

No.P-JAH-E005

DATE 2022-03

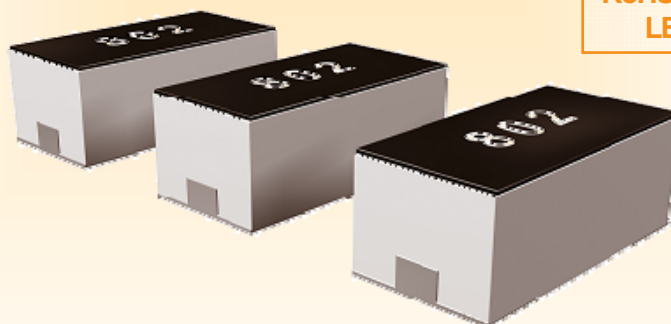
PRODUCTS DATA SHEET

MICRO FUSE

Type JAH

Size 3216

UL/cUL approved
File No. E170721
RoHS COMPLIANT
LEAD FREE



MATSUO ELECTRIC CO., LTD.

Type JAH micro fuse is designed for circuit protection against excessive current in portable electronic equipment, electric circuit around battery, etc. because the demand for high capacity batteries is increasing.
Wire material is adopted for fuse element, and the performance against rush current is improved in spite of compact design.
Also, the ecology design of Type JAH is environmentally friendly because of its complete lead-free.

FEATURES

1. Our original terminal construction makes almost no occurrence of Tombstone phenomenon.
2. Our original construction design provides excellent fusing and quick acting characteristics.
3. Especially, performance against rush current is excellent since wire material is used for fuse element.
4. Surface temperature rise is 75°C or less when applying rated current for fusing. This gives little influence to the peripheral units.
5. Small size of 3216 ($3.2 \times 1.6 \times 1.4$ mm)
6. Suitable for automatic mounting
7. Precise dimensions allows high-density mounting and symmetrical construction of terminals provide "Self-Alignment".
8. Resistance to soldering heat: Flow soldering 10 seconds at 260°C and Reflow soldering 5 seconds at 250°C respectively.
9. A tape carrier of 8 mm width will be provided as a standard package material.
10. Complete lead-free

APPLICATION CLASSIFICATION BY USE

The application classification by use which divided the market and use into four is set up supposing our products being used for a broad use.

Please confirm the application classification by use of each product that you intend to use.

Moreover, please be sure to inform to our Sales Department in advance in examination of the use of those other than the indicated use.

RATING

Item	Rating
Category Temperature Range	-40 ~ +125°C
Rated Current	1.0—1.25—1.6—2.0—2.5—3.15—4.0—5.0—6.3—8.0—10.0—12.5A
Rated Voltage	72VDC
Voltage Drop	Refer to CATALOG NUMBERS AND RATING
Insulation Resistance (between terminals and case)	1000 MΩ or more
Fusing Characteristics	Fusing within 1 minute if the current is 200% of rated current.
Clearing Characteristics	Breaking voltage : 72 V
	Breaking current : 50 A

ORDERING INFORMATION

J A H			7 2 0 2		8 0 2		N A		5 2		
Type	Code	RV	Code	Rated current	Code	Rated current	Code	Package type	Code	Case size	
JAH	7202	72V	102	1.0 A	402	4.0 A	NA	φ180 Reel	52	3.2×1.6	
			132	1.25A	502	5.0 A					
			162	1.6 A	632	6.3 A					
			202	2.0 A	802	8.0 A					
			252	2.5 A	103	10.0 A					
			322	3.15A	133	12.5 A					

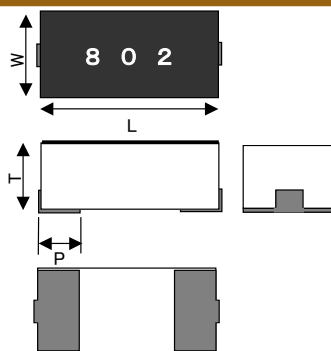
CATALOG NUMBERS AND RATING

January, 2013

Catalog number	Case size	Rated current A	Internal resistance mΩ (Typical)	Voltage drop mV (Max.)	Rated voltage VDC	Breaking current A
JAH 7202 102 □□52	3.2×1.6	1.0	127	200	72	50
JAH 7202 132 □□52	3.2×1.6	1.25	98	200		
JAH 7202 162 □□52	3.2×1.6	1.6	75	200		
JAH 7202 202 □□52	3.2×1.6	2.0	58	200		
JAH 7202 252 □□52	3.2×1.6	2.5	44	200		
JAH 7202 322 □□52	3.2×1.6	3.15	34	200		
JAH 7202 402 □□52	3.2×1.6	4.0	26	200		
JAH 7202 502 □□52	3.2×1.6	5.0	22	200		
JAH 7202 632 □□52	3.2×1.6	6.3	16	160		
JAH 7202 802 □□52	3.2×1.6	8.0	10	150		
JAH 7202 103 □□52	3.2×1.6	10.0	8.2	120		
JAH 7202 133 □□52	3.2×1.6	12.5	3.8	80		

For the taping type, the packing code "NA" will be entered in □□.
Catalog numbers are approved by UL and cUL. (File No.E170721)

DIMENSIONS



Main body : Ceramics

Terminal : Tin plating

(mm)

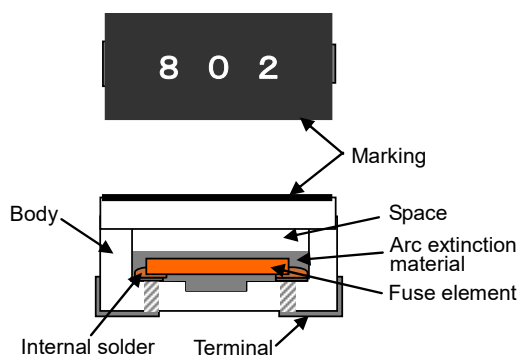
Case size	Case code	L	W	T	P
3216	52	3.2 ± 0.2	1.6 ± 0.2	1.4max.	0.6 ± 0.2

MARKING

Code	Rated current
102	1.0A
132	1.25A
162	1.6A
202	2.0A
252	2.5A
322	3.15A

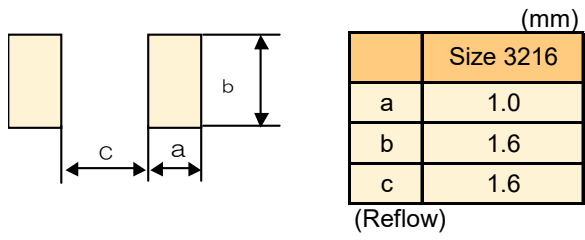
Code	Rated current
402	4.0A
502	5.0A
632	6.3A
802	8.0A
103	10.0A
133	12.5A

CONSTRUCTION

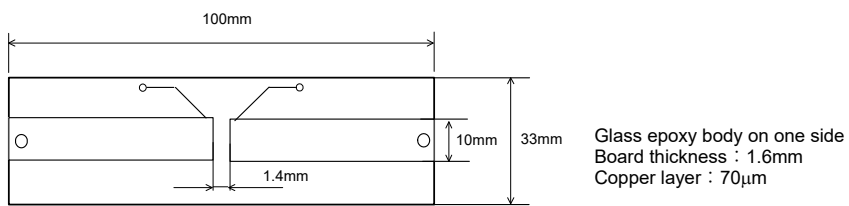


Name	Material, standard, and treatment
Fuse element	Lead-free alloy
Space	—
Arc extinction material	Silicone resin
Terminal	Tin plating
Body	Ceramics
Marking	Epoxy resin
Internal solder	Lead-free alloy

RECOMMENDED PAD DIMENSIONS



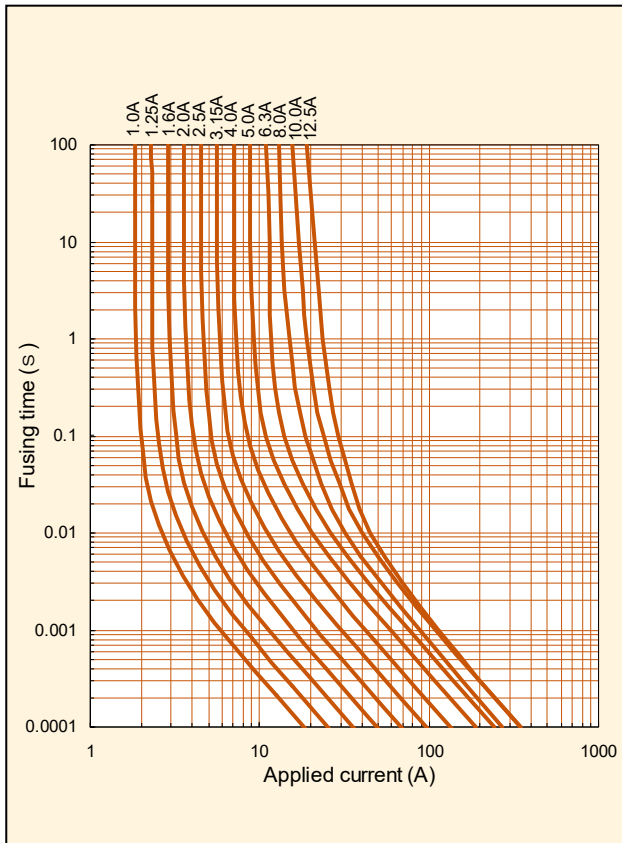
STANDARD TEST BOARD



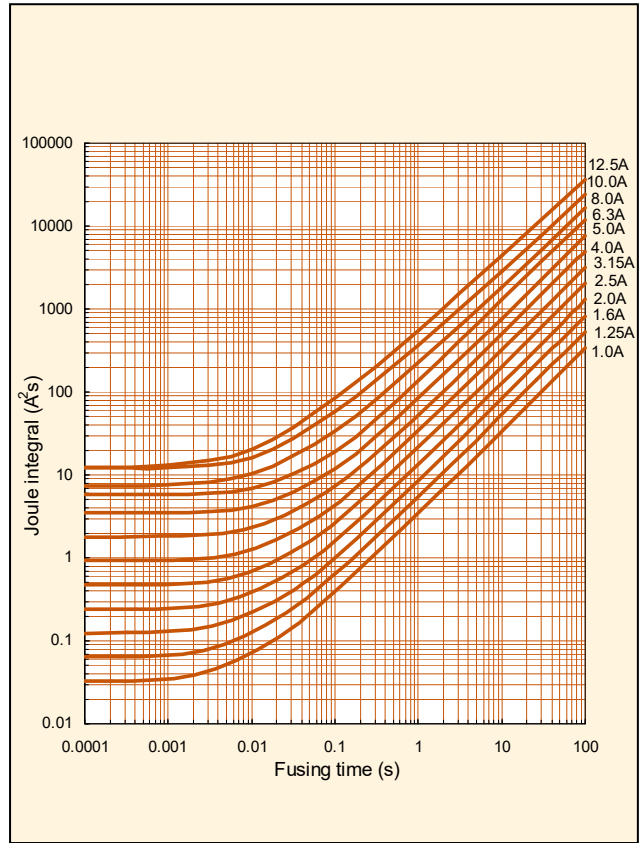
PERFORMANCE

No.	Item	Performance	Test method
1	Temperature rise	Temperature rise shall not exceed 75°C.	Apply rated current.
2	Current-carrying capacity	Shall not open within 1 hour.	Apply 100% of rated current.
3	Clearing characteristics	Arc shall not be continued. Marking shall be legible.	Breaking voltage : Rated voltage Breaking current : 50 A
4	Voltage drop	Voltage drop is below the value specified in CATALOG NUMBERS AND RATING.	Apply rated current.
5	Fusing characteristics	Fusing within 1 min.	Apply 200% of rated current. (Ambient temperature : 10 ~ 30°C)
6	Insulation resistance	1000 MΩ or more	Insulation resistance between terminals and case (ceramics)
7	Electrode strength (Bending)	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Board supporting width : 90 mm Bending speed : Approx. 0.5 mm/sec. Duration : 5 sec. Bending : 3 mm
8	Shear test	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Applied force : 20 N Duration : 10 sec. Tool : R0.5 Direction of the press : side face
9	Substrate bending test	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Supporting dimension : 1.6 mm Applied force : 20 N Duration : 10 sec. Tool : R0.5 Direction of the press : thickness direction of product
10	Solderability (Solder Wetting time)	Solder Wetting time : within 3sec.	Solder : Sn-3Ag-0.5Cu Temperature : 245 \pm 3°C meniscograph method
11	Solderability (new uniform coating of solder)	The dipping surface of the terminals shall be covered more than 95% with new solder.	Solder : JISZ3282 H60A, H60S, H63A Temperature : 230 \pm 2°C meniscograph method
12	Resistance to soldering heat	Marking shall be legible. No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Dipping (1 cycle) Preconditioning : 100 ~ 150°C, 60 sec. Temperature : 265 \pm 3°C, 6 ~ 7 sec. (260 \pm 3°C, 10 sec.) Reflow soldering (2 cycles) Preconditioning : 1-2 m, lower than 180°C Peak : 250 \pm 5°C, 5 sec. Holding : 230 ~ 250°C, 30 ~ 40 sec. Cooling : More than 2 m Manual soldering (2 cycles) Temperature : 350 \pm 10°C Duration : 3 ~ 4 sec. Measure after 1 hour left under room temperature And humidity.
13	Solvent resistance	Marking shall be legible. No mechanical damage. No significant irregularity in the appearance.	Dipping rinse Solvent : Isopropyl alcohol Duration : 90 sec.
14	Vibration	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Frequency range : 10 ~ 55 ~ 10 Hz/min Vibration amplitude : 1.5 mm Duration : 2 hours in each of XYZ directions (total : 6 hours)
15	Shock	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Peak value : 490 m/s ² Duration : 11 msec. 6 aspects \times 3 times (total : 18 times)
16	Thermal shock	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	-55 \pm 3°C : 30 min. Room temperature : 2 ~ 3 min or less 125 \pm 2°C : 30 min. Room temperature : 2 ~ 3 min or less Repeat above step for 10 cycles
17	Moisture resistance	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Temperature : 85 \pm 3°C Humidity : 85 \pm 5% RH Duration : 1000 hours
18	Load life	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Temperature : 85 \pm 2°C Applied current : Rated current \times 70% Duration : 1000 hours
19	Moisture resistance load	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Temperature : 85 \pm 3°C Humidity : 85 \pm 5% RH Applied voltage : rated current \times 70% Duration : 1000 h
20	Stability	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$.	Temperature : 125 \pm 2°C Duration : 1000 hours

FUSING CHARACTERISTICS

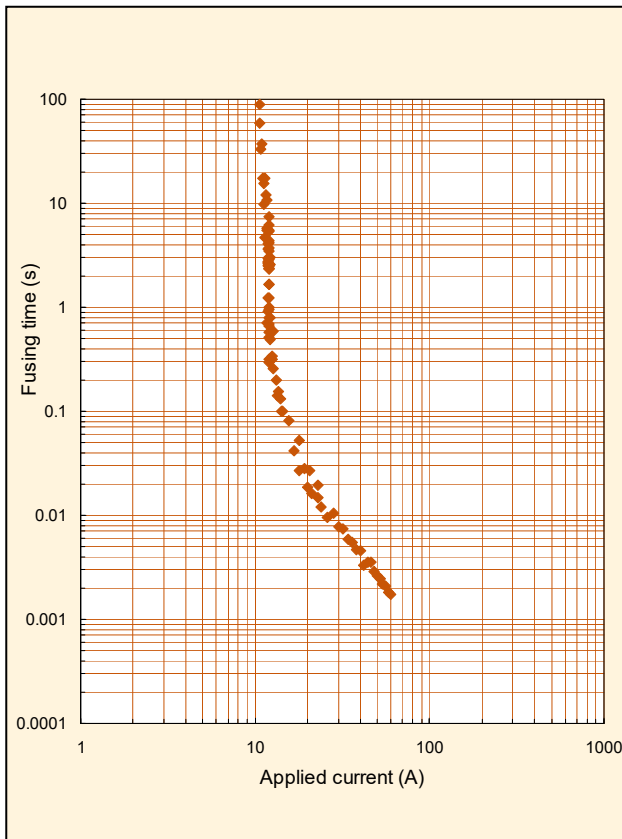


I²T - T CHARACTERISTICS



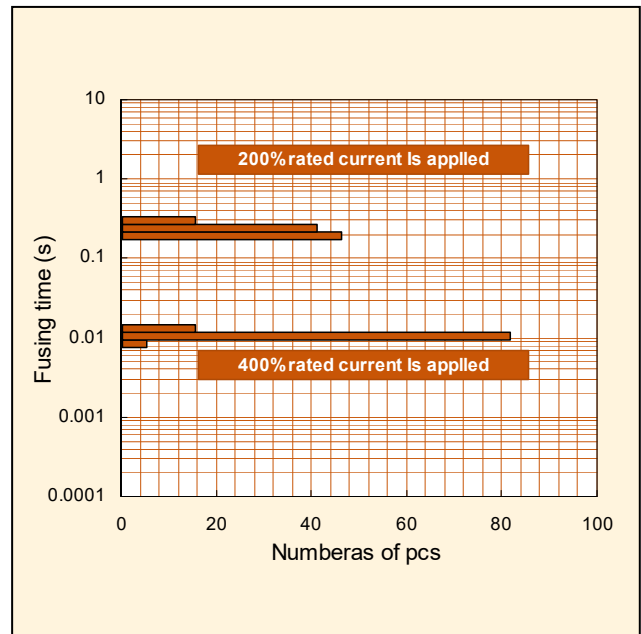
DISTRIBUTION OF FUSING CHARACTERISTICS

JAH 7202 632NA52



DISTRIBUTION OF FUSING TIME

JAH 7202 632NA52



DETERMINATION OF RATED VALUE AND SELECTION OF MICRO FUSE (TYPE JAH)

Determine rated value of micro fuse, and select correct circuit protection element for your circuit. If you select correct circuit protection element, safety of your circuit can be ensured.
How to determine rated value of circuit protection element is described below:

■ Flow for fuse selection

1. Measurement of circuit values using actual device

Measure circuit values, such as operating current of circuit.

2. Calculation from operating current

From obtained operating current and the category temperature, calculate minimum rated value to determine applicable fuse.

3. Calculation from overload current

From obtained overload current, calculate the maximum rated value to determine applicable fuse.

4. Calculation from inrush current

From inrush current, calculate minimum rated value to determine applicable fuse.

5. Final determination of rated value

From the calculation results of steps 2 through 4, determine rated value.

6. Operation check using actual device

After selecting rating, confirm if device works properly under pre-determined conditions.

■ Fuse selection

1. Measurement of circuit values using actual device

Before determining rated value of fuse, preliminarily measure following condition by using the actual device.

1-1 Operating current

Using an oscilloscope or equivalents, measure operating current of circuit.

1-2 Overload current

Using an oscilloscope or equivalents, measure the overload current that needs to break circuit.

1-3 Inrush current

Using an oscilloscope or equivalents, measure inrush current of circuit at power-on or power-off. In addition, determine number of inrush current applied.

1-4 Category temperature

Measure ambient temperature of fuse circuit.

EXAMPLE TO SELECT RATINGS OF TYPE JAH

<Fuse selection>

Effective operating current : 2.8 A

Effective overload current : 40 A

Inrush current waveform : Fig. A

(Pulse width : 1 ms, Wave height : 40 A)

Numbers to withstand inrush current : 100,000 times

Category temperature : 85°C

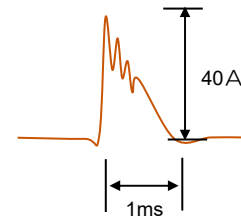


Fig. A : Inrush current waveform

2. Calculation from operating current

2-1 Measurement of operating current

Using an oscilloscope or equivalents, measure operating current (effective current) of actual circuit.

Example : Effective operating current = 2.8 A

2-2 Derating

① Temperature derating factor

Using Fig. B, find temperature derating factor correspond to temperature.

② Rated derating factor

Rated derating factor = 0.78 (Constant irrespective of temperature)

Use Formula 1 to calculate rated current of the fuse to be used for circuit.

Rated current of fuse \geq Operating current / (① \times ②) ... Formula 1

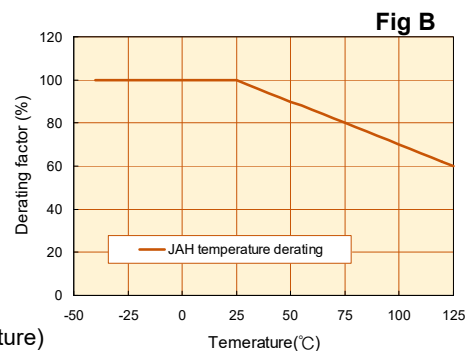
Example : Category temperature = 85°C, Operating current = 2.8 A

① Temperature derating factor = 0.76 (Refer to Fig. B.)

② Rated derating factor = 0.78 (Constant irrespective of temperature)

Calculation using Formula 1 :

Rated current $\geq 2.8 / (0.76 \times 0.78) = 4.72$ A



The above calculation result shows that the fuse with rated current of 4.72 A or more should be selected for this circuit.
Type JAH, with rated current of 5.0 A or more can be selected.

3. Calculation from overload current

3-1 Measurement of overload current

Using oscilloscope or equivalents, measure overload current that needs to break circuit.

Example : Effective overload current = 40 A

3-2 Calculation from overload current

Determine rated current so that overload current can be 2.0 times larger than rated current.

Use Formula 2 to calculate rated current of fuse.

Rated current of fuse \leq Overload current/2.0 ... Formula 2

Example : Overload current = 40 A

Use Formula 2 to calculate the rated current.

Rated current $\leq 40/2.0 = 20$ A

The above calculation result shows that the fuse with rated current of 20 A or less should be selected for this circuit.

Type JAH, with rated current of 12.5 A or less can be selected.

4. Calculation from inrush current

4-1 Measurement of inrush current waveform

Using an oscilloscope or equivalent, measure waveform of inrush current of actual circuit.

4-2 Creation of approximate waveform

Generally, waveform of inrush current is complicated. For this reason, create the approximate waveform of inrush current as shown on Fig. C to simplify calculation.

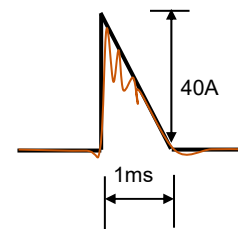


Fig. C : Inrush current waveform
Red line : Actual measurement waveform
Black line : Approximate waveform

4-3 Calculation of I^2t of inrush current

Calculate I^2t (Joule integral) of approximate waveform.

The formula for this calculation depends on the approximate waveform.

Refer to Table A.

Example : Pulse applied = 1 ms, Peak value = 40 A

Approximate waveform = Triangular wave

Since the approximate waveform is a triangular wave, use the following formula for calculation.

I^2t of rush current = $1/3 \times I_m^2 \times t$... Formula 3

(I_m : Peak value, t : Pulse applying time)

Use Formula 3 to calculate I^2t of the rush current:

$I^2t = 1/3 \times 40 \times 40 \times 0.001 = 0.533$ (A²s)

JOULE-INTEGRAL VALUES FOR EACH WAVEFORM

Table A

Name	Waveform	I^2t	Name	Waveform	I^2t
Sine wave (1 cycle)		$\frac{1}{2} I_m^2 t$	Trapezoidal wave		$\frac{1}{3} I_m^2 t_1 + I_m^2 (t_2 - t_1) + \frac{1}{3} I_m^2 (t_3 - t_2)$
Sine wave (half cycle)		$\frac{1}{2} I_m^2 t$	Various wave 1		$I_1 I_2 t + \frac{1}{3} (I_1 - I_2)^2 t$
Triangular wave		$\frac{1}{3} I_m^2 t$	Various wave 2		$\frac{1}{3} I_1^2 t_1 + \{I_1 I_2 + \frac{1}{3} (I_1 - I_2)^2\} (t_2 - t_1) + \frac{1}{3} I_2^2 (t_3 - t_2)$
Rectangular wave		$I_m^2 t$	Charge/discharge waveform		$\frac{1}{2} I_m^2 \tau$

* Following formula is generally used for calculation of I^2t as $i(t)$ equal to current.

$$I^2t = \int_0^t i^2(t) dt$$

4-4 Search of load ratio

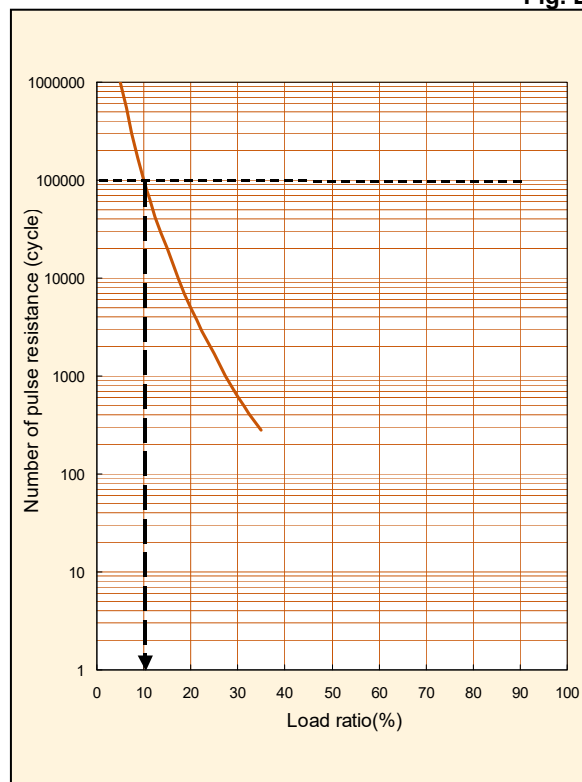
- ① Set up number of cycles to withstand. (generally 100,000 times)
- ② Obtain load ratio from Pulse resistance characteristics. (Fig. D)

Example : 100,000 times is required against inrush current applied.

The load ratio is 10% or less from Fig. D.

PULSE RESISTANCE CHARACTERISTICS

Fig. D



4-5 Calculation from Joule integral and load ratio

Use Formula 4 to calculate the standard I^2t for the fuse to be used.

Standard I^2t of fuse > (I^2t of inrush current/load ratio)
.....Formula 4

Example : I^2t of pulse = $0.533 \text{ A}^2\text{s}$,

Pulse applied = 1 ms, Required load ratio = 10%

From Formula 4,

Standard I^2t of fuse > $0.533/0.1 = 5.33 \text{ (A}^2\text{s)}$

The standard I^2t of the fuse should be $5.33 \text{ (A}^2\text{s)}$ or more.

Since the rush pulse applied is 1 ms, obtain the intersection of 1 ms (horizontal axis) and $5.33 \text{ A}^2\text{s}$ (vertical axis) from Fig. E (refer to the arrow shown in Fig. E).

Select a fuse whose curve is above the intersection. Type JAH, with rated current of 6.3 A or more should be selected.

5. Final determination of rated value

Determine the rated current of micro fuse. Rated current should meet all the calculation results.

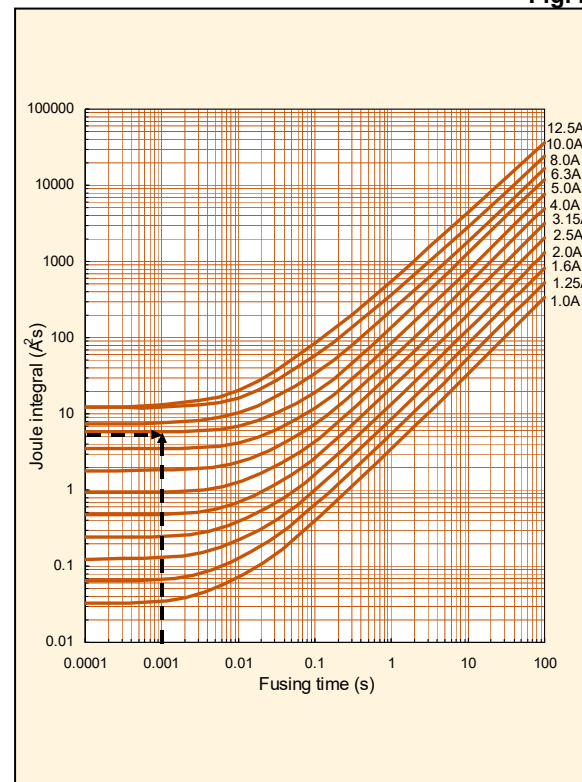
Example : Rated current of 6.3 A~12.5A meets the all requirement.

6. Operation check using actual device

After selecting rating, confirm if the device works properly under pre-determined conditions.

JOULE INTEGRAL VS. FUSING TIME

Fig. E





Application Notes for Micro Fuse

1. Circuit Design

Micro Fuse should be designated only after confirming operating conditions and Micro Fuse performance characteristics.

When determining the rated current, be sure to observe the following items :

- (1) Micro Fuse should always be operated below the rated current (the value considered in the temperature derating rate) and voltage specifications.
- (2) Micro Fuse should always be operated below the rated voltage.
- (3) Micro Fuse should be selected with correct rated value to be fused at overload current.
- (4) When Micro Fuse are used in inrush current applications, please confirm sufficiently inrush resistance of Micro Fuse.
- (5) Please do not apply the current exceeding the breaking current to Micro Fuse.
- (6) Use Micro Fuse under the condition of category temperature.
- (7) Micro Fuse should not be used in the primary power source.

Micro Fuse should be selected by determining the operating conditions that will occur after final assembly, or estimating potential abnormalities through cycle testing.

2. Assembly and Mounting

During the entire assembly process, observe Micro Fuse body temperature and the heating time specified in the performance table. In addition, observe the following items :

- (1) Mounting and adjusting with soldering irons are not recommended since temperature and time control is difficult.
In case of emergency for using soldering irons, be sure to observe the conditions specified in the performance table.
- (2) Micro Fuse body should not contact a soldering iron directly.
- (3) Once Micro Fuse mounted on the board, they should never be remounted on boards or substrates.
- (4) During mounting, be careful not to apply any excessive mechanical stresses to the Micro Fuse.

3. Solvents

For cleaning of Micro Fuse, immersion in isopropyl alcohol for 90 seconds (at 20 ~ 30°C liquid temp.) will not be damaged.

If organic solvents will be used to Micro Fuse, be sure to preliminarily check that the solvent will not damage Micro Fuse .

4. Ultrasonic Cleaning

Ultrasonic cleaning is not recommended for Micro Fuse. This may cause damage to Micro Fuse such as broken terminals which results in electrical characteristics effects, etc. depending on the conditions.

If Ultrasonic cleaning process must be used, please evaluate the effects sufficiently before use.

5. Caution During Usage

- (1) Micro Fuse with electricity should never be touched. Micro Fuse with electricity may cause burning due to Micro Fuse high temperature.
Also, in case of touching Micro Fuse without electricity, please check the safety temperature of Micro Fuse.
- (2) Protective eyeglasses should always be worn when performing fusing tests. However, there is a fear that Micro Fuse will explode during test.
During fusing tests, please cover particles not to fly outward from the board or testing fixture. Caution is necessary during usage at all times.

6. Environmental Conditions

- (1) Micro Fuse should not be stored or operated in the presence of acids, or alkalis, or corrosive atmosphere.
- (2) Micro Fuse should not be vibrated, shocked, or pressed excessively.
- (3) Micro Fuse should not be operated in a flammable or explosive atmosphere.
- (4) Please do not use Micro fuse in the environment where dew condensation occurs.
In case Micro fuse has to be used under the dew condensation condition, please apply moisture-proof coating over Micro fuse.
Covering Micro fuse with moisture-proof coating may affect electrical characteristics, please evaluate the effects sufficiently before use.

7. Emergency

In case of fire, smoking, or offensive odor during operation, please cut off the power in the circuit or pull the plug out.

8. Storage

- (1) Micro Fuse should not be stored in an environment with high temperature, low temperature, high humidity, condensation and dust and avoid direct sunlight or corrosive atmosphere such as H₂S(hydrogen sulfide) or SO₂(sulfur dioxide).
Direct sunlight may cause decolorization and deformation of the exterior and taping.
Also, solderability will be remarkably lower in high humidity.
- (2) If the products are stored for an extended period of time, please contact Matsuo Sales Department for recommendation. The longer storage term causes packages and tapings to worsen. If the products will be stored for longer term, please contact us for advice.
- (3) The products in taping, package, or box should not be given any kind of physical pressure. Deformation of taping or package may affect automatic mounting.

9. Disposal

When Micro Fuse are disposed of as waste or "scrap", they should be treated as "industrial waste". Micro Fuse contain various kinds of metals and resins.

10. Samples

Micro Fuse received as samples should not be used in any products or devices in the market. Samples are provided for a particular purpose such as configuration, confirmation of electrical characteristics, etc.



MATSUO ELECTRIC CO., LTD.

Please feel free to ask our Sales Department for more information on Micro Fuse.

Overseas Sales 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel:06-6332-0883 Fax:06-6332-0920

Head office 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel:06-6332-0871 Fax:06-6331-1386

URL <https://www.ncc-matsuo.co.jp/>

Specifications on this catalog are subject to change without prior notice. Please inquire of our Sales Department to confirm specifications prior to use.

適用用途分類 / APPLICATION CLASSIFICATION BY USE

Rev.5 (2022.02.14)

市場	適用用途分類	用途		推奨品種	推奨品種	推奨品種	推奨品種
		概要	代表的なアプリケーション例	チップタンタルコンデンサ	リード付タンタルコンデンサ	回路保護素子	フィルムコンデンサ
高信頼度機器	1	<ul style="list-style-type: none"> 高度な安全性や信頼性が要求される機器 製品の保守交換が不可能な機器、製品の故障が人命に直接かわる、または、致命的なシステムダウンを引き起こす可能性がある機器 	<ul style="list-style-type: none"> 宇宙開発機器関連(衛星、ロケット、人工衛星) 航空・防衛システム 原子力・火力・水力発電システム 	267型Pシリーズ	111型Pシリーズ	該当なし	該当なし
車載・産業機器	2	<ul style="list-style-type: none"> 信頼性が重視される機器 製品の保守交換が極めて困難な機器や、製品の故障が人命に影響する、あるいは故障の範囲が広範囲である機器 	<ul style="list-style-type: none"> 自動車および鉄道・船舶等の輸送機器の車両制御(エンジン制御、駆動制御、ブレーキ制御) 新幹線・主要幹線の運行制御システム 	267型Nシリーズ 271型Nシリーズ 279型Mシリーズ	111型Nシリーズ 111型Mシリーズ 112型Mシリーズ 204型Nシリーズ 247型	KAB型Nシリーズ JAG型Nシリーズ KVA型Nシリーズ	431型 431型Aシリーズ 503型 553型 602型 801型 802型
	3	<ul style="list-style-type: none"> 製品の保守交換が可能な機器や、製品の故障が人命に影響しないが故障によるシステムダウンの損失が大きく安全管理が要求される機器 	<ul style="list-style-type: none"> エアコン、カーナビ等の車室内搭載部品、車載用通信機器 家庭用/ビル用等のセキュリティ管理システム 工業用ロボットや工作機械等の制御機器 	267型Mシリーズ 267型Eシリーズ 281型Mシリーズ TCA型	204型Mシリーズ	KAB型Mシリーズ	
汎用機器	4	<ul style="list-style-type: none"> 最先端技術を積極的に適用する小型・薄型品 製品の保守交換が可能な機器や、製品の故障によるシステムダウンが部分的な機器向けの市場で広く使用されることを想定した製品 	<ul style="list-style-type: none"> スマートフォン、携帯電話、モバイルPC(タブレット)、電子辞書 デスクトップPC、ノートPC、ホームネットワーク アミューズメント機器(パチンコ、ゲーム機) 	251型Mシリーズ 251型Tシリーズ 281型Eシリーズ TCB型		KAB型 KAB型Tシリーズ KAH型 JAE型、JAG型 JAH型、JAH型Lシリーズ JAJ型、JAK型 JHC型 KVA型	503型Aシリーズ

Market	Application classification by use	Use		Recommendation Type	Recommendation Type	Recommendation Type	Recommendation Type
		Outline	Typical example of application	Chip Tantalum Capacitors	Leaded Tantalum Capacitors	Circuit Protection Components	Film Capacitors
High reliability apparatus	1	<ul style="list-style-type: none"> Apparatus in which advanced safety and reliability are demanded. Whether failure of the apparatus which cannot maintenance exchange products, and a product is direct for a human life, apparatus which changes or may cause a fatal system failure. 	<ul style="list-style-type: none"> Space development apparatus relation (Satellite, Rocket, Artificial Satellite) Aviation and a defensive system Atomic power, fire power, and a water-power generation system 	Type 267 P Sereis	Type 111 P series	With no relevance	With no relevance
In-vehicle - Industrial apparatus	2	<ul style="list-style-type: none"> Apparatus in which reliability is important. The apparatus in which maintenance exchange of a product is very difficult, and failure of a product influence a human life, or the range of failure is wide range. 	<ul style="list-style-type: none"> Vehicles control of transport machines, such as a car, and a railroad, a vessel (Engine control, drive control, brake control) The operation control system of the Shinkansen and a main artery 	Type 267 N Sereis Type 271 N Sereis Type 279 M Sereis	Type 111 N series Type 111 M series Type 112 M series Type 204 N series Type 247	Type KAB N series Type JAG N series Type KVA N series	Type 431 Type 431 A series Type 503 Type 553 Type 602 Type 801 Type 802
	3	<ul style="list-style-type: none"> Apparatus which can maintenance exchange products, and apparatus in which the loss of the system failure is large although failure of a product does not influence a human life, and maintenance engineering is demanded 	<ul style="list-style-type: none"> Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility Security management system for home/buildings etc. Control apparatus, such as Industrial use robots and a machine tool etc. 	Type 267 M Sereis Type 267 E Sereis Type 281 M Sereis Type TCA	Type 204 M series	Type KAB M series	
Apparatus in general	4	<ul style="list-style-type: none"> The small size and the thin article which applies leading-edge technology positively The product supposing being used widely in the market for the apparatus which can maintenance exchange products, and apparatus with a partial system failure by failure of product. 	<ul style="list-style-type: none"> Smart phone, Mobile phone, Mobile PC (tablet), Electronic dictionary Desktop PC, Notebook PC, Home network Amusement apparatus (Pachinko, Game machine) 	Type 251M Series Type 251 T Series Type 281 E Series Type TCB		Type KAB Type KAB T series Type KAH Type JAE, Type JAG Type JAH, Type JAH L series Type JAJ, Type JAK Type JHC Type KVA	Type 503 A series