



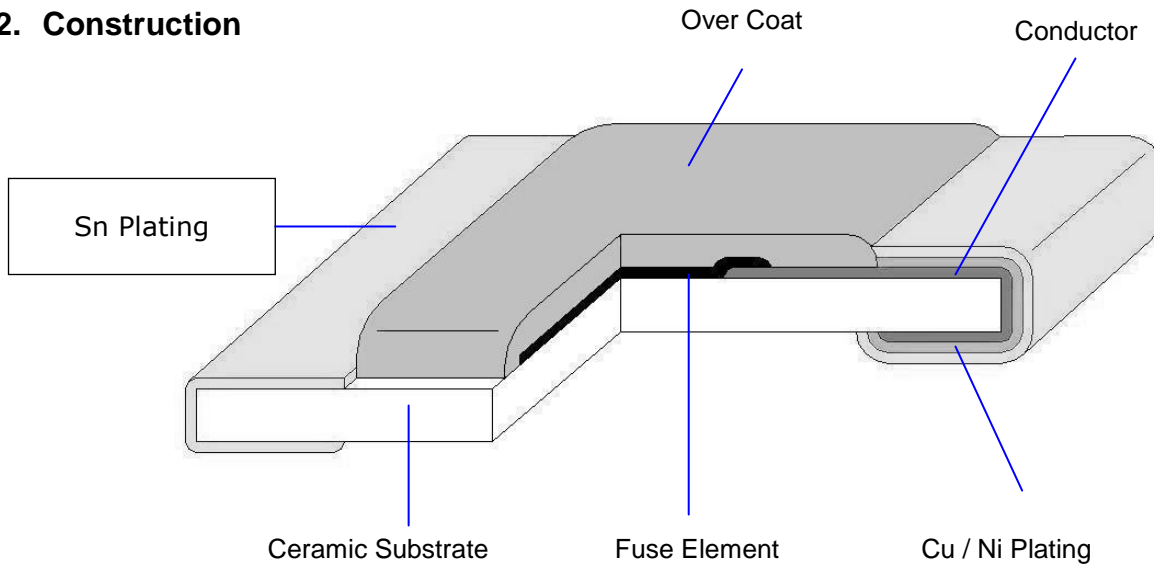
# Thin Film Chip Fuse

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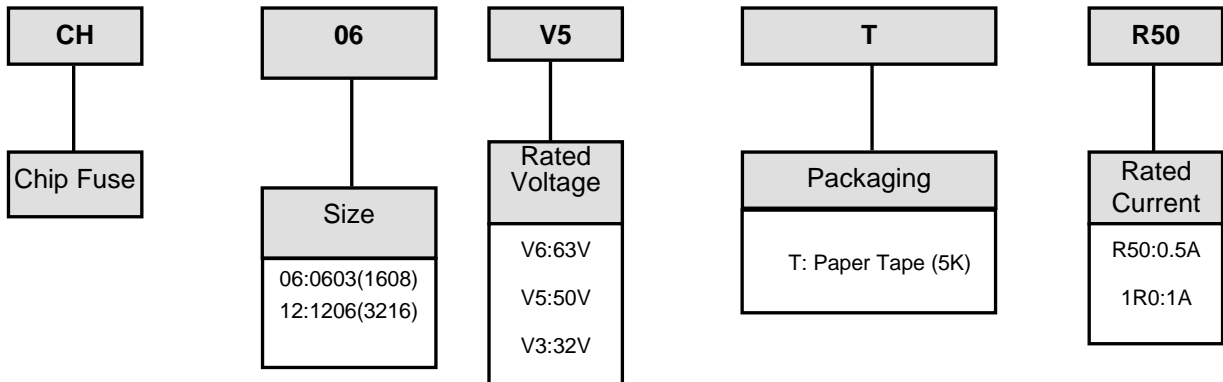
## 1. Scope

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

## 2. Construction



## 3. Type Designation

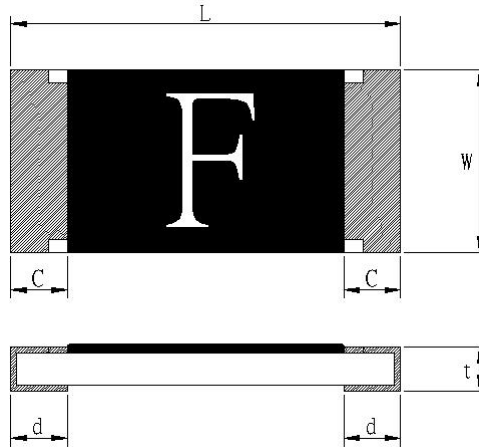




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## 4. Dimensions



Unit: mm

Type (Inch Size code)	Dimensions (mm)				
	L	W	C	d	t
CH06 (0603)	1.6±0.1	0.80±0.1	0.3±0.2	0.35±0.2	0.45±0.1
CH12 (1206)	3.1±0.1	1.55±0.1	0.5±0.3	0.50±0.2	0.60±0.1

## 5. Applications and ratings

Part Designation	Marking	Rated Current	Fusing Time	Resistance (mΩ) Tolerance± 25%	Rated Voltage	Typical $I^2t(A^2S)$	Body Temperature rising	
CH06V5TR50	F	0.50A	Open within 1~60sec.at 200% rated current	270	DC 50V	0.013	<75°C at 100% rated current	
CH06V3T1R50	P	1.50A		42		DC 32V		0.089
CH06V3T3R00	3	3.00A		16				0.500
CH06V3T4R0	W	4.00A		11		1.665		

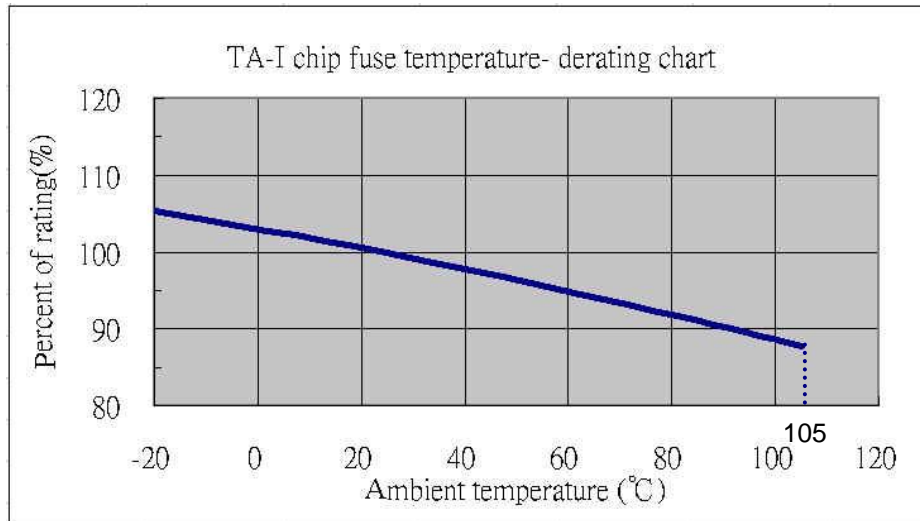
Part Designation	Marking	Rated Current	Fusing Time	Resistance (mΩ) Tolerance± 25%	Rated Voltage	Typical $I^2t(A^2S)$	Body Temperature rising
CH12V6TR50	F	0.50A	Open within 1~60sec.at 200% rated current	416	DC 63V	0.027	<75°C at 100% rated current



## 6. Temperature Derating Curve

6.1 Normal Ambient Temperature: 25°C

6.2 Operating Temperature: -20°C~105°C, whit proper Derating factor as below:



## 7. Reliability Tests

Parameter	Requirement	Test Method
Carrying capacity	No fusing	Rated current ,4hr
Fusing Time	Within 1~60sec.	200% of its rated current
Interrupting Ability	No mechanical damages	After the fuse is interrupted ,rated voltage applied for 30sec again
Bending Test	No mechanical damages	Distance between holding points: 90mm, Bending:3mm,1time ,30sec
Resistance to solder Heat	±20%	260°C±5°C,10±1second
Solderability	95% coverage minimum	235°C±5°C, 2±0.5second 245°C±5°C, 2±0.5second (Lead Free)
Temperature Rise	<75°C	100% of its rated current, Measure of surface temperature
Resistance to Dry Heat	±20%	105°C±5°C,1000 hrs
Resistance to Solvent	No evident damages on protective coating and marking	23°C±5°C of Isopropyl alcohol 90second
Residual Resistance	10kΩ and more	Measure DC resistance after fusing
Thermal Shock	ΔR< 10 %	-20°C/+25°C/+125°C/+25°C, 10 cycles



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## 8. Marking

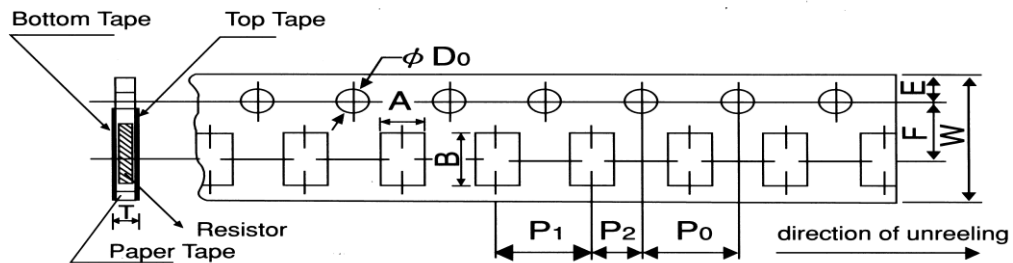
Symbol for Rating Current

Symbol	F	I	K	L	<u>M</u>	P	N	S	T	3	U	W	Y	Z
Rating Current(A)	0.5	0.63	0.8	1	1.25	1.5	1.6	2	2.5	3	3.15	4	5	7

## 9. Taping & Reel

### 9.1 Taping Dimensions

4mm pitch paper



Packing	Type	A	B	W	F	E	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	T
Paper Tape	CH06	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	$\phi 1.5$ +0.1 -0	0.64±0.1
Paper Tape	CH12	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	$\phi 1.5$ +0.1 -0	0.84±0.1

Unit: mm

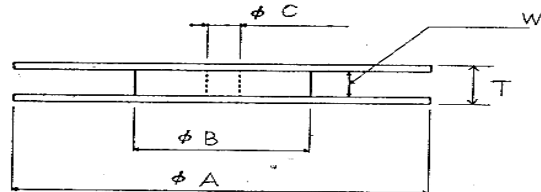
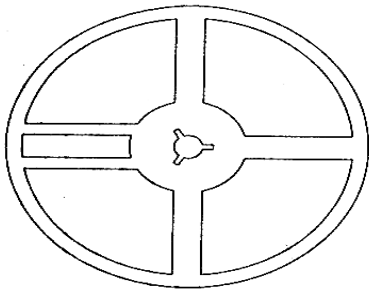
Type series		Paper Tape
		4 mm pitch
		180mm/R
CH	06	5000
CH	12	5000



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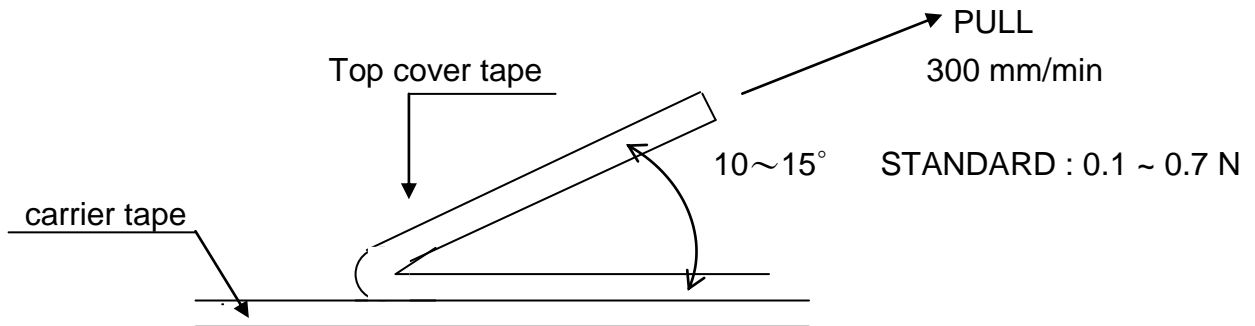
## 9.2 Reel Specifications



Unit: mm

Series	$\phi A$	$\phi B$	$\phi C$	W	T
CH06 CH12	178 $\pm$ 2.0	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	9.0 $\pm$ 1.0	11.4 $\pm$ 2.0

## 9.3 Peel –off force :



## 10. Storage Conditions:

Temperature: 5°C~35°C, Humidity: 40%~75%

## 11. Shelf Life:

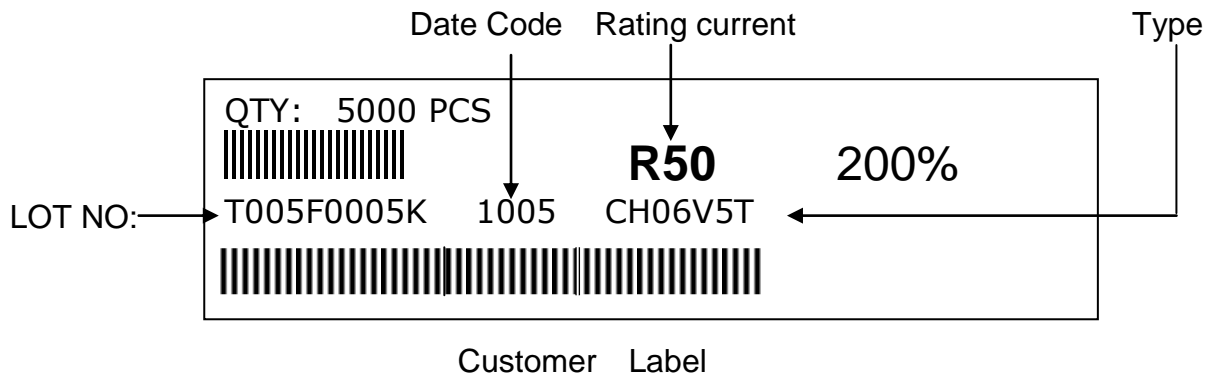
2 years from manufacturing date



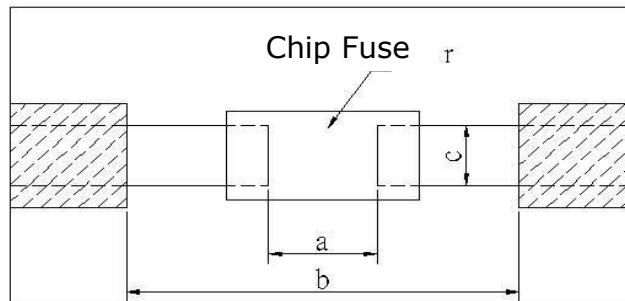
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## 12. Label



## 13. Recommended land patterns



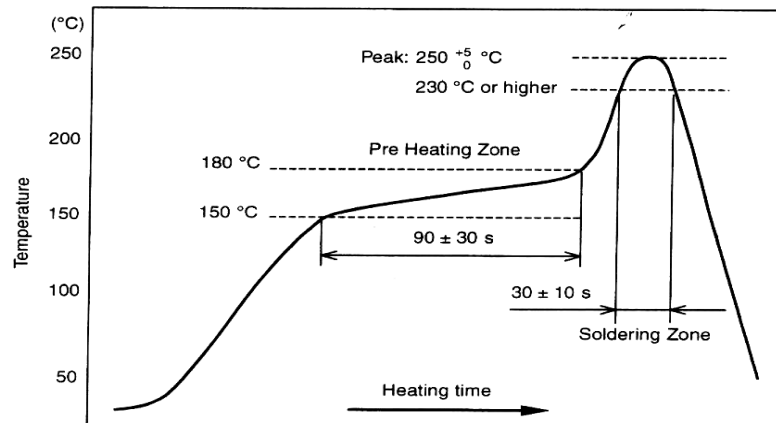
Type	Size	Land pattern		
		Dimension		
		a	b	c
CH	06 ( 0603 )	0.7~0.9	2.0~2.2	0.8~1.0
CH	12 ( 1206 )	2.0~2.4	4.4~5.0	1.2~1.8



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



Peak :  $250 \pm 5 \text{ } ^\circ\text{C}$  , 5 sec  
- 0

Pre – heat Zone : 150 to 180  $^\circ\text{C}$  ,  $90 \pm 30 \text{ sec}$

Soldering Zone : 230 $^\circ\text{C}$  or higher ,  $30 \pm 10 \text{ sec}$

## 15. Approval by UL248-14

The fuses have been approved by UL.

File No. of UL Recognition is E241710

## 16. 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.



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### 17. Manufacturing Country & City :

TA-I TECHNOLOGY CO., LTD. ( Taiwan– Tao Yuan )

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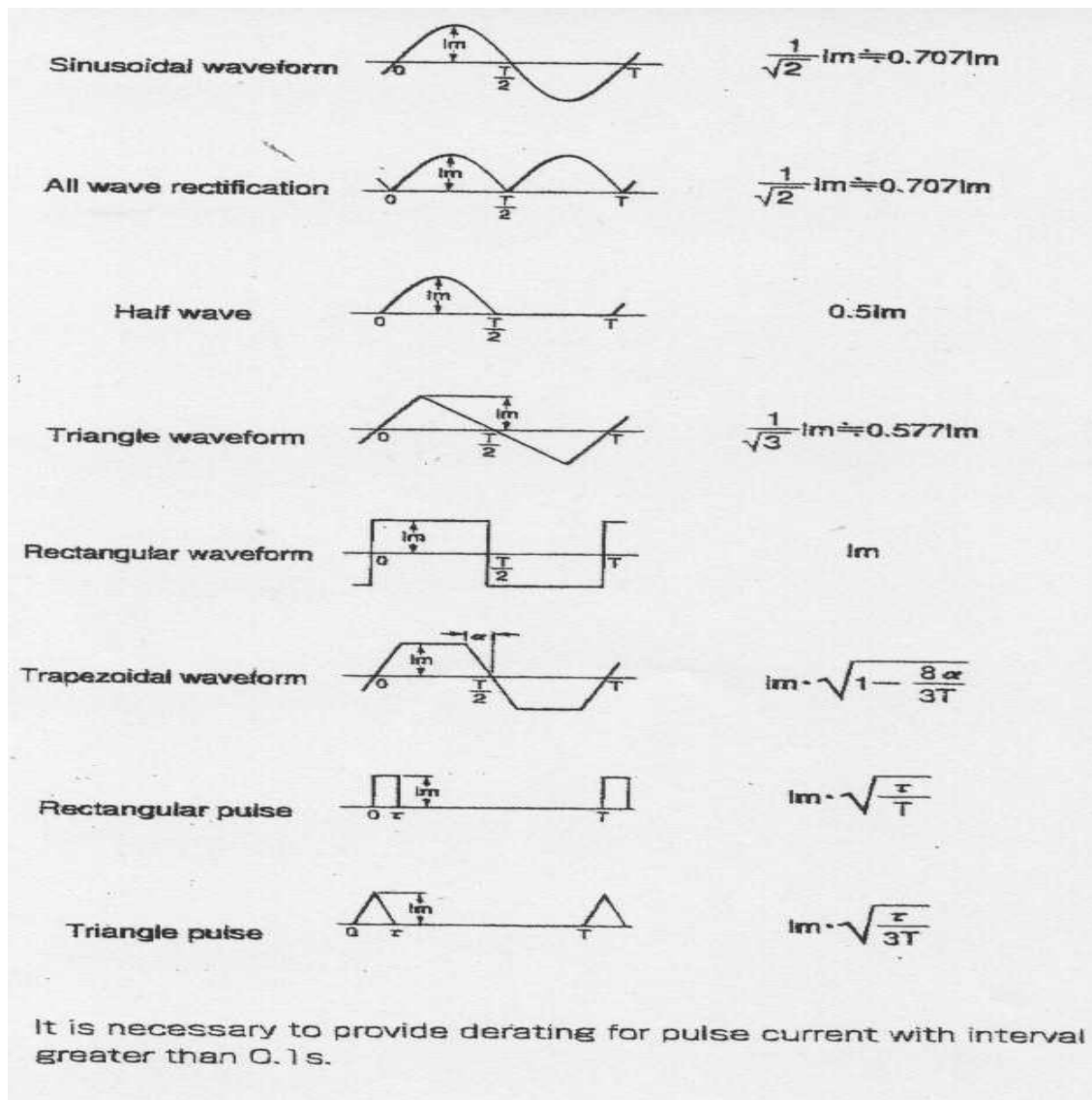
## Selection Guideline of Fuse:

### ■ 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<sub>p</sub> = 1.5 A , Normal operating current = 1.5 A



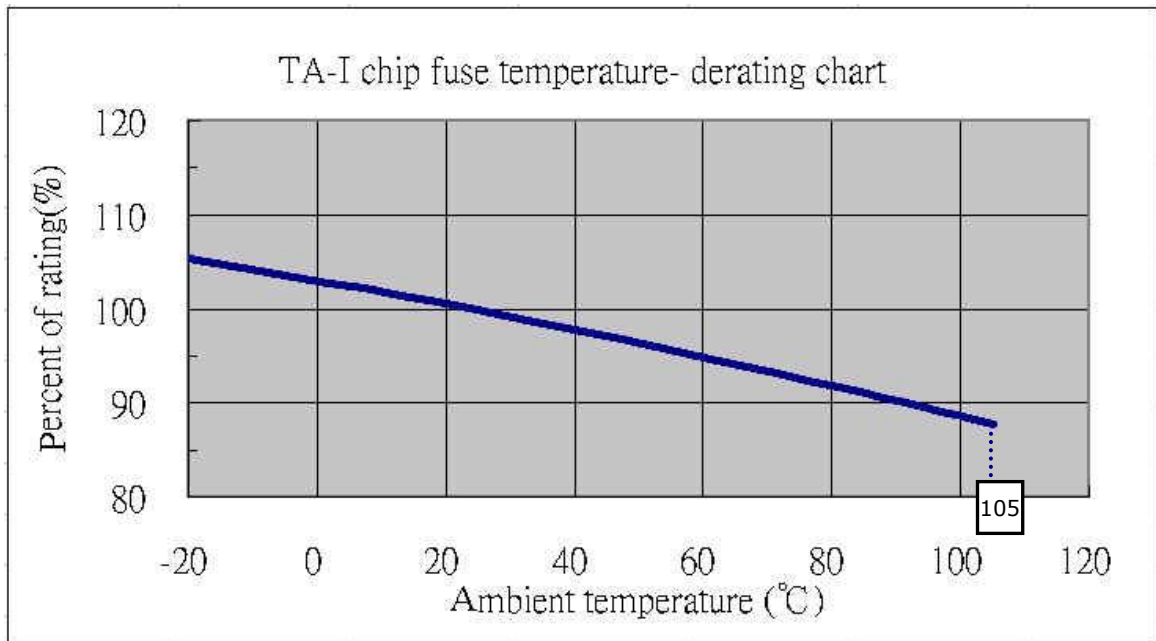


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## Derating ratio for different ambient Temperature

- Referring to bottom figure and select the appropriate derating ratio :  
 e.g., Ambient temperature is 60 degree C  
 the derating ratio  $\approx$  0.95



## Calculating the required rating of fuse needed .

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

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

$\swarrow$  Safety coefficient       $\searrow$  Ambient temperature

e.g.,

Condition : Normal operating current =1.5 A  
 Ambient temperature 40 °C : Derating ratio  $\approx$  0.95

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

**2.255 < rating current of fuse**



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## ■ 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 CH06V3T3R00 .

Part Designation	Marking	Rated Current	Rated Voltage	Part Designation	Marking	Rated Current	Rated Voltage
CH06V5TR50	F	0.50A	50V	CH12V6TR50	F	0.50A	63V
CH06V3T1R50	P	1.50A	32V				
CH06V3T3R00	3	3.00A	32V				
CH06V3T4R0	W	4.00A	32V				



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## ■ Inrush current :

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

e.g., choosing 0603 Fuse

Condition :

1. Rectangular Wave ,  $I_p = 9 \text{ A}$  ,  $t = 1 \text{ (ms)}$  ,  
 Calculate  $I_p^2t = 9^2 \times 1 \times 10^{-3} = 0.081 \text{ (A}^2\text{s)}$
2. Choosing CH06V3T3R00 (  $I^2t = 0.5 \text{ (A}^2\text{s)}$  ) ,  $\implies$  **Page 12 index-table**
3. Inrush shock : 100,000 times (  $\approx 0.35$  )  $\implies$  **Inrush derating ratio**

Calculating :

$\curvearrowright$  **Inrush 100,000 times**

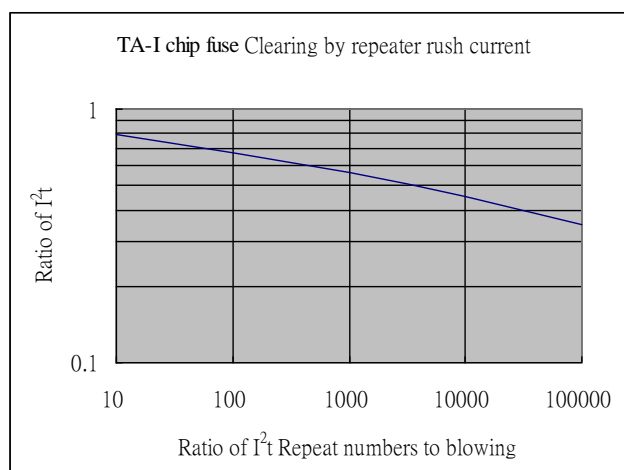
1. Choosing fuse's  $I^2t$  (A<sup>2</sup>s) value X Derating ratio > calculate  $I^2t$  (A<sup>2</sup>s) value
2.  $0.5 \times 0.35 = 0.175 \text{ (A}^2\text{s)}$
3.  $0.175 > 0.081$

**The fuse is able to meet circuit's application**

TA-I FUSE $I^2t$ ( A <sup>2</sup> s )			
Part Number	Typical $I^2t$ (A <sup>2</sup> s)	Part Number	Typical $I^2t$ (A <sup>2</sup> s)
CH06V5TR50	0.013	CH12V6TR50	0.027
CH06V3T1R50	0.089		
CH06V3T3R00	0.500		
CH06V3T4R0	1.665		

Note\*: Typical  $I^2t$  value is measured at 10x-rated current, Application with surge over 10x-rated current.

Please confirm with us.





## Inrush Waveform

Sinusoidal waveform (1 cycle)		$\frac{1}{2} Im^2 t$
Sinusoidal waveform (1/2 cycle)		$\frac{1}{2} Im^2 t$
Triangle waveform		$\frac{1}{3} Im^2 t$
Rectangular waveform		$Im^2 t$
Trapezoidal waveform		$\frac{1}{3} Im^2 t_1 + Im^2 (t_2 - t_1) + \frac{1}{3} Im^2 (t_3 - t_2)$
Various waveform 1		$I_1 I_2 t + \frac{1}{3} (I_1 - I_2)^2 t$
Various waveform 2		$\frac{1}{3} I_1^2 t_1 + \{I_1 I_2 + \frac{1}{3} (I_1 - I_2)^2\} (t_2 - t_1) + \frac{1}{3} I_2^2 (t_3 - t_2)$
Charge/Discharge waveform		$\frac{1}{2} Im^2 \tau$
Lightning surge waveform		$Im^2 \{t_1/3 + 0.721 (t_2 - t_1)\}$

$t_1$ : duration of wave front  
 $t_2$ : duration of wave tail