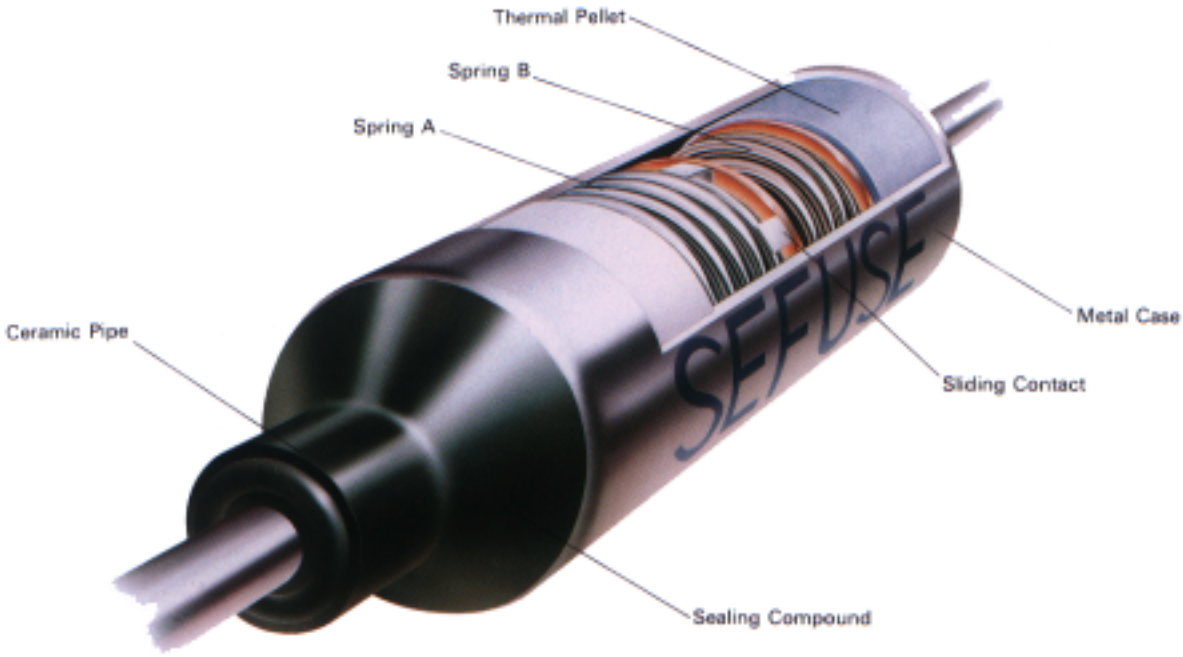
just imagine
NEC MULTIMEDIA

NEC

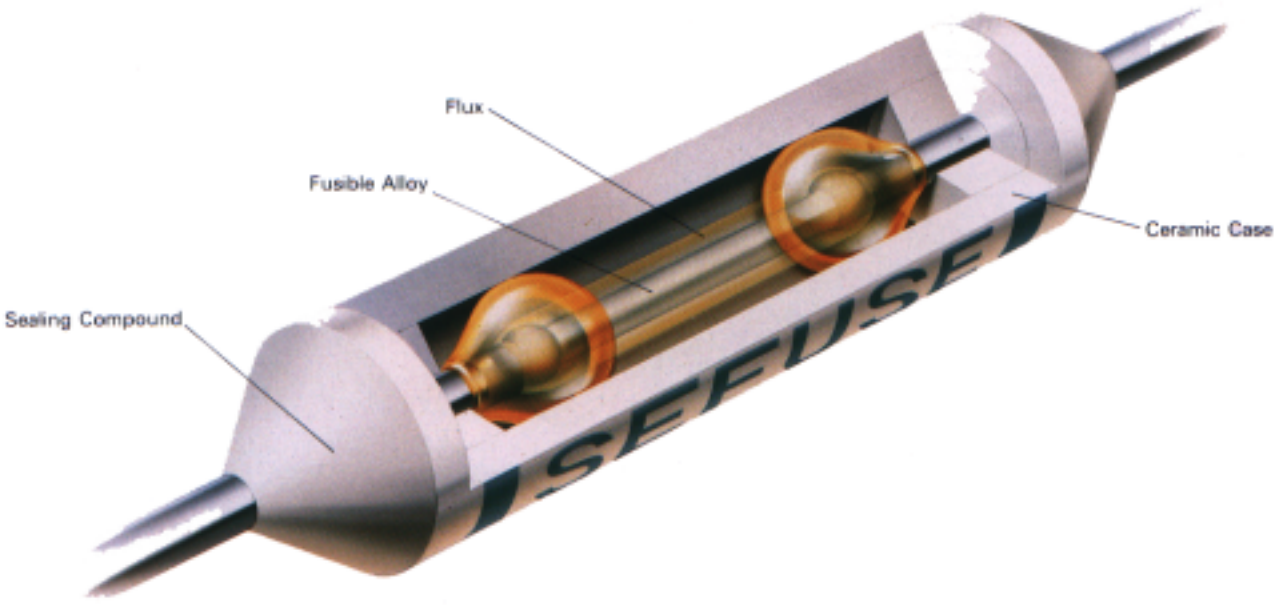
SEFUSE™
THERMAL CUTOFF 8th Edition

Cutaway View of SEFUSE™

SF Type



SF Type



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Series	Rated Current	Rated Functioning Temperature	Page
SF / E	10 Aa.c.	73 ˚C to 240 ˚C	8
SF / Y	15 Aa.c.	73 ˚C to 24C ˚C	8
SM / A	2 Aa.c.	70 ˚C to 187 ˚C	9
SM / B	1 Aa.c.	100 ˚C to 150 ˚C	9
SM / G	0.5 Aa.c.	100 ˚C to 150 ˚C	9

Select optimum series according to temperature and electrical ratings.

Please be sure to read the "Cautions" on pages 16 through 19 before using.

Introduction

NEC's SEFUSE™ is a compact and reliable thermal cutoff designed to protect domestic electrical appliances and industrial electrical equipment from fire. Cutoff occurs and an electrical circuit opens when ambient temperature increases to an abnormal level.

Two NEC SEFUSE types are available. The SF type uses an organic thermosensitive material as the thermal pellet and its operating temperature range is 73 ˚C to 240 ˚C.

The SM type uses a fusible alloy and has an operating range of 70 ˚C to 187 ˚C.

SEFUSE is manufactured in Japan and thailand, and both factories are ceritified by the International Standards Organization (ISO) for the ISO9001 quality standard. The factory in Japan is certified for the ISO 14001 environmental management system too.

Features

- Compact, durable, and reliable by resin-sealed construction
- One shot operation
- Excellently sensitive to abnomal temperature rise and high accuracy in operation
- Stable and precise operation
- Wide choice of types to suit the application (SF or SM)
- Meets many international safety standards

Applications

- Electric heaters, electric irons, hair dryers, electric blankets
- Air conditioners, compressors, washing machines, electric fans, ventilation fans, electric pencil sharpeners, electric sewing machines, copy machines, various motors
- Color televisions, LCD televisions, stereo equipment, lamps, fluorescent lamps, electric shavers, video and audio cassette recorders, various transformers, AC adaptor, charger, Battery packs
- Rice cookers, microwave ovens, electric refrigerators, electric water pots, toasters, electric pans, coffee makers, juicers, dish dryers
- Gas boilers, gas heaters, oil heaters, cameras, telephone switching (PBX) equipment

Safety standards

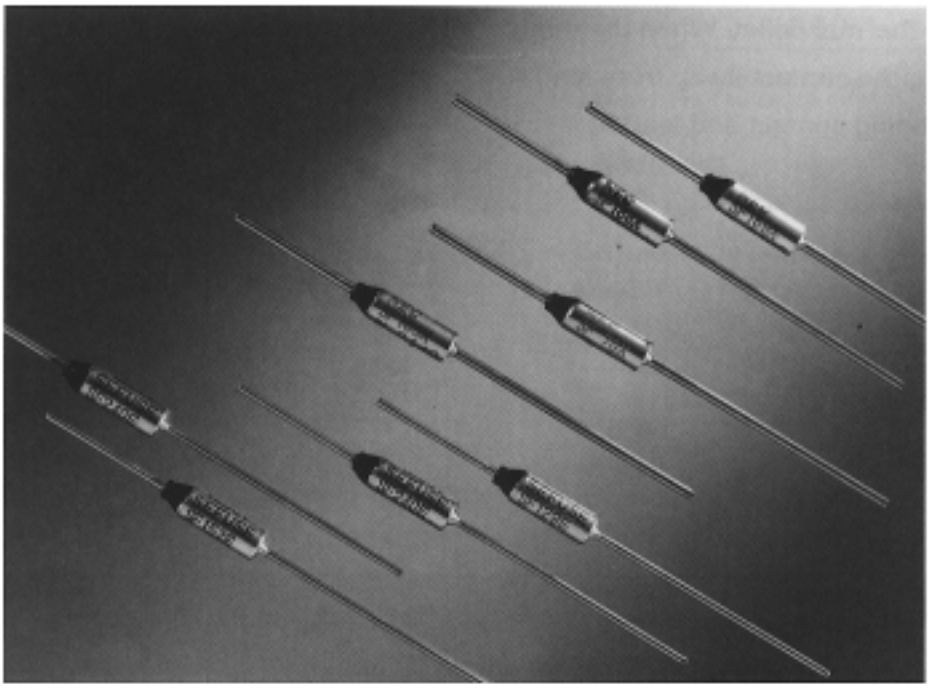
Japan	UL	CSA	VDE	BEAB
Electrical Appliance and Material Control Law of Japan	Underwriters Laboratories Inc. (U. S. A.)	Canadian Standards Association	Verband Deutscher Elektrotechniker e.V. (F. R. G.)	British Electrotechnical Approvals Board

Product Types

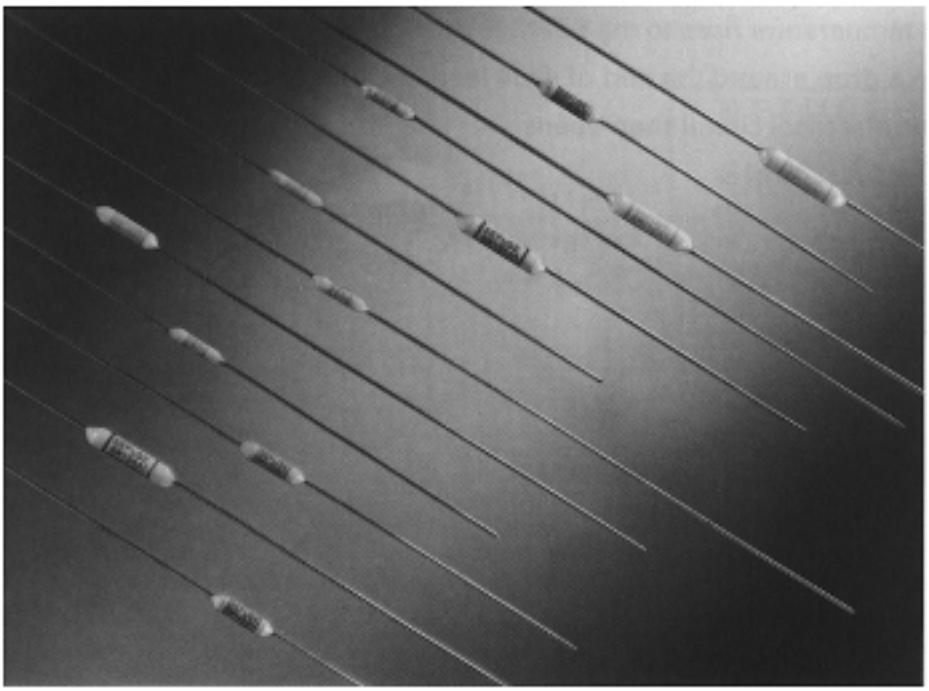
The SF type uses an organic thermosensitive pellet inside a metal case. It features a large cutoff (rated) current of 10 A or 15 A.

The SM type uses a fusible alloy inside a ceramic case. It has a cutoff(rated)current of 0.5 A, 1 A or 2 A. Because of its insulated case, the SM type can be attached directly where temperature detection is required.

- SF Type



- SM Type

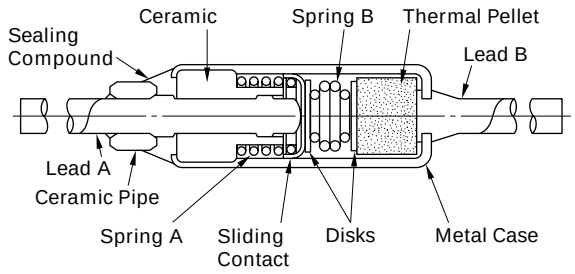


Operating Principle

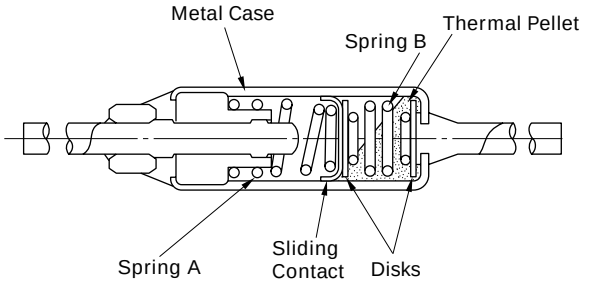
SF Type

THE SF type contains a sliding contact, springs, and a thermal pellet inside a metal case. When spring B is compressed, firm contact between lead A and the sliding contact occurs. This presses two disks against the sliding contact and the thermal pellet. At normal temperatures, current flows from lead A to the sliding contact and then through the metal case to lead B. When the ambient temperature rises to the SEFUSE operating temperature, the heat transferred through the metal case melts the thermal pellet. When the thermal pellet melts, springs A and B expand, moving the disk and sliding the contact away from lead A. The electrical circuit is opened by breaking contact between the sliding contact and lead A.

- Before Operation



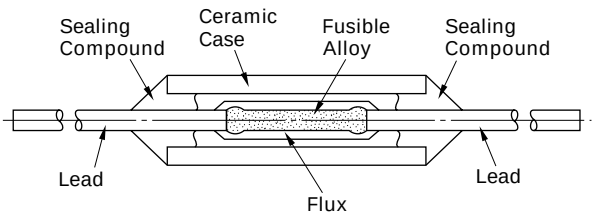
- **After Operation**



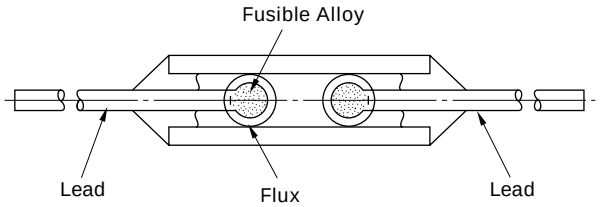
SM Type

In the SM type, leads A and B are connected by a conductive thermal pellet (fusible alloy). The current flows directly from one lead to the other. The fusible alloy is coated with a special flux. When ambient temperature rises to the SEFUSE operating temperature, the fusible alloy melts and condenses into a drop around the end of each lead because of surface tension and the coating of special flux. The electrical circuit then opens.

- Before Operation



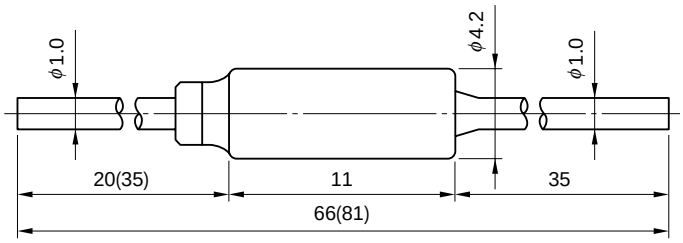
- **After Operation**



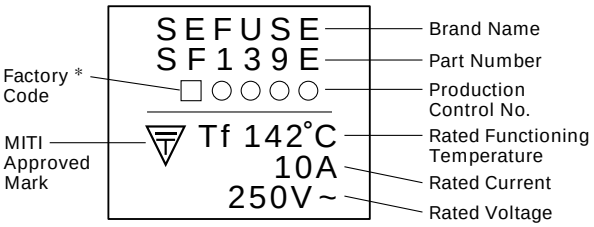
Drawings Dimensions, and Marking

SF Type

- SF/E Series — Unit : mm

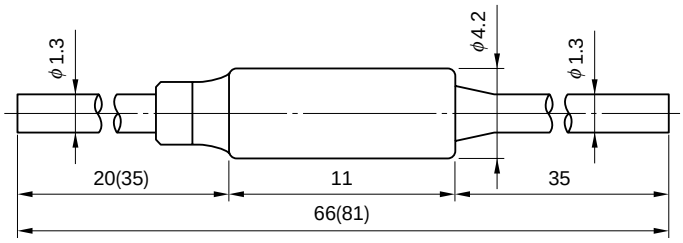


- MARKING

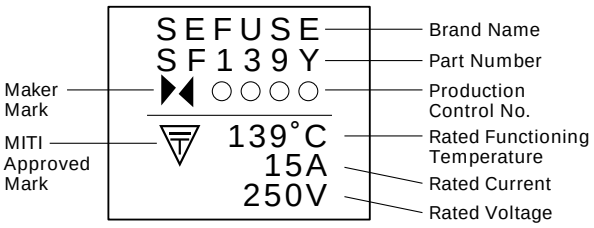


* Factory Code represents the factory location as shown below.
Japan : none, Thailand : B

- SF/Y Series — Unit : mm



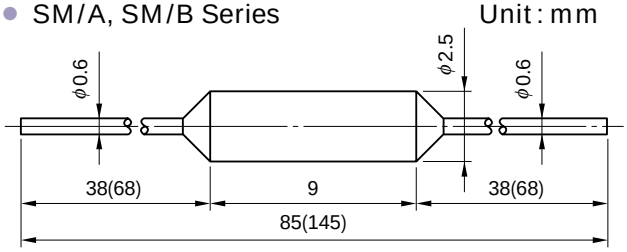
- MARKING



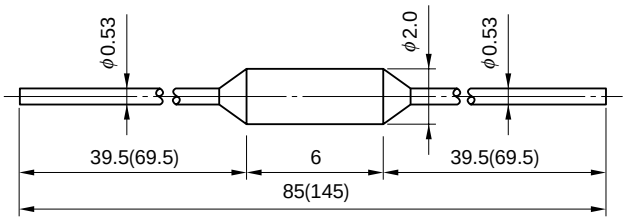
Note: The dimensions for long lead devices are in parentheses.

SM Type

- SM/A, SM/B Series — Unit : mm

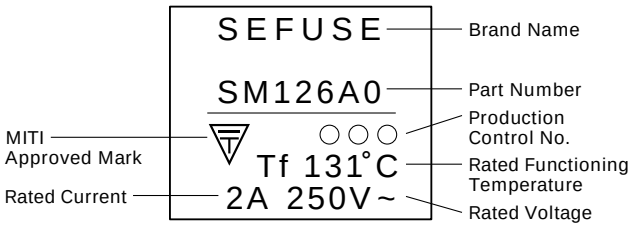


SM/A

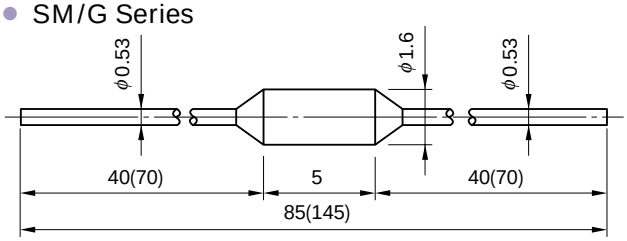


SM/B

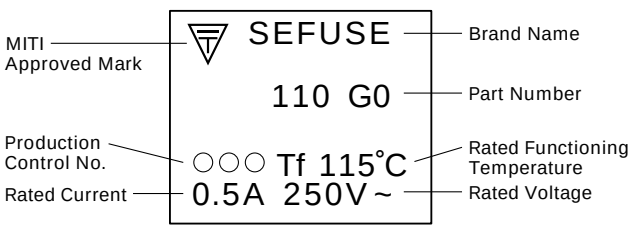
- MARKING



- SM/G Series



- MARKING



Note: The dimensions for long lead devices are in parentheses.

Standard Ratings

SF Type

SF/E Series

Part Number 1)	Rated Functioning Temperature TF, Tf	Operating Temperature	T_H Th TC	T_M Tm	Rated Current	Rated Voltage	Safety Standard				▽	
							UL	CSA	VDE	BEAB	made in Japan	made in Thailand
SF 70E	73 ˚C	70±2 ˚C	45 ˚C	150 ˚C	2) 10 A (AC)	3) 250 V (AC)	E71747 4)	LR 52330	5) 6778.2 –1171 –0002	C0632	33–312	33–835
SF 76E	77 ˚C	76± $^{0}_{4}$ ˚C	51 ˚C	150 ˚C								
SF 91E	94 ˚C	91± $^{3}_{1}$ ˚C	66 ˚C	150 ˚C							33–331	33–834
SF 96E	99 ˚C	96±2 ˚C	71 ˚C	150 ˚C								
SF109E	113 ˚C	109± $^{3}_{1}$ ˚C	84 ˚C	150 ˚C							33–332	33–833
SF119E	121 ˚C	119±2 ˚C	94 ˚C	150 ˚C							33–333	33–832
SF129E	133 ˚C	129±2 ˚C	104 ˚C	159 ˚C								
SF139E	142 ˚C	139±2 ˚C	114 ˚C	159 ˚C							33–334	33–831
SF152E	157 ˚C	152±2 ˚C	127 ˚C	172 ˚C								
SF169E	172 ˚C	169± $^{1}_{3}$ ˚C	144 ˚C	189 ˚C					(6778.2 –4510 –1008)		33–335	33–830
SF188E	192 ˚C	188± $^{3}_{1}$ ˚C	164 ˚C	300 ˚C							33–336	33–886
SF214E	216 ˚C	214± $^{1}_{3}$ ˚C	189 ˚C	350 ˚C							33–549	33–827
SF226E	227 ˚C	226± $^{1}_{3}$ ˚C	190 ˚C	2)							33–354	33–828
SF240E	240 ˚C	237±2 ˚C	190 ˚C	350 ˚C								

Note : 1) Part numbers are for standard lead devices. For long leads, add the number "–1" at the end of part number.

2) The maximum temperature limit of SF226E is partially approved as shown below.

T_M.Tm	UL	CSA	VDE	BEAB
SF226E	240˚C *	330˚C	300˚C	300˚C

* Under application to increase to over 300˚C

3) The additional electrical ratings are recognized by UL and CSA as follows.
UL : 277 Vac / 15 Aac (Resistive), 240 Vac / 15 Aac (Resistive), 120 Vac / 15 Aac (Resistive, Inductive)
CSA : 250 Vac max. / 15 Aac max. (Resistive, Inductive)

4) SF169E, SF188E, SF214E, SF226E and SF240E are also UL-recognized of optional CH-rating (Conductive Heat Aging Test).

5) The VDE recognized file number had been changed in February 1998. The number in parentheses are previous file number.

SF/Y Series

Part Number 1)	Rated Functioning Temperature	Operating Temperature	Rated Current	Rated Voltage	Safety Standard ▽
SF 70Y	73 ˚C	70±2 ˚C	15 A (AC)	250 V (AC)	33–312
SF 76Y	77 ˚C	76± $^{0}_{4}$ ˚C			
SF 91Y	94 ˚C	91± $^{3}_{1}$ ˚C			33–331
SF 96Y	99 ˚C	96±2 ˚C			
SF109Y	113 ˚C	109± $^{3}_{1}$ ˚C			33–332
SF119Y	121 ˚C	119±2 ˚C			33–333
SF129Y	133 ˚C	129±2 ˚C			
SF139Y	142 ˚C	139±2 ˚C			33–334
SF152Y	157 ˚C	152±2 ˚C			
SF169Y	172 ˚C	169± $^{1}_{3}$ ˚C			33–335
SF188Y	192 ˚C	188± $^{3}_{1}$ ˚C			33–336
SF214Y	216 ˚C	214± $^{1}_{3}$ ˚C			33–549
SF226Y	227 ˚C	226± $^{1}_{3}$ ˚C			33–354
SF240Y	240 ˚C	237±2 ˚C			

Note : 1) Part numbers are for standard lead devices. For long leads, add the number "–1" at the end of part number.

SM Type

#) The VDE recognized file number had been changed in February 1998. The number in parentheses are previous file number.

SM/A Series

Part Number 1)	Rated Functioning Temperature TF, Tf	Operating Temperature	T_H Th TC	T_M Tm	Rated Current	Rated Voltage	Safety Standard				
							UL	CSA	VDE	BEAB	
SM065A0	70 ˚C	65±2 ˚C	40 ˚C	80 ˚C	2 A (AC)	250 V (AC)	E71747	LR52330	#)		33–528
SM095A0	100 ˚C	95$\pm^{5}_{0}$ ˚C	65 ˚C	115 ˚C					6778.2 –1171 –0001	C0600	33–466
SM110A0	115 ˚C	110±2 ˚C	80 ˚C	125 ˚C							33–472
SM126A0	131 ˚C	126±2 ˚C	96 ˚C	140 ˚C							33–467
SM130A0	135 ˚C	130±2 ˚C	100 ˚C	145 ˚C					(6778.2 –4510 –1007)		
SM145A0	150 ˚C	145±2 ˚C	115 ˚C	160 ˚C							33–468
SM164A0	169 ˚C	164$\pm^{3}_{2}$ ˚C	133 ˚C	180 ˚C							33–470
SM182A0	187 ˚C	182±2 ˚C	152 ˚C	195 ˚C							33–556

Note : 1) Part numbers are for standard devices. For long leads, change the last number from 0 to 1.

SM/B Series

Part Number 1)	Rated Functioning Temperature TF, Tf	Operating Temperature	T_H Th TC	T_M Tm	Rated Current	Rated Voltage	Safety Standard				
							UL	CSA	VDE	BEAB	
SM095B0	100 ˚C	95$\pm^{5}_{0}$ ˚C	65 ˚C	115 ˚C	1 A (AC)	250 V (AC)	E71747	LR52330	#) 6778.2 –1171 –0004	C0557	33–466
SM110B0	115 ˚C	110±2 ˚C	80 ˚C	125 ˚C							33–472
SM126B0	131 ˚C	126±2 ˚C	96 ˚C	140 ˚C							33–467
SM130B0	135 ˚C	130±2 ˚C	100 ˚C	145 ˚C					(6778.2 –4510 –1009)		
SM145B0	150 ˚C	145±2 ˚C	115 ˚C	160 ˚C*							33–468

Note : 1) Part numbers are for standard devices. For long leads, change the last number from 0 to 1.
* Tm of SM145B for CSA is 155 ˚C

SM/G Series

Part Number 1)	Rated Functioning Temperature TF, Tf	Operating Temperature	T_H Th TC	T_M Tm	Rated Current	Rated Voltage	Safety Standard				
							UL	CSA	VDE	BEAB	
SM095G0	100 ˚C	95$\pm^{5}_{0}$ ˚C	65 ˚C	115 ˚C	2) 0.5 A (AC)	2) 250 V (AC)	E71747	LR52330	#) 6778.2 –1171 –0003	C0743	33–466
SM110G0	115 ˚C	110±2 ˚C	80 ˚C	125 ˚C							33–472
SM126G0	131 ˚C	126±2 ˚C	96 ˚C	140 ˚C							33–467
SM130G0	135 ˚C	130±2 ˚C	100 ˚C	145 ˚C					(6778.2 –4510 –1005)		
SM145G0	150 ˚C	145±2 ˚C	115 ˚C	155 ˚C							33–468

Note : 1) Part numbers are for standard lead devices. For long leads, change the last number from 0 to 1.
2) The additional electrical ratings are recognized by UL as follows.
SM095G : DC 50 V / 3 A,
SM110G, SM126G, SM130G, SM145G : DC 50 V / 5 A

Definition of Terms

- Rated Functioning Temperature

  Rated functioning temperature is the operating temperature of thermal cutoffs, measured using the method specified in the safety standard. In present E.A.M.C. (Electrical Appliance and Material Control) Law of Japan, Valid until June 2001, the operation should be within the specified operating temperature range of ± 7˚C. In various standards such as UL, CSA, VDE, BEAB and new E.A.M.C. Low of Japan, which comply with the IEC standard, it is called the rated functioning temperature, and should operate within the prescribed temperature range of +0/–10 ˚C.

  It is represented by the symbol T_F in the UL standard, and by the symbol Tf in the CSA, VDE and BEAB and new E.A.M.C. standards.

  In SEFUSE, a temperature that complies with both standards is set as the rated functioning temperature, and is indicated on the body of the thermal cutoff.

- Operating Temperature

  Operating temperature is the actual operating temperature range when the thermal cutoff is made to operate inside a constant temperature oven whose temperature is raised at the rate of 1 ˚C/min. while a detection current of 100 mA or lower is applied.

  The operating temperature is a standard set by NEC and is not specified by a safety standard.

- T_H, Th, Tc (Holding Temperature)

  Holding temperature is the maximum temperature at which, when applying a rated current to the thermal cutoff, the state of conductivity is not changed during specified time not hess than 168 hours (1 week).

  It is represented by the symbol T_H in the UL standard, Th in the CSA standard, and Tc in the VDE, BEAB and new E.A.M.C. standards.

- T_M, Tm (Maximum Temperature Limit)

  Maximum temperature limit is the temperature up to which thermal cutoffs will not change its state of cutoff without impairing.

  It is represented by the symbol T_M in the UL standard and by Tm in the CSA, VDE, BEAB and new E.A.M.C. standards.

- Rated Current

  Reted current is the maximum current that thermal cutoffs allow to carry and are able to cutoff the circuit in safety.

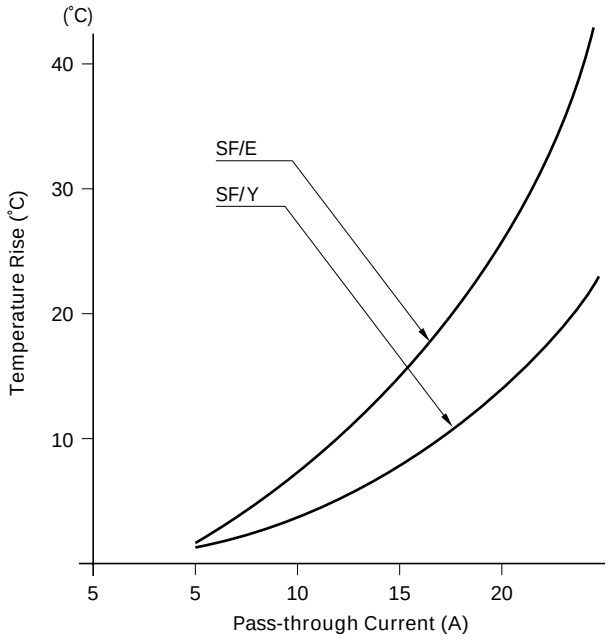
- Rated Voltage

  Reted voltage is the maximum voltage that is allowed to apply to the circuit in wich the thermal cutoff is used.

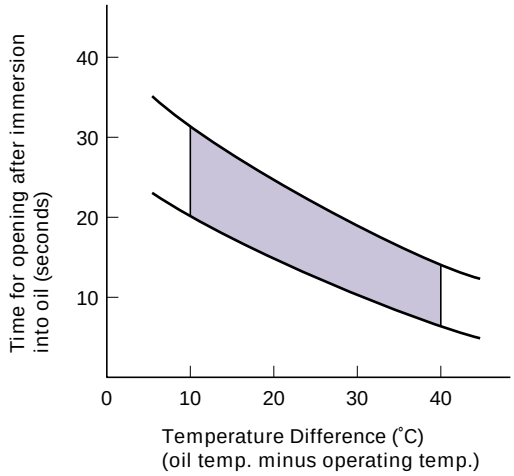
Performance Data

SF/E & SF/Y Series

Temperature Rise



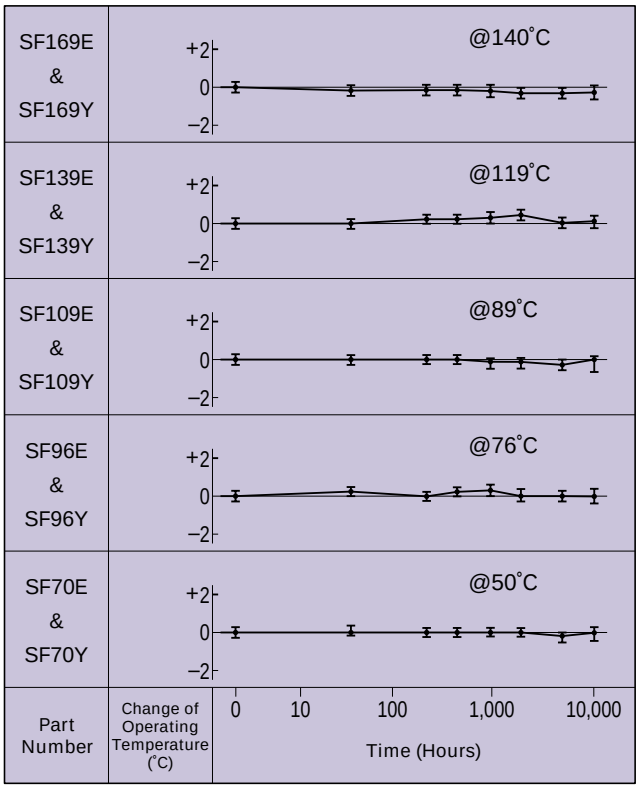
Response Time



Initial Characteristics

Part Number	Operating Temperature (˚C)	Insulation Resistance after Operation (MΩ)	Withstand Voltage after Operation (kV)	Internal Resistance (mΩ/25 mm)
SF169E & SF169Y	169 / 168 / 167	10^6 / 10^5 / 10^4	2.0 / 1.5 / 1.0	1.5 / 1.0 / 0.5 (E / Y)
SF139E & SF139Y	140 / 139 / 138	10^6 / 10^5 / 10^4	2.0 / 1.5 / 1.0	1.5 / 1.0 / 0.5 (E / Y)
SF109E & SF109Y	112 / 111 / 110	10^6 / 10^5 / 10^4	2.0 / 1.5 / 1.0	1.5 / 1.0 / 0.5 (E / Y)
SF96E & SF96Y	97 / 96 / 95	10^6 / 10^5 / 10^4	2.0 / 1.5 / 1.0	1.5 / 1.0 / 0.5 (E / Y)
SF70E & SF70Y	71 / 70 / 69	10^6 / 10^5 / 10^4	2.0 / 1.5 / 1.0	1.5 / 1.0 / 0.5 (E / Y)

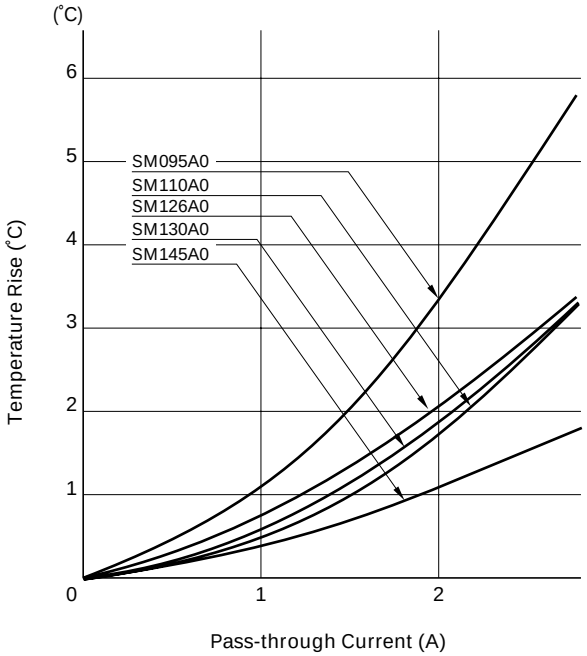
High Temperature Storage Test



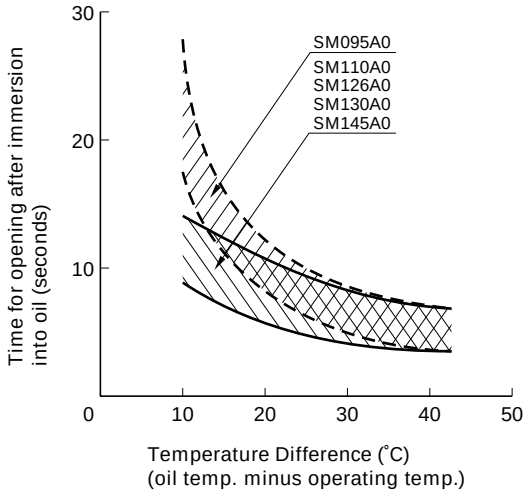
Note : The values following @ are the storage temperature.

SM/A Series

Temperature Rise



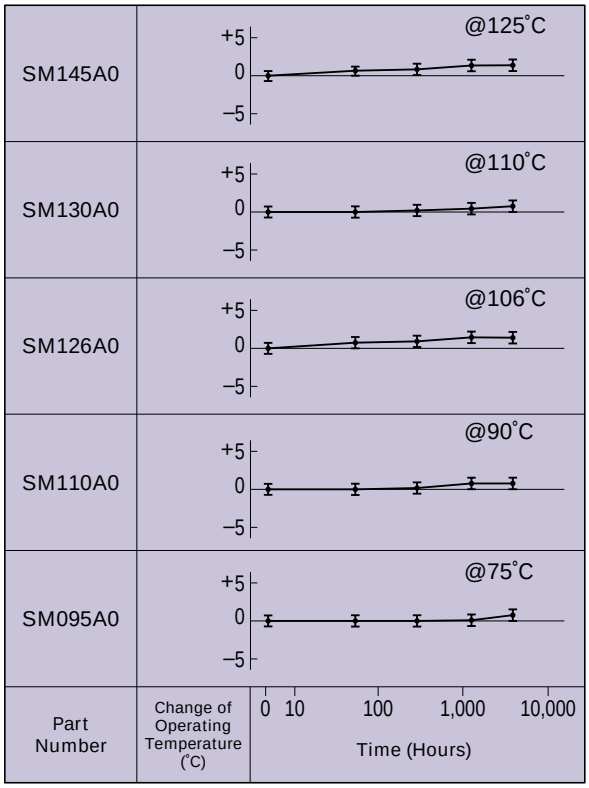
Response Time



Initial Characteristics

Part Number	Operating Temperature (˚C)	Insulation Resistance after Operation (MΩ)	Withstand Voltage after Operation (kV)	Internal Resistance (mΩ/25 mm)
SM145A0	146 / 145 / 144	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	3.4 / 3.0 / 2.6
SM130A0	131 / 130 / 129	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.4 / 4.0 / 3.6
SM126A0	127 / 126 / 125	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.4 / 4.0 / 3.6
SM110A0	111 / 110 / 109	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.4 / 4.0 / 3.6
SM095A0	99 / 98 / 97	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	11 / 9 / 7

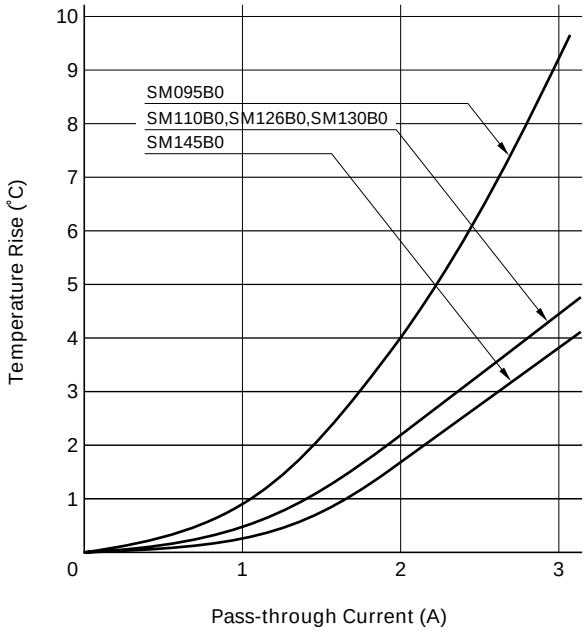
High Temperature Storage Test



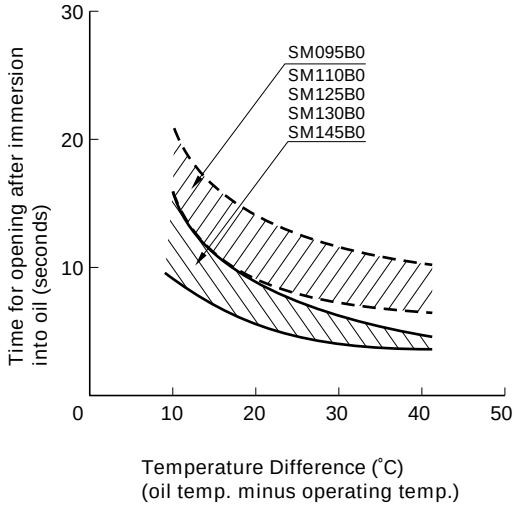
Note : The values following @ are the storage temperature.

SM/B Series

Temperature Rise



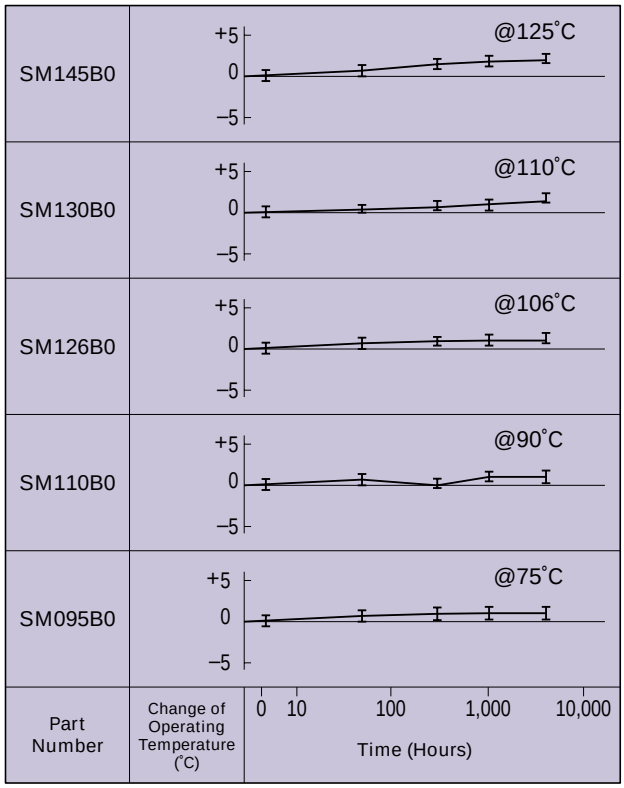
Response Time



Initial Characteristics

Part Number	Operating Temperature (˚C)	Insulation Resistance after Operation (MΩ)	Withstand Voltage after Operation (kV)	Internal Resistance (mΩ/25 mm)
SM145B0	146 / 145 / 144	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.0 / 3.5 / 3.0
SM130B0	130 / 129 / 128	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.7 / 4.6 / 4.5
SM126B0	127 / 126 / 125	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.8 / 4.6 / 4.4
SM110B0	112 / 111 / 110	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	4.7 / 4.6 / 4.5
SM095B0	98 / 97 / 96	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	9.5 / 9.0 / 8.0

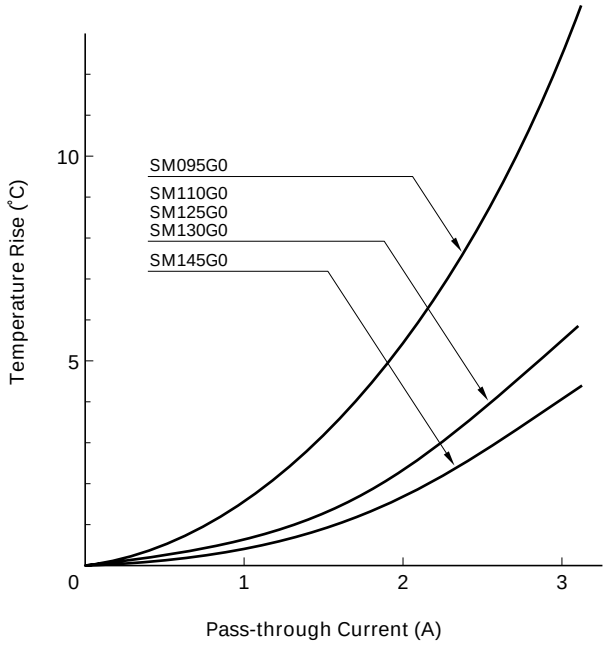
High Temperature Storage Test



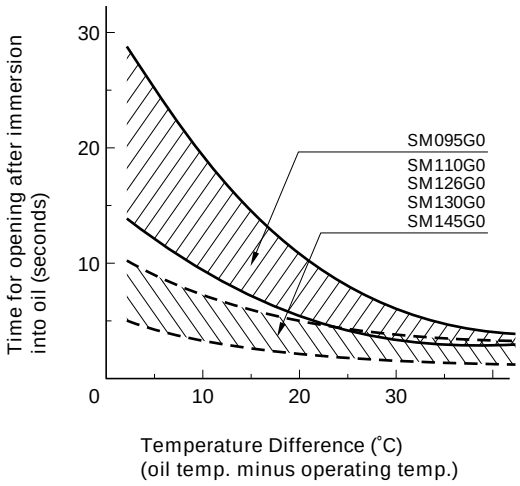
Note : The values following @ are the storage temperature.

SM/G Series

Temperature Rise



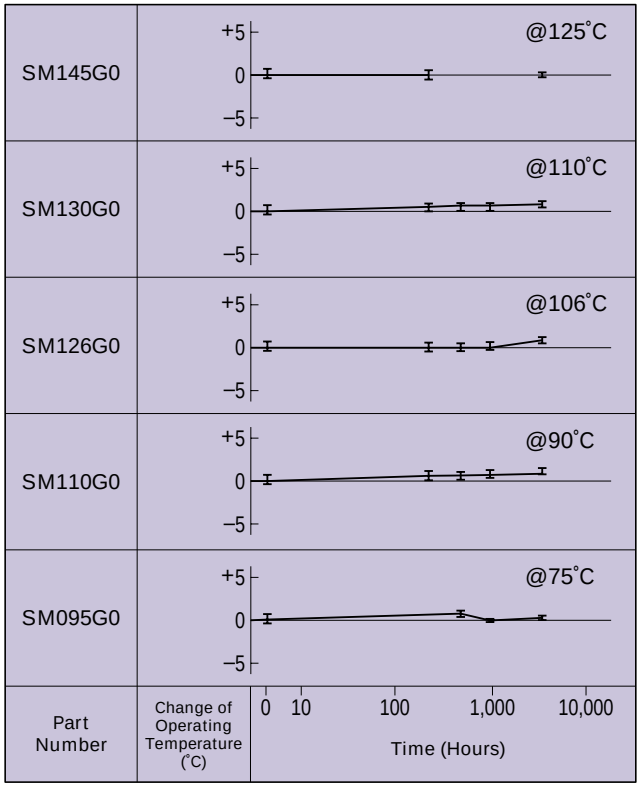
Response Time



Initial Characteristics

Part Number	Operating Temperature (˚C)	Insulation Resistance after Operation (MΩ)	Withstand Voltage after Operation (kV)	Internal Resistance (mΩ/25 mm)
SM145G0	146 / 145 / 144	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	5.0 / 4.0 / 3.0
SM130G0	131 / 130 / 129	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	6.0 / 5.0 / 4.0
SM126G0	127 / 126 / 125	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	6.0 / 5.0 / 4.0
SM110G0	112 / 111 / 110	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	6.0 / 5.0 / 4.0
SM095G0	99 / 98 / 97	10^6 / 10^5 / 10^4	3.0 / 2.0 / 1.0	13.0 / 11.0 / 9.0

High Temperature Storage Test



Note : The values following @ are the storage temperature.

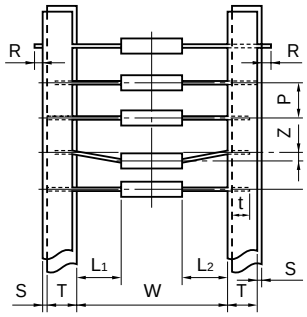
Lead Cutting and Taping

NEC will perform lead cutting or taping as requested by customers.

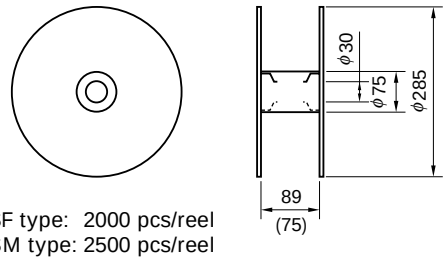
○ Applicable Products

- SF type : SF＊＊＊E (only for lead cutting), SF＊＊＊E-1
  Does not apply to the SF/Y series.
- SM type : SM＊＊＊A0, SM＊＊＊B0, SM＊＊＊G0 (short lead type)

○ Taping



reel



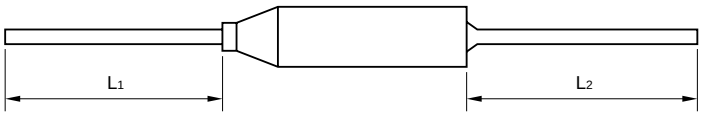
SF type: 2000 pcs/reel
SM type: 2500 pcs/reel

(Unit : mm)

W	P	L1-L2	T	Z	R	t	S
52±2	5±0.5	2.0	6±1	2.0	0.5	3.2	0.8
63±2							
67±2							

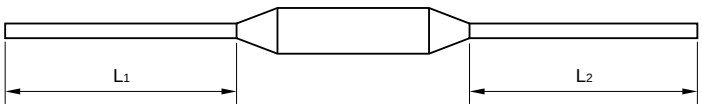
○ Lead Cutting

- SF Type



L1 : 7 to 30
L2 : 7 to 33 (mm)

- SM Type



L1, L2 : 7 to 33 (mm)

For more information on dimensions not described in diagrams above, please call NEC.

Cautions

This section describes cautions designed to protect the performance of the thermal cutoff. Be sure to read and fully understand these cautions.

To obtain full performance from the thermal cutoff, it is necessary for the customer to appropriately store the thermal cutoff, design appropriate circuits for the application, and perform evaluations, mounting and testing as necessary. Problems arising from the inappropriate execution of the above are the responsibility of the customer, and NEC declines any and all responsibility.

Design Cautions

- Do not use this device for and purpose other than as a thermal cutoff.
  The thermal cutoff is designed to detect abnormal rises in temperature and break circuits if needed. It is not a current fuse that cuts excess current. If used as a current fuse, the SEFUSE may malfunction.

- Do not use this device in aerospace equipment, aeronautical equipment, nuclear reactor control systems, life support equipment or systems, transportation machinery engine control or safety-related equipment.
  This device is designed for use in household electric appliance, office automation equipment, audio and video equipment, computer communications equipment, test and measurement equipment, personal electronic equipment and transportation equipment (excluding engine control).

- The customer should select the proper thermal cutoff device, mounting location, and mounting method as appropriate for each application.
  Verify whether the chosen selections are appropriate by repeatedly testing the final design for thermal cutoff under normal conditions as well as under predicted maximum abnormal conditions.

- Make designs so that the temperature of the body of the thermal cutoff does not exceed the temperatures shown in Table 1.
  If, the temperature is exceeded on a regular basis, the thermal cutoff may start operating only at temperature lower than the normal operating temperature. Malfunctions may also occur. Even if the thermal cutoff's operating temperature is exceeded, it may malfunction.

SM Type		SF Type	
Type	Body Temperature	Type	Body Temperature
SM065A	45 ˚C	SF 70E, Y	50 ˚C
SM095A, B, G	75 ˚C	SF 76E, Y	56 ˚C
SM110A, B, G	90 ˚C	SF 91E, Y	71 ˚C
SM126A. B. G	106 ˚C	SF 96E, Y	76 ˚C
SM130A, B, G	110 ˚C	SF109E, Y	89 ˚C
SM145A, B, G	125 ˚C	SF119E, Y	99 ˚C
SM164A	140 ˚C	SF129E, Y	109 ˚C
SM182A	140 ˚C	SF139E, Y	119 ˚C
		SF152E, Y	132 ˚C
		SF169E, Y	140 ˚C
		SF188E, Y	140 ˚C
		SF214E, Y	140 ˚C
		SF226E, Y	140 ˚C
		SF240E, Y	140 ˚C

Table 1

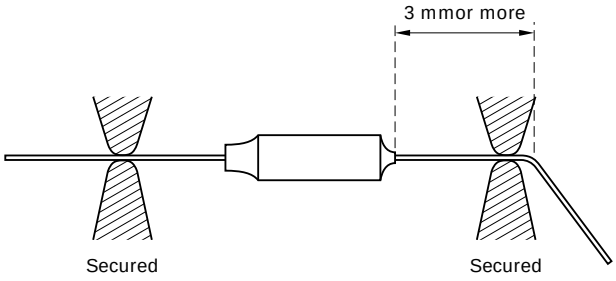
- The body temperature of the thermal cutoff becomes higher as current passes through and might rise higher than the ambient operating temperature (see test data). The temperature may rise even higher depending on the mounting method and other conditions. Therefore, after mounting the thermal cutoff under the same conditions you would use for the actual application, work the final product and measure the body temperature of the thermal cutoff.

- Use the thermal cutoff with a voltage and current level lower than the rated level.
  If the thermal cutoff is used with a voltage or current level higher than the rated level, contacts may melt in the SF type, causing the fuse to malfunction. In the SM type, the body of the thermal cutoff may be destroyed.

- Do not use the thermal cutoff in water, organic solvents or other liquids, or environments containing sulfurous acid gas, nitrous acid gas, or high humidity. Doing so will cause deterioration of the sealing resin, the thermal cutoff may operate at lower than operating temperature, or any other malfunctions may occur. Also, the thermal cutoff may not operate even if its operating temperature is exceeded.

Lead wire process

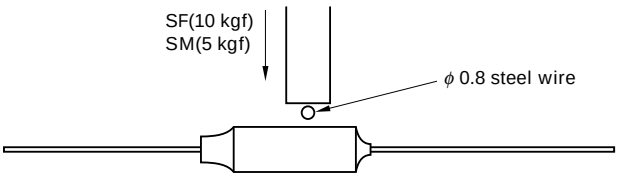
- When bending the lead wire, in order to protect the resin seal from excessive pressure, secure the lead wire close to the case and bend the part beyond the secured section.



The lead wire should be bent at a distance 3 mm or more from the body of the fuse, and should not be twisted.

- The tensile strength applied to the lead wire should be 5 kg or less for the SF type, and 1 kg or less for the SM type.

- The strength applied to the body of the thermal cutoff should be 10 kg or less for the SF type, and 5 kg or less for the SM type.



In the case of an SF type, deformation of the case may change the location of the moving electrode during operation and may cause the thermal cutoff to operate only at temperatures lower than the normal operating temperature range. The thermal cutoff also may not operate even if the thermal cutoff's operating temperature is exceeded.

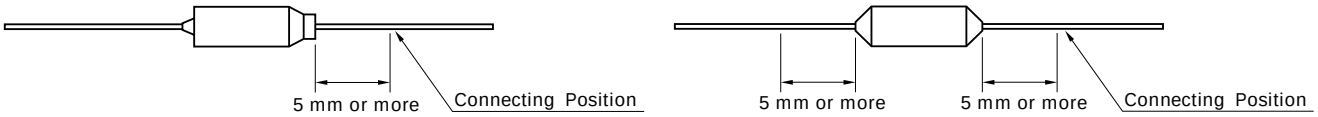
Mounting

SEFUSE can be mounted by soldering, caulking, or welding.

- If soldering, note that the thermal cutoff may not function because of excessive solder temperature.
  To prevent such malfunctions, for example, holding the lead new the case by a tool is effective for allowing the heat to escape, and the soldering should be done in short interval.
  Another effective method is to use a lower solder temperature and to solder at a location that is distant from the case.

- If caulking or welding, be careful to keep the resistance value of the connecting section low.
  If the connecting section has a high resistance value, the passing current may generate an abnormally high temperature that will cause the thermal cutoff to operate (break the circuit).

- It is recommended that the connecting position at the lead of resign-sealed side should be 5 mm or more from the body of the thermal cutoff.



- After mounting the thermal cutoff, be careful not to apply force that may pull, push or twist the lead wires.

- If using an SF type thermal cutoff, be sure not to make the lead on the resin-sealed side touch the case. This would cause the current to flow from the lead on the resin-sealed side to the opposite lead so that the thermal cutoff cannot break the circuit.
  Note that the body of the SF type is the same in potential as the circuit. Therefore, it must be electrically isolated from the other metalic part.

Storage

- The body and lead A of SF type, and the leads of SM164A and SM182A are silver-plated. Therefore, these parts may discolor because of sulfuration. In the case, the marking of the body will become difficult to discriminate or the solder-ability of lead will decline. To avoid this, the SEFUSE should not keep around materials (such as cardboard or rubber, etc.) which generate sulfurous acid gas.

- When the SEFUSE have to be storaged in a cardboard box, the SEFUSE's packs should be put into other bags (such as polyethylene) and make sure the packs seal.

Recommendation

- Be careful when mounting the thermal cutoff because external force, heat, or a harmful atmosphere (containing excessive humidity or sulfurous acid gas) may damage the characteristics of the thermal cutoff. If applicable, it is recommended to warn general consumers who are not aware of the usage cautions for the thermal cutoff not to mount, remove or replace the thermal cutoff through a note to this effect in the user's manual and other related material.

If you desire any clarifications or explanations regarding these cautions, please call an NEC sales representative.

The values contained in this document were obtained under certain testing conditions at NEC. They are not guaranteed and are for reference only.

The information in this document is based on documents issued in February, 1999 at the latest. The information is subject to change without notice. For actual design-in, refer to the latest publications of data sheet, etc., for the most up-date specifications of the device.

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NEC devices are classified into the following three quality grades:

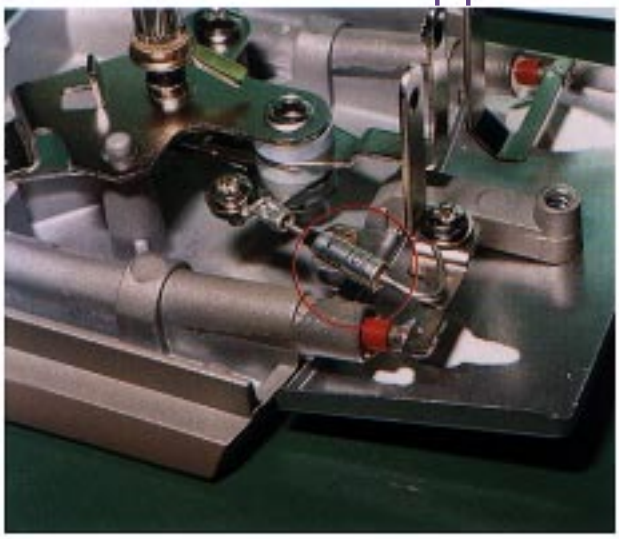
"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "Quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

- Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
- Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
- Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

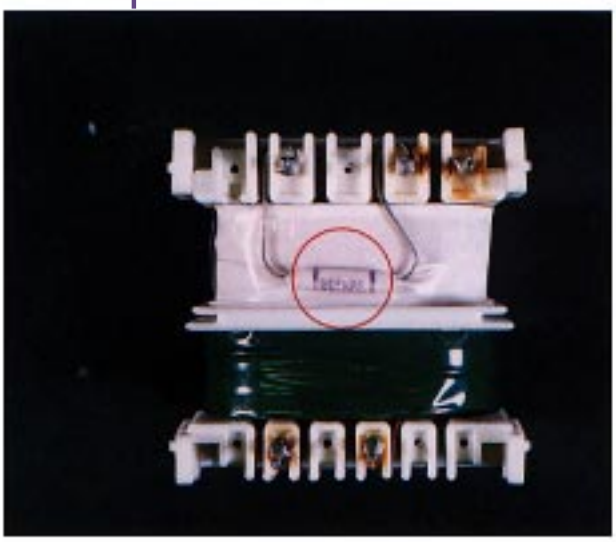
The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.

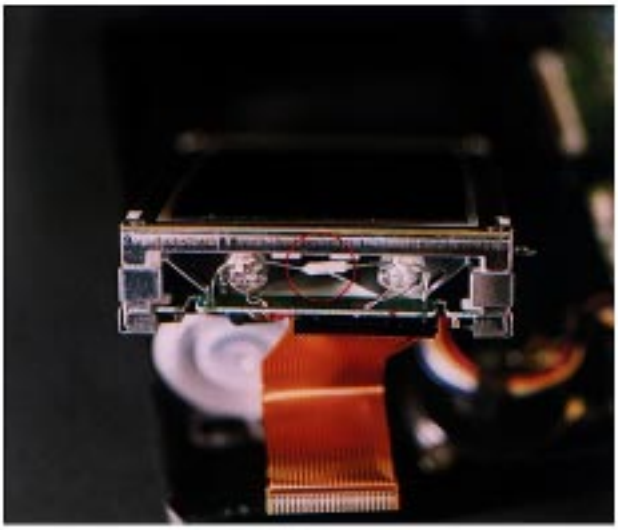
Application Examples



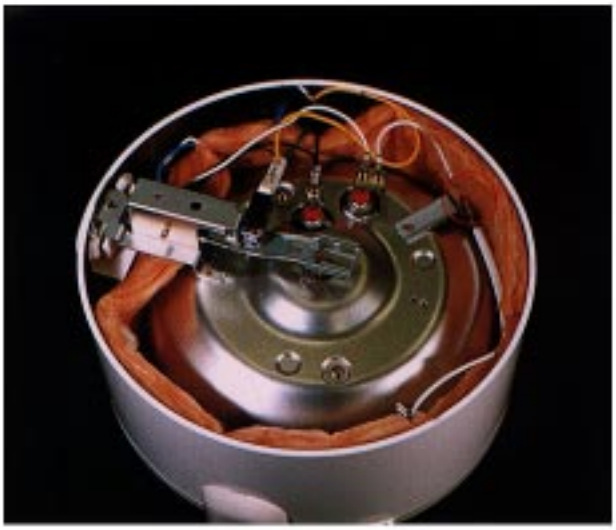
Electric Iron



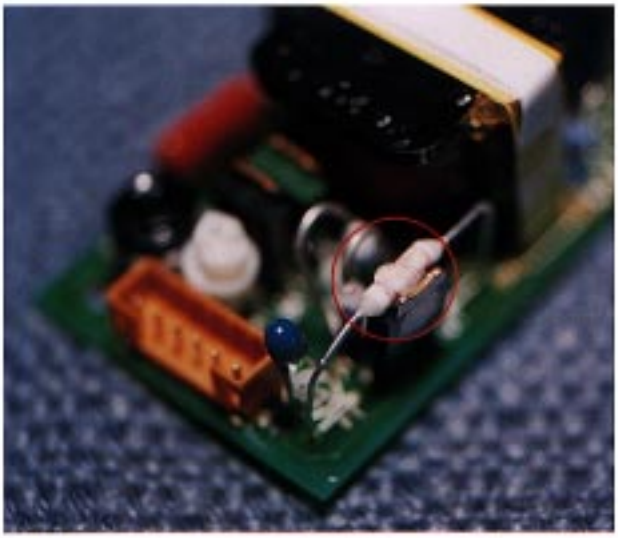
Transformer



LCD Television



Rice Cooker



Inverter for EL Light Drive

Remark(*)

For the purpose of photography, the insulation tube of the thermal cutoff has been removed.
In reality, the thermal cutoff is covered by the insulation tube.

For further information, please contact:

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