



Thin Film Chip Fuse



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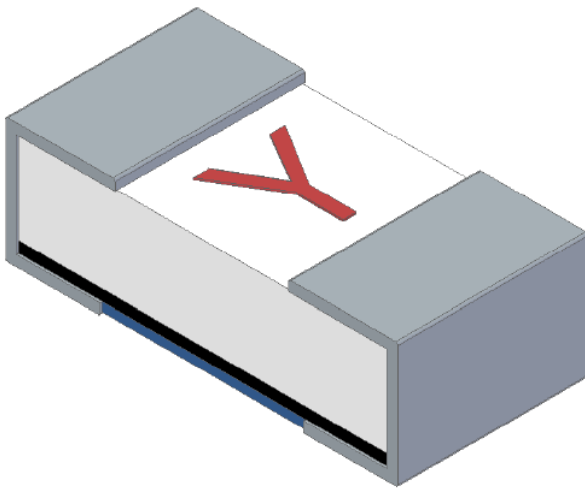
1. Scope

This specification applies for the CFTI04 series of thin film chip fuse made by TA-I.

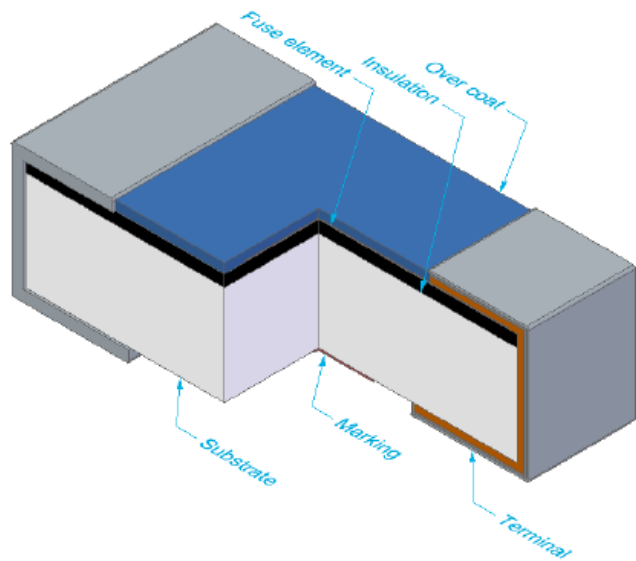
The general design ensures excellent structure stability and nice performance on breaking capacity.

2. Construction

Front Side of CFTI04



Back Side of CFTI04



3. Type Designation

CFTI	04	V3	T	0R63
	Size	Rate Voltage	Packaging	Rate Current
Chip Fuse	04:0402(1005)	V3:32V	T: Paper Tape (10K)	0R63:0.63A 1R00:1.00A 1R50:1.50A 2R00:2.00A 2R50:2.50A 3R00:3.00A 3R15:3.15A 3R50:3.50A 4R00:4.00A 5R00:5.00A



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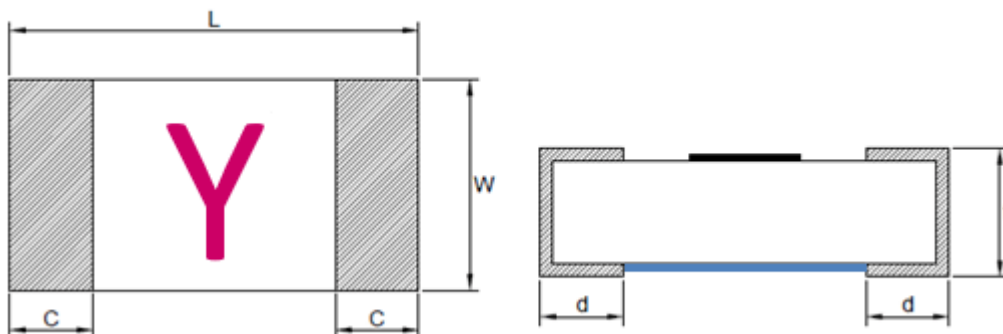


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4. Dimensions



Unit: mm

Type (Inch Size code)	Dimensions (mm)				
	L	W	C	d	t
CFTI04 (0402)	1.00±0.15	0.52±0.10	0.20±0.10	0.25±0.10	0.35±0.10

5. Applications and ratings

Part Designation	Marking	Rated Current	Fusing Time	Resistance (mΩ) Tolerance±25%	Typical I ² t (A ² s)	Rated Voltage	Breaking Capacity	Body Temperature rising
CFTI04V3T0R63	I	0.63A	Open within 5sec.at 200% rated current	450	0.0079	DC 32V	DC32V 100A	<75°C at 100% rated current
CFTI04V3T1R00	L	1.00A		150	0.0197			
CFTI04V3T1R50	P	1.50A		120	0.0443			
CFTI04V3T2R00	S	2.00A		52	0.0518			
CFTI04V3T2R50	T	2.50A		40	0.0688			
CFTI04V3T3R00	3	3.00A		33	0.1616			
CFTI04V3T3R15	U	3.15A		30	0.1273			
CFTI04V3T3R50	H	3.50A		25	0.2083			
CFTI04V3T4R00	W	4.00A		20	0.3072			
CFTI04V3T5R00	Y	5.00A		16	0.7218			

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



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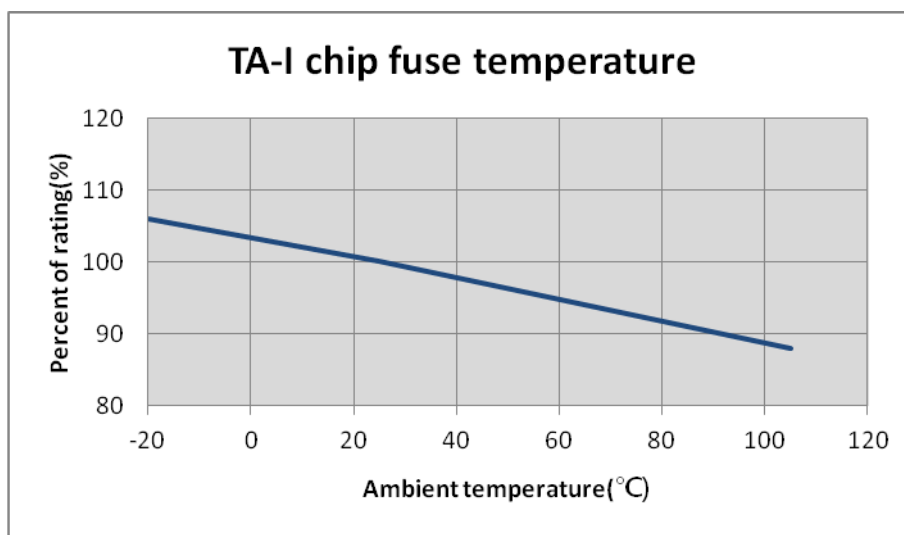
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6 Temperature Derating Curve

6.1 Normal Ambient Temperature: 25°C

6.2 Operating Temperature: -20°C ~105°C , with proper derating factor as below:



7 Reliability Tests

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



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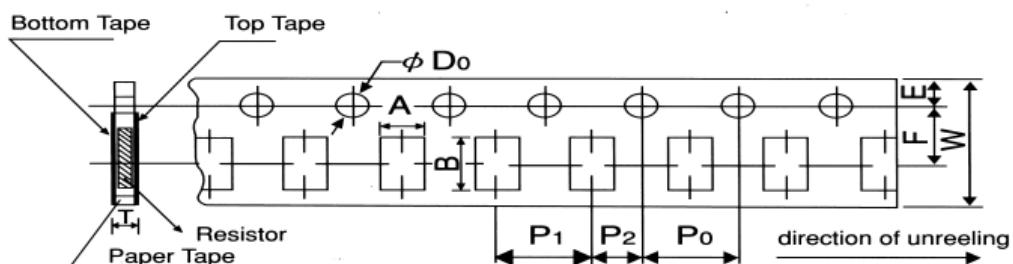
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8 Taping & Reel

8.1 Taping Dimensions

4mm pitch paper

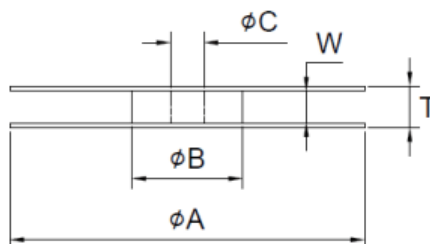


Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Paper Tape	CFTI04	0.7±0.05	1.2±0.05	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.05	4.0±0.1	$\phi 1.5^{+0.1}_0$	0.45±0.1

Unit: mm

Type Size		Paper Tape
		2 mm pitch
		180mm/R
CFTI	04	10000

8.2 Reel Specifications



Unit: mm

Series	ϕA	ϕB	ϕC	W	T
CFTI04	178 ±2.0	60.0±1.0	13.0±1.0	9.0±1.0	11.4±2.0

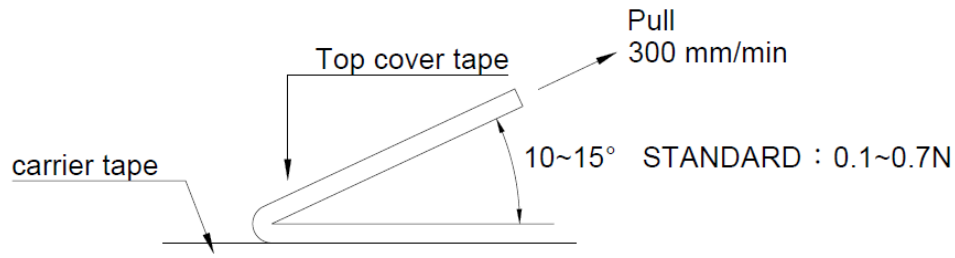


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8.3 Peel –off force:



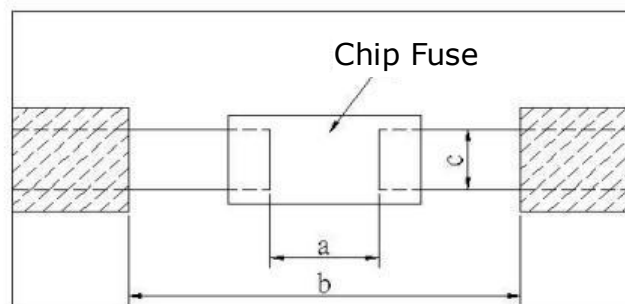
9 Storage Conditions:

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

10 Shelf Life:

2 years from manufacturing date

11 Recommended land patterns



Type	Land pattern Size	Dimension		
		a	b	c
CFTI	04 (0402)	0.55~0.65	1.40~1.60	0.74~0.94

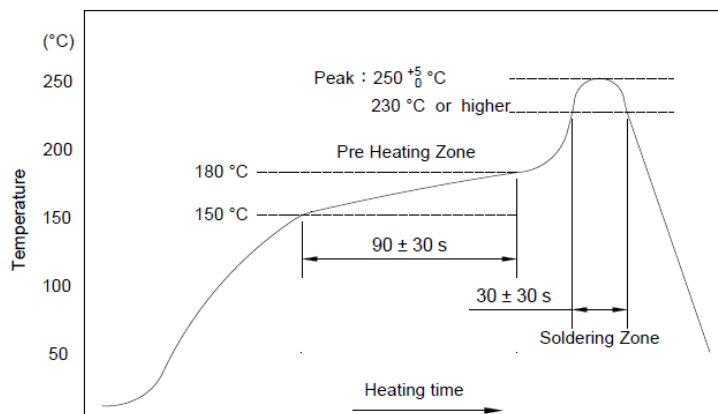


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12. Recommend IR – Reflow profile: (solder: Sn96.5 / Ag3 / Cu0.5)



Peak : $250 \pm 5/-0$ °C, 5 sec.

Pre-heat Zone : 150 to 180 °C , 90±30 sec

Soldering Zone : 230°C 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

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Associated companies:

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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 RESISTOR FACTORY (China – Dongguan)

Tel: (+86) 769-8339-4790~3

Fax : (+86) 769-8339-4794

(4) TAI OHM ELECTRONICS (M) SDN. BHD. (Malaysia – Penang)

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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 0402)
- ⊙ Agency Approval required (e.g., UL248-14)

■ Normal operating current

e.g., Rectangular Wave, If $I_p = 1.5 \text{ A}$, Normal operating current = 1.5 A


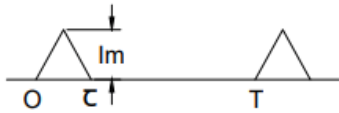
No.	Type	Waveform	Formula
1	Sinusoidal Waveform		$\frac{1}{\sqrt{2}} I_m \approx 0.707 I_m$
2	All Wave Rectification		$\frac{1}{\sqrt{2}} I_m \approx 0.707 I_m$
3	Half Wave		$0.5 I_m$
4	Triangle Waveform		$\frac{1}{3} I_m \approx 0.577 I_m$
5	Rectangular Waveform		I_m
6	Trapezoidal Waveform		$I_m \sqrt{1 - \frac{8\alpha}{3T}}$



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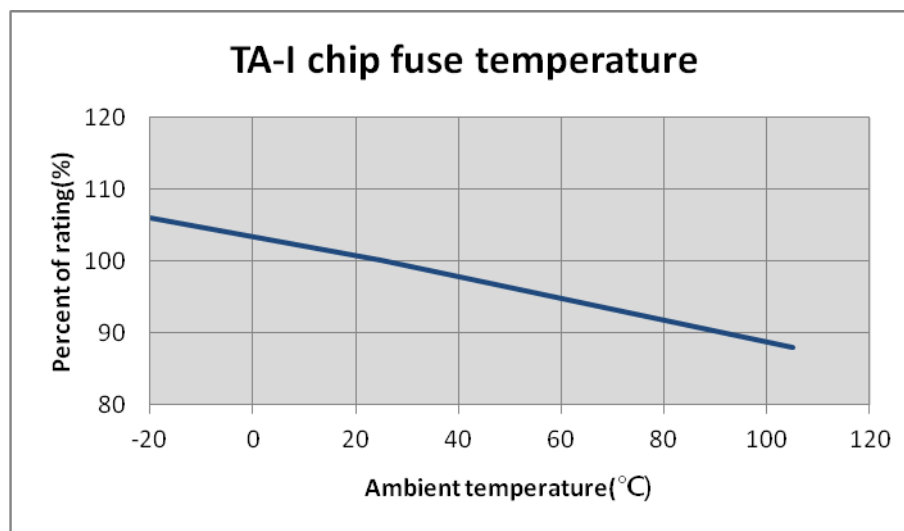
No.	Type	Waveform	Formula
7	Rectangular Pulse		$I_m \sqrt{\frac{\tau}{T}}$
8	Triangle Pulse		$I_m \sqrt{\frac{\tau}{3T}}$

■ 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

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

☉ e.g.

Condition: Normal operating current = 1.5 A

Ambient temperature 60 °C : Derating ratio \approx 0.95



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

$$2.255 < \text{rating current of fuse}$$

■ 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 CFTI04V3T2R50.

Part Designation	Marking	Rated Current
CFTI04V3T0R63	I	0.63A
CFTI04V3T1R00	L	1.00A
CFTI04V3T1R50	P	1.50A
CFTI04V3T2R00	S	2.00A
CFTI04V3T2R50	T	2.50A
CFTI04V3T3R00	3	3.00A
CFTI04V3T3R15	U	3.15A
CFTI04V3T3R50	H	3.50A
CFTI04V3T4R00	W	4.00A
CFTI04V3T5R00	Y	5.00A

■ Inrush current:

- ◆ Considering inrush waveform & calculate I^2t (A²s) value
- ◆ Choosing fuse's I^2t (A²s) value > calculate I^2t (A²s) value
- ◆ Considering Ratio of I^2t repeat numbers to blowing .
- ◆ Confirm with us.

e.g., choosing 0402 Fuse

Condition:

1. Rectangular Wave, $I_p = 4$ A, $t = 1$ ms , calculate $I_p^2t = 4^2 \times 1 \times 10^{-3} = 0.016$ (A²s)
2. Choosing CFTI04V3T3R00, $I^2t = 0.0638$ (A²s) → Page 11 index-table
3. Inrush shock : 100,000 times (≈ 0.35) → inrush ratio
4. Choosing fuse's I^2t (A²s) value X Derating ratio (inrush 100000 times) > calculate I^2t (A²s) value
5. $0.0638 \times 0.35 = 0.0223$ (A²s) > 0.016 → CFTI04V3T3R00 is able to meet circuit's application



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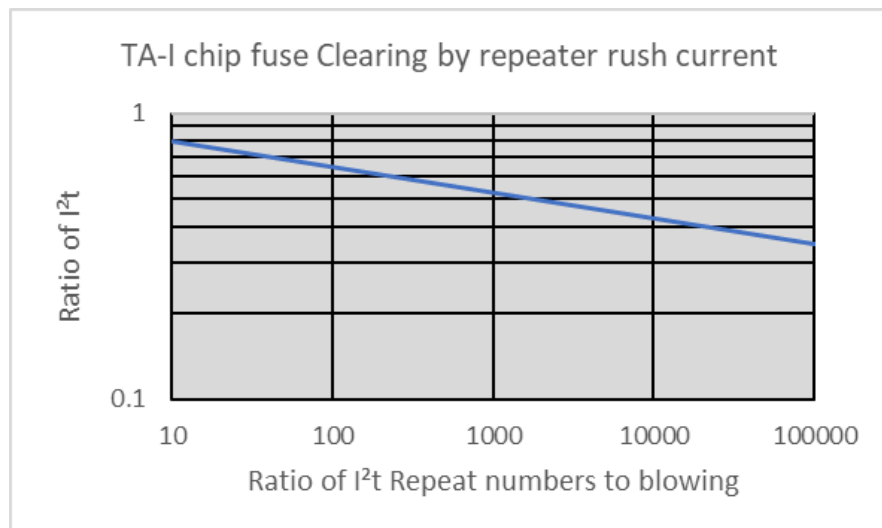
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TA-I Fuse CFTI04 Series I ² t	
Part Number	Typical I ² t (A ² s)
CFTI04V3T0R63	0.0045
CFTI04V3T1R00	0.0073
CFTI04V3T1R50	0.0148
CFTI04V3T2R00	0.0259
CFTI04V3T2R50	0.0378
CFTI04V3T3R00	0.0638
CFTI04V3T3R15	0.0800
CFTI04V3T3R50	0.1000
CFTI04V3T4R00	0.1536
CFTI04V3T5R00	0.3200

Note*: Typical I²t value is measured at 10x-rated current, Application with surge over 10x-rated current.
Please confirm with us.





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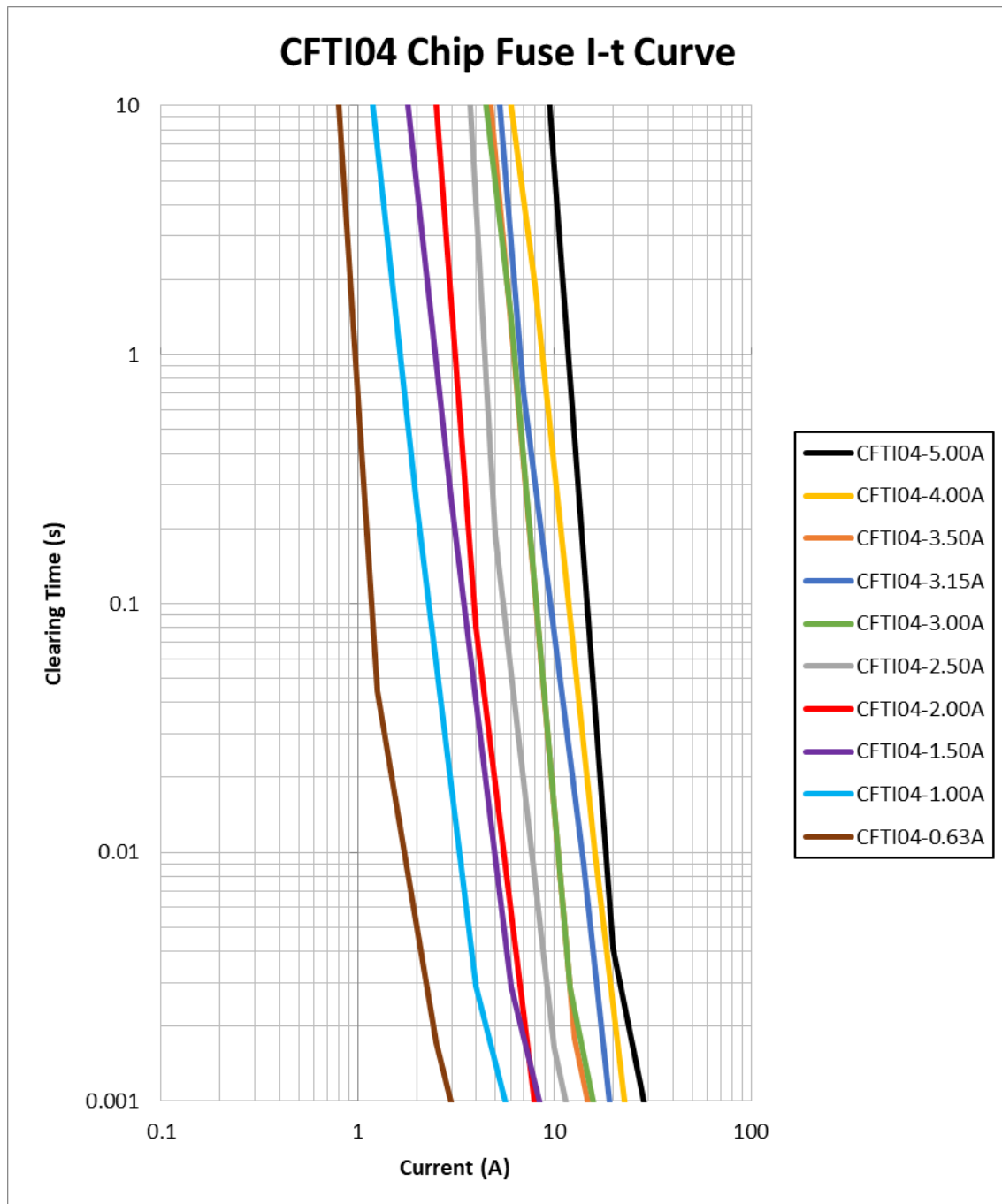
No.	Type	Waveform	Formula
1	Sinusoidal Waveform (1 Cycle)		$\frac{1}{2} I_m^2 t$
2	Sinusoidal Waveform (1/2 Cycle)		$\frac{1}{2} I_m^2 t$
3	Triangle Waveform		$\frac{1}{3} I_m^2 t$
4	Rectangular Waveform		$I_m^2 t$
5	Trapezoidal Waveform		$\frac{1}{3} I_m^2 t + I_m^2 (t_1 - t_2) + \frac{1}{3} I_m^2 (t_2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



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