

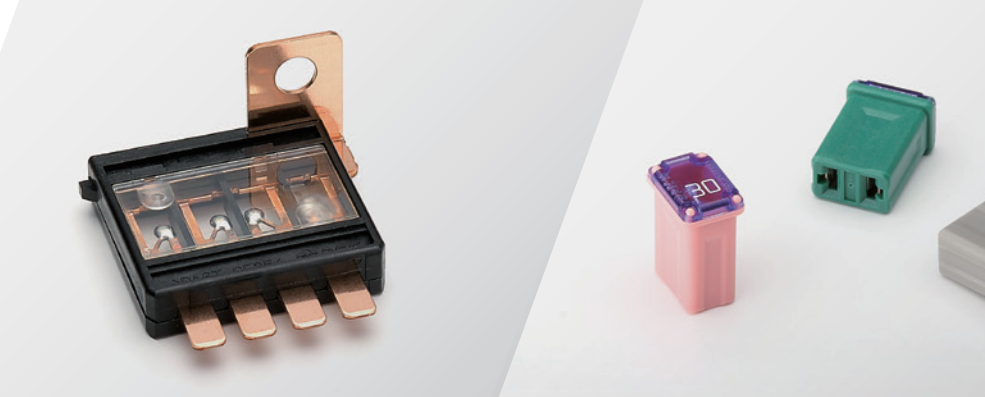


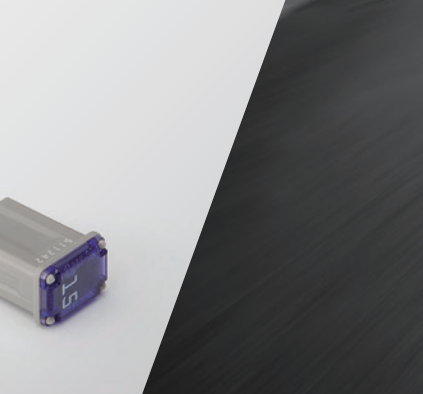
Automotive Fuse Catalogue



As a leading fuse maker, PEC will continue to deliver unrivaled quality and reliability through specialized technology.

The competitive automotive industry continues to introduce new products and technologies toward the creation of a safer, more comfortable automotive society. As one of the world's leading fuse makers, Pacific Engineering Corporation (PEC) is fully committed to achieving this goal. Fuses must be absolutely reliable as the last line of defense for electronic devices and electric wiring, which are increasingly being adopted in vehicles. PEC will continue to deliver original, high-quality products by leveraging its accumulated expertise and rigorous quality control. With an unwavering spirit, we will continue to pursue new challenges.





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Meeting the demands of the prevailing times through technology and innovative thinking in step with developments in the automotive industry

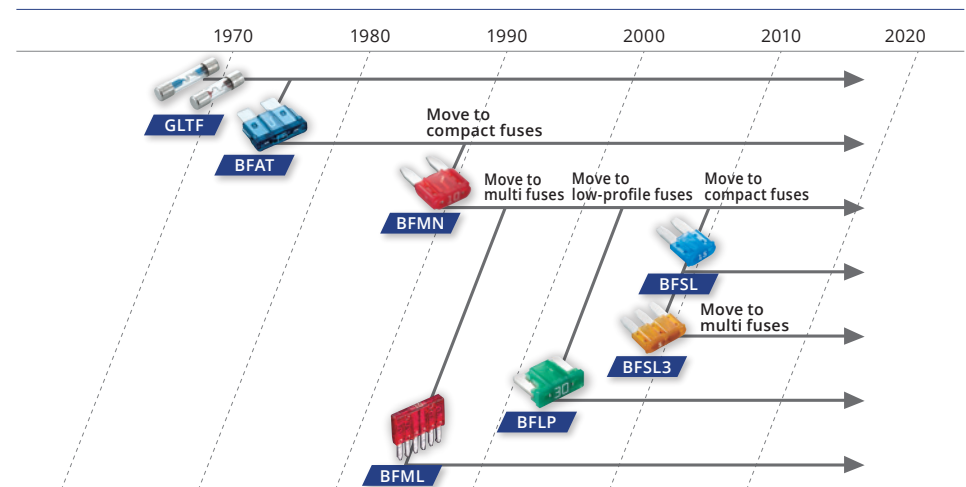
Fuses are an indispensable part of automobiles. The evolution in automobiles has propelled advances in fuses, while the invention of new fuses has conversely supported the development of new automobiles. Since PEC entered the fuse market in 1970, it has developed cutting-edge fuse products and contributed to the advancement of the automotive industry.

Blade Fuses

In 1960–70, automobiles were equipped with glass tube fuses, which were manufactured by hand at the time. PEC became the first company worldwide to successfully achieve automated mass production of such fuses in 1971, thus responding to the needs of various sectors including the automotive industry. Not long thereafter, in 1975, the company started production of blade fuses (auto fuses), which have become the most common type of automotive fuse in use today. Compared with glass tube fuses, blade fuses have a simpler structure and excel in terms of size (more compact), weight (lighter) and durability. PEC recognized the utility of blade fuses early on and has accumulated extensive manufacturing expertise for this product. Blade fuses have been successively adopted by automakers, leading to widespread usage. Prompted by automaker calls for products tailored to the growing complexity of automotive electronics and miniaturization of circuits, blade fuses went through a series of improvements that gave rise to multi fuses and more compact versions, and these are currently still utilized in a large number of automobiles.



Transformation of Blade Fuses

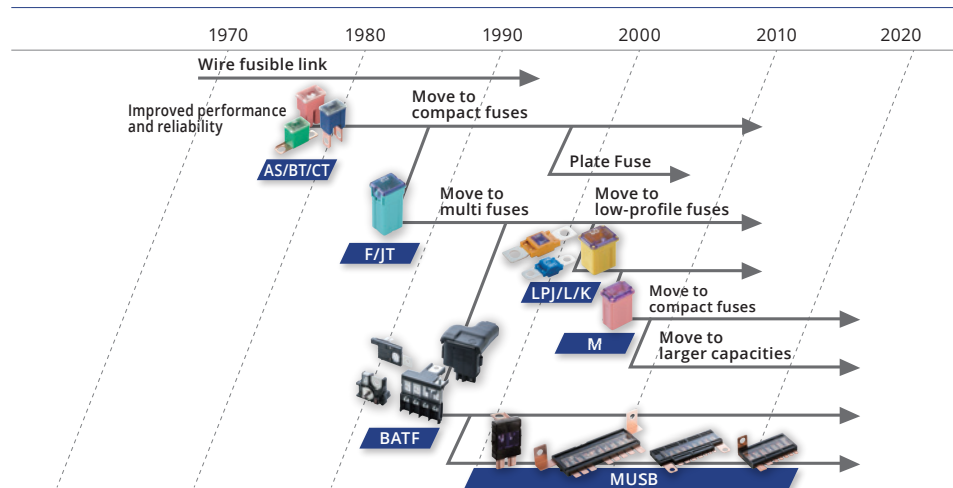


Slow blow fuses

Moving into the 1980s, automobiles continued to increasingly incorporate electronics, and the pursuit of enhanced driving comfort led to the introduction of various new functions such as power windows, automatic wipers and air conditioning. In conjunction with this trend, automobiles started featuring multiple motors. Auto fuses, which blow out immediately when their threshold capacity is exceeded, were unsuitable for motors because the latter generate a current that far exceeds their rated load when they are switched on. This meant a new type of fuse was needed. In response, PEC developed slow blow fuses that delayed the temperature rise accompanying high currents and therefore did not blow out immediately. The company started sales of slow blow fuses in 1982. The product was well received by the market and came to be used worldwide. From the 2000s, PEC expanded its product portfolio with multi slow blow fuses, which protect multiple circuits, to accommodate the growing complexity of electronic control systems used in automobiles.



Transformation of Slow Blow Fuses

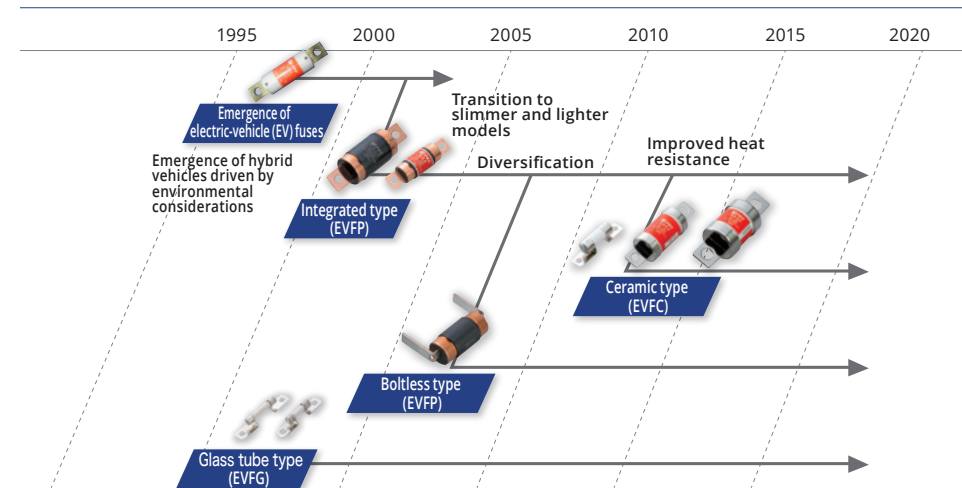


Electric vehicle fuses

From the late 1990s, automakers around the world started exploring the production of environmentally friendly vehicles. The most promising strategy at the time appeared to be the use of electricity as a power source for driving. Automakers thus ramped up development of hybrid vehicles, which combined conventional engines with electric motors, and electric vehicles (EVs). However, the resulting next-generation vehicles required an entirely new type of fuse. Electric-powered driving needs much higher voltages for on-board electronics, which conventional fuses could not withstand. In addition to blown fuses, another problem was that the high voltage could also give rise to an arc discharge phenomenon that would result in the destruction of circuits. To resolve these issues, PEC developed dedicated EV fuses for hybrid cars in 1997. The new fuses were adopted in the first hybrid vehicle that year and by various automakers later. To this day, they continue to be used by virtually all automakers around the world in a wide range of applications, and they have also been adopted in F1 and other racing vehicles.



Transformation of High-voltage Fuses



Ampere Ratings and Housing Color



In fuses, the ampere rating and the type of fuse are indicated by the color of the fuse housing. Please refer to the diagram below for ampere ratings and housing colors.

BF [Ampere Ratings - Housing Colors]



SBF [Ampere Ratings - Housing Colors]



International Standards

International Standard Part

In Japan, standards for automotive fuses are deliberated on by the Fuse Subcommittee of the Society of Automotive Engineers of Japan, and are published in JASO standards. These standards then undergo a consultation process with representatives of various countries, and are harmonized internationally as ISO standards.

*Standard International Products

RoHS

The RoHS* Directive, an EU environmental regulation, prohibits from products specific substances such as lead and mercury, in order to reduce the environmental burden from the disposal of electric and electronic devices.

*Restriction of Hazardous Substances

UL Standard

The UL standard is the safety standard established by UL (Underwriters Laboratories Inc.), a U.S. non-profit organization. To meet the UL standard, electric products, parts, and materials must pass a safety test.

ELV

The ELV Directive, or end-of-life vehicle directive, is an EU set of environmental restrictions aimed at reducing the environmental burden of cars when they are being disposed of by reducing automotive waste and end-of-life vehicles. Under this regulation, automobile manufacturers are required to assume the costs for the recovery and recycling of car-related waste.

*End of Life Vehicle

Meeting the needs of hybrid and electric cars.
High Voltage automotive fuses for next generation vehicles

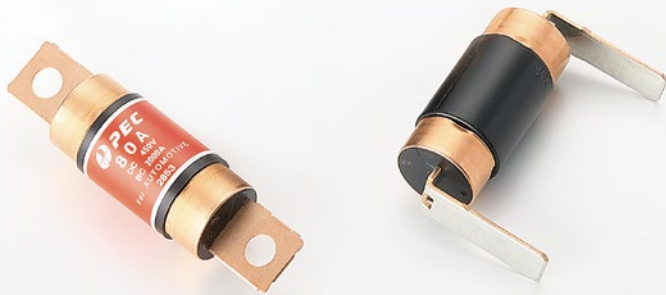


High Voltage Fuse

EVF

EVFP($\phi 20$)

Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

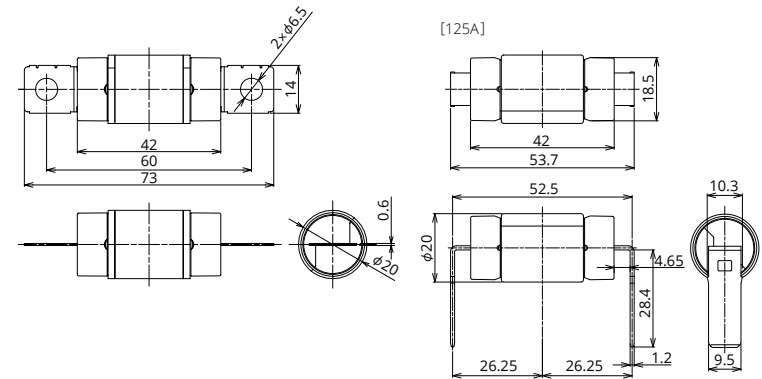


General Specification

Rated Voltage	DC450V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~85°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	140
Insertion Force	—
Pull-out Load	—
Recommended Torque	(7.2±2.2)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
60	2851	M6	$\phi 20$	1.30 m Ω	43.5 mV
70	2855			1.10 m Ω	40.8 mV
80	2853			0.90 m Ω	38.5 mV
100	2854			0.75 m Ω	40.5 mV
125	2826			0.63 m Ω	41.5 mV

*1 Voltage drop: apply 50% of the rated current.

*In case a product other than the ones published in this document is desired, please contact us for details.

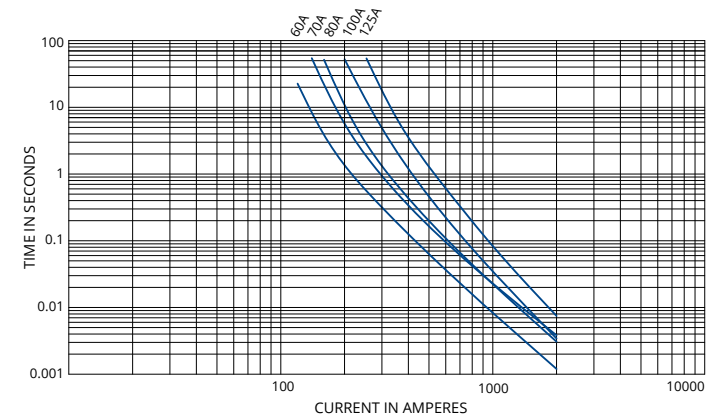
*There is also plug-in type fuse. Please contact us for details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5 sec.	100 sec.
300%	0.5 sec.	15 sec.
500%	—	1 sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFP($\phi 30$)

Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

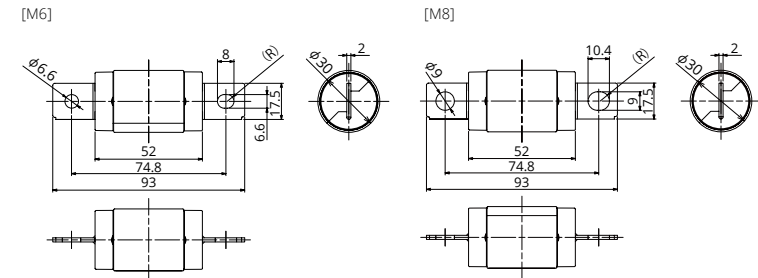


General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~85°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	80
Insertion Force	—
Pull-out Load	—
Recommended Torque	M6(6.0±1.0)N·m M8(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
150	2940	M6	$\phi 30$	0.52 m Ω	44.3 mV
175	2941			0.43 m Ω	43.8 mV
200	2942			0.37 m Ω	44.0 mV
225	2943			0.33 m Ω	43.2 mV
250	2944			0.31 m Ω	44.0 mV
300	2945			0.25 m Ω	46.0 mV
150	2950	M8	$\phi 30$	0.52 m Ω	44.3 mV
175	2951			0.43 m Ω	43.8 mV
200	2952			0.37 m Ω	44.0 mV
225	2953			0.33 m Ω	43.2 mV
250	2954			0.31 m Ω	44.0 mV
300	2955			0.25 m Ω	46.0 mV

*1 Voltage drop: apply 50% of the rated current.

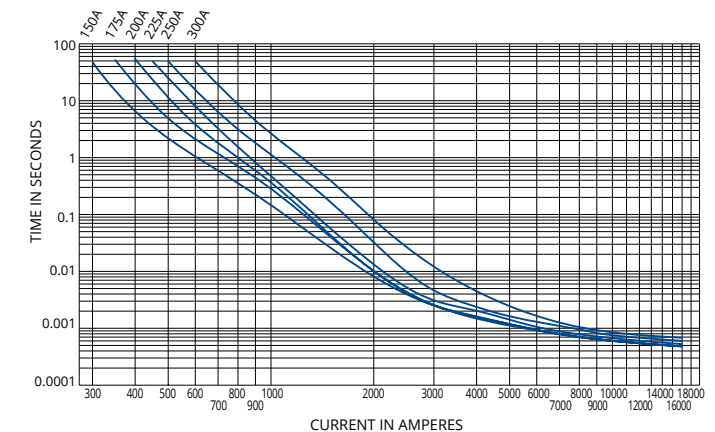
*In case a product other than the ones published in this document is desired, please contact us for details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFP($\phi 38$)

Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

EVF

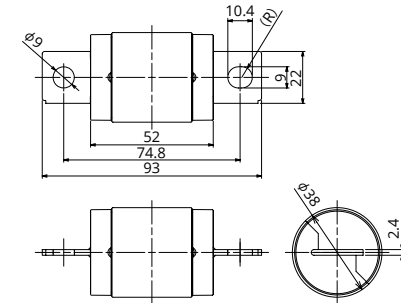


General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~85°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	40
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
350	2976	M8	$\phi 38$	Coming up	Coming up
400	2977				
450	2978				
500	2979				

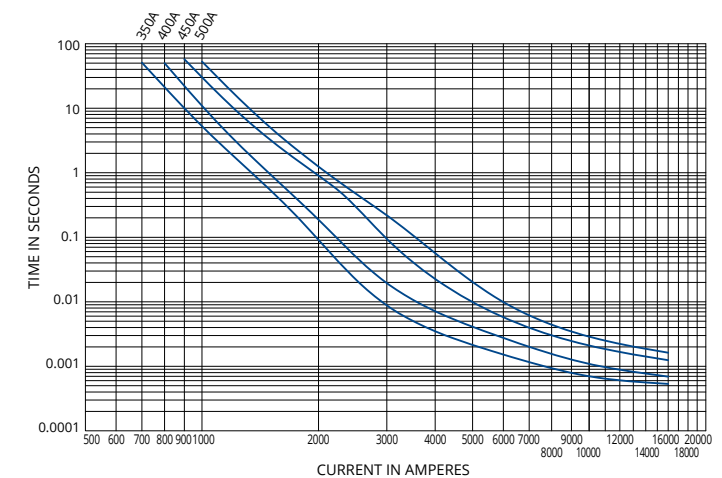
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFP(φ38) Tin plating

Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

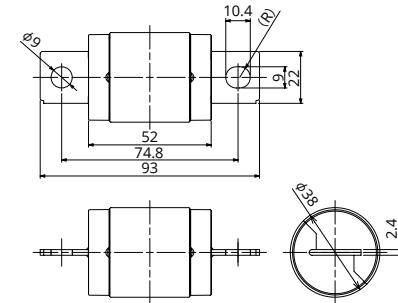


General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~85°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	40
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
350	2986	M8	φ38	Coming up	Coming up
400	2987				
450	2988				
500	2989				

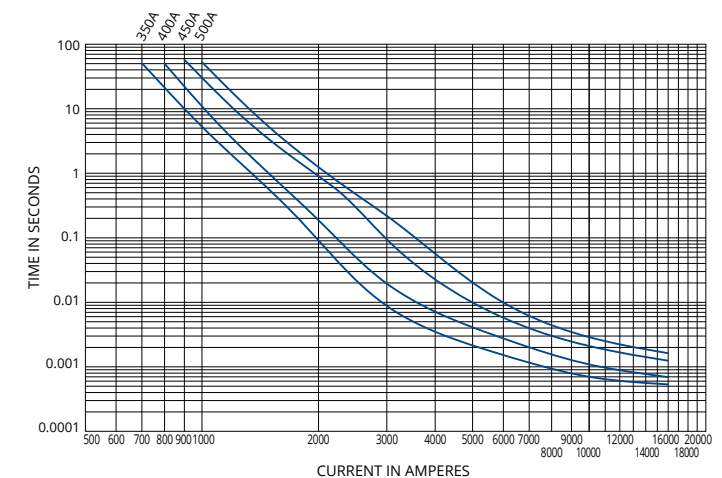
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFP(38×64)

Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

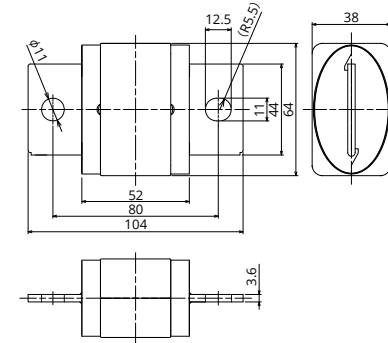


General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	32
Insertion Force	—
Pull-out Load	—
Recommended Torque	(16.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
500	2975	M10	—	Coming up	Coming up
600	2970				
700	2971				
800	2972				
900	2973				
1000	2974				

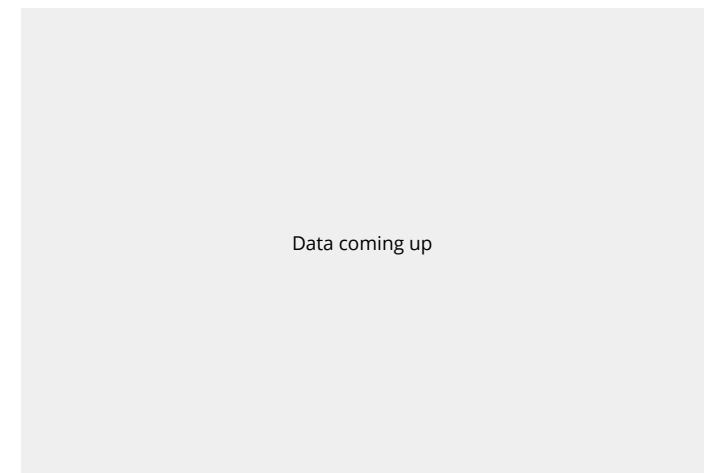
*In case a product other than the ones published in the document is desired, please contact us.
 *SOP planned for March 2019. Please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFC($\phi 20$)

High Voltage automotive fuses with excellent durability properties

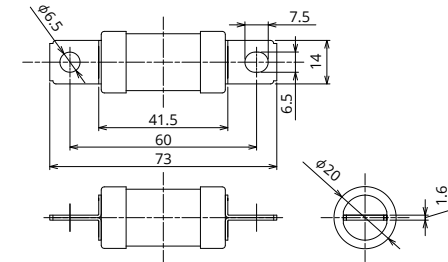


General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~125°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	140
Insertion Force	—
Pull-out Load	—
Recommended Torque	(9.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
60	under development	M6	φ20	under development	under development
70					
80					
100					
125					

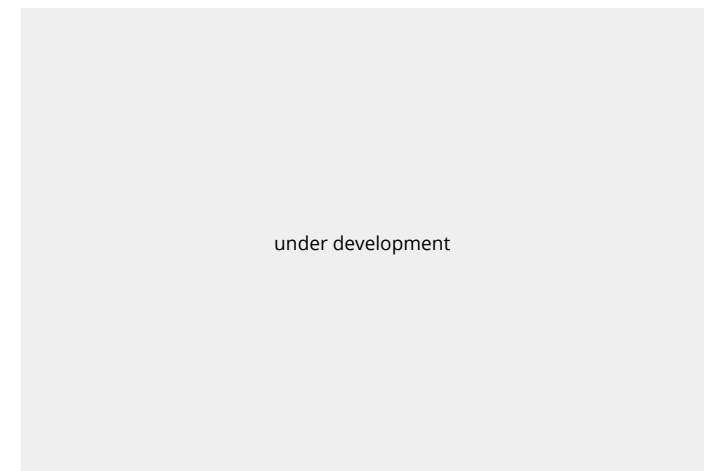
*This product is under development, so please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
135%	150sec.	3600sec.
150%	20sec.	1000sec.
200%	8sec.	150sec.
300%	1sec.	15sec.
500%	0.05sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFC($\phi 30$)

High Voltage automotive fuses with excellent durability properties

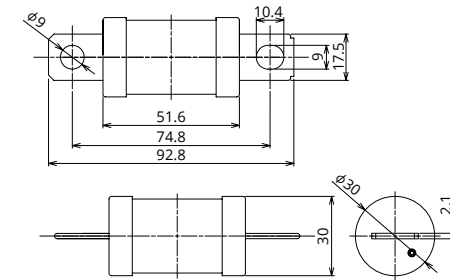


General Specification

Rated Voltage	DC450V
Breaking Capacity	6000A
Recommended Operating Temp.	-40°C~125°C*2
Standard	—
Country of Origin	Japan
Plating	Ni Plating
Standard Packaging	80
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
150	2870	M8	$\phi 30$	0.67 m Ω	160 mV
175	2871			0.56 m Ω	170 mV
200	2872			0.47 m Ω	170 mV
225	2873			0.40 m Ω	170 mV
250	2874			0.35 m Ω	180 mV

*1 Voltage drop: apply 100% of the rated current.

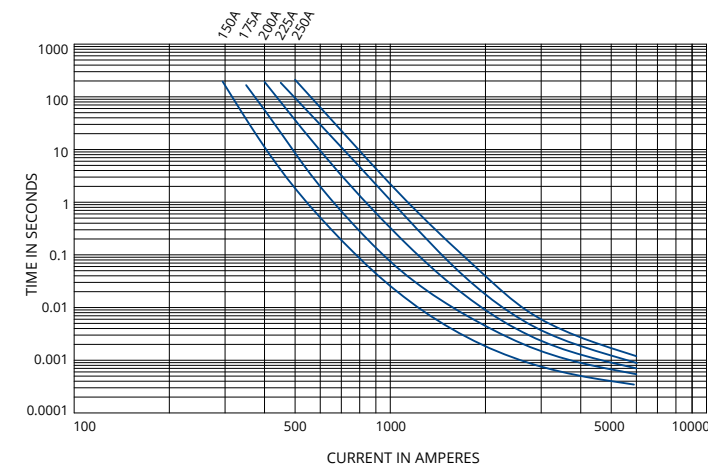
*In case a product other than the ones published in this document is desired, please contact us for details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	1sec.	300sec.
300%	0.2sec.	30sec.
500%	0.05sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFC($\phi 38$)

High Voltage automotive fuses with excellent durability properties

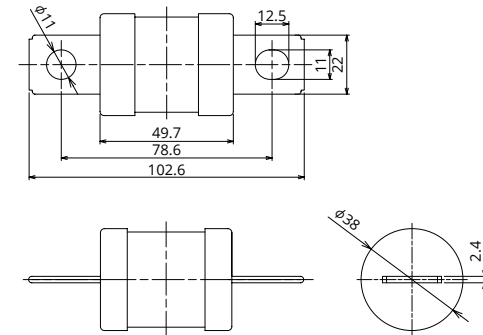


General Specification

Rated Voltage	DC450V
Breaking Capacity	6000A
Recommended Operating Temp.	-40°C~125°C*2
Standard	—
Country of Origin	Japan
Plating	Ni Plating
Standard Packaging	40
Insertion Force	—
Pull-out Load	—
Recommended Torque	(16.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
300	2876	M10	$\phi 38$	0.255 m Ω	125 mV
350	2877			0.195 m Ω	135 mV
400	2878			0.175 m Ω	150 mV

*1 Voltage drop: apply 100% of the rated current.

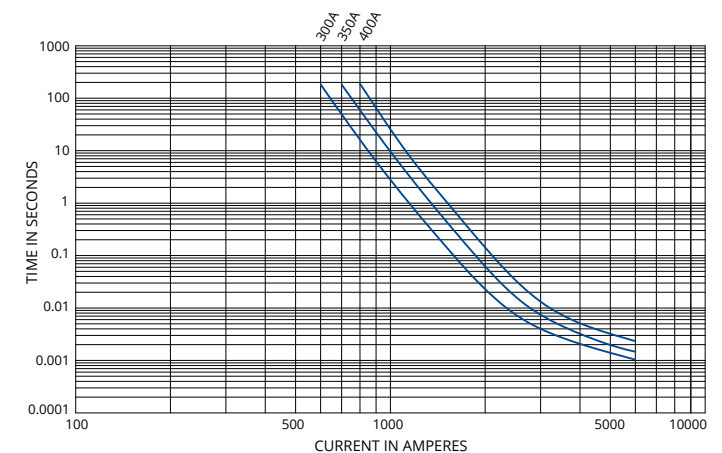
*In case a product other than the ones published in this document is desired, please contact us for details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	1sec.	300sec.
300%	0.2sec.	30sec.
500%	0.05sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFC($\phi 6.7$)

Fuses to protect auxiliary system circuits such as electric compressors and DC/DC converters

EVF

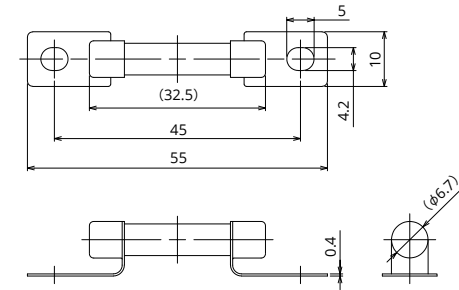


General Specification

Rated Voltage	DC450V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	China
Plating	Ni Plating
Standard Packaging	400
Insertion Force	—
Pull-out Load	—
Recommended Torque	(2.1±0.2)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
1	2704	M4	$\phi 6.7$	645.0 m Ω	Coming up
5	2705			43.0 m Ω	

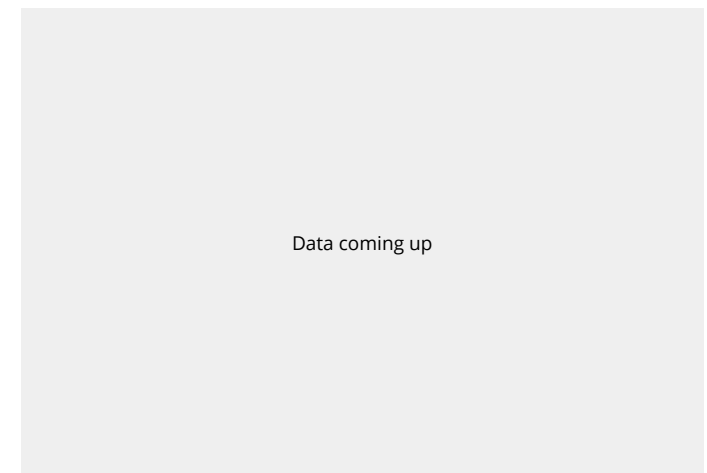
*In case a product other than the ones published in the document is desired, please contact us.
*This product is under development, so please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
350%	—	0.5sec.
600%	—	0.2sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFG($\phi 7.2$)

Fuses to protect auxiliary system circuits such as electric compressors and DC/DC converters

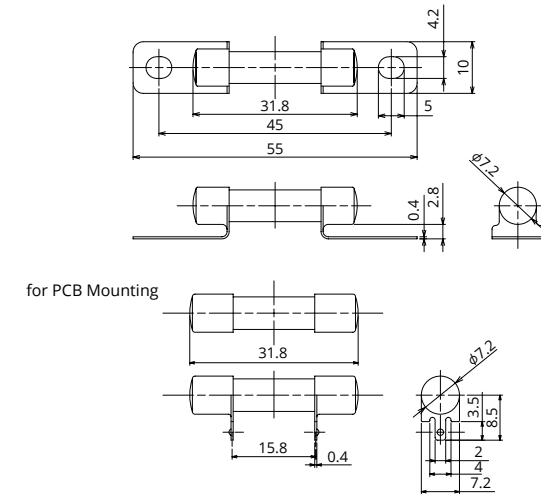


General Specification

Rated Voltage	DC450V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan/Thailand
Plating	Ni Plating
Standard Packaging	300
Insertion Force	—
Pull-out Load	—
Recommended Torque	(2.1±0.2)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
10	2754	M4	$\phi 7.2$	Coming up	Coming up
15	2729			6.3 m Ω	52 mV
20	2759			3.9 m Ω	41 mV
30	2737			2.5 m Ω	41 mV
30	2728			for PCB Mounting	Coming up

*1 Voltage drop: apply 50% of the rated current.

*In case a product other than the ones published in the document is desired, please contact us.

*PCB-mount type is under development, so please contact us for the details.

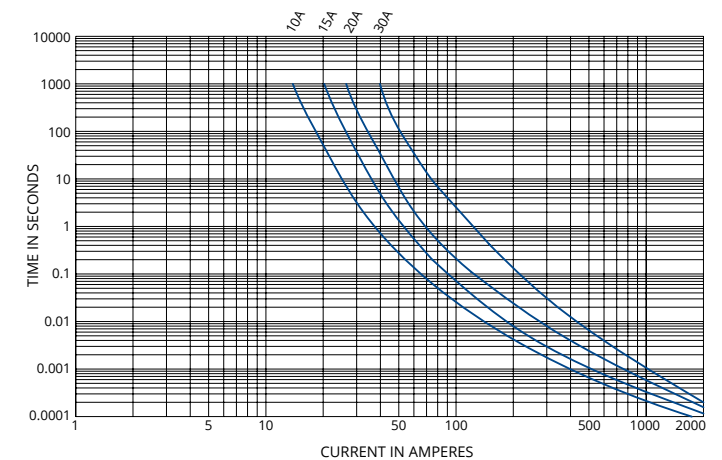
Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
135%	300sec.	3600sec.
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.
600%	— (0.05sec.)	— (1sec.)

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*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



EVFG($\phi 10.3$)

Fuses to protect auxiliary system circuits such as electric compressors and DC/DC converters

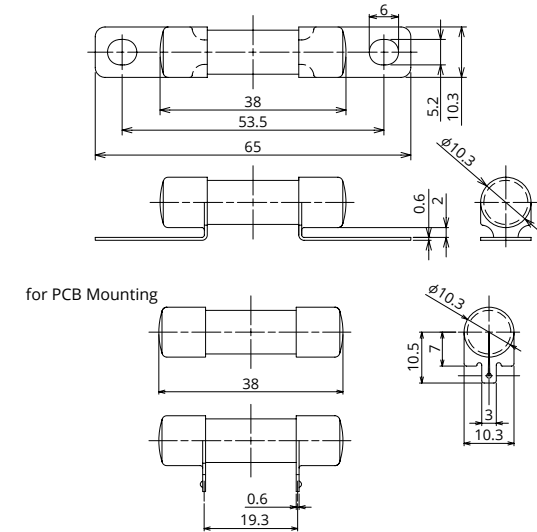


General Specification

Rated Voltage	DC450V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan/Thailand
Plating	Ni Plating
Standard Packaging	200
Insertion Force	—
Pull-out Load	—
Recommended Torque	(4.5±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
15	2744	M5	$\phi 10.3$	7.4 m Ω	63 mV
20	2743			4.2 m Ω	47 mV
30	2742			2.8 m Ω	47 mV
40	2748			2.1 m Ω	48 mV
50	2749			1.6 m Ω	48 mV
40	2645			for PCB Mounting	—

*1 Voltage drop: apply 50% of the rated current.

*In case a product other than the ones published in the document is desired, please contact us.

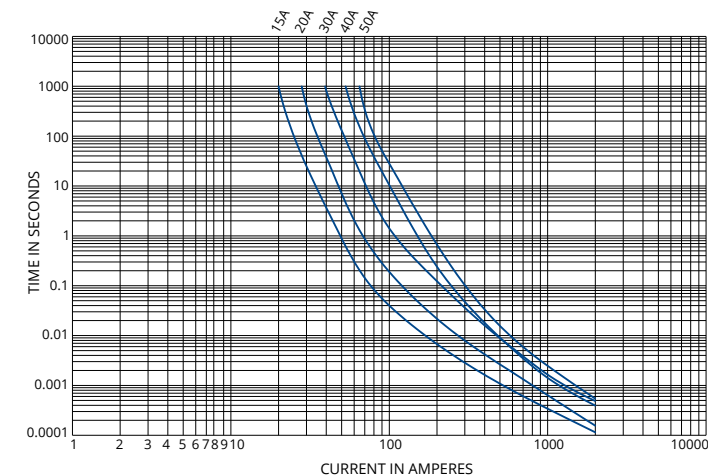
*PCB-mount type is under development, so please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
135%	300sec.	3600sec.
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Automotive fuses that are most used
by the automotive manufacturers in the world



Blade Fuse

BF

BFSL

This state-of-the-art blade fuse was realized by reducing the width of the BFMN to offer space reduction

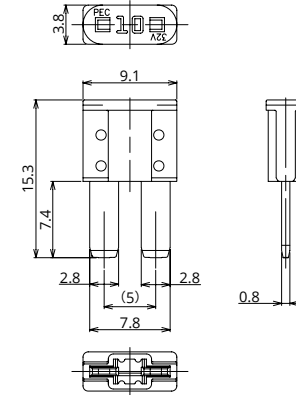


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	18,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
3	1168	Violet	Coming up	Coming up
4	1169	Pink	Coming up	Coming up
5	1173	Tan	17.3 mΩ	117 mV
7.5	1174	Brown	10.7 mΩ	109 mV
10	1175	Red	7.85 mΩ	104 mV
15	1176	Blue	5.05 mΩ	100 mV
20	1177	Yellow	3.65 mΩ	95 mV
25	1178	Natural	2.75 mΩ	88 mV
30	1179	Green	2.18 mΩ	82 mV

※1 Voltage drop: apply 100% of the rated current.

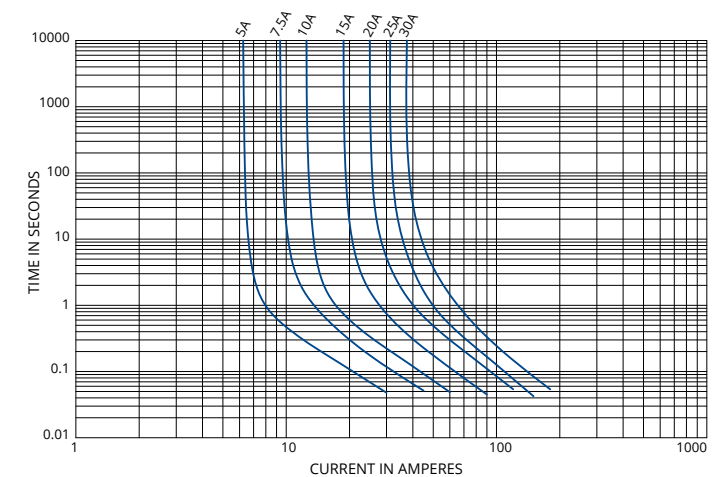
*Adjusting the specification for 3A and 4A. Please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	120sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFSL-3

BFSL-3 is a multi terminal state-of-the-art blade fuse

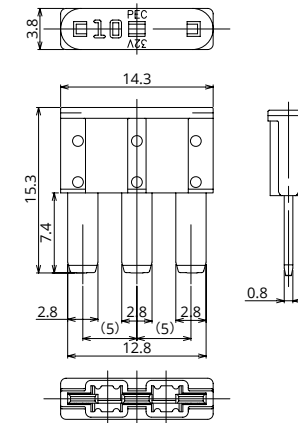


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
5	1183	Tan	16.9 mΩ	110 mV
7.5	1184	Brown	10.6 mΩ	104 mV
10	1185	Red	7.94 mΩ	104 mV
15	1186	Blue	5.07 mΩ	97 mV

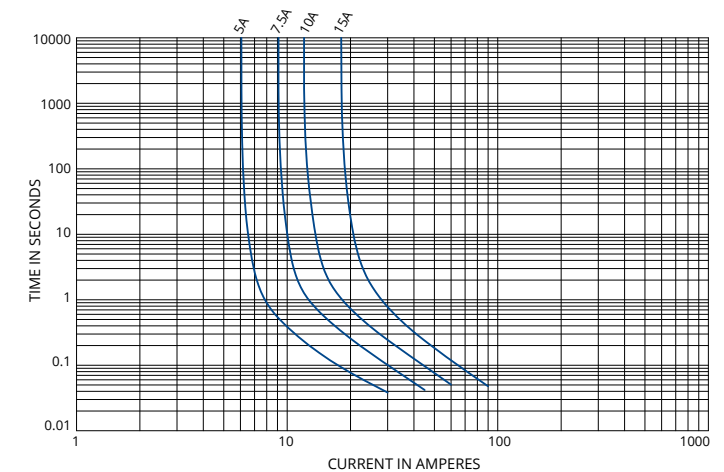
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	120sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFLP

BFLP is a lower-cost and more compact BFMN

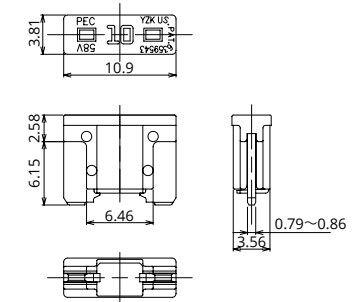


General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-9
Country of Origin	Japan/Mexico
Plating	Ag Plating
Standard Packaging	20,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
2	1190	Gray	46.6 mΩ	126 mV
3	1191	Violet	33.7 mΩ	137 mV
4	1192	Pink	20.6 mΩ	109 mV
5	1193	Tan	16.5 mΩ	115 mV
7.5	1194	Brown	10.2 mΩ	105 mV
10	1195	Red	7.38 mΩ	104 mV
15	1196	Blue	4.55 mΩ	97 mV
20	1197	Yellow	3.25 mΩ	94 mV
25	1198	Natural	2.50 mΩ	93 mV
30	1199	Green	1.94 mΩ	88 mV

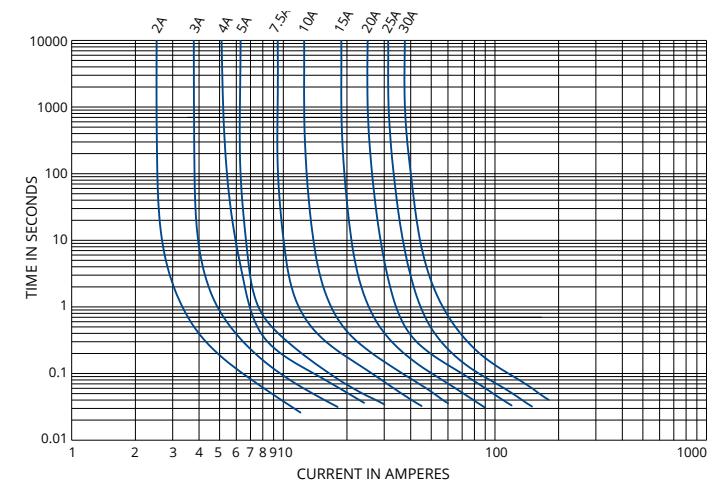
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFMN

BFMN is a lower-cost and more compact BFAT

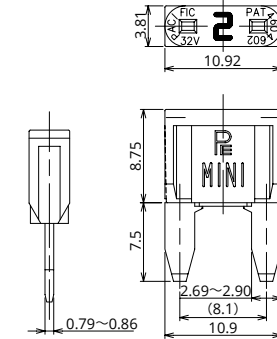


General Specification












Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
1	1281	Black 	121 mΩ	175 mV
2	1202	Gray 	49.7 mΩ	140 mV
3	1203	Violet 	29.6 mΩ	140 mV
4	1204	Pink 	23.8 mΩ	136 mV
5	1205	Tan 	16.7 mΩ	112 mV
7.5	1207	Brown 	11.1 mΩ	112 mV
10	1210	Red 	7.82 mΩ	106 mV
15	1215	Blue 	4.93 mΩ	99 mV
20	1220	Yellow 	3.48 mΩ	95 mV
25	1225	Natural 	2.58 mΩ	92 mV
30	1230	Green 	2.12 mΩ	86 mV

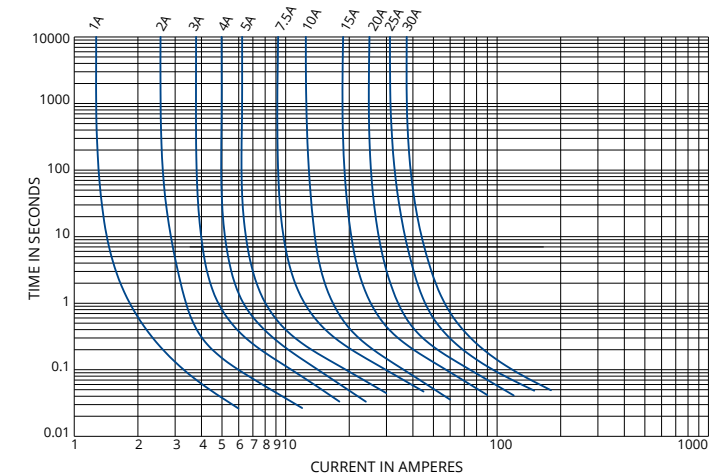
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFMN-S

The BFMN-S is a blade fuse with the housing at the same level of UL standard V-0

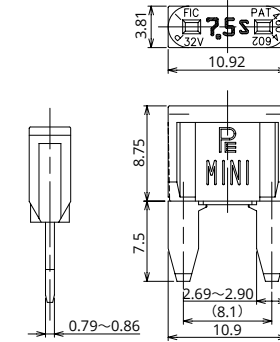


General Specification





Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
5	1271	Tan 	16.7 mΩ	112 mV
7.5	1272	Brown 	11.1 mΩ	112 mV
10	1273	Red 	7.82 mΩ	106 mV
15	1274	Blue 	4.93 mΩ	99 mV

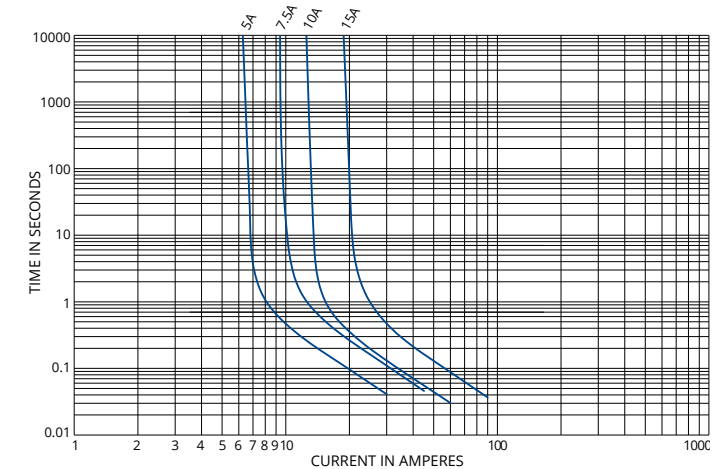
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

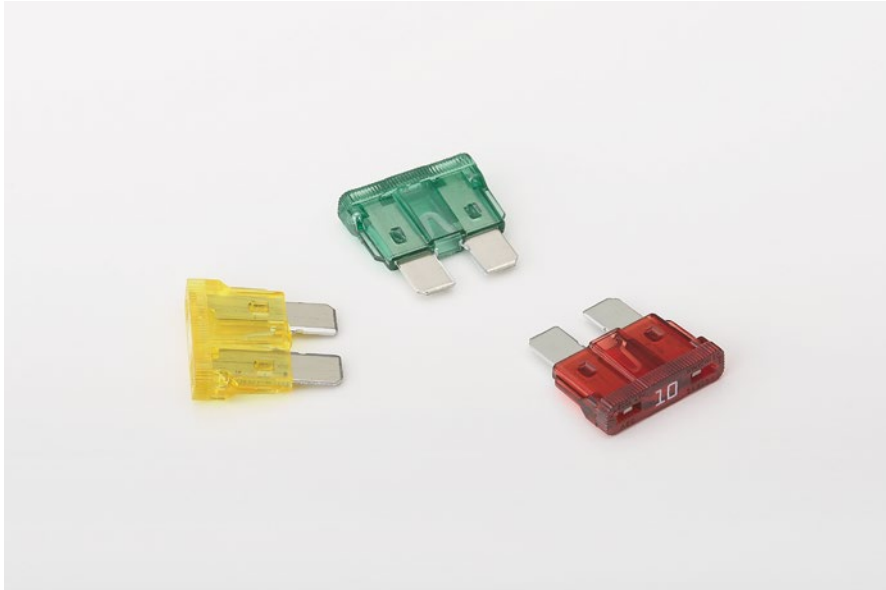
*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFAT-D

The BFAT is a blade fuse that has spread extensively in non-automotive applications

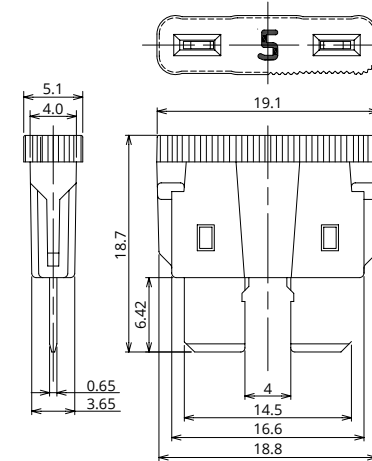


General Specification














Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Sn Plating
Standard Packaging	12,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
1	1039	Black 	156 mΩ	225 mV
2	1021	Gray 	55.6 mΩ	175 mV
3	1022	Violet 	31.7 mΩ	133 mV
4	1023	Pink 	22.7 mΩ	128 mV
5	1041	Tan 	17.5 mΩ	121 mV
7.5	1042	Brown 	11.0 mΩ	112 mV
10	1043	Red 	8.12 mΩ	116 mV
15	1044	Blue 	5.08 mΩ	105 mV
20	1026	Yellow 	3.58 mΩ	99 mV
25	1027	Natural 	2.76 mΩ	96 mV
30	1028	Green 	2.20 mΩ	92 mV
35	1029	Dark Green 	1.76 mΩ	91 mV
40	1048	Orange 	1.48 mΩ	95 mV

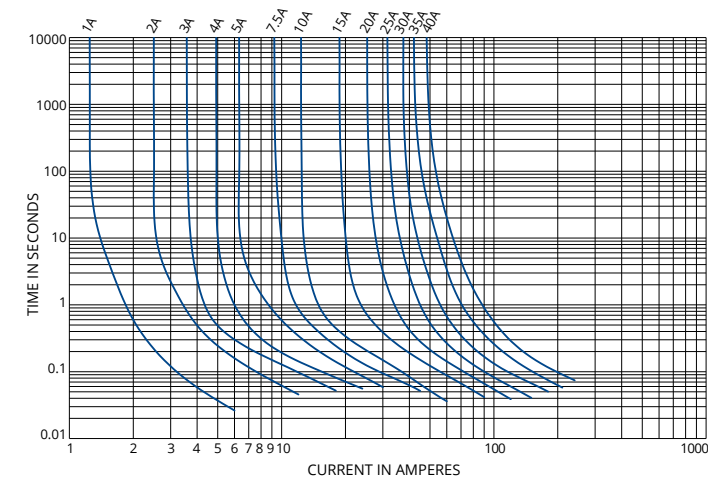
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFAT-S

The BFAT-S is a BFAT with Ag plated terminals

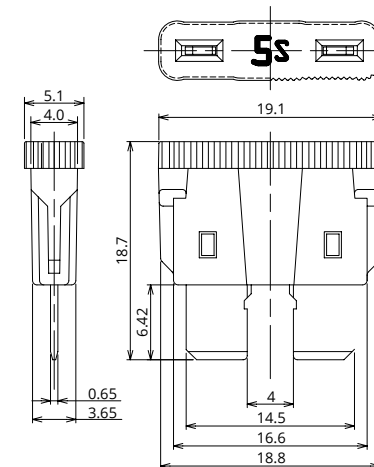


General Specification









Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	12,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
5	1131	Tan 	17.5 mΩ	121 mV
7.5	1132	Brown 	11.0 mΩ	112 mV
10	1133	Red 	8.12 mΩ	116 mV
15	1134	Blue 	5.08 mΩ	105 mV
20	1135	Yellow 	3.58 mΩ	99 mV
25	1136	Natural 	2.76 mΩ	96 mV
30	1137	Green 	2.20 mΩ	92 mV
40	1138	Orange 	1.48 mΩ	95 mV

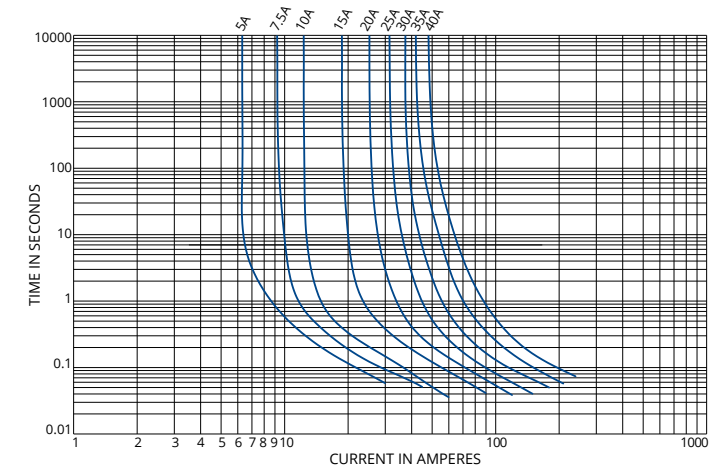
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

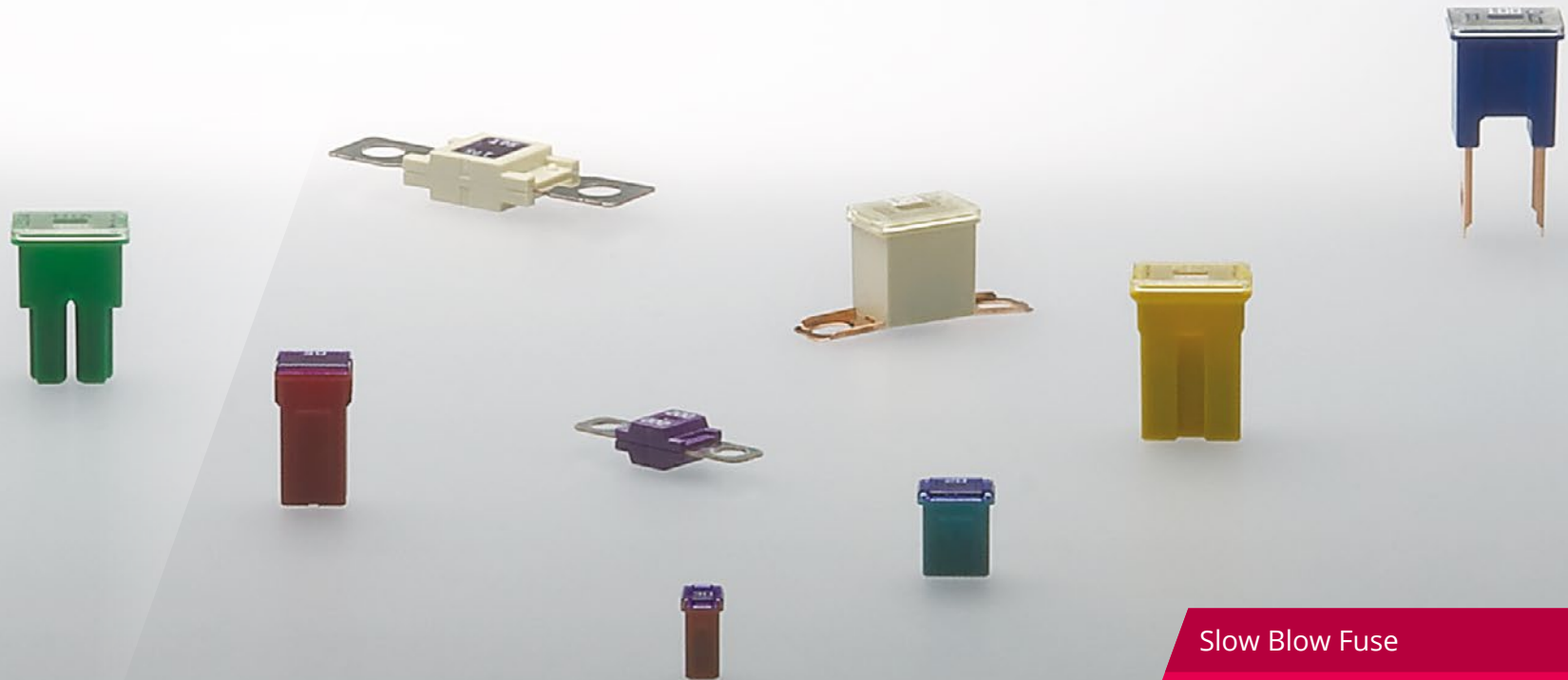
% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



The safety and reliability of the fuses have dramatically increased and therefore their demand has expanded



Slow Blow Fuse

SBF

SBFC-M

The SBFC-M is a more compact and more lightweight SBFC-LPJ fuse. It is the world's smallest and lightest SBF

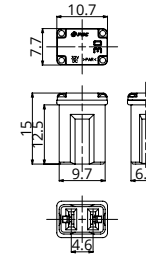


General Specification

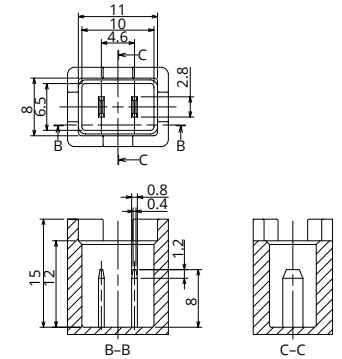
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	JASO D612-4
Country of Origin	Japan/Mexico
Plating	Sn Plating
Standard Packaging	4,000
Insertion Force	44.1N
Pull-out Load	4N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
15	3113	Gray	5.3 mΩ	97 mV
20	3123	Light Blue	4.0 mΩ	94 mV
25	3173	White	3.1 mΩ	93 mV
30	3133	Pink	2.6 mΩ	92 mV
40	3143	Green	2.1 mΩ	98 mV

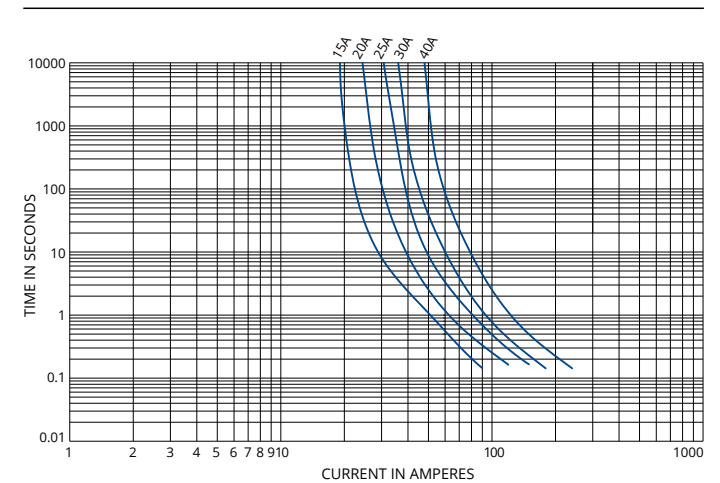
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFC-MS

High-amperage SBFC-M

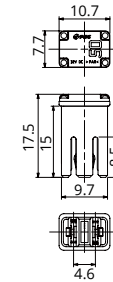


General Specification

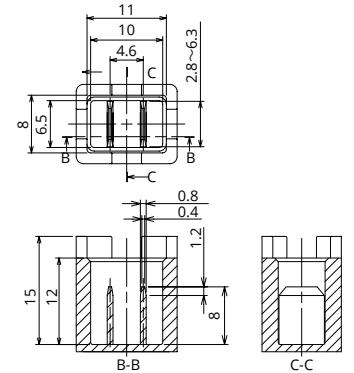
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	4,000
Insertion Force	44.1N
Pull-out Load	4N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
15	3125	Gray	Coming up	Coming up
20	3145	Light Blue		93.2 mV
25	3155	White		92.6 mV
30	3165	Pink		79.6 mV
40	3175	Green		75.8 mV
50	3185	Red		83.7 mV
60	3195	Yellow		70.5 mV

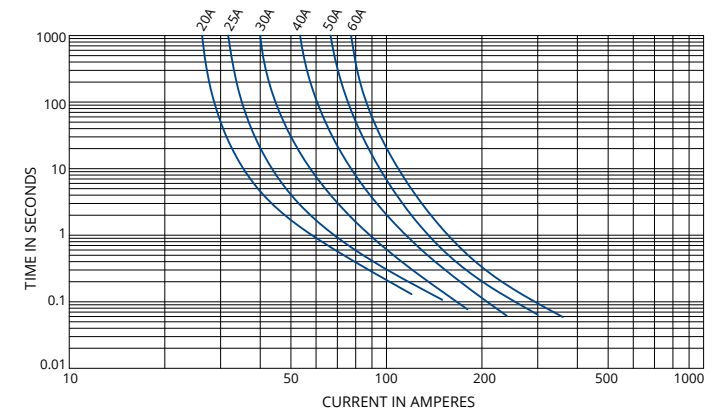
*1 Voltage drop: apply 100% of the rated current.
 *For the details of 15A, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	2sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFC-LPJ

The SBFC-LPJ is a more compact and more lightweight SBFC-JT

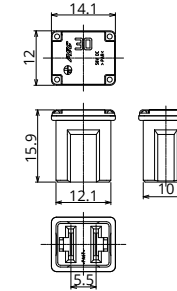


General Specification

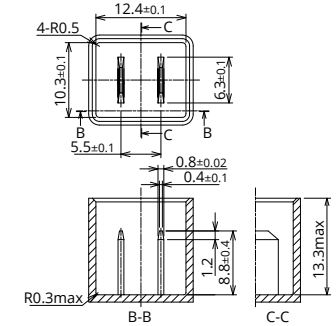
Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Japan/Mexico
Plating	—
Standard Packaging	2,000
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
20	3422	Light Blue	4.3 mΩ	103 mV
25	3472	White	3.5 mΩ	106 mV
30	3432	Pink	3 mΩ	103 mV
40	3442	Green	1.9 mΩ	92 mV
50	3452	Red	1.5 mΩ	92 mV
60	3462	Yellow	1.2 mΩ	93 mV

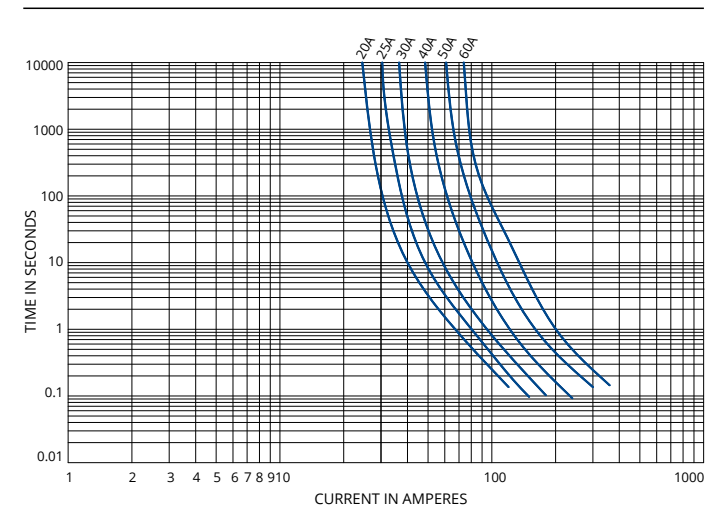
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFC-JT

Low-amperage plug-in type fuse

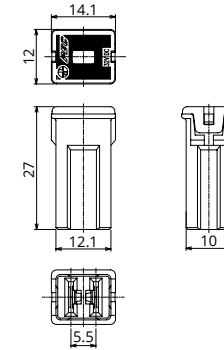


General Specification

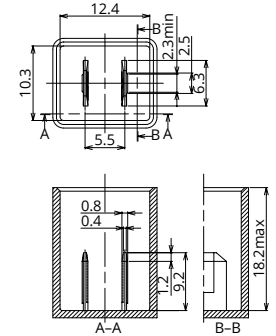
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Japan/Mexico
Plating	—
Standard Packaging	3,000
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
20	3424	Light Blue	4.8 mΩ	113 mV
25	3474	White	3.7 mΩ	105 mV
30	3434	Pink	3.1 mΩ	106 mV
40	3444	Green	2.0 mΩ	92 mV
50	3454	Red	1.7 mΩ	92 mV
60	3464	Yellow	1.2 mΩ	93 mV

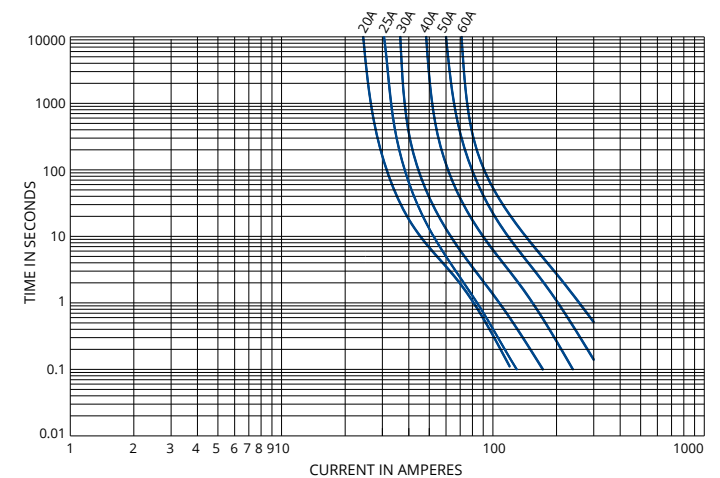
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFC-ET

High-amperage plug-in type fuse

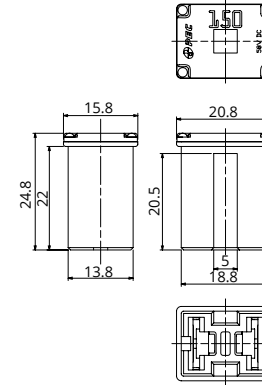


General Specification

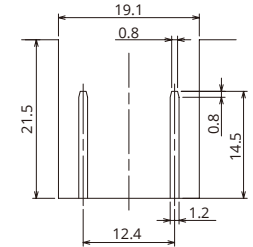
Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	500
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
50	3340	Red	1.23 mΩ	84.4 mV
60	3350	Yellow	0.99 mΩ	91.2 mV
70	3360	Brown	0.95 mΩ	84.2 mV
80	3370	Black	0.88 mΩ	84.2 mV
100	3380	Blue	0.72 mΩ	86.5 mV
125	3390	Pink	0.56 mΩ	97.9 mV
150	3400	Gray	0.52 mΩ	107.1 mV

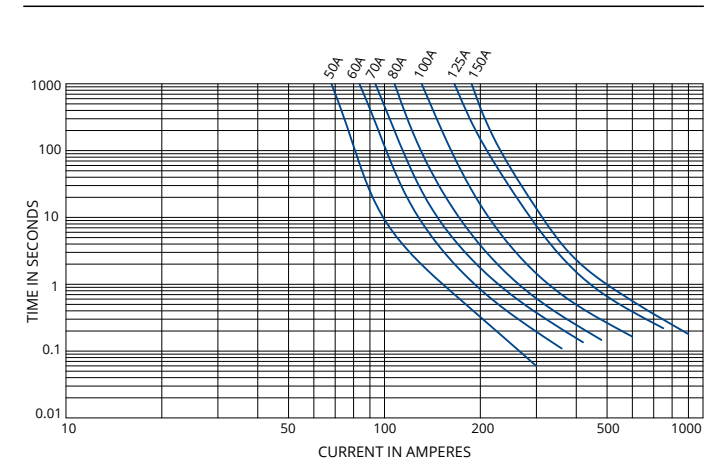
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
150%	30sec.	3600sec.
200%	5sec.	100sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFW-L M5

M5 bolt type

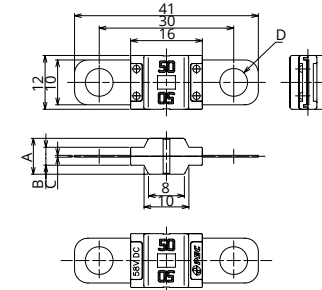


General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5*3
Country of Origin	Japan
Plating	Sn Plating
Standard Packaging	2,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(4.5±1.0)N·m

*2 Please contact us for the details of operating temperature.
*3 Except for the breaking capacity

Dimensions



CURRENT RATING		DIMENSION			
		A	B	C	D
30A~80A	M5 TYPE	8	4	0.4	5.4
100A~200A	M5 TYPE	8.24	4.24	0.64	5.4

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3139	Orange	2.11 mΩ	86 mV
40	3149	Green	1.40 mΩ	77 mV
50	3159	Red	1.18 mΩ	73 mV
60	3169	Yellow	0.89 mΩ	71 mV
70	3179	Brown	0.72 mΩ	66 mV
80	3189	White	0.47 mΩ	51 mV
100	3107	Blue	0.41 mΩ	58 mV
125	3117	Pink	0.35 mΩ	59 mV

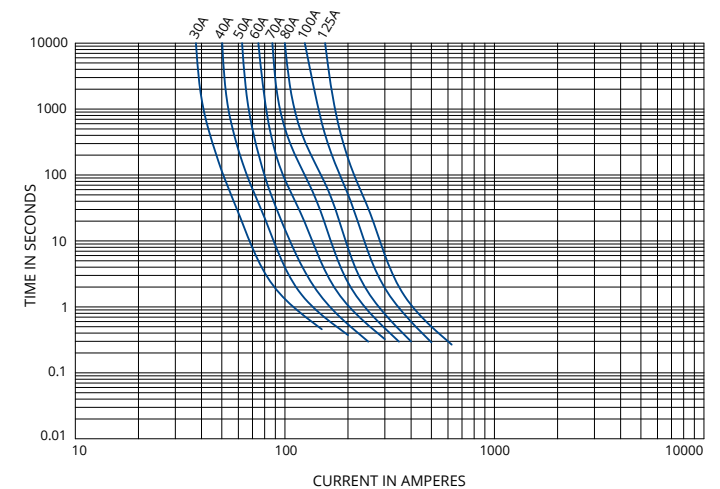
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
110%	4hrs.	—
150%	90sec.	3600sec.
200%	3sec.	100sec.
300%	0.3sec.	3sec.
500%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFW-L M6

M6 bolt type

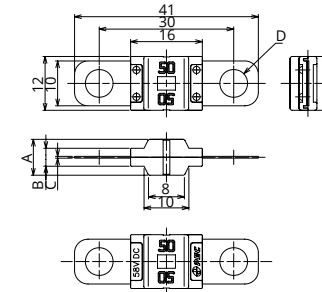


General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5*3
Country of Origin	Japan
Plating	Sn Plating
Standard Packaging	2,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(6.0±1.0)N·m

*2 Please contact us for the details of operating temperature.
*3 Except for the breaking capacity

Dimensions



CURRENT RATING		DIMENSION			
		A	B	C	D
30A~80A	M6 TYPE	8	4	0.4	6.2
100A~200A	M6 TYPE	8.24	4.24	0.64	6.2

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3338	Orange	2.11 mΩ	86 mV
40	3348	Green	1.40 mΩ	77 mV
50	3358	Red	1.18 mΩ	73 mV
60	3368	Yellow	0.89 mΩ	71 mV
70	3378	Brown	0.72 mΩ	66 mV
80	3388	White	0.47 mΩ	51 mV
100	3319	Blue	0.41 mΩ	58 mV
125	3329	Pink	0.35 mΩ	59 mV
150	3108	Gray	0.36 mΩ	50 mV
175	3118	Tan	0.31 mΩ	51 mV
200	3128	Violet	0.29 mΩ	52 mV

*1 Voltage drop: apply 100% of the rated current (150A-200A: at 75% of the rated current).

Time-Current Characteristic [30A~125A]

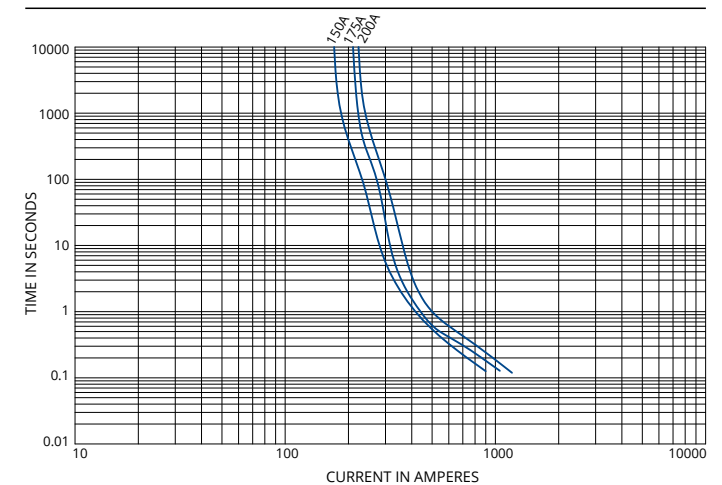
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
110%	4hrs.	—
150%	90sec.	3600sec.
200%	3sec.	100sec.
300%	0.3sec.	3sec.
500%	0.1sec.	1sec.

Time-Current Characteristic [150A~200A]

% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	100hrs.	—
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

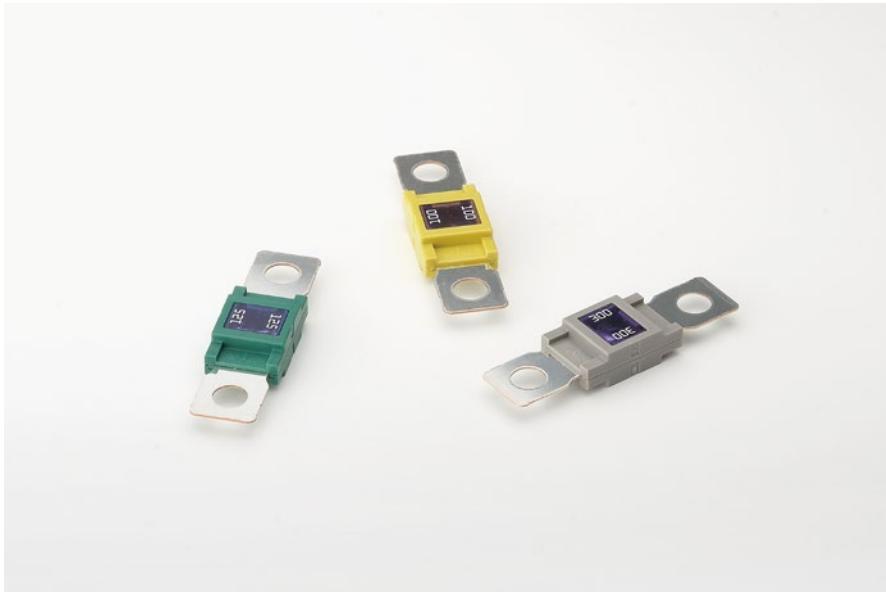
Time-Current Characteristic Chart



*Please refer to the blowing characteristic graph of the 30A to 125A fuses on page 32.

SBFW-K

High-amperage bolt type fuse

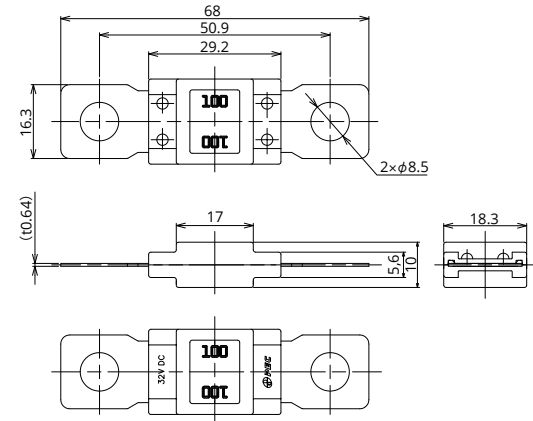


General Specification

Rated Voltage	DC32V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5
Country of Origin	Mexico
Plating	Sn Plating
Standard Packaging	1,200
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
80	3102	Red	0.72 mΩ	85 mV
100	3112	Yellow	0.58 mΩ	83 mV
125	3122	Green	0.44 mΩ	82 mV
150	3132	Orange	0.36 mΩ	89 mV
175	3142	White	0.32 mΩ	91 mV
200	3152	Blue	0.30 mΩ	95 mV
225	3162	Tan	0.26 mΩ	97 mV
250	3172	Pink	0.24 mΩ	100 mV
300	3182	Gray	0.20 mΩ	63 mV
350	3134	Dark Green	0.18 mΩ	50 mV
400	3144	Violet	0.16 mΩ	52 mV
450	3154	Dark Yellow	0.14 mΩ	56 mV
500	3164	Brown	0.13 mΩ	63 mV

*1 Voltage drop: apply 100% of the rated current (300A-500A: at 75% of the rated current).

Time-Current Characteristic [80A-250A]

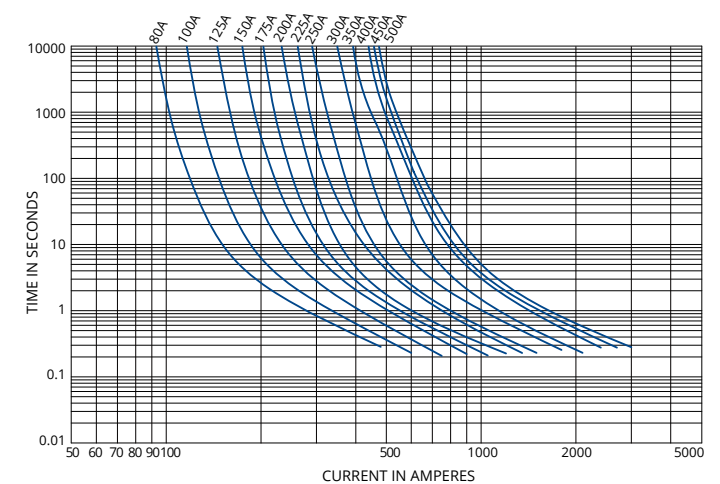
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	4hrs.	—
135%	120sec.	1800sec.
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.
500%	0.1sec.	1sec.

Time-Current Characteristic [300A-500A]

% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	4hrs.	—
200%	1sec.	15sec.
350%	0.5sec.	5sec.
600%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

International Standard Part

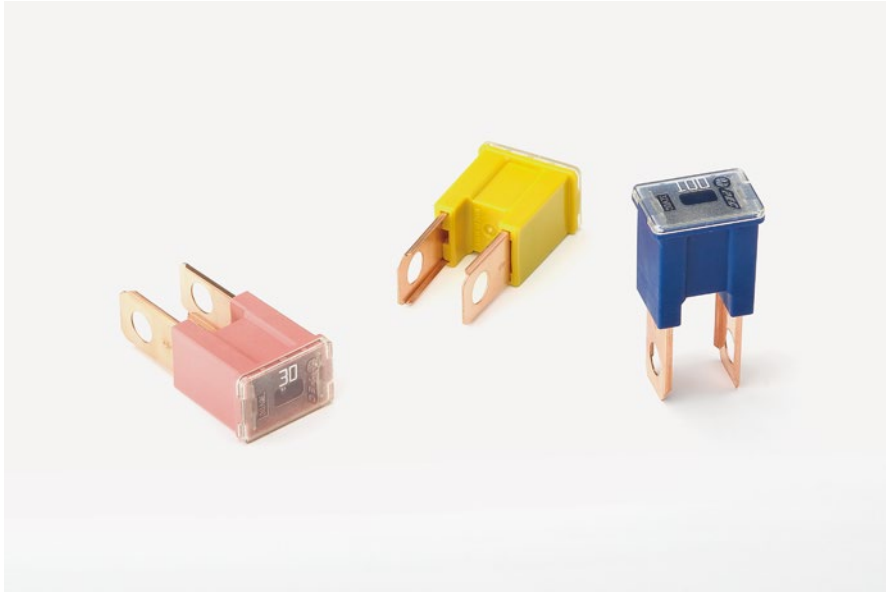
RoHS

ELV



SBFC-BT

Bolt type fuse

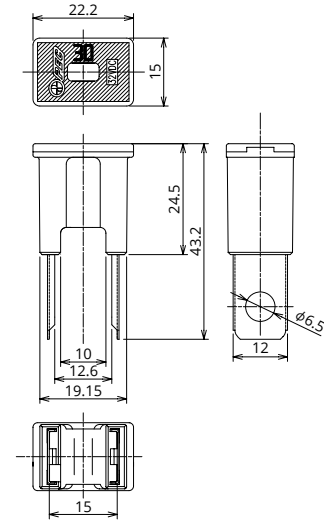


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Japan
Plating	—
Standard Packaging	500
Insertion Force	—
Pull-out Load	—
Recommended Torque	(6.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3136	Pink	3.0 mΩ	94 mV
40	3146	Green	2.2 mΩ	98 mV
50	3156	Red	1.7 mΩ	95 mV
60	3166	Yellow	1.3 mΩ	83 mV
70	3176	Brown	1.0 mΩ	93 mV
80	3186	Black	0.84 mΩ	66 mV
100	3206	Blue	0.67 mΩ	66 mV
120	3226	White	0.62 mΩ	62 mV
140	3246	Maroon	0.55 mΩ	86 mV

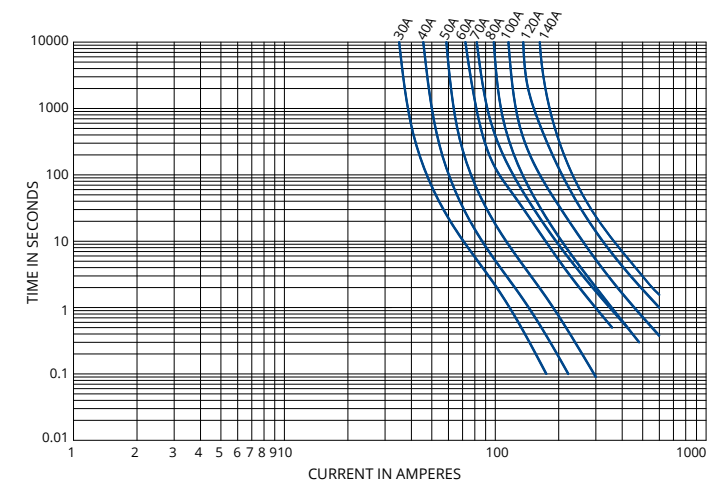
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
200%	5sec.	100sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFC-CT

Bolt type fuse

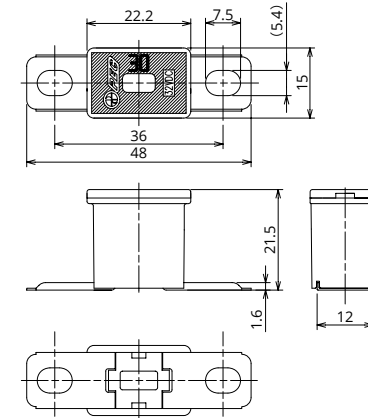


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Japan
Plating	—
Standard Packaging	500
Insertion Force	—
Pull-out Load	—
Recommended Torque	(4.5±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3233	Pink	3.0 mΩ	105 mV
40	3243	Green	2.1 mΩ	105 mV
50	3253	Red	1.7 mΩ	96 mV
60	3263	Yellow	1.1 mΩ	74 mV
70	3273	Brown	1.0 mΩ	78 mV
80	3283	Black	0.63 mΩ	61 mV
100	3303	Blue	0.51 mΩ	65 mV
120	3323	White	0.42 mΩ	67 mV
140	3343	Maroon	0.36 mΩ	68 mV

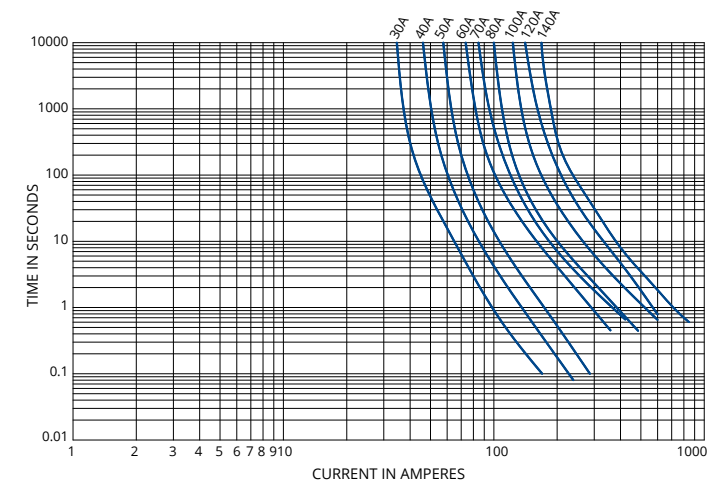
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
200%	5sec.	100sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

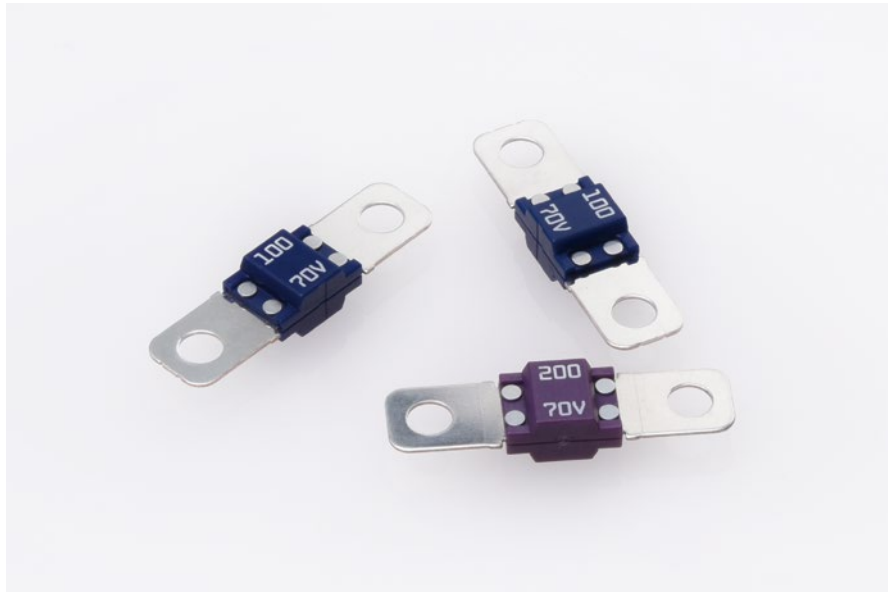
*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFW-L48V-M6L

SBFW-L type for 48V system

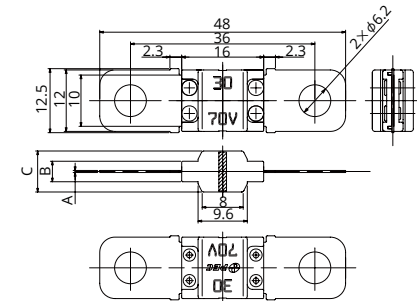


General Specification

Rated Voltage	DC70V
Breaking Capacity	2500A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO20934
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	2000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(9.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



CURRENT RATING	DIMENSION		
	A	B	C
30A~80A	0.4	4	8
100A~200A	0.64	4.24	8.24

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3005	Orange	Coming up	120 mV
40	3015	Green		120 mV
50	3025	Red		120 mV
60	3035	Yellow		110 mV
70	3045	Brown		110 mV
80	3055	White		110 mV
100	3065	Blue		100 mV
125	3075	Pink		100 mV
150	3085	Gray		100 mV
175	3095	Tan		100 mV
200	3006	Violet	100 mV	

*1 Voltage drop: apply 100% of the rated current.

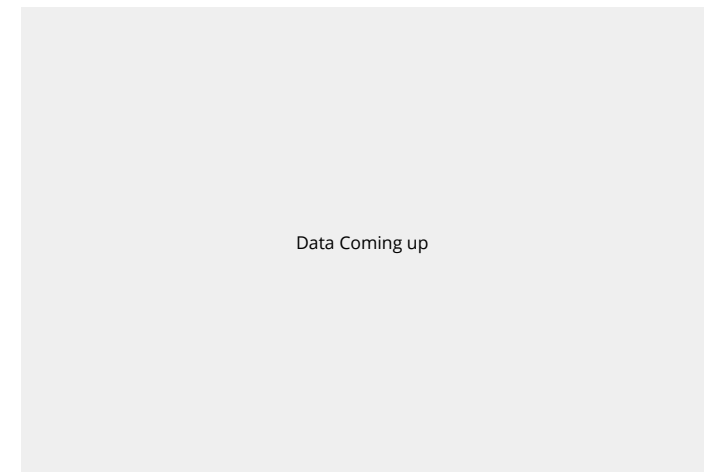
*Full line-up to be available in the end of 2018. Please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
135%	300sec.	3600sec.
150%	90sec.	500sec.
200%	1sec.	50sec.
300%	0.3sec.	4sec.
500%	0.1sec.	1sec.
600%	0.07sec.	0.7sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFW-K48V-M8

SBFW-K type for 48V system

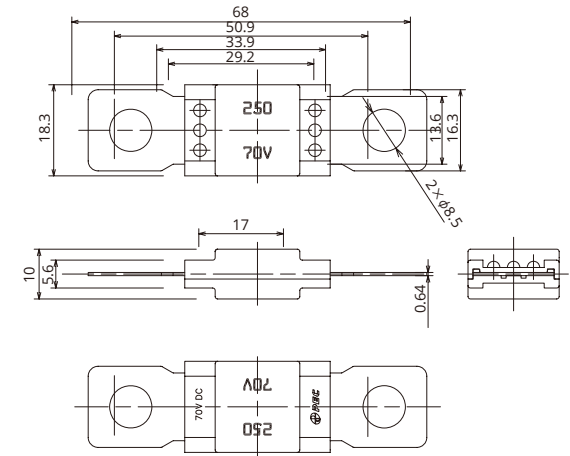


General Specification

Rated Voltage	DC70V
Breaking Capacity	2500A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO20934
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	400
Insertion Force	—
Pull-out Load	—
Recommended Torque	(20.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
60	3090	Light Blue	1.03 mΩ	110 mV
80	3001	Red	0.75 mΩ	110 mV
100	3011	Yellow	0.55 mΩ	110 mV
125	3021	Green	0.43 mΩ	110 mV
150	3031	Orange	0.36 mΩ	110 mV
175	3041	White	0.30 mΩ	110 mV
200	3051	Blue	0.80 mΩ	110 mV
225	3061	Tan	0.23 mΩ	110 mV
250	3071	Pink	0.22 mΩ	110 mV
300	3091	Gray	0.17 mΩ	80 mV
350	3002	Dark Green	0.15 mΩ	80 mV
400	3012	Violet	0.13 mΩ	80 mV
450	3022	Dark Yellow	0.12 mΩ	80 mV
500	3032	Brown	0.11 mΩ	80 mV

*1 Voltage drop: apply 100% of the rated current (300A - 500A: at 75% of the rated current).
*Full line-up to be available in the end of 2018. Please contact us for the details.

Time-Current Characteristic [80A~250A]

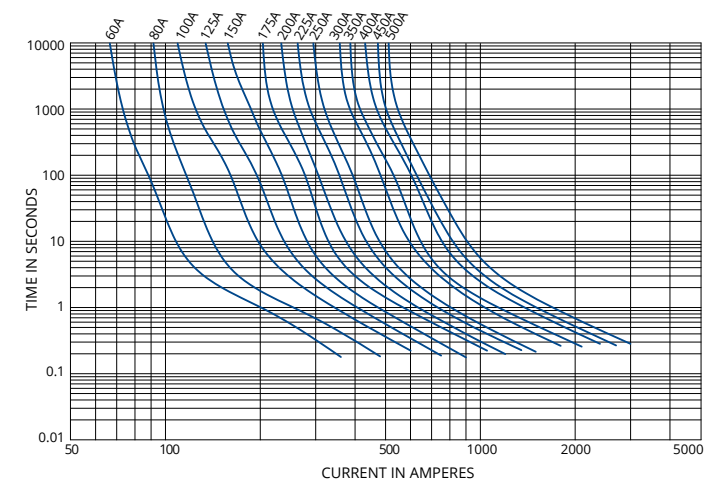
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	4hrs.	—
135%	120sec.	1800sec.
150%	20sec.	450sec.
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.

Time-Current Characteristic [300A~500A]

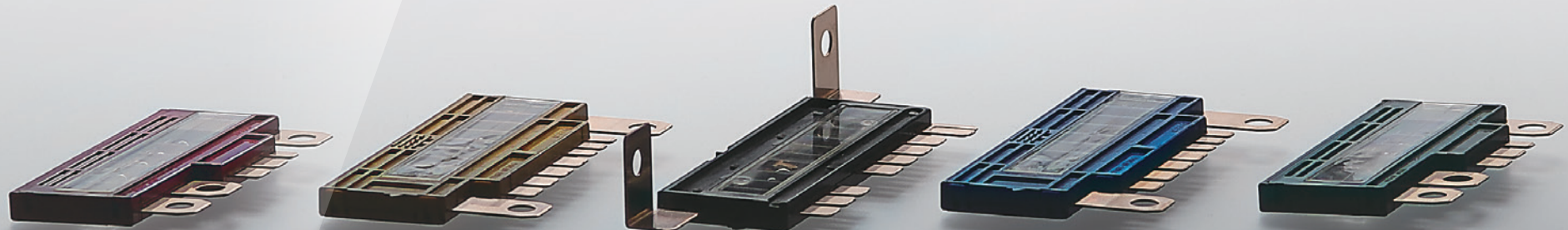
% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	4hrs.	—
200%	1sec.	15sec.
350%	0.5sec.	5sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Meeting the needs of the diverse and complex automotive circuits.
PEC's Multi terminal Slow Blow Fuses with compact multi-circuits



Multi Slow Blow Fuse

MUSB

Multi Slow Blow Fuse

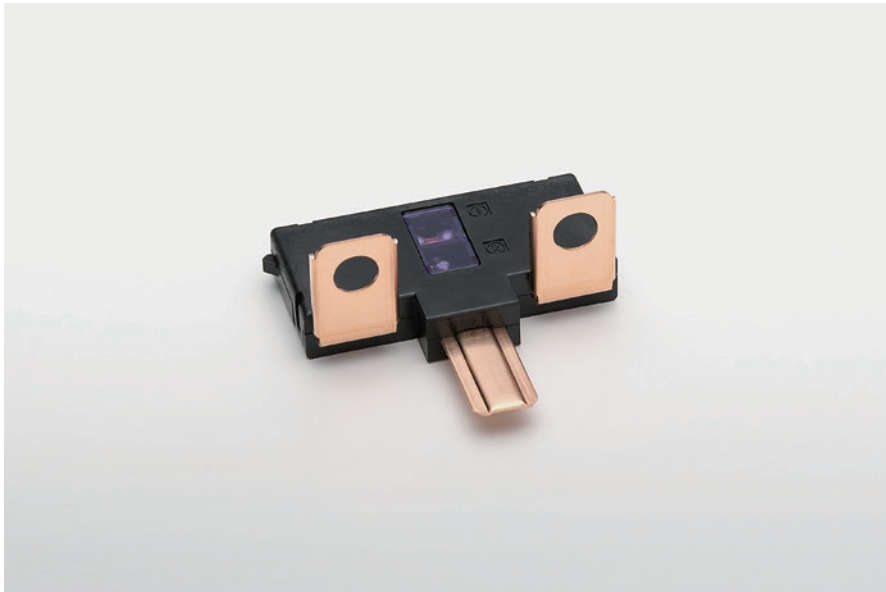
RoHS

ELV



MUSB-A

For 2 circuits

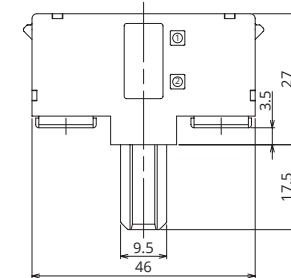


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	300

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2
1	3580	100A	70A
2	3581	120A	70A
3	3582	100A	40A
4	3583	120A	40A
5	3584	100A	60A
6	3585	80A	50A
7	3589	80A	70A
8	3579	100A	30A
9	3621	60A	50A
10	3622	120A	60A

Multi Slow Blow Fuse

RoHS

ELV



MUSB-B

For 2 circuits

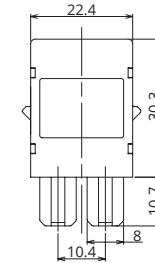


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	600

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2
1	3590	40A	50A
2	3591	50A	50A
3	3592	30A	30A
4	3593	30A	40A
5	3594	60A	50A
6	3595	40A	20A
7	3626	30A	50A
8	3628	40A	40A
9	3573	20A	20A

Multi Slow Blow Fuse

RoHS

ELV



MUSB-L3

For 4 circuits

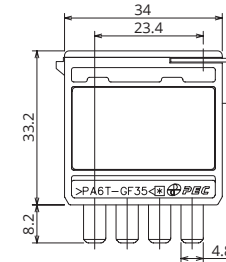


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	480

*2 Please contact us for the details of operating temperature.

Dimensions

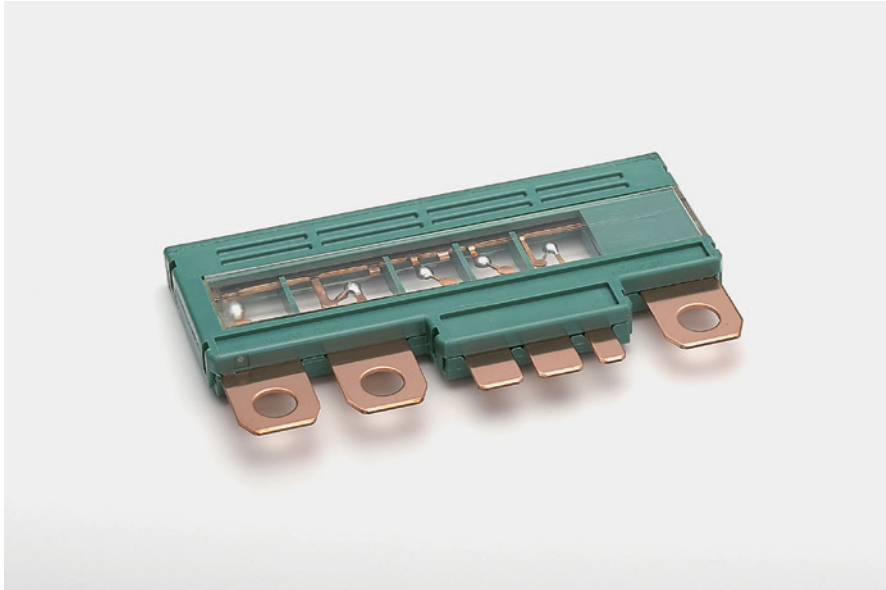


Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4
1	3682	20A	20A	20A	20A
2	3683	40A	40A	40A	40A
3	3684	30A	30A	30A	30A
4	3685	20A	30A	30A	30A
5	3686	30A	40A	30A	40A

MUSB-J1

For 5 circuits

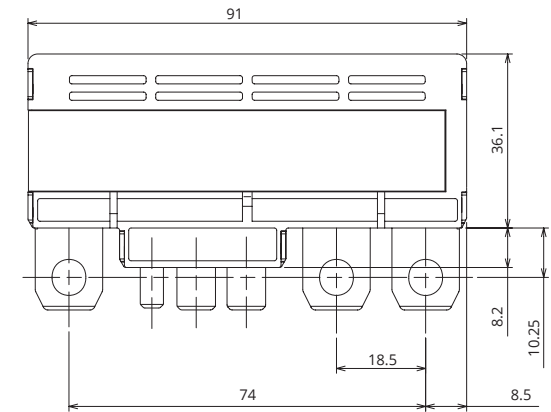


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Thailand
Plating	—
Standard Packaging	210

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5
1	3614	120A	80A	40A	50A	30A
2	3616	140A	80A	50A	50A	30A
3	3618	140A	60A	50A	50A	30A
4	3619	150A	80A	50A	50A	30A
5	3623	140A	60A	40A	30A	30A

Multi Slow Blow Fuse

RoHS

ELV



MUSB-L1

For 6 circuits

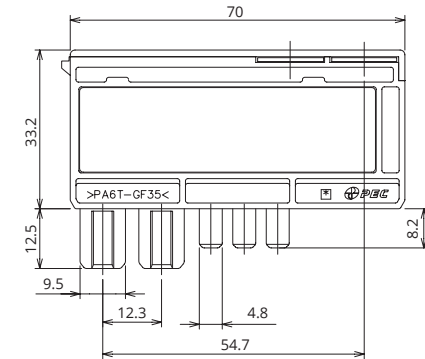


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	320

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6
1	3692	70A	40A	30A	30A	30A	100A
2	3693	70A	30A	40A	20A	30A	100A
3	3694	70A	70A	40A	20A	30A	150A
4	3695	70A	40A	20A	40A	30A	120A
5	3696	70A	70A	40A	30A	30A	150A
6	3697	70A	70A	30A	40A	30A	120A
7	3698	70A	60A	40A	20A	30A	125A
8	3699	70A	30A	40A	20A	30A	150A
9	3717	60A	40A	30A	30A	30A	BUSBAR
10	3716	70A	40A	40A	20A	30A	100A
11	3715	60A	70A	40A	30A	40A	150A
12	3714	70A	50A	40A	20A	30A	200A

MUSB-P2

For 7 circuits

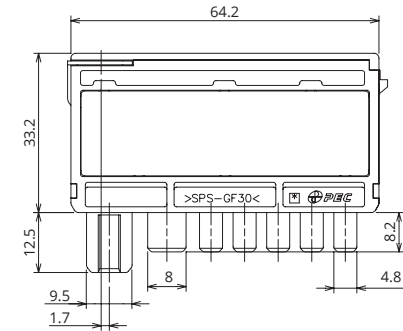


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Thailand
Plating	—
Standard Packaging	240

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6	FUSE 7
1	3664	70A	60A	40A	30A	30A	40A	30A
2	3665	70A	40A	20A	40A	30A	40A	30A
3	3666	70A	40A	40A	30A	20A	30A	30A
4	3667	70A	40A	30A	40A	30A	40A	30A
5	3668	70A	60A	40A	30A	30A	20A	40A

Multi Slow Blow Fuse

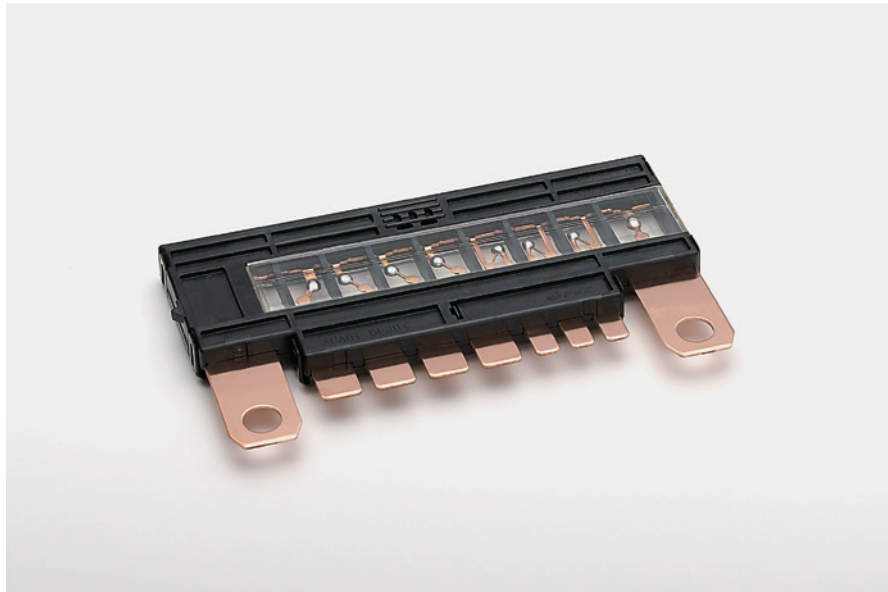
RoHS

ELV



MUSB-M2

For 8 circuits

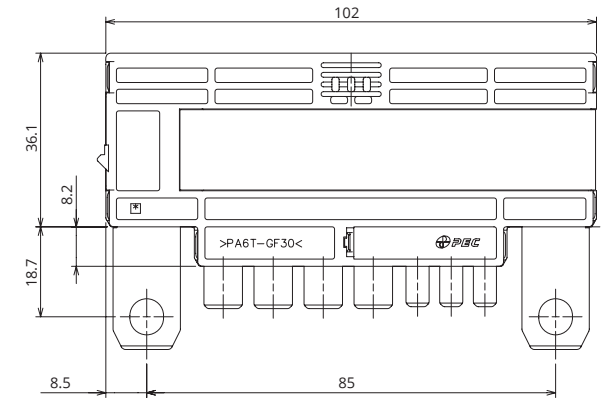


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Thailand
Plating	—
Standard Packaging	160

*2 Please contact us for the details of operating temperature.

Dimensions

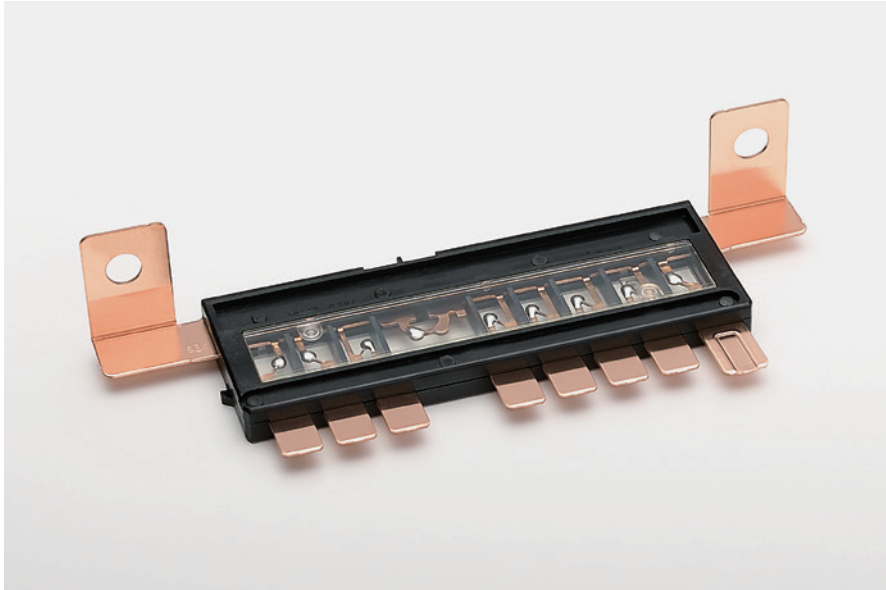


Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6	FUSE 7	FUSE 8
1	3624	80A	50A	50A	50A	30A	30A	30A	120A
2	3625	80A	50A	50A	50A	30A	30A	30A	140A
3	3731	80A	50A	50A	40A	40A	30A	30A	140A
4	3732	80A	50A	50A	40A	40A	30A	30A	150A
5	3733	50A	50A	50A	40A	30A	30A	40A	100A
6	3734	80A	50A	50A	30A	30A	30A	40A	140A
7	3735	80A	50A	50A	50A	40A	30A	30A	150A

MUSB-F

For 9 circuits

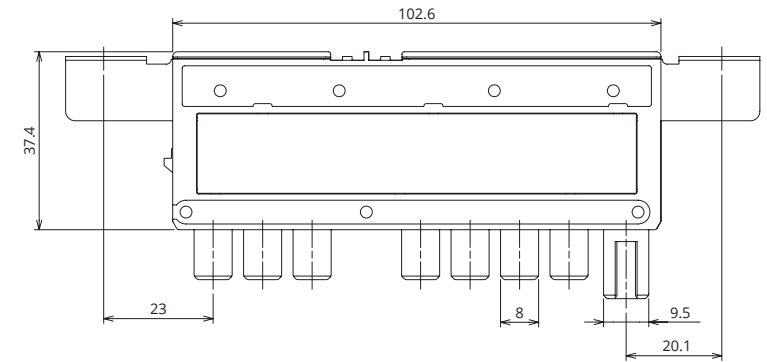


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	160

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6	FUSE 7	FUSE 8	FUSE 9
1	3654	60A	60A	40A	40A	40A	40A	60A	60A	150A
2	3655	50A	40A	30A	40A	40A	40A	40A	50A	150A
3	3656	50A	50A	30A	40A	40A	40A	40A	80A	150A
4	3657	50A	50A	30A	40A	40A	40A	40A	80A	125A
5	3747	40A	50A	50A	50A	40A	30A	40A	80A	150A

Multi Slow Blow Fuse

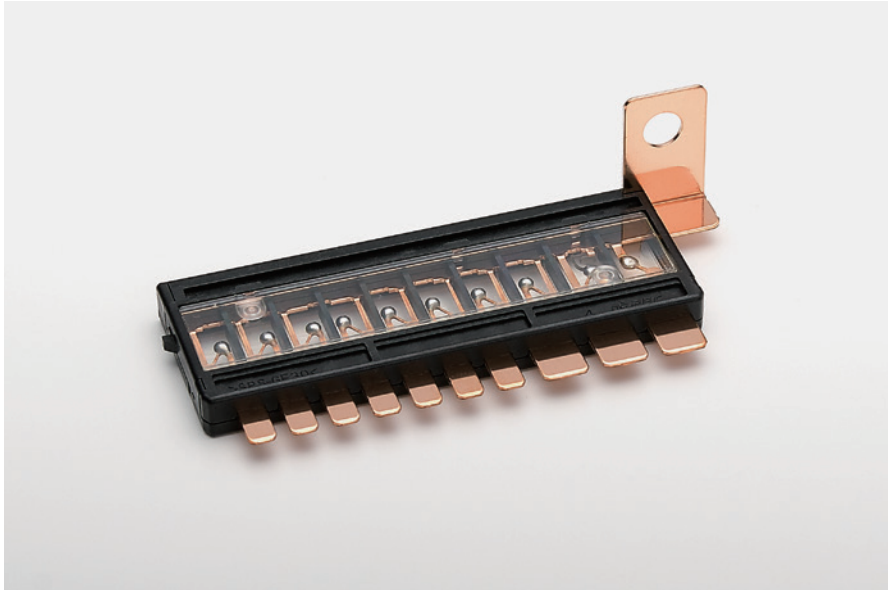
RoHS

ELV



MUSB-P1

For 10 circuits

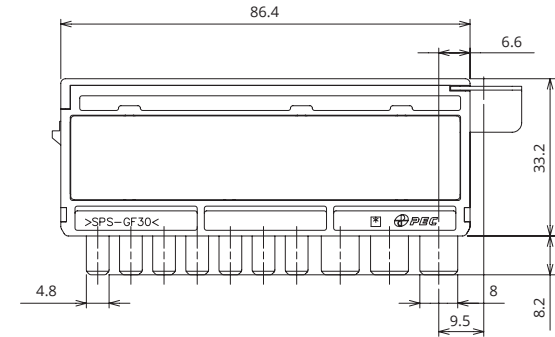


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Thailand
Plating	—
Standard Packaging	160

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6	FUSE 7	FUSE 8	FUSE 9	FUSE 10
1	3643	60A	40A	30A	30A	30A	30A	30A	30A	30A	30A
2	3644	60A	40A	30A	30A	20A	30A	30A	30A	30A	30A
3	3645	60A	40A	50A	30A	30A	30A	30A	30A	30A	30A
4	3646	60A	40A	50A	30A	20A	30A	30A	30A	30A	30A
5	3647	60A	50A	60A	40A	30A	30A	30A	30A	20A	40A
6	3648	60A	50A	60A	40A	30A	40A	40A	40A	20A	40A
7	3649	60A	30A	60A	40A	20A	30A	30A	30A	20A	30A
8	3712	60A	50A	60A	40A	30A	40A	40A	30A	20A	40A

Multi Slow Blow Fuse

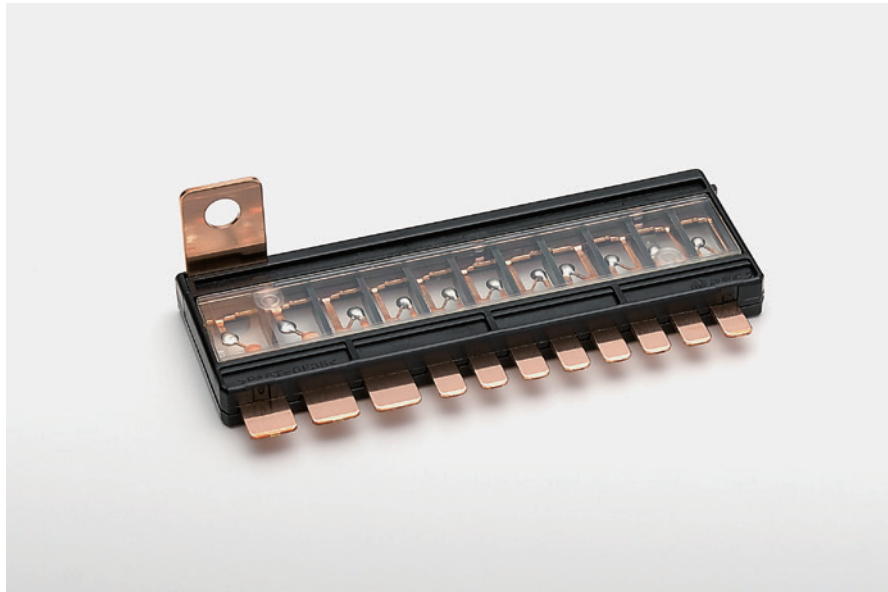
RoHS

ELV



MUSB-L2

For 11 circuits

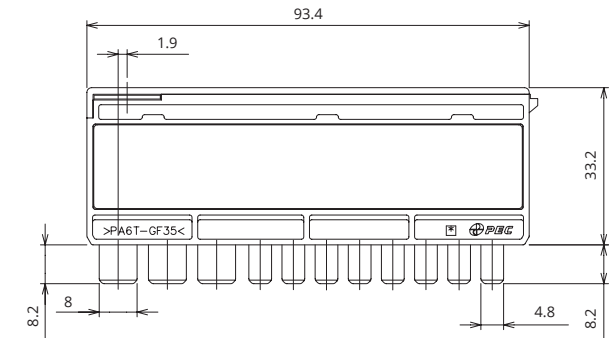


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	240

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3	FUSE 4	FUSE 5	FUSE 6	FUSE 7	FUSE 8	FUSE 9	FUSE 10	FUSE 11
1	3672	50A	60A	60A	30A	30A	30A	30A	40A	30A	20A	20A
2	3673	50A	60A	60A	30A	30A	40A	30A	40A	30A	20A	20A
3	3674	50A	60A	40A	30A	30A	30A	30A	40A	30A	30A	30A
4	3675	50A	60A	40A	30A	30A	30A	30A	40A	30A	20A	20A
5	3676	50A	60A	60A	30A	30A	40A	30A	40A	30A	30A	30A
6	3677	50A	60A	60A	40A	30A	40A	40A	40A	30A	30A	30A
7	3678	30A	60A	60A	40A	30A	40A	40A	40A	30A	30A	30A
8	3679	30A	60A	60A	30A	30A	40A	20A	40A	30A	30A	40A
9	3791	30A	60A	60A	30A	30A	30A	30A	40A	30A	20A	20A
10	3792	30A	60A	60A	30A	30A	40A	30A	40A	30A	20A	20A
11	3793	30A	30A	20A	20A	30A	40A	30A	30A	40A	30A	20A
12	3794	30A	60A	60A	30A	30A	40A	30A	40A	30A	30A	30A
13	3975	70A	60A	30A	40A	30A	30A	40A	40A	30A	30A	30A

Multi Slow Blow Fuse

RoHS

ELV



MUSB-T

For 3 circuits

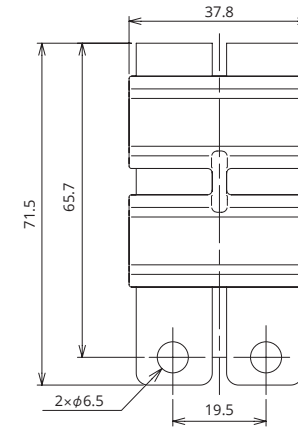


General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Mexico
Plating	—
Standard Packaging	—

*2 Please contact us for the details of operating temperature.

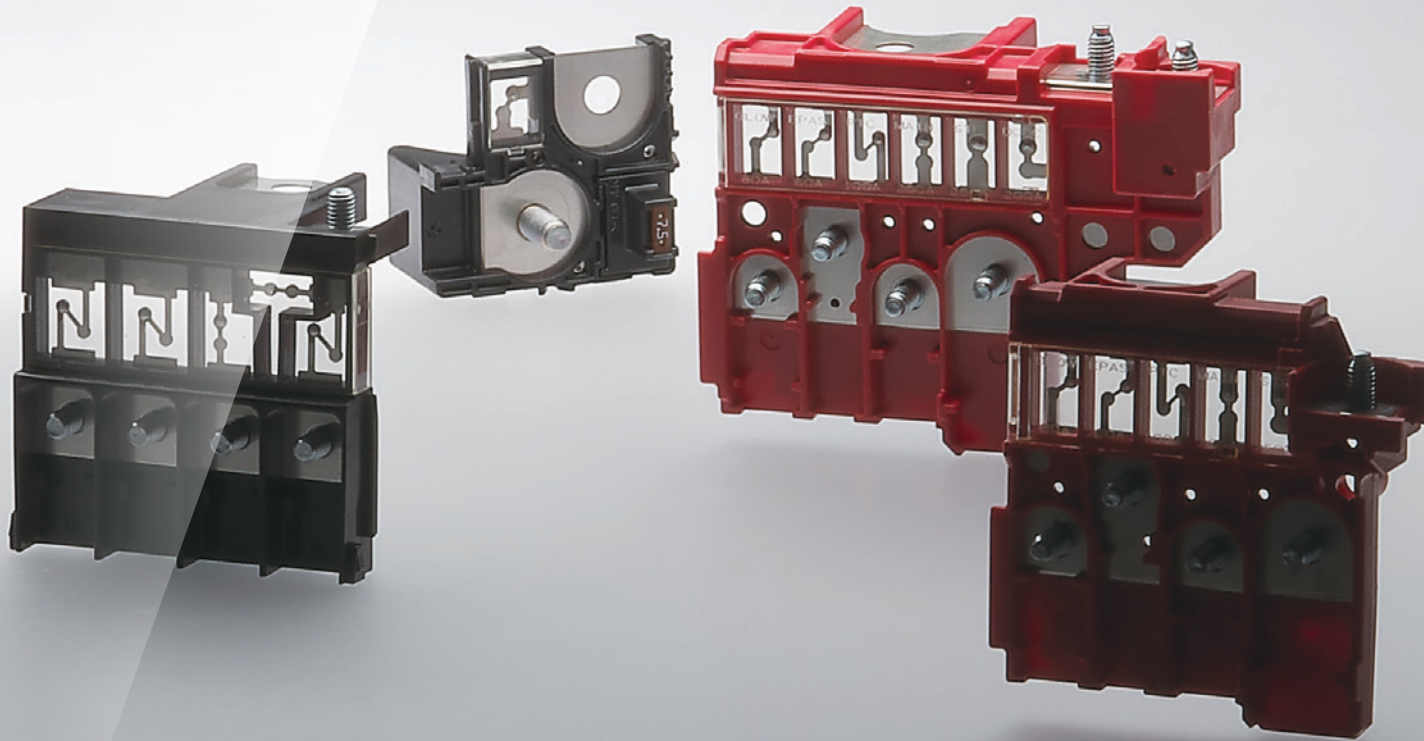
Dimensions



Product Lineup

	Part Number	FUSE 1	FUSE 2	FUSE 3
1	3729	125A	100A	325A
2	3739	125A	70A	375A
3	3738	125A	80A	375A
4	3737	125A	80A	300A
5	3736	125A	275A	200A

Integration of multiple fuse circuits with the battery terminal
Possibility of direct attachment onto the battery, hence battery cable slimination



Battery Terminal Fuse

BATF

Battery Terminal Fuse

RoHS

ELV

BATF-I

For 5 circuits



Battery Terminal Fuse

RoHS

ELV

BATF-L

For 2 circuits



Battery Terminal Fuse

RoHS

ELV

BATF-M

For 5 circuits



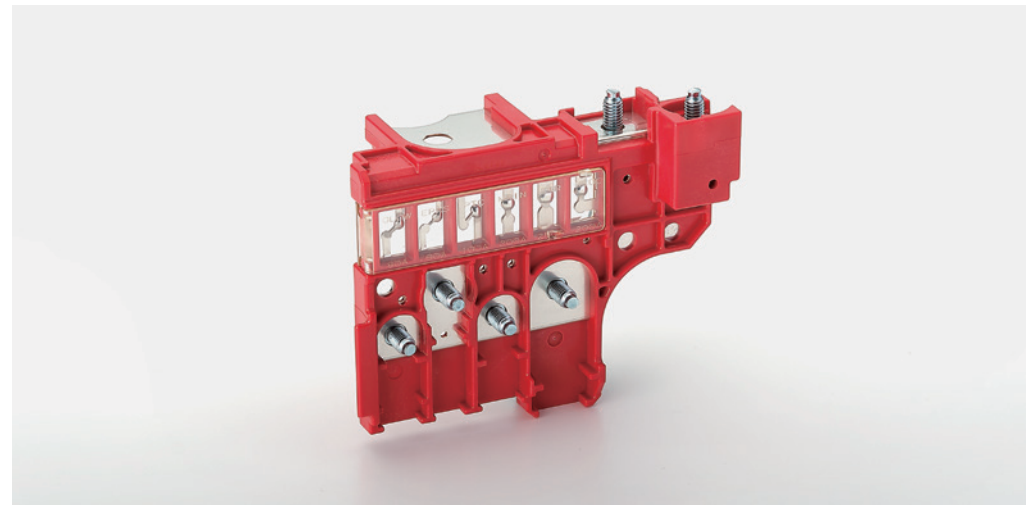
Battery Terminal Fuse

RoHS

ELV

BATF-N

For 6 circuits



BATF

Fuse accessories which make the fuse mounting and replacement easy and safe



Accessories

Accessories

BFAT Fuse Holders

Fuse Holder (Connector Type)

RoHS

ELV



Exclusive for BFAT (1pc)

Product information

Part Number	1514-0000
Connector type for connecting	250 Perpendicular 2P-F connector
Rating	BFAT rated to 30A

Fuse Holder (Connector Type)

RoHS

ELV



Exclusive for BFAT (2pcs)

Product information

Part Number	1406-2100
Connector type for connecting	250 Parallel 4P-F connector
Rating	BFAT rated to 30A
*The maximum permissible current for two-pole electrical distribution is total 30A	

Inline Holder

RoHS

ELV



Exclusive for BFAT

Product information

Connector type for connecting	
Casing : 1512-2100	
Terminal (small) : 1512-2400 (wire size: 0.5 - 1.25sq.mm)	
Terminal (large) : 1512-3400 (wire size: 2.0 - 3.0sq.mm)	
*Casing and terminal are ready to be assembled by the customer	
Rating	BFAT rated to 30A

BFAT Terminals

RoHS

ELV



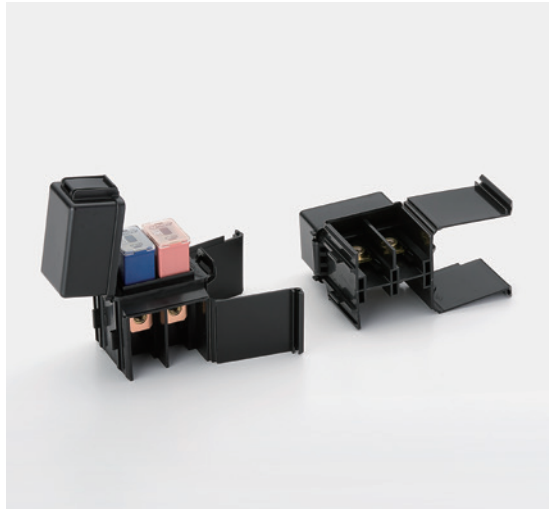
Terminals to install BFAT fuses onto a PCB

Product information

Part Number	1502-0000
Rating	BFAT rated to 30A

SBF Fuse Holders

Fuse Holder (Block No.17)



RoHS

ELV

Exclusive for SBFC-BT (2pcs)

Product information

Part Number 3536-0000

Fuse Holder (Block No.33)



RoHS

ELV

Exclusive for SBFC-AS (3pcs)

Product information

Part Number 3562-0000

Short Pins



BFMN-SP



RoHS

ELV

For interrupting dark current
(Exclusive for BFMN)

Product information

Part Number 1240-0000

BFLP-SP



RoHS

ELV

For interrupting dark current
(Exclusive for BFLP)

Product information

Part Number 1151-0000

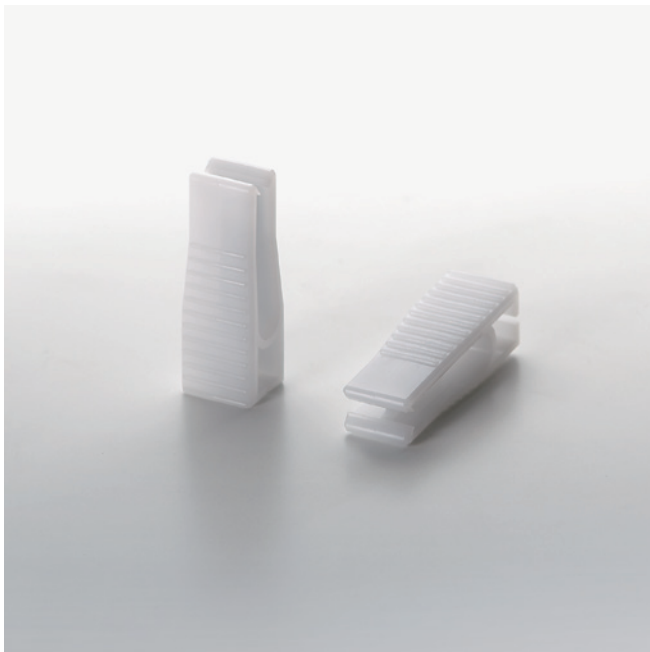
Fuse Pullers

Essential product to easily extract the BF at the time of replacement

Fuse Pullers No.2

RoHS

ELV



Product information

Part Number	1506-0000
Type of fuse	BFAT

Fuse Pullers No.7

RoHS

ELV



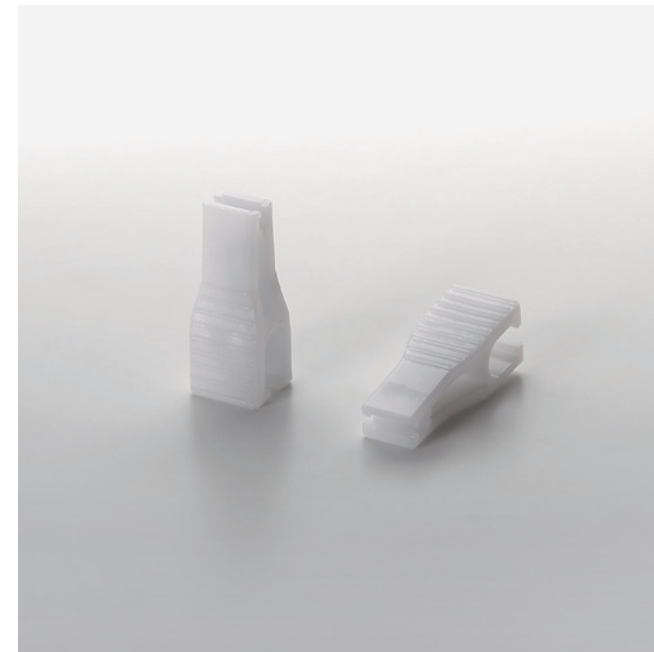
Product information

Part Number	1509-2000
Type of fuse	BFAT, BFMN

Fuse Pullers No.9

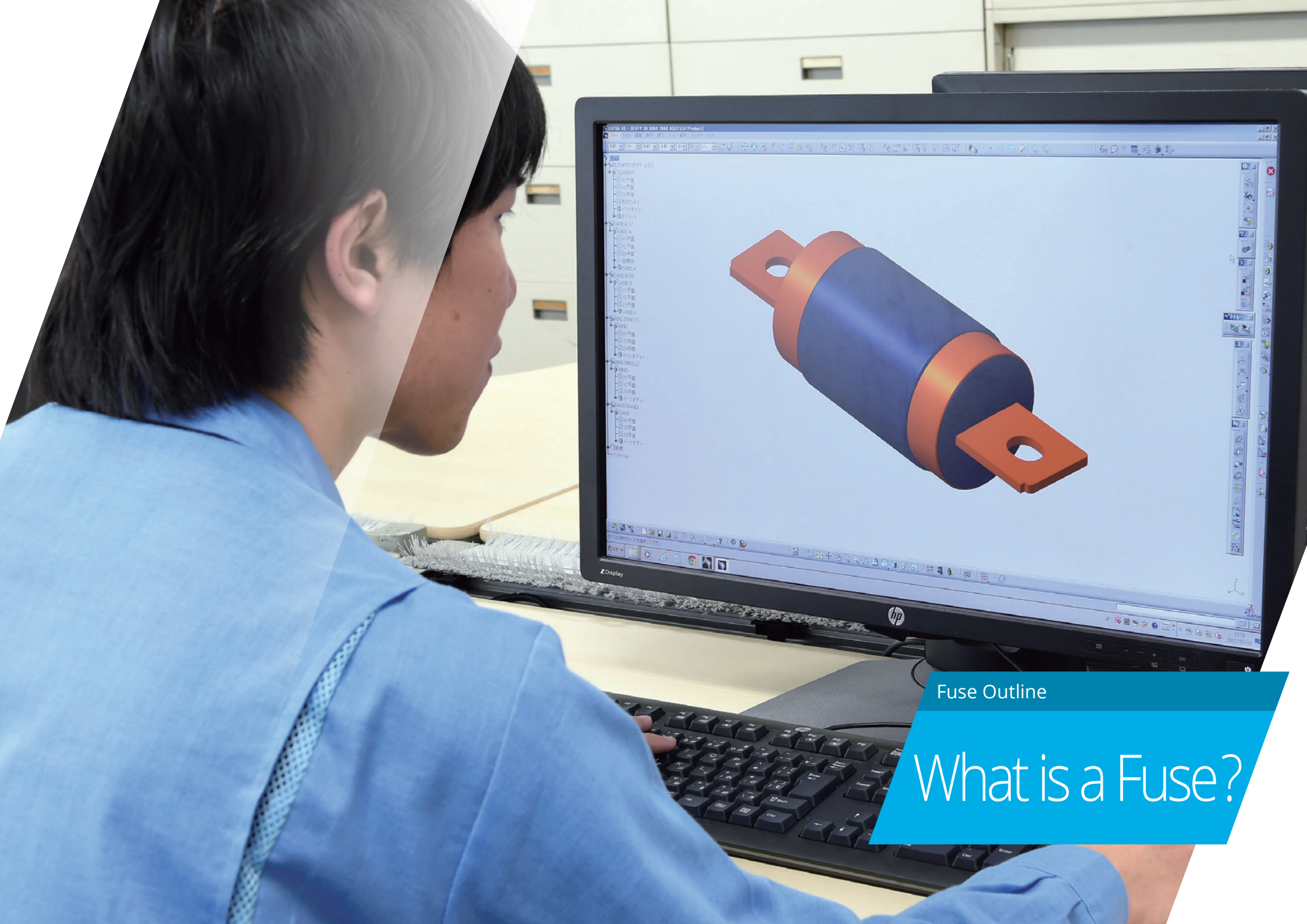
RoHS

ELV



Product information

Part Number	1509-4000
Type of fuse	BFMN, BFLP



Fuse Outline

What is a Fuse?

What is a Fuse?

It is said that Thomas Edison, the inventor of the light bulb, first put forth the idea of a fuse. Ever since, fuses have been widely used across a wide range of applications to ensure the safety of electric circuits and protect devices.

Electric circuits are connected to various devices through electric wiring and switches that receive electricity from a power source. Fuses are installed in series with the electric circuit on the upstream flow of electricity and are designed to immediately interrupt the circuit when exposed to overcurrent resulting from a short-circuit on the downstream flow. They are therefore critical components that protect the wiring and devices in an electric circuit from damage caused by fires and the like.

When exposed to overcurrent, a fuse's metal element, which is distinguished by a small cross-sectional area, reaches its melting point and subsequently blows. This effectively interrupts (protects) the circuit.

Fuses are classified into different types depending on their usage purpose and application. For example, there are fuses for high-voltage insulating structures, cylindrical fuses for applications that receive or distribute electricity, tube-type fuses used in residential electric appliances, surface-mount fuses for printed wiring boards, and automotive fuses.

Automotive Fuses

Even when confining the discussion to automotive fuses, these can still be divided in a wide range of types based on usage purpose. (Figure 1)

Among this large variety of automotive fuses, the type that has made most headway with standardization and is currently employed in vehicles all over the world is the blade fuse (BF). In recent years, the number of fuses installed per vehicle has increased in tandem with wider adoption of electric and digital systems in automobiles, an increase in the number of on-board devices, and a shift to increasingly compact fuses.

Figure 1: Automotive fuse types

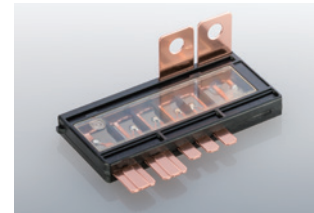
BF (Quick blow type)



SBF (Slow blow type)



MUSB (Slow blow type)



Characteristics of Automotive Fuses

Automotive fuses differ in their application from other types due to their exposure to vibrations, ambient temperature and other factors, as well as in terms of precision and reliability. In other words, they are required to operate under much more demanding conditions. In addition, their size and weight are also important elements.

[Special Requirements for Automotive Fuses]

(1) Vibrations

Automobiles are exposed to vibrations under a wide range of conditions including when driving continuously on highways, when driving on poor or cobbled roads, or when idling. Automotive fuses must be able to withstand a vibration acceleration of 44.1m/s² for automobiles and 196m/s² for motorcycles, and guarantee performance even when exposed to resonance vibration from frequency changes.

(2) Ambient Temperature

Automobiles are expected to deliver problem-free driving performance both in the scorching heat of desert environments and in areas subjected to extreme cold. Moreover, because fuses are installed in the engine compartment and the passenger compartment, they are required to function within a broad temperature range of -40-120°C.

(3) Precision

Automobiles vary widely in weight depending on their fuel efficiency, and they tend to utilize extremely compact electric wiring to achieve a corresponding reduction in weight. For this reason, the actual current used in automotive electrical wiring is close to the allowable current capacity, and the time-current characteristics of fuses must be managed within this narrow range.

(4) Reliability

When a fuse malfunctions during driving, it immediately impairs the vehicle's ability to drive. If this occurs while driving on a highway or in similar circumstances, it can lead to serious accidents. In today's world, where vehicles have an average service life that exceeds over 10 years, fuses are required to deliver durability in the form of sustained functionality amid various changes in environment.

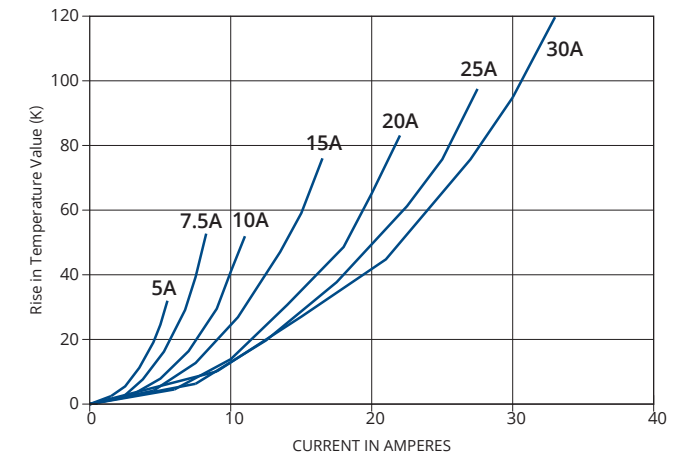
(5) Size and Weight

If we look at automobiles in the context of the CO₂ emission regulations specified in the Kyoto Protocol, we learn that the CO₂ emissions generated while driving are substantially higher than the ones generated when producing the parts, materials and vehicle itself or when disposing of a vehicle. Accordingly, vehicle weight reduction is an important factor for the automotive sector, and fuses are also expected to be compact and lightweight while at the same time guaranteeing performance.

Temperature Rises in Fuses

Fuses have a specific electric resistance value. When exposed to current, their temperature will rise depending on the load. (Figure 2) Test results for temperature rises can vary significantly based on the type of jig or fuse connection used, and fuse performance is therefore measured using a standard jig (i.e., specified by a relevant industry standard). Because measurements of temperature rise in the lab will be different from data obtained during actual driving, the general approach is to conduct a second evaluation based on reliability tests for each vehicle model. Fuses with connection terminals made out of heat-resistant copper alloy are able to withstand a temperature of up to 140°C. If we assume a temperature of 80°C inside the engine compartment, this means the fuses can handle a temperature increase of 60K.

Figure 2: Temperature rise



Time-current Characteristics of Fuses

Time-current characteristics are the most important specifications of fuses.

Fuses are designed to only withstand continuous current that is equivalent to their rated current. When the current flowing through a fuse exceeds the rated current, the fuse must cut off the current within a predetermined time interval, thus ensuring the current flow is interrupted.

For this reason, the melting time of a fuse when exposed to overcurrent is specified by international and national standards for each type of fuse. In the case of BFMN fuses (Figure 3), which are the most common type in use today, the applicable standards are ISO 8820-3 (international), JASO D612 (Japan) and SAE J2077 (US). These standards specify uniform time-current characteristics, which are regarded as the international standard.

[Rated values (Table 1), time-current characteristics (Figure 4)]

Time-current standard values specify an upper threshold for the melting time to prevent an overcurrent from flowing continuously and resulting in fire or damage to connected electrical wiring and electric devices. This is the ultimate purpose of a fuse. At the same time, a lower threshold is specified to ensure the current is not interrupted during the initial rush at the start of the current flow, and thus ensure durability.

Time-current characteristics differ by fuse type. For example, motor circuits employ slow blow fuses (SBF) that feature a slow-blow mechanism to withstand the comparatively long current rush that is produced when a motor starts operating. It is common practice to use SBFs for circuits using motors of automatic wipers and power windows, and BFs for applications such as lamps.

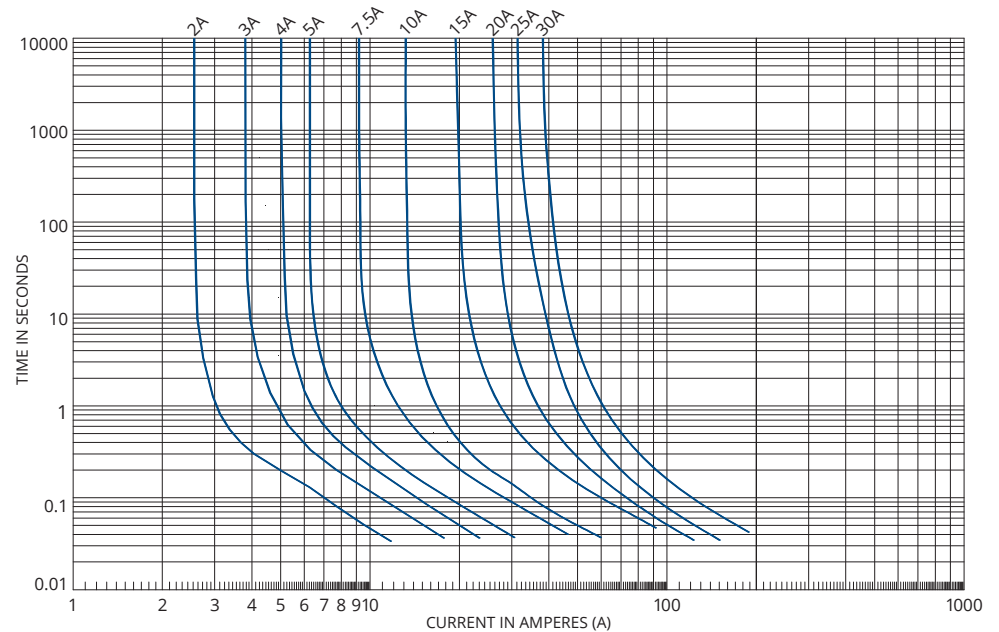
Figure 3: BFMN



Table 1: Rated time-current characteristics

% of Ampere Rating (A)	Operating Time
110%	100hrs.
135%	0.75~600sec.
160%	0.25~50sec.
200%	0.15~5sec.
350%	0.04~0.5sec.
600%	0.02~0.1sec.

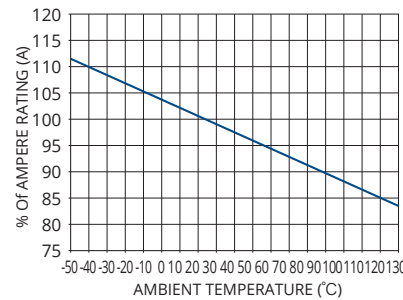
Figure 4: Time-current characteristics



Fuses and Ambient Temperature

The metal element inside a fuse is designed to melt through Joule heat produced by overcurrent, thus interrupting the current flow in the circuit. Because the Joule heat (I^2Rt) required to melt the metal element differs based on the ambient temperature, the time at which the metal element in the fuse will reach its melting point will also vary. In other words, the actual capacity of a fuse will vary based on the ambient temperature. The amount of change from the actual capacity is referred to as the temperature change rate. The temperature change rate differs based on the type of metal element used. For example, a 10A-rated BF with a zinc element has an actual capacity of 8.5A at an ambient temperature of 120°C, and the temperature change rate is $-0.15\%/^{\circ}\text{C}$ (Figure 5). The corresponding rate is $-0.075\%/^{\circ}\text{C}$ assuming a copper element and $-0.14\%/^{\circ}\text{C}$ in the case of a copper-tin element.

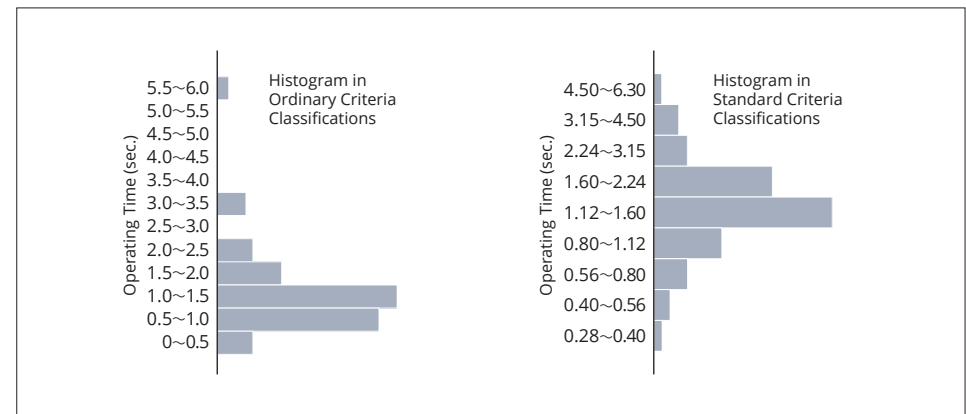
Figure 5:
Fuse Temperature Change Rate



Fuse Precision

The melting time does not simply exhibit a direct proportional correlation with the actual current value, but rather is determined by the Joule heat (I^2Rt) generated by the passing current value. Accordingly, when verifying variations in the melting time or conducting quality guarantee tests such as frequency distribution and measuring actual current values, an error can occur in the form of a negative LCL time. By using a standard value (JIS Z8601) in statistical analysis, the variation in the skewed melting time returns to a normal distribution, enabling the use of general quality control management methods. (Figure 7)

Figure 7: Variation in melting time

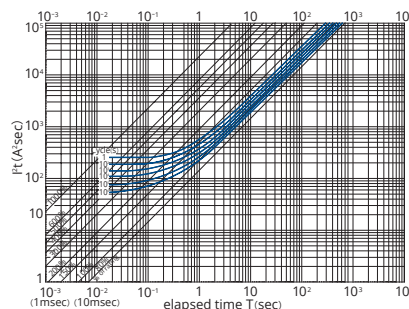


Durability of Fuses

The durability (i.e., service life) of a fuse depends on the load, current waveforms, ambient temperatures and other factors. If exposed to a consistent current frequency, the service life of a fuse (total usage count) can be easily determined from the I^2t characteristics diagram (Figure 6) organized by capacity.

Fuses need to have a capacity that exceeds the service life (total usage count) demanded by automakers. In the case of continuous current flow, they are recommended to be used with a rate load of 70% or below.

Figure 6:
 I^2t characteristics diagram



Fuses and Electric Wiring

To ensure fuses conform with devices and connected electric wiring and thus protect related circuits, it is necessary to select electric wiring of a suitable size that can handle the fuse's rated current. (Figure 8)

(1) Load Current

For blade fuses, Fuses should be selected in such a way as to ensure the load current does not exceed 70% of the rated current. When setting the load current value, the following factors should be considered.

- Is the load current continuous or pulsed?
- Is there a current surge when turning the switch on?
- Intermittent or continuous current?

(2) Ambient temperature

A fuse's time-current characteristics are affected by ambient temperature, so the ambient temperature at the location where the fuse is installed must be considered. A fuse's rated current is calculated based on the ambient temperature and the rate of change in capacity (Figure 5).

(3) Fusing Current

The current at which the fuse should precisely blow is determined from a blowing standard.

(4) Maximum Circuit Resistance

To guarantee fuses' time-current characteristics, the maximum circuit resistance value is required while also taking into account the ambient temperature of the electric wiring.

(5) Selection of Smallest Wire Size

For the electric wiring size, select a size for which the resistance value after factoring in the wiring length is smaller than the maximum resistance value for the circuit. The correlation between a representative fuse's rated current and the electric wiring size and length is shown in Figure 2.

Figure 8:
Time-current characteristics of a fuse and smoke-producing characteristics of electrical wiring

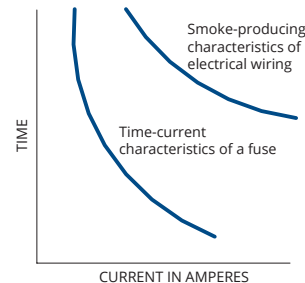


Table 2: Correlation between fuse rating, electric wiring size and electric wiring length

Fuse Ampere Rating (A)	Nominal Cross Sectional Area of Wires (mm ²)						
	0.3	0.5	0.85	1.25	2	3	5
3	37	—	—	—	—	—	—
4	38	43	—	—	—	—	—
5	22	34	—	—	—	—	—
7.5	15	23	36	—	—	—	—
10	11	17	27	39	—	—	—
15		11	18	26	43	—	—
20			13	19	32	—	—
25				15	25	40	—
30					21	34	—

* The figures in the middle of the table show the maximum length of the electric wiring (m).

* Values exceeding 50m are indicated with "—".

* Taken from JASO D610

Automotive Fuse Ratings

Fuses utilized in general home appliances are specified by the JIS standards, but automotive fuses are a specialized type of fuse covered by the JASO standards in Japan. The JASO standards for automotive fuses are the only public standard governing automotive fuses in Japan. JASO is part of the Society of Automotive Engineers of Japan, and its standards are deliberated by an automotive electronics subcommittee with members consisting of automakers, fuse users, fuse makers and third parties. As the only Japanese specialized fuse maker, PEC serves as the executive secretary of the subcommittee and contributes to the standardization work in that capacity.

The global standard for automotive fuses is ISO8820, which has been established under the international ISO standards. The fuse subcommittee works to support Japanese compliance with ISO standardization activities. PEC participates in international conferences as a Japanese representative member and deliberates international standards with representative members from other countries. The current Japanese standard is largely reconciled with the international one so the contents of JASO D612 and ISO 8820 are more or less the same.

Fuse Types

[Glass Tube Fuses]

Upon hearing the word fuse, many people first picture a glass tube fuse consisting of a glass tube that contains a metal element. Glass tubes were used as early as the 1910s to prevent accidents due to overcurrent during engine ignition. However, these fuses abruptly moved into the spotlight in the 1970s. Against the backdrop of air pollution problems linked to vehicle emissions, automakers developed engine control units (ECUs; microprocessor-based engine controllers) with the aim of maintaining engine performance and fuel efficiency while complying with emissions regulations. The development of ECUs triggered a sudden acceleration in the adoption of automotive electronic solutions. This in turn increased demand for fuses, which play a role in ensuring the safety of electric circuits and the protection of devices.



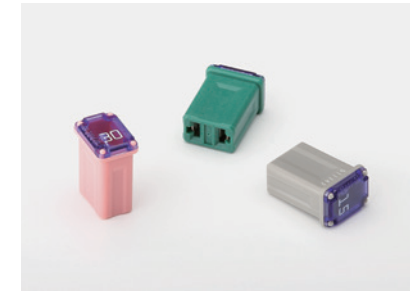
[Blade Fuses]

Blade fuses (auto fuses) were developed in 1975 and continue to be the mainstream fuse type utilized in vehicles today. Compared with glass tube fuses, blade fuses require only half the parts, their simplified structure is ideal for mass production, and they are smaller, lighter and more durable. Amid the shift toward electronics in the automotive sector, blade fuses were rapidly adopted by automakers around the world.



[Slow Blow Fuses]

The 1980s introduced a range of automotive electronic solutions aimed at enhancing passenger comfort, including power windows and automatic wipers. As a result, vehicles came to be equipped with a large number of motors. However, motors temporarily produce a large current that exceeds their rated capacity when they are switched on. Conventional auto fuses, which immediately blow when exposed to overcurrent, were therefore not appropriate for this type of application. Instead, automakers employed slow blow fuses, which are distinguished by a slow rise in temperature when exposed to high current and therefore do not blow immediately. PEC developed slow blow fuses in 1982 ahead of its competitors. Moving into the 2000s, automotive ECUs grew increasingly complex, resulting in the need for miniaturization of the circuit itself. The product that emerged to meet these needs was the multi slow blow fuse, which protected multiple circuits.



[EV Fuses]

From the mid-1990s, automakers started exploring the concept of environmentally friendly vehicles, giving rise to the EV fuse. Electric-powered vehicles require much higher currents than their gasoline counterparts. For this reason, conventional fuses would immediately blow and the high current would give rise to another problem in the form of the arc discharge phenomenon that could lead to destruction of circuits. The EV fuses developed by PEC in cooperation with Toyota Motor Corporation became the first products to resolve this problem, and have been adopted in the hybrid vehicles of a large number of automakers. They have also been installed in electric vehicles that have been developed to deliver additional environmental performance since the 2000s.





**TAIHEIYO
SEIKO**

Company Profile

Company Profile



Involvement in Quality Control and Environmental Protection.

Our company, together with our various group offices have received an automotive industry quality management system standard, the IATF16949 certification. In addition, regarding the environmental protection, we are certified with the ISO14001. As the good corporate citizen that we are, we will continue striving to achieve both, product quality assurance and environmental protection. We will ensure compliance to laws and regulations and ISO standards.

Quality First



IATF 16949 Certification

PEC Manufacturing (Thailand) Ltd.
January 2018 (IATF 16949:2016)
PEC de Mexico S.A. de C.V. (Guanajuato)
April 2018 (IATF 16949:2016)
Ogaki Factory, Ogaki West Factory certified in
September 2018 (IATF 16949:2016)



ISO/IEC 17025 Certification

Quality Assurance Dept. Testing sect certified in
October 2001 (ISO/IEC 17025)
Quality Assurance Dept. Testing sect certified in
December 2006 (ISO/IEC 17025:2005)



ISO 9000 Certification

Automotive parts Dept. and Air Conditioning parts Dept.
certified in May 1997 (ISO 9001)
Electric parts Dept. (ISO 9002)
PEC of America Corp. certified in
December 1997 (ISO 9002)
PEC de Mexico S.A. de C.V. (Tijuana) certified in
October 2001 (ISO 9001:2009)
Pacific Engineering Corporation certified in
May 2003 (ISO 9001:2000)
PEC Manufacturing (Thailand) Ltd. certified in
June 2003 (ISO 9001:2000)
PEC Manufacturing (Thailand) Ltd. certified in
February 2009 (ISO 9001:2008)
PEC de Mexico S.A. de C.V. (Tijuana) certified in
August 2010 (ISO 9001:2008)
Pacific Engineering Corporation certified in
September 2010 (ISO 9001:2008)
PEC de Mexico S.A. de C.V. (Guanajuato) certified in
February 2016 (ISO 9001:2008)
PEC Manufacturing (Thailand) Ltd. certified in
January 2018 (ISO 9001:2015)
PEC de Mexico S.A. de C.V. (Guanajuato) certified in
April 2018 (ISO 9001:2015)
Pacific Engineering Corporation certified in
September 2018 (ISO 9001:2015)



Create and earth-friendly environment



ISO 14001 Certification

The whole company certified in December 2001
Pacific Engineering Corporation certified in
November 2005 (ISO 14001:2004)
PEC Manufacturing (Thailand) Ltd. certified in
November 2010 (ISO 14001:2004)
Pacific Engineering Corporation certified in
November 2016 (ISO 14001:2015)
PEC Manufacturing (Thailand) Ltd. certified in
November 2017 (ISO 14001:2015)





Network

Pacific Engineering Corporation established its manufacturing base in the city of Ogaki, known as the 「Capital of Water」. With a focus on the Pacific rim region PEC supplies high-quality products to various regions in Japan. In addition, PEC offers a global service in line with the world's optimal procurement strategies through its production and sales activities out of its 3 poles: Japan, Mexico and Thailand.

Domestic Base

Head Quarter Factory Hinoki-cho 450, Ogaki city, Gifu prefecture.
TEL:0584-91-3131(Main) FAX:0584-91-6102

Ogaki Factory Kuzegawa-cho 7-5-8, Ogaki city, Gifu prefecture.
TEL:0584-81-3131(Main) FAX:0584-81-6102

Production centers abroad

Mexico PEC de México,S.A. de C.V. (Guanajuato)

Thailand PEC Manufacturing (Thailand) Ltd.

Sales offices abroad

North America PEC of America Corporation (San Diego Main Office)

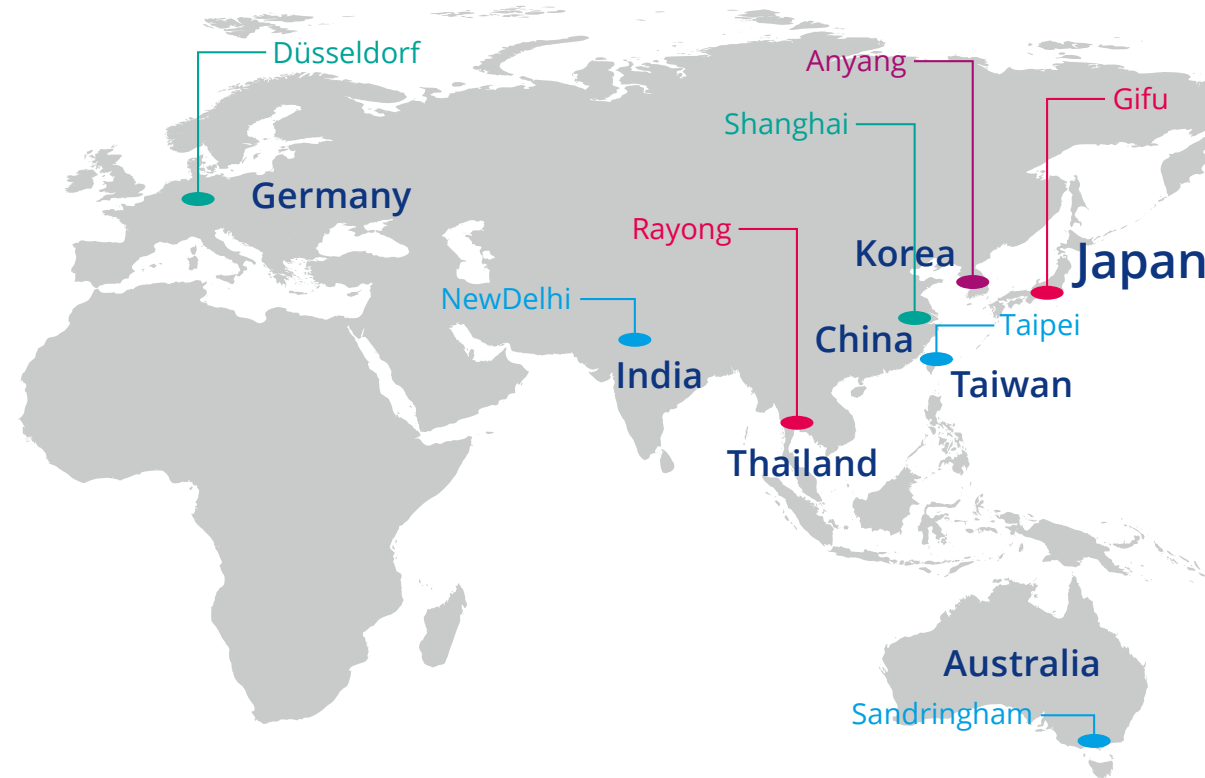
China PEC (Shanghai) Corporation

Germany PEC (Europe) GmbH

Technical Support offices abroad

North America PEC of America Corporation, Detroit Technical Office

Korea Pacific Engineering Coporation Korea Korea Technical Office.



Head Quarter Factory



Ogaki Factory



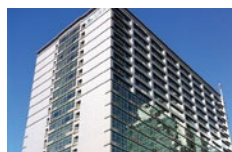
PEC of America Corporation, Detroit Technical Office



PEC of America Corporation (San Diego Main Office)



PEC de México,S.A. de C.V. (Guanajuato)



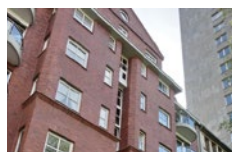
PEC Korea Technical Office.



PEC (Shanghai) Corporation



PEC Manufacturing (Thailand) Ltd.



PEC (Europe) GmbH

Copmany Overview

Official company name	Taiheyo Seiko Kabushiki Kaisha
Name in English	Pacific Engineering Corporation
Establishment	October 3rd, 1961
HQ address	Hinoki-cho 450, Ogaki city, Gifu prefecture, Japan, 503-0981 TEL 0584-91-3131 (Main) FAX 0584-91-6102
Business Overview	Automotive Fuse development and production Precision metal stamping, Tooling die manufacturing
Capital	JPY 98,400,000
Sales	JPY 23,600,000,000 (as of March 2018)
Employees	Domestic: 383 (as of April 2018) Worldwide: 1196 (as of April 2018)
Directors	Chairman: Hirohisa Ogawa President: Takahisa Ogawa Vice President: Norio Io Managing Director Executive Officer: Tomonao Mekada Board of Directors Executive Officer: Toshinori Iwata Board of Directors Executive Officer: Koichiro Mabuchi Executive Officer: Yasushi Mawatari Executive Officer: Shigehiko Ogawa Executive Officer: Akihiko Yoshida Executive Officer: Manabu Ota Executive Officer: Kazuhiko Nakashima Auditor: Isao Kawamura

M E M O



Pacific Engineering Corporation

Head Quarter Factory Hinoki-cho 450, Ogaki city, Gifu prefecture. TEL : 0584-91-3131(Main) FAX : 0584-91-6102
Ogaki Factory Kuzegawa-cho 7-5-8, Ogaki city, Gifu prefecture. TEL : 0584-81-3131(Main) FAX : 0584-81-6102
URL : <http://www.pecj.co.jp> *We can respond to your RFQ through our web page. For details consult our home page.