

No. P-JAGN-E006

DATE 2023-09

# PRODUCTS DATA SHEET

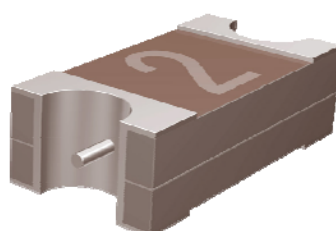
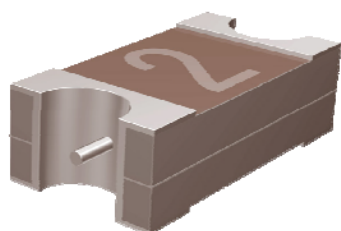
## MICRO FUSE

### TYPE JAG N Series

SIZE 3.2x1.6mm

UL. cUL approved  
File No. E170721

RoHS compliant  
<Complete lead-free>



Granted Patents

Japanese patent (No.4200450)



**MATSUO ELECTRIC Co., LTD.**

## Type JAG N Series

Type JAG N series micro fuse is designed for circuit protection against excessive current in automotive electronics, industrial use, and etc. Because the demand for high capacity batteries is increasing with the spread of HV and EV.

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 JAG N series is environmentally friendly because of complete lead-free.

## FEATURES

1. Our original construction design has excellent fusing and cutting characteristics.
2. Especially, performance against rush current is excellent since wire material is used for fuse element.
3. Surface temperature rise is 75°C or less when applying rated current.  
This gives less influence to the peripheral units.
4. Resistance to soldering heat: Reflow or flow soldering 10 seconds at 260°C.
5. Our original terminal construction makes almost no occurrence of Tombstone phenomenon.
6. Small size of 3216 (3.2mm x 1.6mm x 1.4 mm)
7. Suitable for automatic mounting.
8. Precise dimensions allows high-density mounting and symmetrical construction of terminals provide "Self-Alignment".
9. Complete lead-free, bromine-free.
10. Due to its high reliability, Type JAG N series are applicable for automotive electric control unit that are required for higher reliability.

## 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	0.5-0.63-0.8-1.0-1.25-1.6-2.0-2.5-3.15-4.0-5.0-6.3-8.0-10.0A
Rated Voltage	32VDC, 50VDC, 72VDC, 96VDC
Voltage Drop	Refer to CATALOG NUMBERS AND RATING
Insulation Resistance (between terminals and case)	1000MΩ or more
Fusing Characteristics	Fusing within 1 minute if the current is 200% of rated current.
Clearing Characteristics	Breaking voltage : Rated Voltage
	Breaking Current : 50A

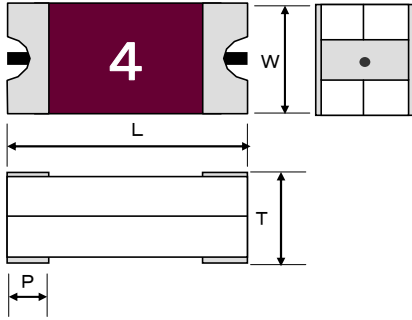
## ORDERING INFORMATION

JAG		N		3202		252		NA		52	
Type	Series	Code	Voltage	Code	Rated current	Code	Rated current	Code	Package type	Code	Case size
JAG	N	3202	32V	501	0.5 A	252	2.5 A	NA	φ 180 Reel	52	3.2X1.6
		5002	50V	631	0.63 A	322	3.15 A				
		7202	72V	801	0.8 A	402	4.0 A				
		9602	96V	102	1.0 A	502	5.0 A				
				132	1.25 A	632	6.3 A				
				162	1.6 A	802	8.0 A				
				202	2.0 A	103	10.0 A				

Catalog number	Case size	Rated current A	Internal resistance mΩ (Typical)	Voltage drop mV (Max.)	Rated voltage VDC	Breaking current A
JAGN 3202 501 □□52	3.2×1.6	0.5	310	280	32	50
JAGN 3202 631 □□52		0.63	240	240		
JAGN 3202 801 □□52		0.8	190	200		
JAGN 3202 102 □□52		1.0	145	200		
JAGN 3202 132 □□52		1.25	112	200		
JAGN 3202 162 □□52		1.6	87	200		
JAGN 3202 202 □□52		2.0	70	200		
JAGN 3202 252 □□52		2.5	54	200		
JAGN 3202 322 □□52		3.15	43	200		
JAGN 3202 402 □□52		4.0	34	200		
JAGN 3202 502 □□52		5.0	11.6	200		
JAGN 3202 632 □□52		6.3	9.16	200		
JAGN 3202 802 □□52		8.0	7.17	200		
JAGN 3202 103 □□52		10.0	5.96	200		
JAGN 5002 502 □□52		3.2×1.6	5.0	11.6		
JAGN 5002 632 □□52	6.3		9.16	200		
JAGN 5002 802 □□52	8.0		7.17	200		
JAGN 5002 103 □□52	10.0		5.96	200		
JAGN 7202 501 □□52	3.2×1.6	0.5	310	280	72	50
JAGN 7202 631 □□52		0.63	240	240		
JAGN 7202 801 □□52		0.8	190	200		
JAGN 7202 102 □□52		1.0	145	200		
JAGN 7202 132 □□52		1.25	112	200		
JAGN 7202 162 □□52		1.6	87	200		
JAGN 7202 202 □□52		2.0	70	200		
JAGN 7202 252 □□52		2.5	54	200		
JAGN 7202 322 □□52		3.15	43	200		
JAGN 7202 402 □□52		4.0	34	200		
JAGN 9602 501 □□52	3.2×1.6	0.5	310	280	96	50
JAGN 9602 631 □□52		0.63	240	240		
JAGN 9602 801 □□52		0.8	190	200		
JAGN 9602 102 □□52		1.0	145	200		
JAGN 9602 132 □□52		1.25	112	200		
JAGN 9602 162 □□52		1.6	87	200		

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

## DIMENSIONS



Main body: Glass epoxy  
Terminal: Tin plating

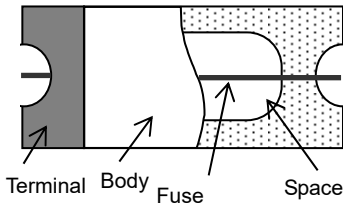
(mm)

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

## MARKING

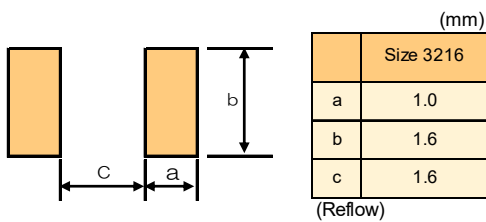
Code	Rated current	Code	Rated current	Code	Rated current
T	0.5A	X	1.60A	5	5.00A
U	0.63A	2	2.00A	6	6.30A
V	0.80A	Y	2.50A	8	8.00A
1	1.00A	3	3.15A	10	10.00A
W	1.25A	4	4.00A		

## CONSTRUCTION

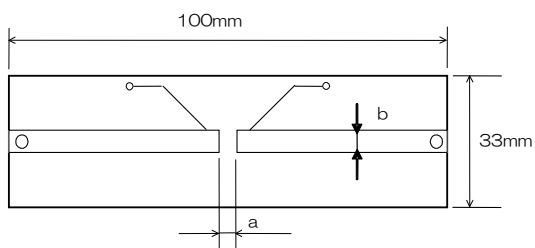


Name	Material, standard, and treatment
Fuse element	Lead-free alloy
Space	—
Terminal	Tin plating
Body	Glass epoxy

## RECOMMENDED PAD DIMENSION



## STANDARD TEST BOARD



Glass epoxy body on one side

Board thickness: 1.6mm

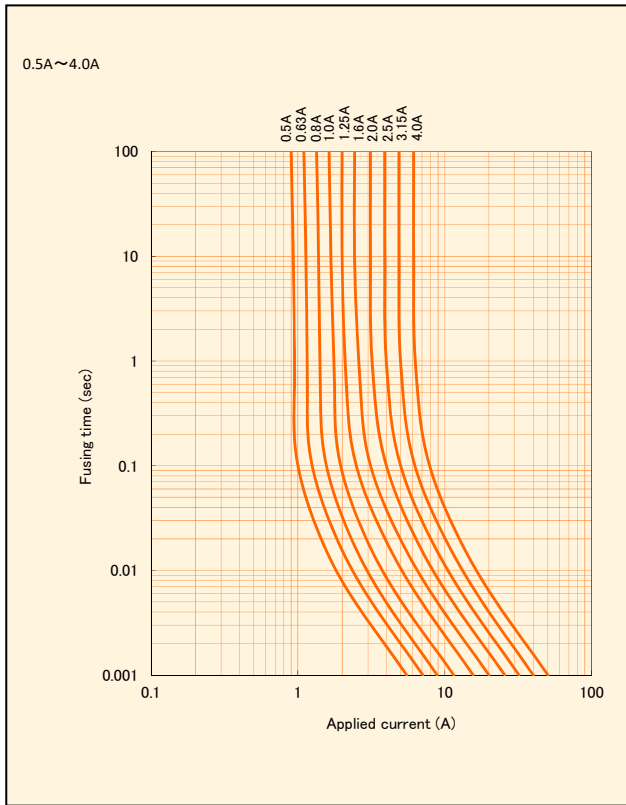
	Less than 5A	More than 5A
a	1.5mm	1.4mm
b	5mm	10mm
Copper layer	35µm	70µm

## PERFORMANCE

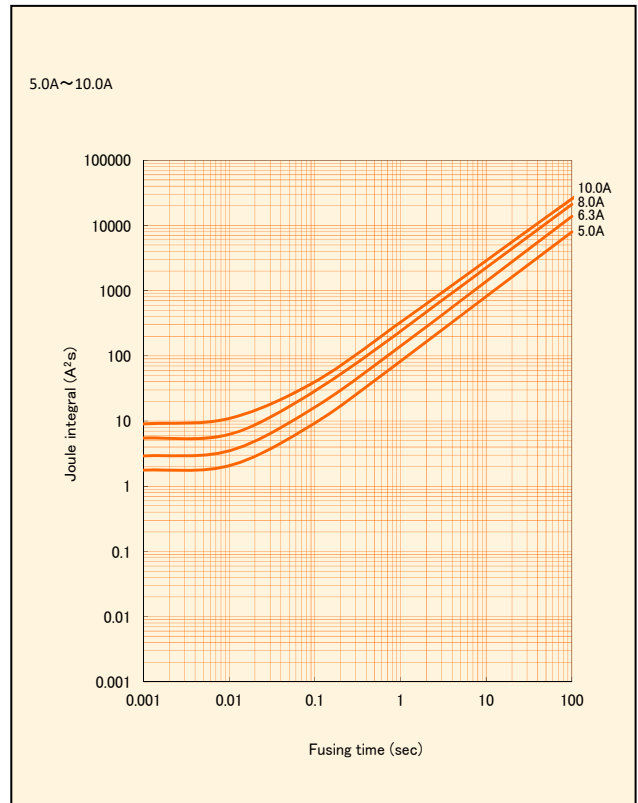
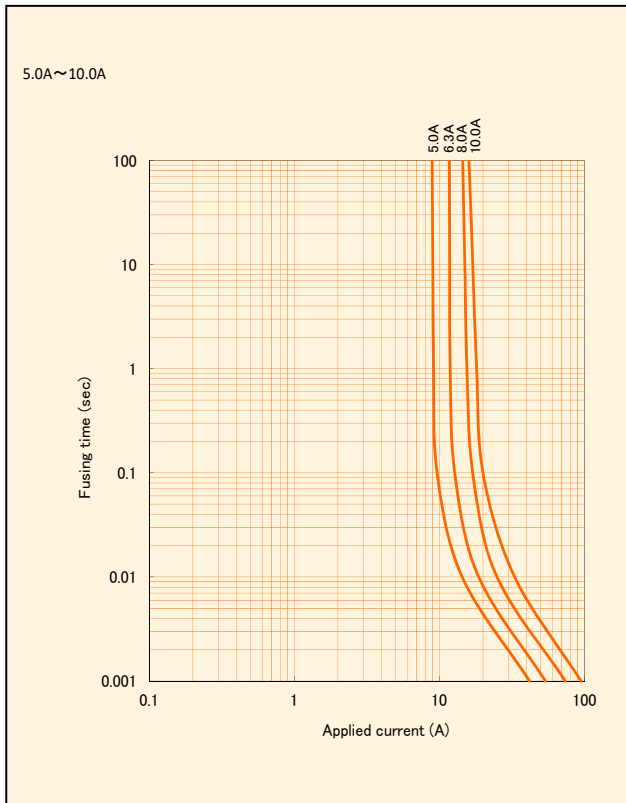
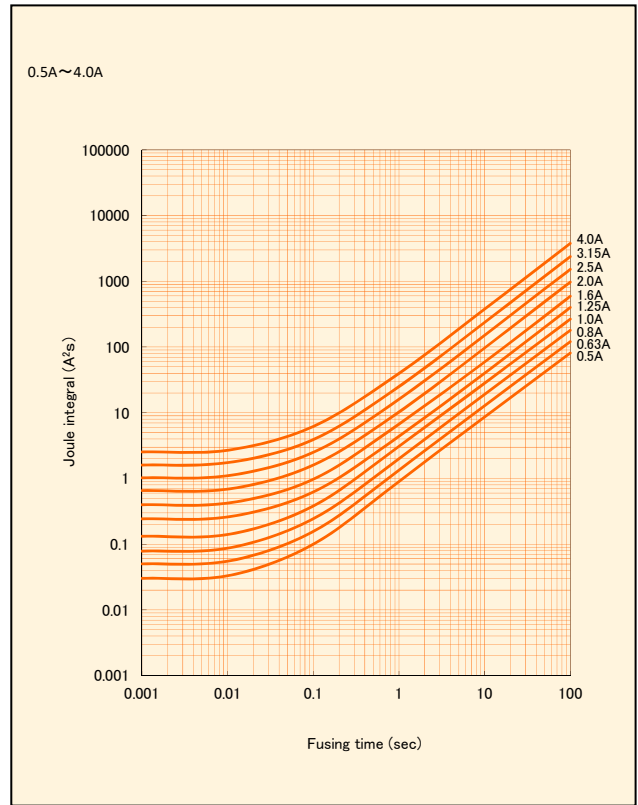
No	Item	Performance	Test method
1	Temperature rise	Temperature rise shall not exceed 75°C	Apply rated current
2	Current-carrying capacity	Shall not open within 1 hour.	Apply rated current
3	Clearing characteristics	Arc shall not be continued. No ignition. Marking shall be legible No bursting of the fuse	Breaking voltage : Rated voltage Breaking current : 50A
4	Voltage drop	Voltage drop is below the value specified in CATALOG NUMBERS AND RATING.	Apply rated current
5	Fusing characteristics	Fusing within 1min.	Apply 200% of rated current (Ambient temperature: 10~30°C)
6	Insulation resistance	1000MΩ or more	Insulation resistance between terminals and case
7	Pulse resistance	No defect in appearance. No fusing.	100,000times x 2ms with 200% of rated current, and 1s pause
8	Electrode strength (Bending)	No mechanical damage. Resistance change after the test shall be within ± 20%.	Board supporting width : 90mm Bending speed : Approx. 0.5mm/s Duration : 60 s Bending : 3mm
9	Shear test	No mechanical damage. Resistance change after the test shall be within ± 20%.	Applied force : 17.7N Duration : 60s Tool : R0.5 Direction of the press : side face
10	Core body strength	No mechanical damage. Resistance change after the test shall be within ± 20%.	Supporting dimension : 1.6mm Applied force : 20N Duration : 10s Tool : R0.5 Direction of the press : thickness direction of product
11	Solderability (Solder Wetting time)	Solder Wetting time : within 3s	Solder : Sn-3Ag-0.5Cu Temperature : 245±3°C meniscograph method Solder : JISZ3282 H60A, H60S, H63A Temperature : 230±2°C meniscograph method
12	Solderability (new uniform coating of solder)	The dipping surface of the terminals shall be covered more than 95% with new solder.	Solder : Sn-3Ag-0.5Cu Temperature : 245±3°C Dipping : 3s Solder : JISZ3282 H60A, H60S, H63A Temperature : 230±2°C Dipping : 3s
13	Resistance to soldering heat	Marking shall be legible. No mechanical damage. Shall meet the electrical performance.	Dipping (1 cycle) Preconditioning : 100~150°C/30±5s Temperature : 260±3°C/5 s <sub>10</sub> <sup>-1</sup> s Reflow soldering (2 cycles) Preconditioning : 150~180°C 90±30s Peak : 250 <sub>10</sub> <sup>+5</sup> °C Holding : 230°C or higher 30±10s Cooling : 3~6°C/s or faster Manual soldering Temperature : 350±10°C Duration : 2~3s Measure after 1hour left under room temperature and humidity.
14	Solvent resistance	Marking shall be legible. No mechanical damage. No significant irregularity in the appearance.	Dipping rinse Solvent : Isopropyl alcohol Duration : 90s
15	Vibration	No mechanical damage. Resistance change after the test shall be within ± 20%.	Peak value : 49m/s <sup>2</sup> (Peak) Vibration amplitude : 20min Frequency range : 10~2000Hz Cycle : 12 cycles each to X, Y, Z direction (36 cycles in total)
16	Shock	No mechanical damage. Resistance change after the test shall be within ± 20%.	Peak value : 14700m/s <sup>2</sup> Reaction time : 0.5ms Waveform : Half-Sine Shock Pulse Velocity variation : 4.7m/s 6 aspects x 3 times (total: 18 times)
17	Thermal shock	No mechanical damage. Resistance change after the test shall be within ± 20%.	The following 1-2 steps as one cycle, applied 1000 cycles in total. Step 1: -55±3°C/30±3min Step 2: 125±2°C/30±3min Within 3min from step 1 to 2.
18	Moisture resistance	No mechanical damage. Resistance change after the test shall be within ± 20%.	Temperature : 85±3°C Humidity : 85±5%RH Duration : 1000h
19	Load life	No mechanical damage. Resistance change after the test shall be within ± 20%.	Temperature : 85±2°C Applied current : Rated current×70% Duration : 1000h Temperature : 125±2°C Applied current : Rated current×60% Duration : 1000h

No	Item	Performance	Test method
20	Stability	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$ .	Temperature : $125 \pm 2^{\circ}\text{C}$ Duration : 1000h
21	Moisture resistance load	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$ .	Temperature : $85 \pm 3^{\circ}\text{C}$ Humidity : $85 \pm 5\% \text{RH}$ Applied current : Rated current $\times 70\%$ Duration : 1000h
22	Whisker	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$ . Checking by microscope more than 50 times, no whisker more than 50 $\mu\text{m}$ .	a) Temperature cycle 1: $-55 \pm 3^{\circ}\text{C}$ / 5-10min 2: $85 \pm 2^{\circ}\text{C}$ / 5-10min 1 and 2, repeating 3 times/1h is one cycle: 1000 cycles b) Shelf test I $30 \pm 2^{\circ}\text{C}$ / $60 \pm 3\% \text{RH}$ / 3000h c) Shelf test II $60 \pm 5^{\circ}\text{C}$ / $87 \pm 3-2\% \text{RH}$ / 3000h
23	ESD resistance	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$ .	ESD-HBM circuit $R_d=2\text{k}\Omega$ , $C_d=150\text{pF}$ Withstand voltage: 4000 - 6000V by contact discharge
24	High and Low Temp	No mechanical damage, and the resistance value cleared the following standard. (1) Step 1 ( $20 \pm 2^{\circ}\text{C}$ ): Initial resistance value (2) Step 2 ( $-40 \pm 3^{\circ}\text{C}$ ): Within $-17\%$ to $+3\%$ of Step 1 result (3) Step 3 ( $20 \pm 2^{\circ}\text{C}$ ): Within $\pm 5\%$ of Step 1 result (4) Step 4 ( $85 \pm 2^{\circ}\text{C}$ ): Within $-3\%$ to $+17\%$ of Step 1 result (5) Step 5 ( $125 \pm 2^{\circ}\text{C}$ ): Within $+2\%$ to $+22\%$ of Step 1 result (6) Step 6 ( $20 \pm 2^{\circ}\text{C}$ ): Within $\pm 5\%$ of Step 1 result	(1) Step 1 ( $20 \pm 2^{\circ}\text{C}$ ) (2) Step 2 ( $-40 \pm 3^{\circ}\text{C}$ ) (3) Step 3 ( $20 \pm 2^{\circ}\text{C}$ ) (4) Step 4 ( $85 \pm 2^{\circ}\text{C}$ ) (5) Step 5 ( $125 \pm 2^{\circ}\text{C}$ ) (6) Step 6 ( $20 \pm 2^{\circ}\text{C}$ ) In order from (1) to (6), changing the temp and measuring the resistance change.
25	Sulfidation Resistance	No mechanical damage. Resistance change after the test shall be within $\pm 20\%$ .	Hydrogen sulfide gas concentration: $3 \pm 1 \text{ppm}$ Temperature: $40 \pm 1^{\circ}\text{C}$ Relative temperature: $90 \pm 5\% \text{RH}$ Duration: 240h

## FUSING CHARACTERISTICS

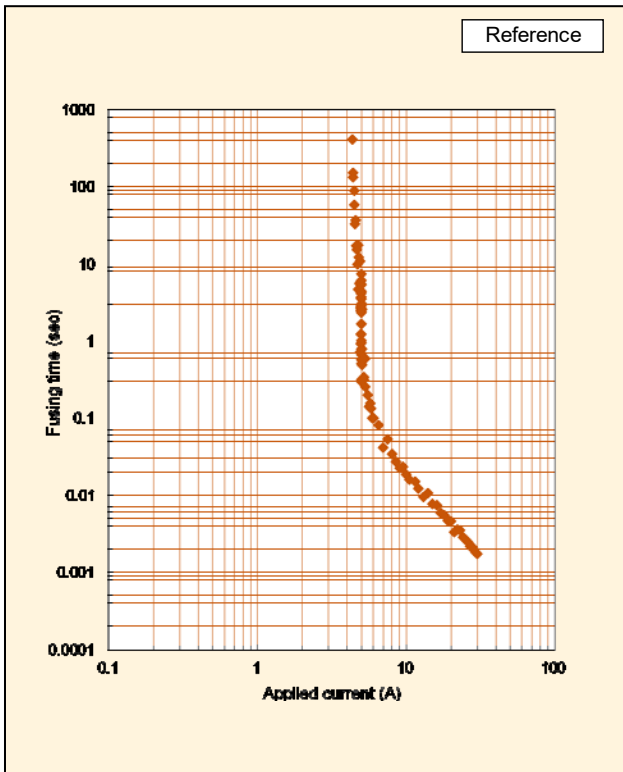


## I<sup>2</sup>T - T CHARACTERISTICS



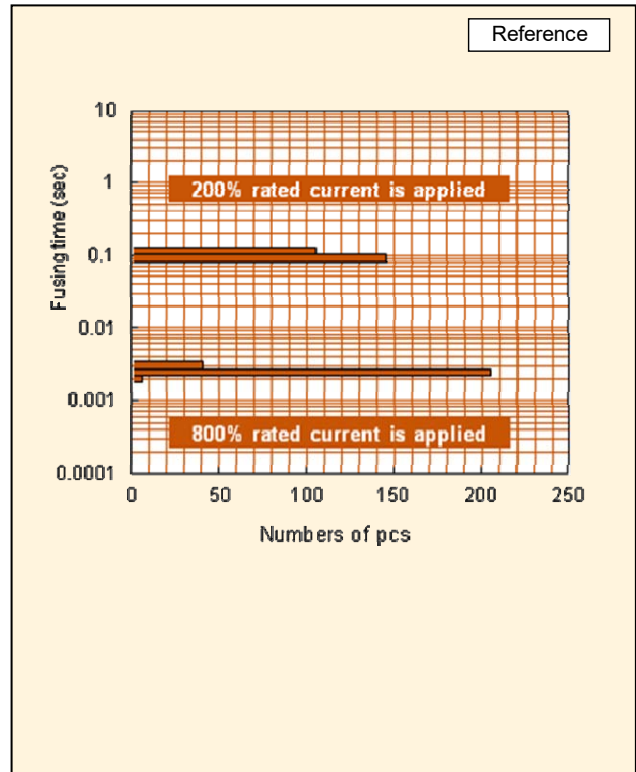
## DISTRIBUTION OF FUSING CHARACTERISTICS

JAGN 3202 322 NA 52



## DISTRIBUTION OF FUSING TIME

JAGN 3202 322 NA 52





## DETERMINATION OF RATED VALUE AND SELECTION OF MICRO FUSE (TYPE JAG N SERIES)

Determine the rated value of the micro fuse, and select the correct circuit protection element for your circuit. If you select the correct circuit protection element, safety of your circuit can be ensured.

How to determine the rated value of the circuit protection element is described below:

### ■ Flow for fuse selection

#### 1. Measurement of circuit values using actual device

Measure the circuit values, such as operating current of the circuit.

#### 2. Calculation from operating current

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

#### 3. Calculation from overload current

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

#### 4. Calculation from inrush current

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

#### 5. Final determination of rated value

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

#### 6. Operation check using actual device

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

### ■ Fuse selection

#### 1. Measurement of circuit values using actual device

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

##### 1-1. Operating current

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

##### 1-2. Overload current

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

##### 1-3. Inrush current

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

##### 1-4. Category temperature

Measure the ambient temperature of the fuse circuit.

### EXAMPLE TO SELECT RATINGS OF TYPE JAG N SERIES

<Fuse selection>

Effective operating current : 1.2 A

Effective overload current : 6.0 A

Inrush current waveform : Fig. A

(Pulse width : 1 ms, Wave height : 6.0 A)

Numbers to withstand inrush current : 100,000 times

Category temperature : 85°C

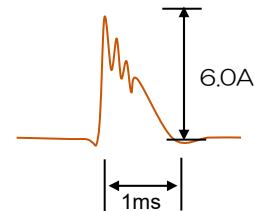


Fig. A : Inrush current waveform

#### 2. Calculation from operating current

##### 2-1. Measurement of operating current

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

Example : Effective operating current = 1.2 A

##### 2-2. Derating

###### ① Temperature derating factor

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

###### ② Rated derating factor

Rated derating factor = 0.78 (Constant irrespective of temperature)

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

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

Example : Category temperature = 85°C, Operating current = 1.2 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  $\geq 1.2 / (0.76 \times 0.78) = 2.02$  A

The above calculation result shows that the fuse with rated current of 2.02 A or more should be selected for this circuit.

Type JAG N Series, with rated current of 2.5 A or more can be selected.

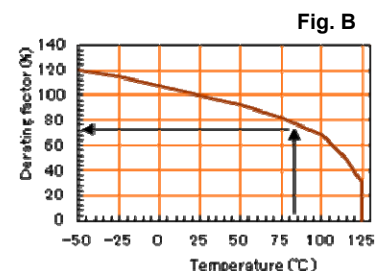


Fig. B

### 3. Calculation from overload current

#### 3-1. Measurement of overload current

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

Example : Effective overload current = 6.0 A

#### 3-2. Calculation from overload current

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

Use Formula 2 to calculate the rated current of the fuse.

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

Example : Overload current = 6.0 A

Use Formula 2 to calculate the rated current.

Rated current  $\leq$  6.0/2.0 = 3.0 A

The above calculation result shows that the fuse with rated current of 3.0 A or less should be selected for this circuit.

Type JAG N Series, with rated current of 2.5 A or less can be selected.

### 4. Calculation from inrush current

#### 4-1. Measurement of inrush current waveform

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

#### 4-2. Creation of approximate waveform

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

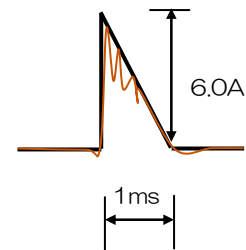


Fig. C : Inrush current waveform

Red line : Actual measurement waveform

Black line : Approximate waveform

#### 4-3. Calculation of $I^2t$ of inrush current

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

The formula for this calculation depends on the approximate waveform.

Refer to Table A.

Example : Pulse applied = 1 ms, Peak value = 6.0 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:

$I^2t = 1/3 \times 6 \times 6 \times 0.001 = 0.012$  (A<sup>2</sup>s)

## 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		$\frac{1}{2} I_m^2 t$

\* 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

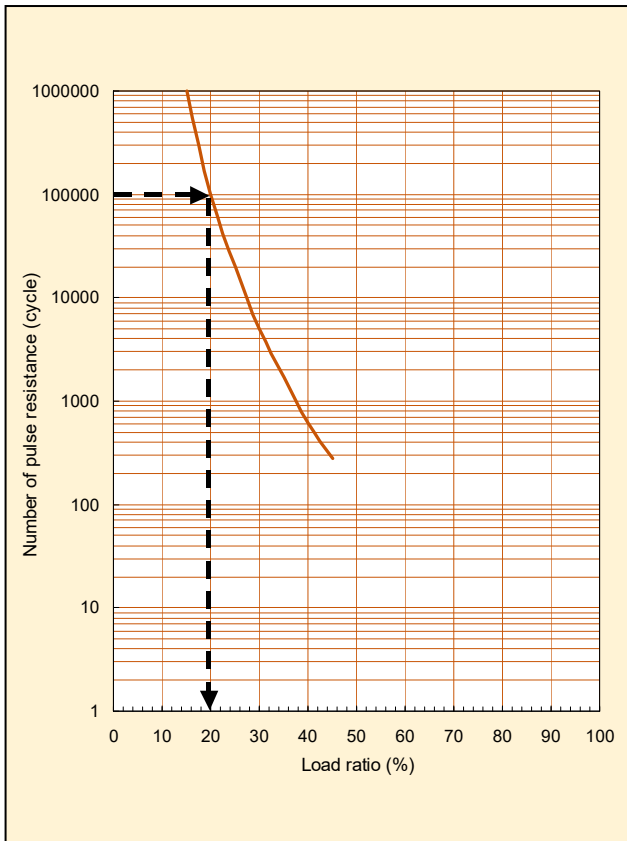
- ① Set up the number of cycles to withstand.  
(generally 100,000 times)
- ② Obtain the load ratio from Pulse resistance characteristics.  
(Fig. D)

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

The load ratio is 20% 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 = 0.012 A<sup>2</sup>s,  
Pulse applied = 1 ms, Required load ratio = 20%

From Formula 4,  
Standard  $I^2t$  of fuse > 0.012/0.2 = 0.06 (A<sup>2</sup>s)

The standard  $I^2t$  of the fuse should be 0.06 (A<sup>2</sup>s) or more.

Since the rush pulse applied is 1 ms, obtain the intersection of 1 ms (horizontal axis) and 0.06 A<sup>2</sup>s (vertical axis) from Fig. E (refer to the arrow shown in Fig.E).

Select a fuse whose curve is above the intersection. Type JAG N Series, with rated current of 0.8 A or more should be selected.

5. Final determination of rated value

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

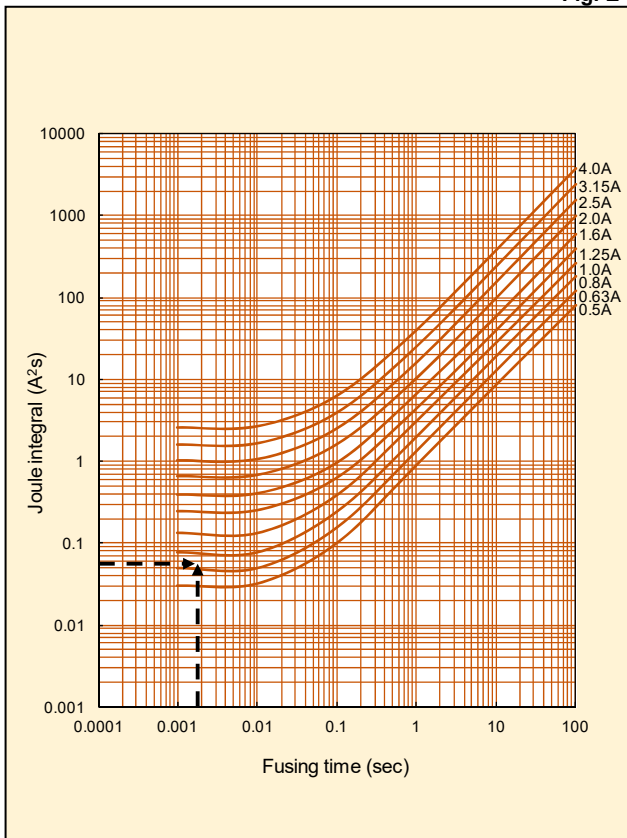
Example : 2.5A meets the all requirement.

6. Operation check using actual device

After selecting the rating, confirm if the device works properly under the 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 H<sub>2</sub>S(hydrogen sulfide) or SO<sub>2</sub>(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.
- (4) The plastic reel (made of PS) used for packaging the product is intended for use in ambient temperatures (5-35°C). To prevent issues during automated insertion due to reel deformation or other factors, please keep the reel away from direct sunlight and heat sources, and ensure it does not reach high temperatures (above 60°C), including during transportation.

### 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.6 (2023.03.01)

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"> <li>高度な安全性や信頼性が要求される機器</li> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>宇宙開発機器関連(衛星、ロケット、人工衛星)</li> <li>航空・防衛システム</li> <li>原子力・火力・水力発電システム</li> </ul>	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"> <li>信頼性が重視される機器</li> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>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)</li> <li>新幹線・主要幹線の運行制御システム</li> </ul>	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	JAG型シリーズ JAJ型Nシリーズ JAK型Nシリーズ JHC型Nシリーズ KAB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 801型 802型
	3	<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>エアコン,カーナビ等の車室内搭載部品,車載用通信機器</li> <li>家庭用/ビル用等のセキュリティ管理システム</li> <li>工業用ロボットや工作機械等の制御機器</li> </ul>	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"> <li>最先端技術を積極的に適用する小型・薄型品</li> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>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</li> <li>デスクトップPC, ノートPC, ホームネットワーク</li> <li>アミューズメント機器(パチンコ,ゲーム機)</li> </ul>	251型Mシリーズ 281型Eシリーズ TCB型		JAE型, JAG型 JAJ型, JAK型 JHC型 KAB型 KAB Tシリーズ 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"> <li>- Apparatus in which advanced safety and reliability are demanded.</li> <li>- 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.</li> </ul>	<ul style="list-style-type: none"> <li>- Space development apparatus relation (Satellite, Rocket, Artificial Satellite)</li> <li>- Aviation and a defensive system</li> <li>- Atomic power, fire power, and a water-power generation system</li> </ul>	Type 267 P Series	Type 111 P series	With no relevance	With no relevance
In-vehicle Industrial apparatus	2	<ul style="list-style-type: none"> <li>- Apparatus in which reliability is important.</li> <li>- 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.</li> </ul>	<ul style="list-style-type: none"> <li>- Vehicles control of transport machines, such as a car, and a railroad, a vessel (Engine control, drive control, brake control)</li> <li>- The operation control system of the Shinkansen and a main artery</li> </ul>	Type 267 N Series Type 271 N Series Type 279 M Series	Type 111 N series Type 111 M series Type 112 M series Type 204 N series Type 247	Type JAG N series Type JAJ N series Type JAK N series Type JHC N series Type KAB N series Type KVA N series	Type 431 Type 431 A series Type 503 Type 553 Type 801 Type 802
	3	<ul style="list-style-type: none"> <li>- 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</li> </ul>	<ul style="list-style-type: none"> <li>- Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility</li> <li>- Security management system for home/buildings etc.</li> <li>- Control apparatus, such as Industrial use robots and a machine tool etc.</li> </ul>	Type 267 M Series Type 267 E Series Type 281 M Series Type TCA	Type 204 M series	Type KAB M series	
Apparatus in general	4	<ul style="list-style-type: none"> <li>- The small size and the thin article which applies leading-edge technology positively</li> <li>- 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.</li> </ul>	<ul style="list-style-type: none"> <li>- Smart phone, Mobile phone, Mobile PC (tablet), Electronic dictionary</li> <li>- Desktop PC, Notebook PC, Home network</li> <li>- Amusement apparatus (Pachinko, Game machine)</li> </ul>	Type 251M Series Type 281 E Series Type TCB		Type JAE, Type JAG Type JAJ, Type JAK Type JHC Type KAB Type KAB T series Type KVA	Type 503 A series

# テーピング数量・リール寸法 Taping Quantity And Carrier Tape Dimensions

## チップタンタルコンデンサ Chip Tantalum Capacitors

定格：251型Mシリーズ, TCB型  
Type : 251 M Series, TCB

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	P <sub>0</sub> (mm)	φD <sub>0</sub> (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
U	1.0×0.5	8.0±0.3	3.5±0.05	1.75±0.1	2.0±0.05	2.0±0.05	4.0±0.1	1.55±0.03	10,000	
M	1.6×0.8				4.0±0.1				4,000 / 3,000 <sup>*1</sup>	
S	2.0×1.25								1.5 <sup>+0.1</sup> <sub>0</sub>	3,000
A	3.2×1.6									

※1. 251型500規格及びTCB型50規格は3000個/リール  
Quantity per reel of Type 251 Specification Number 500 and Type TCB Specification Number 50 is 3000.

定格：267型Mシリーズ, 267型Eシリーズ, 267型Pシリーズ, 271Nシリーズ  
279型Mシリーズ, 281型Mシリーズ, 281型Eシリーズ  
Type : 267 M Series, 267 E Series, 267 P Series, 271 N Series  
279 M Series, 281 M Series, 281 E Series

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	P <sub>0</sub> (mm)	D <sub>0</sub> (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
A	3.2×1.6	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	φ1.5 <sup>+0.1</sup> <sub>0</sub>	2,000	9,000
B	3.5×2.8				8.0±0.1				8,000	
C3	6.0×3.2	12.0±0.3	5.5±0.05	1.5±0.1					500	
D3	7.3×4.4		5.7±0.05		2,500					
H	7.3×4.4		5.7±0.1		1,500					
E	7.3×5.8	5.5±0.05		1.75±0.05			2,000			

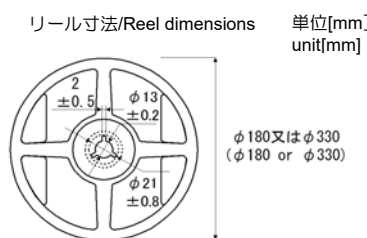
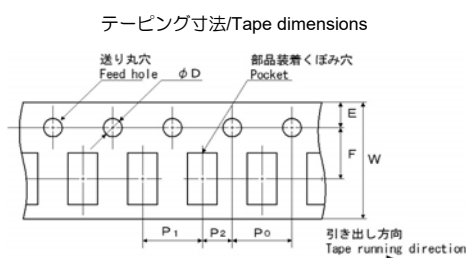
定格：267型Nシリーズ, TCA型  
Type : 267 N Series, TCA

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	P <sub>0</sub> (mm)	D <sub>0</sub> (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
A	3.2×1.6	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	φ1.5 <sup>+0.1</sup> <sub>0</sub>	2,000	9,000
B	3.5×2.8				8.0±0.1				8,000	
C	6.0×3.2	12.0±0.3	5.5±0.05	1.5±0.1					500	
D	7.3×4.4		5.7±0.05		2,500					

## 回路保護素子 Circuit Protection Components

定格：JAE型, JAG型, JAG型Nシリーズ, JAJ型, JAJ型Nシリーズ, JAK型, JAK型Nシリーズ, JHC型, JHC型Nシリーズ  
KAB型, KAB型Nシリーズ, KAB型Mシリーズ, KAB型Tシリーズ, KVA型, KVA型Nシリーズ  
Type : JAE, JAG, JAG N Series, JAJ, JAJ N Series, JAK, JAK N Series, JHC, JHC N Series  
KAB, KAB N Series, KAB M Series, KAB T Series, KVA, KVA N Series

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	P <sub>0</sub> (mm)	D <sub>0</sub> (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
29	1.6×0.8	8.0±0.3	3.5±0.05	1.75±0.05	4.0±0.1	2.0±0.05	4.0±0.1	φ1.55±0.03	5,000	-
31	2.0×1.25								-	
52	3.2×1.6			1.75±0.1	8.0±0.1				2,000	
44E	7.3×5.8								500	
59F	11.0×7.3	24±0.3	11.5±0.05	12.0±0.1	500					



チップタンタルコンデンサ テーピング形状記号  
Chip Tantalum Capacitors Tape code

φ180リール φ180Reel	φ330リール φ330Reel	極性 Anode notation
L	P	送り穴側 + Feed hole +
R	N	送り穴側 - Feed hole -