14	Measure DC resistance after fusing	10kΩ and more
#17	Low Temperature Storage	JESD22-A119	1000 hrs. @ T=-55°C. Unpowered. Measurement at 24±2 hours after test conclusion.	±10%
#18	High Temperature Operating Life	MIL-STD-202 Method 108	1,000 hours, 150°C.Biased at the derated nominal 45% of fuse current rating. Measurement at 24±2 hours after test conclusion.	±20%
#19	Flammability	UL-94	V-0 or V-1 are acceptable. Electrical test not required.	V-0 or V-1
#20	External Visual	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Pre and Post Electrical Test not required	
#21	Physical Dimensions	JESD22-B100	Verify physical dimensions to the applicable component specification.Pre and Post Electrical Test not required.	

8 Taping & Reel

8.1 Taping Dimensions

4mm pitch paper

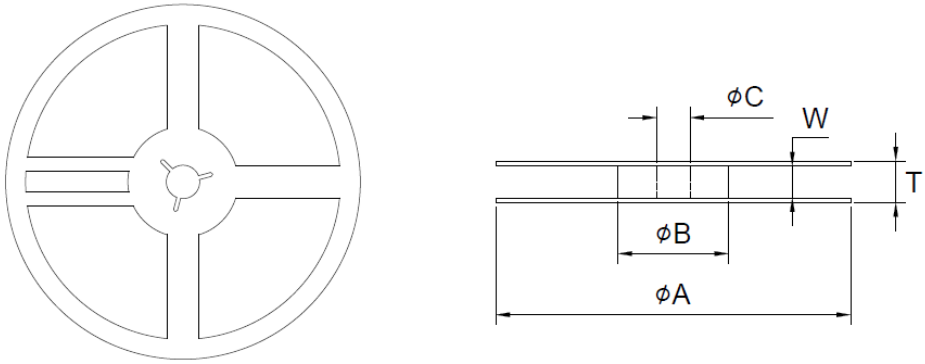


Packing	Type	A	B	W	F	E	P_1	P_2	P_0	D_0	T
Paper Tape	CPS06	1.1±0.1	1.9±0.1	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	ϕ 1.5 +0.1 -0	0.64±0.1
	CPS12	2.0±0.15	3.6±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	ϕ 1.5 +0.1 -0	0.84±0.1

Unit: mm

Type series		Paper Tape
		4 mm pitch
		180mm/R
CPS	06	5000
CPS	12	5000

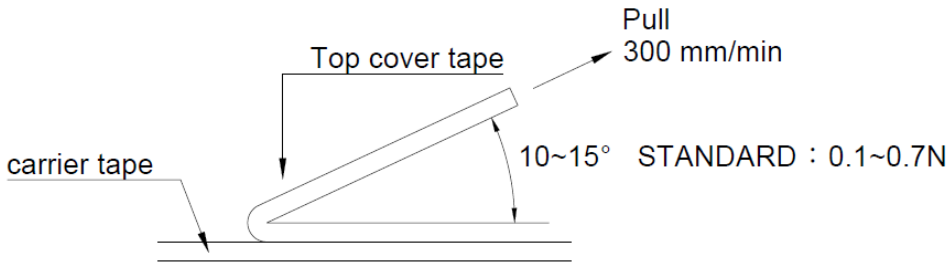
8.2 Reel Specifications



Series	ϕ A	ϕ B	ϕ C	W	T
CPS06 CPS12	178 ±2.0	60.0±1.0	13.0±1.0	9.0±1.0	11.4±2.0

Unit: mm

8.3 Peel –off force:



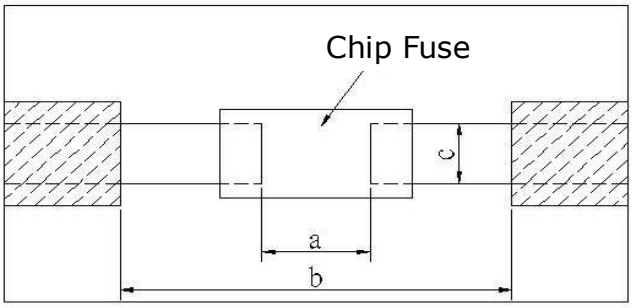
9 Storage Conditions:

Temperature: 5℃~35℃,Humidity:40%~75%

10 Shelf Life:

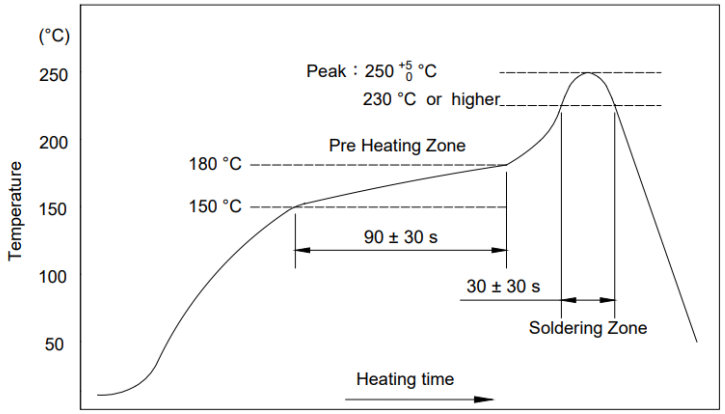
2 years from manufacturing date

11 Recommended land patterns



Land pattern / Type	Size	Dimension a	Dimension b	Dimension c
CPS	06 (0603)	0.85~0.95	2.00~2.20	1.50~1.70
CPS	12 (1206)	0.95~1.05	4.40~5.00	2.30~2.50

12. Recommend IR – Reflow profile: (solder: Sn96.5 / Ag3 / Cu0.5)



Peak : 250+5/-0℃,5 sec.
Pre–heat Zone : 150 to 180 ℃, 90±30 sec
Soldering Zone : 230℃ or higher , 30±10 sec

13. Approval by UL248-14

The fuses have been approved by UL.
File No. of UL Recognition is E241710

14. ECN

Engineering Change Notice: The customer will be informed with ECN if there is significant modification on the characteristics and materials described in Approval Sheet.

15. Manufacturing Country & City:

TA-I TECHNOLOGY CO., LTD. (Taiwan– Tao Yuan)
Tel: (+886) 3-3246169 Fax: (+886) 3-3246167

Associated companies:

(1) TA-I TECHNOLOGY (SU ZHOU) CO., LTD. (China – Su Zhou)
Tel: (+86) 512-63457879 Fax: (+86) 512-63457869

(2) TA-I TECHNOLOGY ELECTRONIC (DONGGUAN) CO., LTD. (China –Dongguan)
Tel: (+86) 769-8339-4790～3 Fax : (+86) 769-8339-4794

(3) FORTUNE TASK ENTERPRISES LIMITED (China – Dongguan)
Tel: (+86) 769-8339-4790～3 Fax : (+86) 769-8339-4794

(4) TAI OHM ELECTRONICS (M) SDN. BHD. (Malaysia – Penang)
Tel: (+60) 4- 3900480 Fax: (+60) 4-3901481

16. Selection Guideline of Fuse:

■ Checklist of selection factors

◎Normal operating current

◎Normal operating voltage (AC or DC)

◎Ambient Temperature

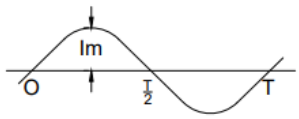
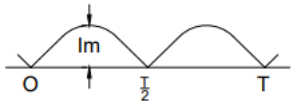
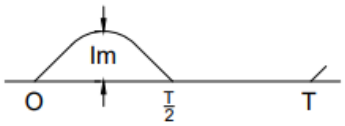
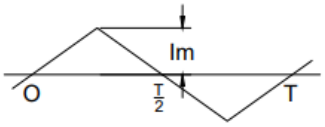
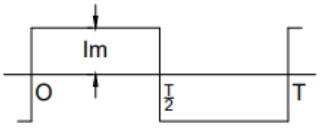
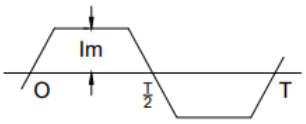
◎Overload current and length of time in which the fuse must open .

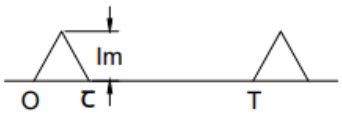
◎Type of fuse (SMD or Tube) and physical size limitation (0603 or 1206)

◎Agency Approval required (e.g., UL248-14)

■ Normal operating current

e.g., Rectangular Wave, If I p = 1.5 A, Normal operating current = 1.5 A

No.	Type	Waveform	Formula
1	Sinusoidal Waveform		錯誤! 找不到參照來源。
2	All Wave Rectification		錯誤! 找不到參照來源。
3	Half Wave		錯誤! 找不到參照來源。
4	Triangle Waveform		錯誤! 找不到參照來源。
5	Rectangular Waveform		錯誤! 找不到參照來源。
6	Trapezoidal Waveform		錯誤! 找不到參照來源。

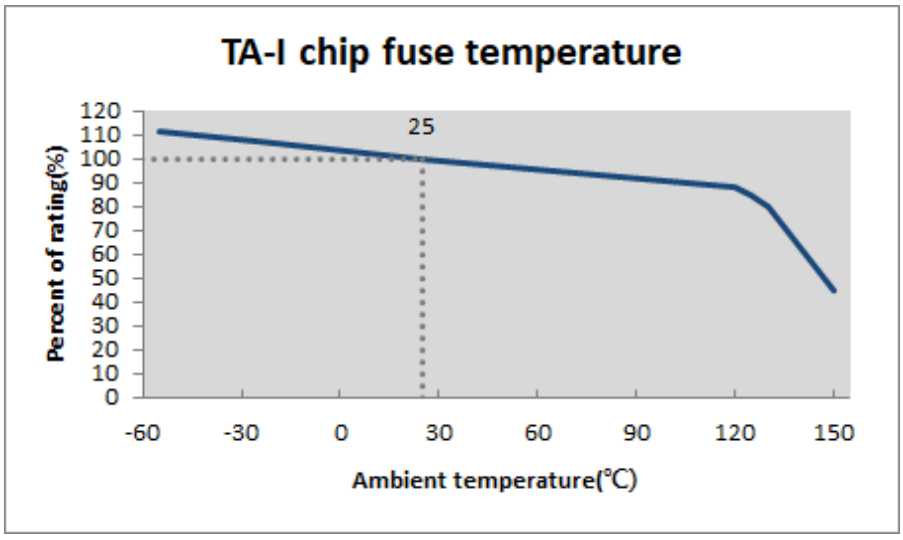
No.	Type	Waveform	Formula
7	Rectangular Pulse		錯誤! 找不到參照來源。
8	Triangle Pulse		錯誤! 找不到參照來源。

■ Derating ratio for different ambient Temperature

◎ Referring to bottom figure and select the appropriate derating ratio:

e.g., Ambient temperature is 60 degree C

the derating ratio≒0.90



■ Calculating the required rating of fuse needed.

◎ Safety coefficient: 70% is safety coefficient from practical experience

◎ $\frac{Normal\ Operating\ Current}{0.7 \times derating\ ratio} <$ **rating current of fuse**

◎ e.g.

Condition: Normal operating current =1.5 A

Ambient temperature 40 ℃: Derating ratio≒0.95

$$\frac{1.5}{0.7 \times 0.95} < \text{rating current of fuse}$$

2.255 < rating current of fuse

■ Determination of the type of fuse

e.g. Condition:

- ◆ Calculating value =2.255 A , 2.255A < rating current of fuse
- ◆ Normal operating voltage : DC 12 V
- ◆ Following bottom index-table: suggesting use CPS06V3T2R50.

Part Designation	Marking	Rated Current	Rated Voltage	Part Designation	Marking	Rated Current	Rated Voltage
CPS06V5TR50	F	0.5A	50V	CPS12V6TR50	F	0.50A	63V
CPS06V3TR63	I	0.63A	32V	CPS12V6TR80	K	0.80A	63V
CPS06V3TR80	K	0.80A	32V	CPS12V6T1R0	L	1.00A	63V
CPS06V3T1R0	L	1.00A	32V	CPS12V6T1R25	M	1.25A	63V
CPS06V3T1R25	M	1.25A	32V	CPS12V6T1R50	P	1.50A	63V
CPS06V3T1R50	P	1.50A	32V	CPS12V6T2R0	S	2.00A	63V
CPS06V3T1R60	N	1.60A	32V	CPS12V3T2R50	T	2.50A	32V
CPS06V3T2R0	S	2.00A	32V	CPS12V3T3R00	3	3.00A	32V
CPS06V3T2R50	T	2.50A	32V	CPS12V3T4R0	W	4.00A	32V
CPS06V3T3R00	3	3.00A	32V	CPS12V3T5R0	Y	5.00A	32V
CPS06V3T3R15	U	3.15A	32V	CPS12V3T7R0	Z	7.00A	32V
CPS06V3T4R0	W	4.00A	32V				
CPS06V3T5R0	Y	5.00A	32V				
CPS06V3T6R0	6	6.00A	32V				

■ Inrush current:

- ◆ Considering inrush waveform & calculate I^2t (A^2s) value
- ◆ Choosing fuse's I^2t (A^2s) value > calculate I^2t (A^2s) value
- ◆ Considering Ratio of I^2t repeat numbers to blowing .
- ◆ Confirm with us.

e.g., choosing 0603 Fuse

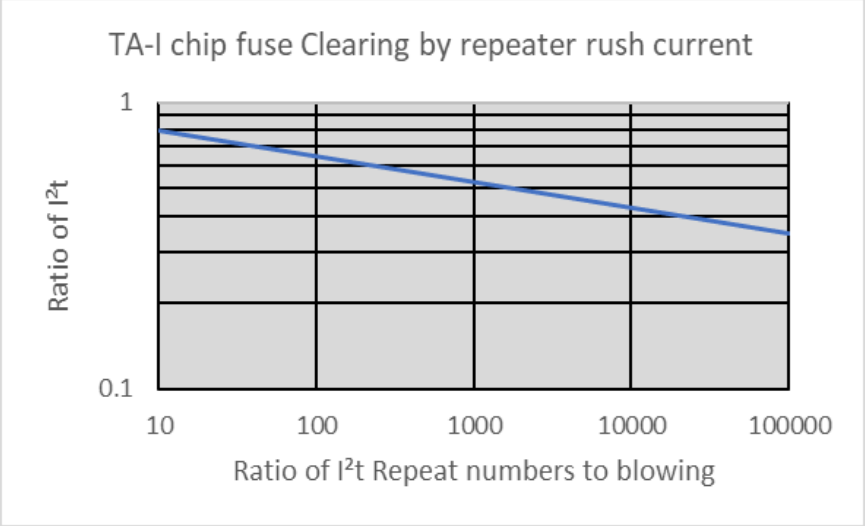
Condition:

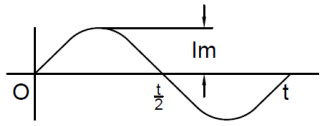
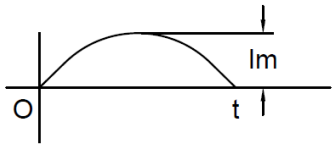
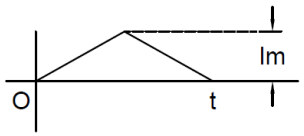
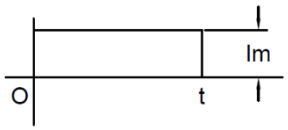
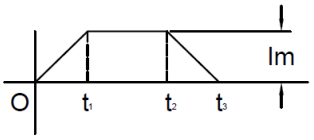
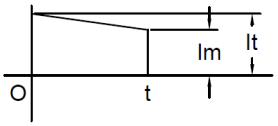
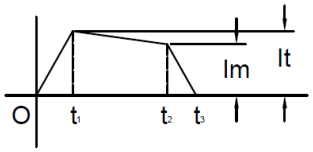
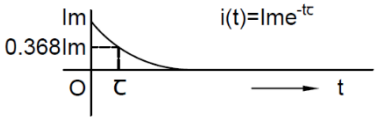
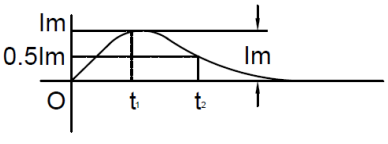
1. Rectangular Wave, Ip = 4 A, t = 1 ms , calculate $Ip^2t = 4^2 \times 1 \times 10^{-3} = 0.016$ (A^2s)
2. Choosing CPS06V3T1R25, $I^2t = 0.056$ (A^2s) → Page 12 index-table
3. Inrush shock : 100,000 times (≒0.35) → inrush ratio

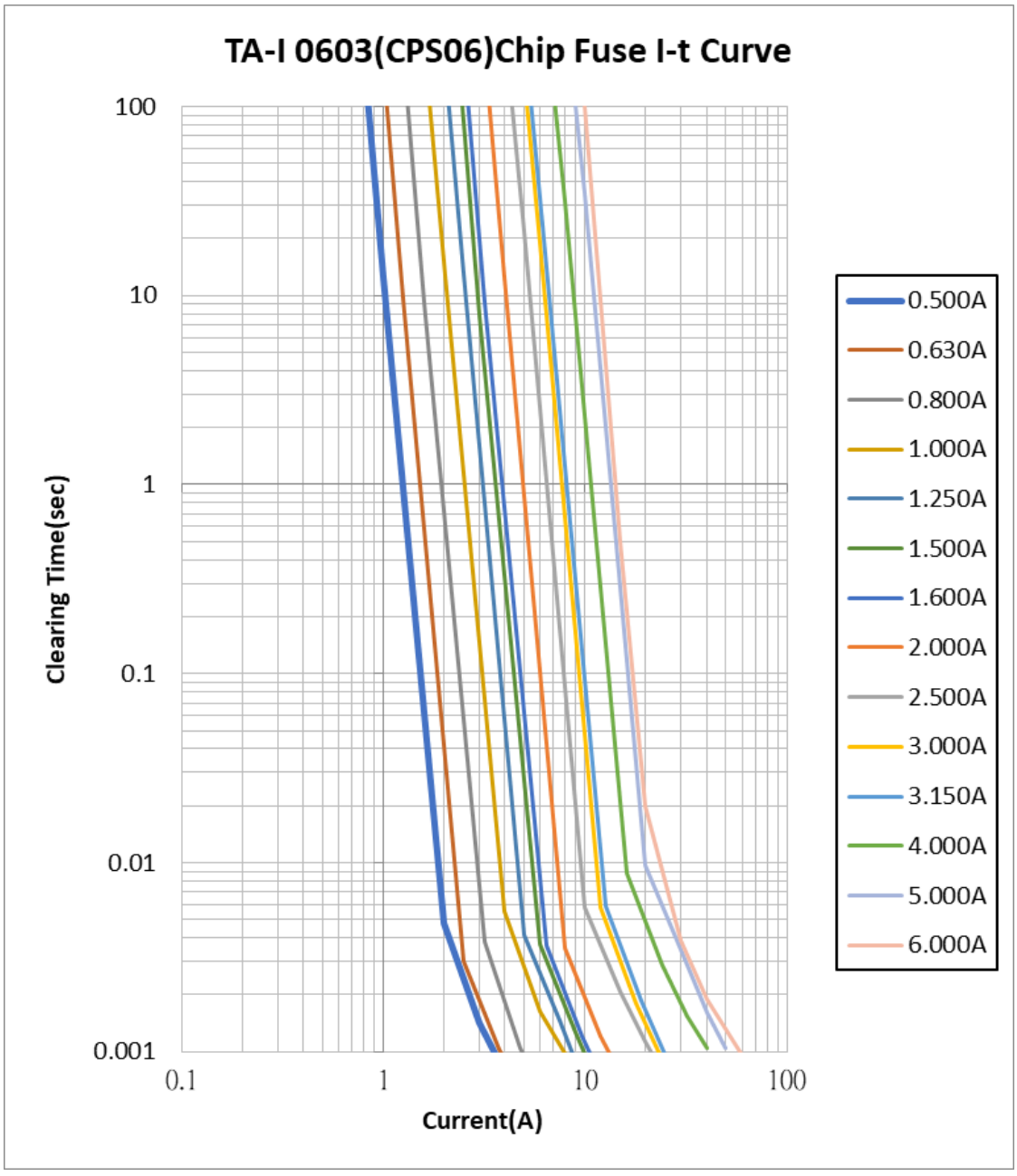
4. Choosing fuse's I^2t (A^2s) value X Derating ratio (inrush 100000 times) > calculate I^2t (A^2s) value
5. 0.056 x 0.35 = 0.0196 (A^2s) > 0.016 →CPS06V3T1R25 is able to meet circuit's application

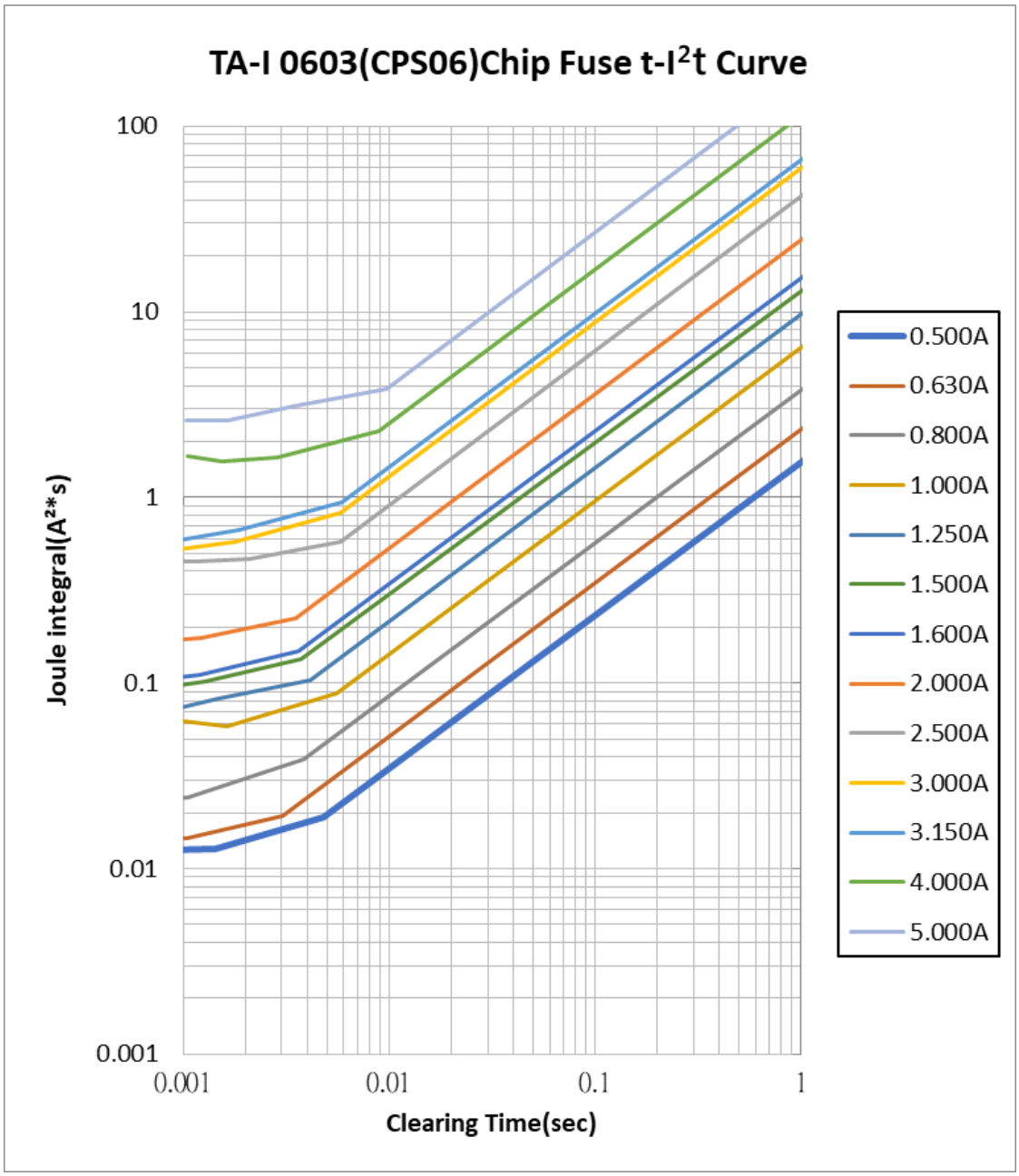
TA-I FUSE I^2t (A^2s)			
Part Number	Typical I^2t (A^2s)	Part Number	Typical I^2t (A^2s)
CPS06V5TR50	0.009	CPS12V6TR50	0.027
CPS06V3TR63	0.014	CPS12V6TR80	0.072
CPS06V3TR80	0.023	CPS12V6T1R0	0.134
CPS06V3T1R0	0.036	CPS12V6T1R25	0.233
CPS06V3T1R25	0.056	CPS12V6T1R50	0.305
CPS06V3T1R50	0.081	CPS12V6T2R0	0.509
CPS06V3T1R60	0.092	CPS12V3T2R50	0.777
CPS06V3T2R0	0.145	CPS12V3T3R00	1.285
CPS06V3T2R50	0.229	CPS12V3T4R0	2.374
CPS06V3T3R00	0.332	CPS12V3T5R0	5.510
CPS06V3T3R15	0.365	CPS12V3T7R0	10.170
CPS06V3T4R0	0.574		
CPS06V3T5R0	0.927		
CPS06V3T6R0	1.860		

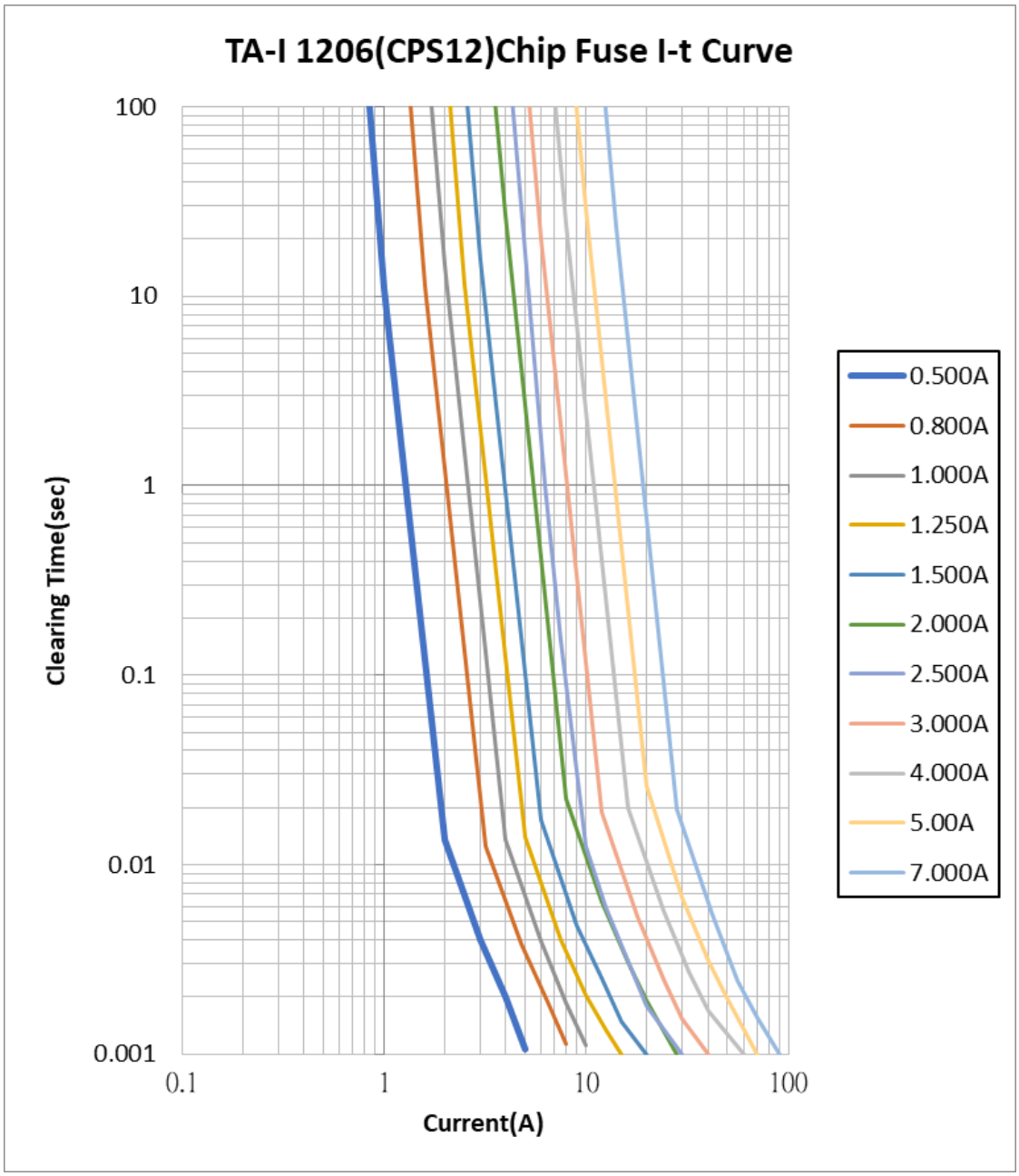
Note*: Typical I^2t value is measured at 10x-rated current, application with surge over 10x-rated current. Please confirm with us.

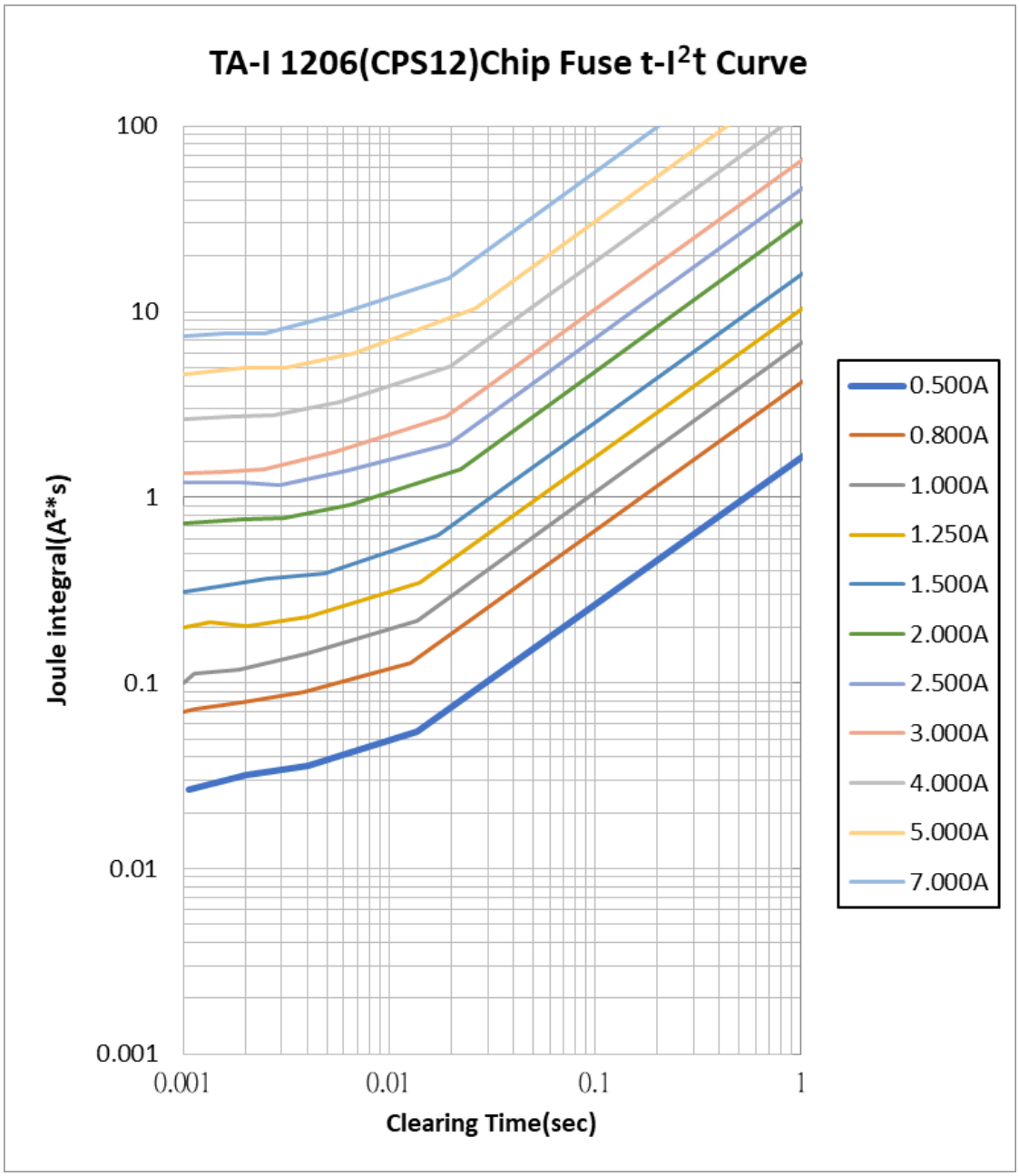


No.	Type	Waveform	Formula
1	Sinusoidal Waveform (1 Cycle)		$\frac{1}{2}I_m{}^2t$
2	Sinusoidal Waveform (1/2 Cycle)		$\frac{1}{2}I_m{}^2t$
3	Triangle Waveform		$\frac{1}{3}I_m{}^2t$
4	Rectangular Waveform		$I_m{}^2t$
5	Trapezoidal Waveform		$\frac{1}{3}I_m{}^2t + I_m{}^2(t_1 - t_2) + \frac{1}{3}I_m{}^2(t_2 - t_3)$
6	Various Waveform 1		$I_1I_2t + \frac{1}{3}(I_1 - I_2)^2t$
7	Various Waveform 2		$I_1I_2t + \left[I_1I_2t + \frac{(I_1 - I_2)^2}{3}\right] * (t_2 - t_1) + \frac{1}{3}(I_2)^2(t_3 - t_2)$
8	Charge/Discharge Waveform		$\frac{1}{2}(I_m{}^2\tau)$
9	Lightning Surge Waveform		$I_m{}^2\left[\frac{t_1}{3} + 0.721(t_2 - t_1)\right]$


TA-I 0603(CPS06)Chip Fuse I-t Curve
Clearing Time(sec)
100
10
1
0.1
0.01
0.001
0.1
1
10
100
Current(A)
0.500A
0.630A
0.800A
1.000A
1.250A
1.500A
1.600A
2.000A
2.500A
3.000A
3.150A
4.000A
5.000A
6.000A


TA-I 0603(CPS06)Chip Fuse t-I²t Curve
Joule integral(A²*s)
100
10
1
0.1
0.01
0.001
0.001
0.01
0.1
1
Clearing Time(sec)
0.500A
0.630A
0.800A
1.000A
1.250A
1.500A
1.600A
2.000A
2.500A
3.000A
3.150A
4.000A
5.000A


TA-I 1206(CPS12)Chip Fuse I-t Curve
Clearing Time(sec)
100
10
1
0.1
0.01
0.001
0.1
1
10
100
Current(A)
0.500A
0.800A
1.000A
1.250A
1.500A
2.000A
2.500A
3.000A
4.000A
5.00A
7.000A


TA-I 1206(CPS12)Chip Fuse t-I²t Curve
Joule integral(A²*s)
100
10
1
0.1
0.01
0.001
0.001
0.01
0.1
1
Clearing Time(sec)
0.500A
0.800A
1.000A
1.250A
1.500A
2.000A
2.500A
3.000A
4.000A
5.000A
7.000A